

STUDY TITLE

DAS-68416-4 (AAD-12) Soybean Feeding Study in the Broiler Chicken

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STUDY COMPLETION DATE

January 6, 2011

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Dow AgroSciences LLC: 101088

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STATEMENT OF NO DATA CONFIDENTIALITY CLAIM

No claim of confidentiality is made for any information contained in this study on the basis of its falling within the scope of FIFRA § 10 (d) (1) (A), (B) or (C).

Company: Dow AgroSciences LLC

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Signature: _____

Date: _____

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CERTIFICATION OF GOOD LABORATORY PRACTICE

This study was conducted in compliance with the United States Environmental Protection Agency's Good Laboratory Practice Standards (GLPs) 40 CFR Part 160, with the following exceptions:

- Water used for the test system was analyzed for coliform organisms, conductivity, organophosphates, minerals, nitrates and mercury utilizing tests conducted by Ag Source Food and Environmental Laboratories. This analysis was not conducted under GLPs.
- Statistical analyses were performed by Gary Cromwell, Ph.D., Animal Science Department, University of Kentucky, Lexington utilizing Statistical Analysis Software (SAS). The software was not validated.
- Additional exceptions are listed in the IV-B (Covance Laboratories Inc.) sub-report.

These exceptions had no effect on the quality or integrity of the study.

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Sponsor, Dow AgroSciences LLC

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QUALITY ASSURANCE STATEMENT

Quality Assurance Inspections of the study entitled "DAS-68416-4 (AAD-12) Soybean Feeding Study in the Broiler Chicken" GML Study No. 208-008-21

According to the records of the Quality Assurance Unit, the following inspections were conducted on the following dates:

| Date Reported to the | | | |
|-------------------------|--|--|---|
| <u>Date Inspected</u> | <u>Sponsor Monitor / Sponsor Monitor Mgmt.</u> | <u>Study Director / Study Dir. Mgmt.</u> | <u>Phase Inspected</u> |
| September 15, 2010 | September 15, 2010 / September 15, 2010 | September 15, 2010 / September 15, 2010 | Environmental Monitoring, Daily Observations |
| September 20, 2010 | September 24, 2010 / September 24, 2010 | September 24, 2010 / September 24, 2010 | Environmental Monitoring, Daily Observations |
| October 4, 2010 | October 8, 2010 / October 8, 2010 | October 8, 2010 / October 8, 2010 | Environmental Monitoring, Feed Consumption, Daily Observation |
| October 6, 2010 | October 8, 2010 / October 8, 2010 | October 8, 2010 / October 8, 2010 | Daily Observation, Feed Consumption |
| October 21, 2010 | October 28, 2010 / October 28, 2010 | October 28, 2010 / October 28, 2010 | Necropsy |
| November 10 & 11, 2010 | November 12, 2010 / November 12, 2010 | November 12, 2010 / November 12, 2010 | Study Data |
| December 1, 4 & 5, 2010 | December 6, 2010 / December 6, 2010 | December 6, 2010 / December 6, 2010 | Draft Report |
| January 4, 2011 | January 4, 2011 / January 4, 2011 | January 4, 2011 / January 4, 2011 | Final Report |

AUDITS CONDUCTED BY GLP TECHNOLOGIES, COVANCE, AND DOW AGROSCIENCES ARE LISTED ON THE QUALITY ASSURANCE STATEMENT PAGES OF THE SUB-REPORTS.

Date: _____

Daniel G. Motszko, M.S.
Quality Assurance Auditor, Genesis Midwest Laboratories

ANIMAL WELFARE STATEMENT

This document will certify that animals used in Genesis Midwest Laboratories Study No. 208-008-21, “DAS-68416-4 (AAD-12) Soybean Feeding Study in the Broiler Chicken” were treated in a humane manner and allowed *ad libitum* access to wholesome feed and water. The housing arrangement (indoor pens) provided adequate space. The animals received an initial health observation by a licensed veterinarian. The animals were humanely sacrificed at the end of the study in accordance with accepted AVMA practices (JAVMA, Vol 28, No.5, 3/1/2001).

Dale W. Fletcher, B.S.
Study Director, Genesis Midwest Laboratories

Date

REPORT APPROVAL AND ACCEPTANCE STATEMENT

The report entitled "DAS-68416-4 (AAD-12) Soybean Feeding Study in the Broiler Chicken" has been reviewed and accepted in its entirety.

TESTING FACILITY

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DATA/SPECIMEN HANDLING

Data acquired at Genesis Midwest Laboratories (GML) during the course of GML Study No. 208-008-21 were obtained in accordance with EPA FIFRA Good Laboratory Practice Standards (40 CFR Part 160). Raw data were entered directly onto prepared forms in ink and were reviewed periodically by the Study Director.

All data and records required by the study protocol were contained in Genesis Midwest Laboratories Study File 208-008-21. All data and records will be transferred to Dow AgroSciences LLC on completion of the study.

PERSONNEL

Personnel assigned to GML Study No. 208-008-21 included the following individuals:

| | |
|--------------------|---|
| Study Director | Dale W. Fletcher, B.S. |
| Quality Assurance: | Daniel G. Motszko, M.S. |
| Other Personnel: | Dennis R. Colby Matthew L. Coulthard Christopher L. Fletcher, B.S., J.D. Susan J. Roehl Michael Strobush, D.V.M., Grassland Veterinary Service |

STUDY SCHEDULE

| | |
|---|--------------------|
| Protocol Signed by Study Director | May 10, 2010 |
| Test Animal Receipt | September 8, 2010 |
| Experimental Treatment Initiation (Phase 1 - Starter) | September 8, 2010 |
| Experimental Treatment Completion (Phase 1 - Starter) | September 22, 2010 |
| Experimental Treatment Initiation (Phase 2 - Grower)..... | September 22, 2010 |
| Experimental Treatment Completion (Phase 2 - Grower) | October 6, 2010 |
| Experimental Treatment Initiation (Phase 3 - Finisher)..... | October 6, 2010 |
| Experimental Treatment Completion (Phase 3 - Finisher)..... | October 21, 2010 |

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STUDY SUMMARY

A study was conducted at Genesis Midwest Laboratories (GML) to evaluate the nutritional and metabolic value of feed containing a genetically-modified (GM) soybean, a non-modified near-isogenic soybean, or standard commercially available soybeans. All birds received their respective diets for 42 days. Effects on mortality and weight gain, feed conversion efficiencies, and market dressed carcass, muscle (breast, thigh, leg and wing), liver and abdominal fat pad weights were determined.

Five treatment groups of 120 birds (12 replicates of ten birds each), balanced by sex and housed 10 to a pen, received diets prepared with either transgenic soybean DAS-68416-4 (AAD-12) meal, non-transgenic near-isogenic soybean (non-AAD-12 control) meal or meal made from non-transgenic standard commercially available soybeans (3 lots). Broiler chickens were fed diets appropriate to their treatment group in three phases - starter, grower and finisher. The proportion of soybean meal in all diets was constant among treatment groups during each of the three phases (40.4%, 36.4%, and 31.5% for phases 1, 2 and 3, respectively). Birds were monitored for body weight, feed consumption, and general health. At the end of each phase, and at the end of the experiment, the performance (weight gain, feed intake, and feed:gain ratio) of broilers fed the transgenic soybean meal diet was compared with broilers fed diets made with near-isogenic or commercial lots of soybean meal. At the termination of the test, all animals were humanely sacrificed. Market dressed carcass, muscle (breast, thigh, leg and wing), liver and abdominal fat pad weights were determined on four (4) birds from each pen.

No statistically significant differences occurred between broilers fed genetically modified (transgenic) soybean and those fed the genetically similar (near-isogenic) soybean, except for daily feed intake for male birds. Daily feed intake was 3.7% less for male birds fed diets containing the transgenic soybean meal compared with those fed the non-transgenic near-isogenic soybean meal, but this did not occur for females and was not manifested in any significant change in performance for the male birds. This difference may have been an artifact related to the loss of male birds in all treatments, which can affect estimation of feed intake. In this study, losses were typical of commercial production. A small number (3) of statistically significant differences were seen in the data set of the three commercial diets containing non-transgenic soybean meal when compared to the genetically modified (transgenic) soybean meal, but those differences were not seen consistently in all of the commercial soybean meal diets.

In conclusion, analyses of growth performance (body weights, average daily gain, average daily feed intake and feed:gain ratio) and carcass traits (live weight, hot weight, chilled carcass weight, dressing percent hot, dressing percent cold, fat pad, liver, breast, wings, thighs and legs) revealed no biologically meaningful differences between birds fed diets containing genetically modified (transgenic) soybean meal and the non-transgenic near-isogenic and commercial soybean meals. Results from this study indicate that feed prepared with DAS-68416-4 soybean meal was nutritionally similar to feed prepared with non-transgenic near-isogenic soybean meal.

OBJECTIVE

A study was conducted at Genesis Midwest Laboratories (GML) to compare the nutritional and metabolic value of soybean meal produced from DAS-68416-4, a non-transgenic near-isogenic line and three reference/commercial sources when fed to commercial broiler chickens (Ross/Ross 708) from hatching until Day 42. The effects of diet on health, mortality, weight gain, feed conversion efficiencies, market dressed carcass, muscle (breast, thigh, leg and wing), liver and abdominal fat pad weights were determined.

MATERIALS AND METHODS

1.1 Design

Five groups of broilers were fed diets containing soybean meal from one of five sources:

| TREATMENTS | | | | |
|---|--|---------------------------------|--------------------------------------|------------------------------------|
| Diet 1 | Diet 2 | Diet 3 | Diet 4 | Diet 5 |
| Genetically modified (GM) (AAD-12, DAS-68416-4) soybean | Near-isogenic soybean (non-AAD-12 control) | Commercial soybean 1 (LG C3540) | Commercial soybean 2 (Pioneer 93B82) | Commercial soybean 3 (HiSoy 38C60) |
| TSN032920-0001 | TSN032945-0001 | TSN032947-0001 | TSN032948-0001 | TSN032949-0001 |

For each group, there were 12 replicates (six pens of males and six pens of females) with ten broilers per pen. Broilers were placed in pens, which were randomly assigned within blocks to the treatment groups at initiation of the test (Figure 1). Randomization of the pens and treatment groups was provided by Dr. Gary Cromwell, Animal Sciences Department, University of Kentucky. The test diets were administered throughout each phase (starter, grower and finisher) of the study. This route of administration was selected because it represents the only possible route of exposure. Broiler chickens were chosen as the test model because it is a widely distributed and rapidly growing food animal. The number of animals per treatment group was selected to account for individual variations and to ensure sufficient statistical power to detect biologically significant changes between treatments. The protocol, amendments, and deviation are presented in Appendix I.

1.2 Test Diets

Dow AgroSciences LLC provided the five [transgenic soybean, near-isogenic (non-transgenic) soybean and commercial soybeans 1, 2, and 3] soybean meal grains used for this study. Refer to Appendix II for summary information on the grains.

The composition and feed formulation of the diets is presented in Appendix III. Analytical reports on the characterization of the grains supplied by Dow AgroSciences LLC and compositional analyses of the grains and formulated diets used in the study are presented in Appendix IV.

GLP Technologies (22723 State Highway 6 South, Navasota, TX 77868) prepared the fortified test soybean meal-based diets used for this study. The diets were received in good condition at GML on August 24, 2010. GML Master Log Access Numbers 10-TS-07 A, B, C, D and E were assigned to the diets. The meal test diets were packaged in approximately 50-pound paper sacks labeled with color-coded (black, yellow, green, red or blue) labels bearing the following information: GML study #, TSN #, type of grain, and phase (starter, grower or finisher).

Upon receipt at GML, test diets were stored in an environmentally-controlled walk-in cooler at an average temperature of 41°F. Documentation of test diet storage is included in the raw data.

1.3 Treatment Groups

There was one test group (transgenic), one control group (non-transgenic near-isogenic) and three reference/commercial groups. Each group consisted of 12 replicates of ten broilers per pen, or a total of 120 broilers per group. There were six pens of males and six pens of females per group. Broilers were placed in pens that were randomly assigned to the treatment groups. Broilers were weighed by pen prior to placement in the pens. The control and reference groups received diets containing the non-transgenic near-isogenic variety of soybean meal or a commercial line of soybean meal. The test group received a diet containing transgenic (DAS-68416-4) soybean meal. All soybean crops were grown according to typical commercial soybean production practices. Please refer to Appendix II, which summarizes production practices.

1.4 Duration of Study

The study was conducted for a total of 42 days and consisted of three phases: starter (September 8 through September 22, 2010), grower (September 22 through October 6, 2010) and finisher (October 6 through October 21, 2010).

1.5 Test Animals

Seven hundred (700) one-day-old broilers were received from Welp Hatchery (P.O. Box 77, Bancroft, IA 50517) on September 8, 2010 and were housed in Building 2 at the GML facility. The broilers averaged 42.3 grams when allotted to the treatment groups at the start of the study (September 8, 2010). The visually lightest and heaviest birds as well as any birds exhibiting signs of physical abnormality were excluded from the study.

1.6 Identification

The 600 broilers (300 males and 300 females) to be included in the study were placed 10 birds of like sex in pens identified with cards affixed to the cage bearing the GML study number, sponsor number, pen number, treatment group, sex of birds in the pen, and date received. The birds were not individually identified.

1.7 Animal Feed and Water

Water was provided on an *ad libitum* basis via automatic water nipples throughout the study. Feed was provided on an *ad libitum* basis through test day 5. Thereafter, feed was available continuously but consumption controlled by the use of a 12-hour light/12-hour dark photoperiod.

Diets were prepared to meet all nutrient requirements as described by the National Research Council* (NRC) during the three phases of the study (starter, grower, finisher). Approximately the same proportion of soybean meal was used in each diet during each respective phase (40.4%, 36.4%, and 31.5% for phases 1, 2 and 3, respectively) with small adjustments in amino acids (e.g., lysine, methionine) added, if necessary, to insure that the diets were adequate in amino acids.

* National Research Council. 1994. Nutrient Requirements of Poultry, 9th revised edition. National Academy Press, Washington, D.C.

Soybean meal incorporation was targeted at 33-35% of the final volume of feed; however, adjustments to the amount of meal actually incorporated were made to ensure nutritional balance of the feed. Composition and feed formulation of the diets are presented in Appendix III.

Diets were fed in meal form as formulated to Dr. Gary Cromwell's specifications by GLP Technologies. GLP Technologies provided the diets for each phase of the study to the laboratory in bags labeled with color-coded labels bearing the GML study #, TSN #, type of grain, and phase (starter, grower or finisher). The broilers received their appropriate test diet throughout the 42-day test period. Antibiotics were incorporated into the feed as is common commercial practice for growing-finishing broiler operations in this region. The antibiotics used and their amounts can be found in Appendix III.

Analysis of the soybean meal for transgenic proteins was performed by the Sponsor. The soybean grains provided by Dow AgroSciences were processed to yield the respective soybean meal included in diets 1, 2, 3, 4 and 5. There are no contaminants in the diets at levels that are considered to interfere with the conduct or interpretation of the study. Analytical reports are presented in Appendix IV.

Broilers received on-site well water with no additives. Water was available at all times *via* water nipples in each pen. There were no known or suspected contaminants in the drinking water, which is analyzed annually (September 2009 and October 2010). The results of the analyses are part of GML facility data, and a copy is included in the raw data.

Broilers received fresh diet at least once weekly or more often, if necessary, so that feed was available at all times. All diet changes from one phase to the next were made at the same time for all groups. Diets were stored at the laboratory in a walk-in cooler until presented to the broilers. Temperatures were recorded daily in the storage area at GML. Storage conditions ranged from 39°F to 59°F. Environmental monitoring records are included in the raw data.

At the end of each study phase, all remaining diet was incinerated except for one bag/phase/treatment group, which was stored in an environmentally controlled walk-in cooler.

1.8 Grain/Diet Sampling and Analysis

The study was divided into three phases: starter (September 8 through September 22, 2010), grower (September 22 through October 6, 2010) and finisher (October 6 through October 21, 2010). Approximately 1-kg representative samples of each soybean meal and the common corn meal to be employed in the test diets were sent to Covance Laboratories Inc. (3301 Kinsman Boulevard, Madison, WI 53704) for compositional and nutritional analysis. Results obtained from these analyses were used by Dr. Gary Cromwell in preparing the recipes for each formulated test diet, which were prepared at GLP Technologies under the direction of Malcolm Gerngross. In addition, 30-gram samples (minimum of five subsamples obtained with a grain probe from each container) of soybean meal (one from each treatment) were collected by GLP Technologies and sent to the sponsor. Analysis for transgenic protein was conducted on treatments #1 and #2 (genetically modified and genetically similar soybean groups, respectively) and not in treatments 3, 4, and 5.

Additionally, two approximately 500-g representative samples of each batch of formulated feed per treatment per phase were collected at the time of mixing at GLP Technologies and sent to Covance Laboratories Inc. for compositional analysis. At the initiation of each phase, a 500-g sample from each treatment was collected at GML and sent to Covance Laboratories Inc. for Weende analysis, calcium, phosphorus and gross energy analysis. In addition, at the termination of each phase, approximately 500-g representative samples of each formulated test diet (15 samples) were collected and placed in a freezer where they were held frozen until sent to Dow AgroSciences LLC at study termination.

1.9 Observations and Measurements

Housing and Environmental Conditions

Husbandry practices followed the “Guide for the Care and Use of Agricultural Animals in Agricultural Research and Teaching” as published by the Federation of Animal Science Societies, first revised edition, January 1999 and were conducted so as to adhere as closely as possible to commercial operations. Broilers were maintained in raised pens providing approximately 1 sq. ft/animal, which simulated commercial broiler operations (Figure 1). Each pen had two feeders and a nipple waterer.

During the test, all birds were maintained indoors in climate-controlled housing. Temperatures and relative humidity were recorded daily from receipt until termination.

Continuous lighting was provided for the first five days of the study. Thereafter, the lighting was maintained at 12 hours light/12 hours dark per day for the balance of the study.

Mortality

All broilers were observed at least twice daily for mortality, general condition, overt signs of adverse effects and abnormal behavior.

Observations of General Health

All broilers were received at GML within 6 hours of hatching and immediately placed in study pens. Within 24 hours after receipt, all broilers were observed by a licensed veterinarian to assess overall health status. The broilers were observed by the veterinarian as normal and healthy.

The broilers were observed a minimum of twice daily for general condition, overt signs of disease and abnormal behavior.

Body Weight

Pen body weights were obtained at initiation, at each diet change (days 14 and 28) and prior to termination (day 42) and are presented in Table 1. Body weights were measured at approximately the same time of day (± 1 hour). The precision of the scale for body weight measurements was within 0.1 kilogram.

Feed Consumption

Feed consumption was recorded throughout the test on the same day as the pen body weights (days 14, 28 and 42) and is presented in Table 2. Broilers received fresh diet at least weekly. Feed consumption was measured by weighing the amount of feed placed in the feeder at the time of presentation, recording any additional diet added, and weighing the remaining feed at the end of each phase. To provide accurate feed consumption values, feeders were periodically adjusted to prevent excessive wastage by the broilers. No attempt was made to quantify the amount of wasted feed.

Feed Conversion

Individual feed conversion was calculated for each phase (Table 3). Feed conversion was determined by dividing the total average feed consumed per broiler/pen/phase by the body weight gain per broiler/pen/phase (average daily feed intake/average daily gain).

Euthanasia

Termination was on a treatment basis and was scheduled to coincide with test day 42 to simulate commercial practices. Body weights for each group of birds were measured on the day prior to the birds being transported to the processing facility.

Gross Necropsy

All birds that died during the course of the study were subjected to a gross necropsy. Four birds per pen were arbitrarily selected at termination and transferred to a local meat processor (Sunny-Side Meadows, Dorchester, WI 54425) for sacrifice. Gross visual examinations of these birds were performed.

Carcass Measurements

Upon arrival at the processing plant, the birds were individually weighed and humanely terminated by cervical dislocation, immediately followed by removal of the head and exsanguination. The carcasses were then defeathered and feet removed prior to evisceration. Each carcass was then weighed (hot carcass weight). A dressing percentage (hot weight divided by last live weight x 100) was calculated for each carcass. After an approximate 1-hour chill in an ice water bath at approximately 2°C, the market dressed carcass weight, muscle (breast, thigh, leg, wing), liver and abdominal fat pad weights were recorded to determine carcass yield for each broiler (Table 4).

1.10 Disposition of Test Animals

After all protocol requirements were met (slaughter at state-approved processing plant and final carcass measurements), the carcasses were disposed of by an approved method in compliance with local regulations (incineration). Certification of carcass disposal is presented in Appendix V.

1.11 Statistical Analyses

Data manipulation, rounding and calculations employed in the tables were conducted using Microsoft® Excel 2000 (Microsoft Corporation, Redmond, WA 98052) or Statistical Analysis Software

(SAS).

Regardless of the number of digits displayed, Excel stores numbers with up to 15 digits of precision. Calculations used more significant digits than displayed in the report tables, and often carried through to the end result with multiple calculations. When rounding numbers, the software rounds a number ending with the digit 5 or greater to the next higher number. For this reason, there may be minor differences between values listed in report tables compared to values that are hand calculated using rounded numbers listed in the tables.

Statistical analyses of data collected during the study (body weights, feed consumption, body weight gain and feed conversion) and measurements at termination (hot carcass weight, dressing percentage, muscle (breast, thigh, leg, wing), liver and abdominal fat pad weights) were provided by Gary L. Cromwell, Ph.D., Animal Sciences Department, University of Kentucky, Lexington. The data were analyzed as a split plot design with 12 replications (6 replications of males and 6 replications of females) that were considered as the main plot and the 5 dietary treatments and replication x treatment (4 and 44 degrees of freedom (df), respectively) considered the subplot. The 6 replications of males and the 6 replications of females were allotted within the main plot in a randomized block arrangement, with block representing position in the building. Blocks and gender were tested with block x gender as the error term. Within the subplot, the effects of dietary treatment and the diet x gender interaction were tested with the residual error term, with 40 df. The residual error term consisted of block x treatment (20 df) and block x gender x treatment (20 df). The transgenic (treatment 1) group was compared to the near-isogenic (treatment 2) and commercial groups (treatments 3, 4 and 5). The near-isogenic soybean is the closest comparator to the transgenic soybean and a non-transgenic feed in the study. In all instances, pen was considered the experimental unit. Probabilities of <0.05 were considered statistically significant. Data used in the statistical analyses conducted by Dr. Gary Cromwell are presented in Appendix VI.

RESULTS AND DISCUSSION

2.1 Protein Expression in Meal and Feed

No AAD-12 or PAT protein was found in the DAS-68416-4 grain sample. During the processing of soybean grain, the soybean undergoes toasting at approximately 220-240°F. At this temperature, the protein is denatured, resulting in a lack of AAD-12 and PAT enzyme activity and ELISA reactivity. Feed containing DAS-68416-4 meal was not analyzed because of the lack of protein expression in the meal.

2.2 Housing and Environmental Conditions

Temperatures (minimum/maximum) ranged from 74.0°F (23°C) to 92.3°F (34°C) during Phase 1, 70.2°F (21°C) to 85.4°F (30°C) during Phase 2 and 68.0°F (20°C) to 83.7°F (29°C) during Phase 3. Relative humidity ranged from 52% to 81%, 34% to 87% and 34% to 89% during phases 1, 2 and 3, respectively. Environmental monitoring records are included in the raw data.

2.3 Observations

During the study, 14 birds were found dead - five in treatment 1 (AAD-12, DAS-68416-4 transgenic soybean), one in treatment 2 (non-AAD-12 control soybean), three in treatment 3 (commercial soybean 1, LG C3540), and five in treatment 5 (commercial soybean 3, HiSoy 38C60). No birds were found dead in treatment 4 (commercial soybean 2, Pioneer 93B62). Ten of the 14 birds found dead were smaller than their pen mates and four of the 14 birds were found lying on their back, which is characteristic of the sudden death syndrome (Julian, RJ. Production and Growth Related Disorders and Other Metabolic Diseases of Poultry – A Review. *Vet. J.* 2005 May, **169**:350–369). Twenty-three birds [four in treatment 1 (AAD-12, DAS-68416-4 transgenic soybean), seven in treatment 2 (non-AAD-12 control soybean), five in treatment 3 (commercial soybean 1, LG C3540), two in treatment 4 (commercial soybean 2, Pioneer 93B82, and five in treatment 5 (commercial soybean 3, HiSoy 38C60)] were sacrificed *in extremis* – one during the starter phase due to extremely small size and the other 22 during the finisher phase due to inability of the birds to move about freely in the pen and access feed and water on their own. The inability of these birds to move about freely appeared to develop rapidly during the finisher phase. This condition is characteristic of documented leg disorders in broiler chickens [Knowles TG, Kestin SC, Haslam SM, Brown SN, Green LE, et al (2008) Leg Disorders in Broiler Chickens:

Prevalence, Risk Factors and Prevention. PLoS One 3(2):e1545. doi:10.1371/journal.pone.0001545].

Gross pathological examinations of the 14 birds found dead and the 23 birds sacrificed *in extremis* revealed no abnormal tissue alterations noted in any of the birds.

The mortalities (14, 2.3%) appeared unrelated to treatment and are below normal levels of mortalities seen in commercial operations [3.5%; Tim Geiger, Production Manager (Phone: 608 323-2823), Gold'N Plump Poultry, Inc., 209 N. Third Street, Arcadia, WI 54612 – personal communication].

With the exception of the birds sacrificed *in extremis*, the remaining broilers in each treatment (1, 2, 3, 4 and 5) appeared normal and active throughout the entire study (Phases 1, 2 and 3). No behavioral differences were noted in broilers between the various groups.

There was a significant treatment x sex interaction for the number of birds that survived till the end of the study, but there was no significant difference between the treatment containing the transgenic soybean meal and the treatment containing the non-transgenic near-isogenic meal for either sex (Table 5).

2.4 Animal Body Weights/Feed Consumption/Feed Efficiency and Carcass Measurements

Comparison of GM and Non-Transgenic Near-isogenic Soybean Meal

Final weight, daily gain, daily feed intake, and feed/gain for the entire experimental period were not significantly different for broilers fed diets containing the transgenic and the non-transgenic near-isogenic soybean meal (Table 6). In addition, there were no significant differences in growth performance of birds fed the diets during the initial 14-day period (Phase 1/starter) or during the initial 28-day period (Phases 1/starter and 2/grower) of the study.

There was a significant treatment x sex interaction for final weight, daily gain, and daily feed intake (Table 7). For this reason, statistical analyses were conducted for each of these parameters for each sex independently. There were no significant differences between the transgenic and non-transgenic near-isogenic treatments for either sex with the exception of daily feed intake for males (99.6 gms and 103.4 gms, respectively)(Table 5). This was not accompanied by a significant difference in daily gain, feed/gain, or final weight, and may have been an artifact of the estimation of

feed intake when male birds died or were removed from the treatment groups *in extremis*. In any case, male bird performance was not significantly affected.

Final carcass live weight, hot dressed weight, and cold dressed weight of the four randomly selected broilers per pen were not significantly different for the two treatment groups (Table 8). Dressing percent based on hot or cold weight were not significantly different between the two groups. Weights and percentages of breast, thighs, legs, wings, fat pad, and liver also were not significantly different between birds fed diets containing the transgenic soybean meal and those fed diets containing the non-transgenic near-isogenic soybean meal (Table 8).

Comparison of GM and Three Commercial Soybean Meals

Overall, broilers fed the GM soybean meal performed similarly as those fed the three commercial soybean meals during the initial 2 weeks of the study, during the initial 4 weeks, and over the entire test period (Table 6). The only difference was a slower ($P < 0.02$) growth rate for the birds fed the LG soybean meal compared with those fed the GM soybean meal during the starter period.

Carcass weights and dressing percent did not differ significantly between birds fed the GM and those fed the three commercial soybean meal groups (Table 8). Breasts of birds fed the HiSoy soybean meal were significantly ($P < 0.01$) heavier than breasts of birds fed the GM soybean meal, but weights of thighs, legs, wings, fat pads, and liver were similar for these two groups. Weights of cuts were not different for the GM, LG or Pioneer groups. When expressed as a percent of the chilled carcass weight, the breasts of the LG and HiSoy groups and the thighs of the Pioneer group were significantly greater than the GM group (Table 8).

Gender Effects

As expected, males grew significantly ($P < 0.01$) faster, consumed significantly ($P < 0.01$) more daily feed, and were more efficient in converting feed to body weight gain ($P < 0.02$) than females (Table 7). As a result of the heavier final weights of males, the weights of their breast, thighs, legs, wings, and livers were significantly greater than those of females (Table 9). Fat pad weights were significantly greater for females compared with males. Hot and cold dressing percents were higher for females than for males ($P < 0.01$).

When expressed as a percentage of the chilled carcass weight (Table 9), the percentages of breasts were greater ($P < 0.01$) for females than males, but the percentages of legs were greater ($P < 0.01$) for males as compared with females. Females exceeded males in percentage of fat pads in the carcasses ($P < 0.01$).

2.5 Experimental Termination

Termination was on a treatment basis and was scheduled to coincide with test day 42 to simulate commercial practices. The order of sacrifice of treatment groups was treatment 2, 3, 4, 5 and 1. Thus, the transgenic treatment group (treatment 1) was terminated last. All birds were terminated on the same day.

2.6 Necropsy

Results of the gross necropsies of the 14 broilers found dead [five in treatment 1 (AAD-12, DAS-68416-4 transgenic soybean), one in treatment 2 (non-AAD-12 control soybean), three in treatment 3 (commercial soybean 1), and five in treatment 5 (commercial soybean 3)] were presented in Section 2.2 Observations. There were no birds found dead in treatment 4 (commercial soybean 2).

A total of 240 broilers [48 broilers (24 male/24 female) per treatment] were subjected to a gross pathological examination at the time of sacrifice. These examinations revealed only a pale liver in one female bird in treatment 2 (non-AAD-12 control soybean). There were no abnormal tissue alterations noted in the remaining birds.

CONCLUSIONS

This 42-day study, conducted at Genesis Midwest Laboratories, to evaluate the nutritional and metabolic value of four control soybean meals and one transgenic soybean meal (DAS-68416-4) on broilers over the starter, grower and finisher phases revealed the transgenic soybean to be equivalent to non-transgenic control soybean.

Broilers in treatment group 1 (DAS-68416-4) consumed transgenic soybean from hatching through study day 42. There were no adverse effects of the consumption of transgenic soybean derived from AAD-12, DAS-68416-4 on mortality or moribundity, general clinical observations, body weight, body weight gain, or feed conversion. Daily feed intake was 3.7% less for male birds fed diets containing the transgenic soybean meal compared with those fed the non-transgenic near-isogenic soybean meal, but this did not occur for females and was not manifested in any significant change in performance for the male birds. This difference may have been an artifact related to the loss of male birds in all treatments (which were typical of commercial production), which can affect estimation of feed intake. These results indicate that event DAS-68416-4 soybean is nutritionally equivalent to the non-transgenic near-isogenic control.

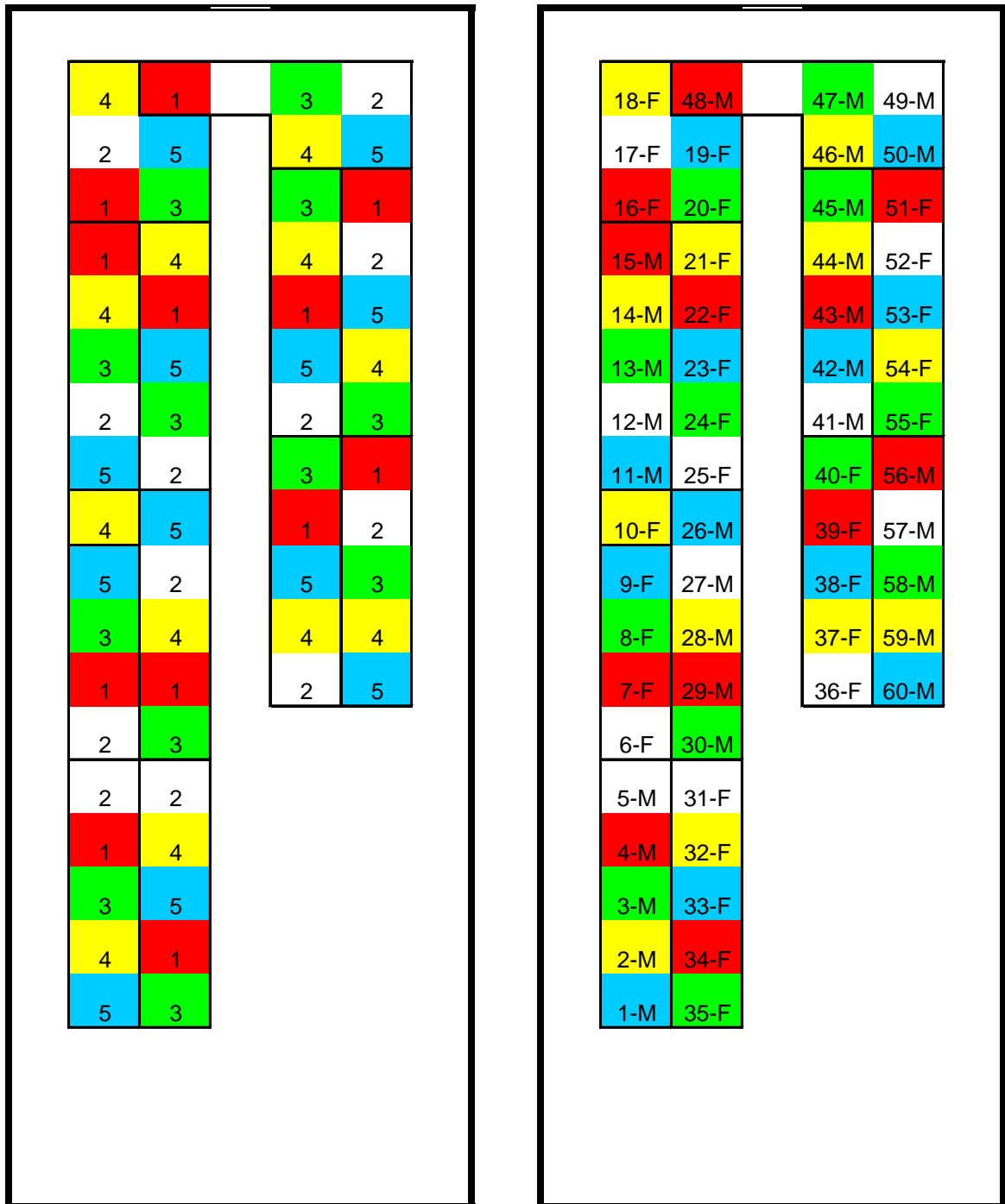
FIGURES

FIGURE 1

Schematic Diagram - Building 2 (Days 1 through 42)

Treatment Groups

Pen # / Sex



TABLES

TABLE 1
BODY WEIGHTS (grams)

| Treatment Group | Replicate | Pen | Sex | INTERVAL | | | | # of birds | | |
|-------------------------|-----------|-----|-----|------------------------|---------------------|---------------------|----------------------|------------|-----------|-----------|
| | | | | Initiation (9/8/10) | Day 14 (9/22/10) | Day 28 (10/6/10) | Day 42 (10/20/10) | Day 14 | Day 28 | Day 42 |
| 1 | 1 | 4 | M | 453.6 | 4100.0 | 14100.0 | 17700.0 | 10 | 10 | 7 |
| 1 | 5 | 15 | M | 461.8 | 4000.0 | 15000.0 | 24100.0 | 10 | 10 | 9 |
| 1 | 3 | 29 | M | 448.8 | 3400.0 | 12400.0 | 27100.0 | 9 | 9 | 9 |
| 1 | 9 | 43 | M | 440.2 | 3500.0 | 13900.0 | 26200.0 | 10 | 10 | 9 |
| 1 | 8 | 48 | M | 445.6 | 4300.0 | 15300.0 | 27400.0 | 10 | 10 | 9 |
| 1 | 12 | 56 | M | 449.2 | 3500.0 | 13300.0 | 24200.0 | 9 | 9 | 8 |
| Mean: | | | | 449.9 | 3800.0 | 14000.0 | 24450.0 | | | |
| SD: | | | | 7.3 | 379.5 | 1073.3 | 3592.6 | | | |
| 1 | 4 | 7 | F | 407.8 | 3500.0 | 12400.0 | 24900.0 | 10 | 10 | 10 |
| 1 | 7 | 16 | F | 386.0 | 3400.0 | 12300.0 | 24900.0 | 10 | 10 | 10 |
| 1 | 6 | 22 | F | 408.0 | 3700.0 | 13100.0 | 25600.0 | 10 | 10 | 10 |
| 1 | 2 | 34 | F | 392.8 | 3700.0 | 13200.0 | 25400.0 | 10 | 10 | 10 |
| 1 | 11 | 39 | F | 386.2 | 3400.0 | 12600.0 | 27500.0 | 10 | 10 | 10 |
| 1 | 10 | 51 | F | 388.4 | 3200.0 | 12600.0 | 28000.0 | 10 | 10 | 10 |
| Mean: | | | | 394.9 | 3483.3 | 12700.0 | 26050.0 | | | |
| SD: | | | | 10.4 | 194.1 | 368.8 | 1354.6 | | | |
| Overall Treatment Mean: | | | | 422.4 | 3641.7 | 13350.0 | 25250.0 | | | |
| SD: | | | | 30.0 | 331.5 | 1022.9 | 2720.1 | | | |
| 2 | 1 | 5 | M | 453.1 | 4100.0 | 14600.0 | 25600.0 | 10 | 10 | 9 |
| 2 | 5 | 12 | M | 456.8 | 3700.0 | 13900.0 | 26000.0 | 10 | 10 | 9 |
| 2 | 3 | 27 | M | 447.8 | 4000.0 | 14300.0 | 24800.0 | 10 | 10 | 8 |
| 2 | 9 | 41 | M | 449.0 | 3800.0 | 13900.0 | 29300.0 | 10 | 10 | 9 |
| 2 | 8 | 49 | M | 468.2 | 3900.0 | 14500.0 | 25700.0 | 10 | 10 | 9 |
| 2 | 12 | 57 | M | 467.2 | 4000.0 | 15400.0 | 32000.0 | 10 | 10 | 10 |
| Mean: | | | | 457.0 | 3916.7 | 14433.3 | 27233.3 | | | |
| SD: | | | | 8.9 | 147.2 | 557.4 | 2809.0 | | | |
| 2 | 4 | 6 | F | 390.2 | 3600.0 | 12500.0 | 25100.0 | 10 | 10 | 10 |
| 2 | 7 | 17 | F | 387.2 | 3200.0 | 11200.0 | 21200.0 | 10 | 10 | 9 |
| 2 | 6 | 25 | F | 390.6 | 3900.0 | 13400.0 | 27700.0 | 10 | 10 | 10 |
| 2 | 2 | 31 | F | 390.4 | 3500.0 | 13100.0 | 25600.0 | 10 | 10 | 10 |
| 2 | 11 | 36 | F | 409.6 | 3500.0 | 12800.0 | 25000.0 | 10 | 10 | 10 |
| 2 | 10 | 52 | F | 375.6 | 3100.0 | 10700.0 | 24700.0 | 10 | 9 | 9 |
| Mean: | | | | 390.6 | 3466.7 | 12283.3 | 24883.3 | | | |
| SD: | | | | 10.9 | 287.5 | 1087.0 | 2102.8 | | | |
| Overall Treatment Mean: | | | | 423.8 | 3691.7 | 13358.3 | 26058.3 | | | |
| SD: | | | | 36.0 | 320.4 | 1392.5 | 2665.1 | | | |

TABLE 1 (Continued)

BODY WEIGHTS (grams)

| Treatment Group | Replicate | Pen | Sex | INTERVAL | | | | # of birds | | |
|-----------------|-----------|-----|-------------------------|------------------------|---------------------|---------------------|----------------------|------------|-----------|-----------|
| | | | | Initiation (9/8/10) | Day 14 (9/22/10) | Day 28 (10/6/10) | Day 42 (10/20/10) | Day 14 | Day 28 | Day 42 |
| 3 | 1 | 3 | M | 457.2 | 4100.0 | 15100.0 | 27200.0 | 10 | 10 | 10 |
| 3 | 5 | 13 | M | 440.2 | 3500.0 | 13400.0 | 25400.0 | 10 | 10 | 9 |
| 3 | 3 | 30 | M | 448.0 | 3400.0 | 12300.0 | 22100.0 | 9 | 9 | 8 |
| 3 | 9 | 45 | M | 464.0 | 3600.0 | 14000.0 | 26400.0 | 10 | 10 | 9 |
| 3 | 8 | 47 | M | 446.2 | 3500.0 | 13300.0 | 29500.0 | 10 | 10 | 10 |
| 3 | 12 | 58 | M | 444.0 | 3700.0 | 14600.0 | 28700.0 | 10 | 10 | 9 |
| | | | Mean: | 449.9 | 3633.3 | 13783.3 | 26550.0 | | | |
| | | | SD: | 8.9 | 250.3 | 1002.8 | 2641.8 | | | |
| 3 | 4 | 8 | F | 415.8 | 3300.0 | 12100.0 | 24400.0 | 10 | 10 | 10 |
| 3 | 7 | 20 | F | 412.2 | 3300.0 | 11800.0 | 24400.0 | 10 | 10 | 10 |
| 3 | 6 | 24 | F | 401.6 | 3300.0 | 9500.0 | 19600.0 | 10 | 8 | 8 |
| 3 | 2 | 35 | F | 385.8 | 3000.0 | 10900.0 | 22000.0 | 10 | 9 | 9 |
| 3 | 11 | 40 | F | 398.6 | 3400.0 | 12100.0 | 27100.0 | 10 | 10 | 10 |
| 3 | 10 | 55 | F | 385.0 | 3300.0 | 12100.0 | 26900.0 | 10 | 10 | 10 |
| | | | Mean: | 399.8 | 3266.7 | 11416.7 | 24066.7 | | | |
| | | | SD: | 12.9 | 136.6 | 1047.7 | 2887.0 | | | |
| | | | Overall Treatment Mean: | 424.9 | 3450.0 | 12600.0 | 25308.3 | | | |
| | | | SD: | 28.2 | 271.4 | 1576.0 | 2939.8 | | | |
| 4 | 1 | 2 | M | 444.7 | 3700.0 | 13700.0 | 27600.0 | 10 | 10 | 10 |
| 4 | 5 | 14 | M | 443.0 | 4200.0 | 15300.0 | 29500.0 | 10 | 10 | 10 |
| 4 | 3 | 28 | M | 438.8 | 3700.0 | 13300.0 | 28300.0 | 10 | 10 | 10 |
| 4 | 9 | 44 | M | 440.6 | 4100.0 | 15500.0 | 26200.0 | 10 | 10 | 8 |
| 4 | 8 | 46 | M | 458.8 | 3800.0 | 14800.0 | 32200.0 | 10 | 10 | 10 |
| 4 | 12 | 59 | M | 467.8 | 4100.0 | 15400.0 | 32700.0 | 10 | 10 | 10 |
| | | | Mean: | 449.0 | 3933.3 | 14666.7 | 29416.7 | | | |
| | | | SD: | 11.6 | 225.1 | 943.8 | 2585.7 | | | |
| 4 | 4 | 10 | F | 395.6 | 3300.0 | 11400.0 | 23200.0 | 10 | 10 | 10 |
| 4 | 7 | 18 | F | 400.0 | 3500.0 | 13000.0 | 25800.0 | 10 | 10 | 10 |
| 4 | 6 | 21 | F | 388.5 | 3400.0 | 12400.0 | 25400.0 | 10 | 10 | 10 |
| 4 | 2 | 32 | F | 399.6 | 3600.0 | 13200.0 | 25700.0 | 10 | 10 | 10 |
| 4 | 11 | 37 | F | 399.6 | 3200.0 | 12100.0 | 26200.0 | 10 | 10 | 10 |
| 4 | 10 | 54 | F | 374.6 | 3300.0 | 12600.0 | 25800.0 | 10 | 10 | 10 |
| | | | Mean: | 393.0 | 3383.3 | 12450.0 | 25350.0 | | | |
| | | | SD: | 10.0 | 147.2 | 650.4 | 1084.0 | | | |
| | | | Overall Treatment Mean: | 421.0 | 3658.3 | 13558.3 | 27383.3 | | | |
| | | | SD: | 31.0 | 339.7 | 1391.8 | 2843.1 | | | |

TABLE 1 (Continued)

BODY WEIGHTS (grams)

| Treatment Group | Replicate | Pen | Sex | INTERVAL | | | | # of birds | | |
|-------------------------|-----------|-----|-----|------------------------|---------------------|---------------------|----------------------|------------|-----------|-----------|
| | | | | Initiation (9/8/10) | Day 14 (9/22/10) | Day 28 (10/6/10) | Day 42 (10/20/10) | Day 14 | Day 28 | Day 42 |
| 5 | 1 | 1 | M | 422.9 | 4000.0 | 13500.0 | 27300.0 | 10 | 9 | 9 |
| 5 | 5 | 11 | M | 462.2 | 4000.0 | 14600.0 | 24100.0 | 10 | 10 | 8 |
| 5 | 3 | 26 | M | 459.1 | 4000.0 | 14400.0 | 21900.0 | 10 | 10 | 7 |
| 5 | 9 | 42 | M | 447.6 | 3600.0 | 13400.0 | 26400.0 | 9 | 9 | 8 |
| 5 | 8 | 50 | M | 445.0 | 4000.0 | 14900.0 | 29100.0 | 10 | 10 | 9 |
| 5 | 12 | 60 | M | 455.0 | 3800.0 | 14400.0 | 27400.0 | 10 | 10 | 9 |
| Mean: | | | | 448.6 | 3900.0 | 14200.0 | 26033.3 | | | |
| SD: | | | | 14.2 | 167.3 | 609.9 | 2601.3 | | | |
| 5 | 4 | 9 | F | 412.4 | 3300.0 | 12300.0 | 24800.0 | 10 | 10 | 10 |
| 5 | 7 | 19 | F | 407.8 | 3600.0 | 12900.0 | 25400.0 | 10 | 10 | 10 |
| 5 | 6 | 23 | F | 390.4 | 3600.0 | 12900.0 | 25500.0 | 10 | 10 | 10 |
| 5 | 2 | 33 | F | 401.8 | 3400.0 | 12300.0 | 24600.0 | 10 | 10 | 10 |
| 5 | 11 | 38 | F | 385.0 | 3500.0 | 12600.0 | 27900.0 | 10 | 10 | 10 |
| 5 | 10 | 53 | F | 372.8 | 3400.0 | 10900.0 | 26100.0 | 10 | 10 | 10 |
| Mean: | | | | 395.0 | 3466.7 | 12316.7 | 25716.7 | | | |
| SD: | | | | 15.0 | 121.1 | 744.1 | 1195.7 | | | |
| Overall Treatment Mean: | | | | 421.8 | 3683.3 | 13258.3 | 25875.0 | | | |
| SD: | | | | 31.3 | 265.7 | 1178.2 | 1937.3 | | | |

TABLE 1-A

BODY WEIGHT GAINS (grams)

| Treatment Group | Replicate | Pen | Sex | PHASE | | |
|-------------------------|-----------|-----|-----|---------|---------|----------|
| | | | | Starter | Grower | Finisher |
| 1 | 1 | 4 | M | 3646.4 | 10000.0 | 3600.0 |
| 1 | 5 | 15 | M | 3538.2 | 11000.0 | 9100.0 |
| 1 | 3 | 29 | M | 2951.2 | 9000.0 | 14700.0 |
| 1 | 9 | 43 | M | 3059.8 | 10400.0 | 12300.0 |
| 1 | 8 | 48 | M | 3854.4 | 11000.0 | 12100.0 |
| 1 | 12 | 56 | M | 3050.8 | 9800.0 | 10900.0 |
| Mean: | | | | 3350.1 | 10200.0 | 10450.0 |
| SD: | | | | 377.0 | 769.4 | 3825.0 |
| 1 | 4 | 7 | F | 3092.2 | 8900.0 | 12500.0 |
| 1 | 7 | 16 | F | 3014.0 | 8900.0 | 12600.0 |
| 1 | 6 | 22 | F | 3292.0 | 9400.0 | 12500.0 |
| 1 | 2 | 34 | F | 3307.2 | 9500.0 | 12200.0 |
| 1 | 11 | 39 | F | 3013.8 | 9200.0 | 14900.0 |
| 1 | 10 | 51 | F | 2811.6 | 9400.0 | 15400.0 |
| Mean: | | | | 3088.5 | 9216.7 | 13350.0 |
| SD: | | | | 188.2 | 263.9 | 1409.6 |
| Overall Treatment Mean: | | | | 3219.3 | 9708.3 | 11900.0 |
| SD: | | | | 315.2 | 751.3 | 3138.0 |
| 2 | 1 | 5 | M | 3646.9 | 10500.0 | 11000.0 |
| 2 | 5 | 12 | M | 3243.2 | 10200.0 | 12100.0 |
| 2 | 3 | 27 | M | 3552.2 | 10300.0 | 10500.0 |
| 2 | 9 | 41 | M | 3351.0 | 10100.0 | 15400.0 |
| 2 | 8 | 49 | M | 3431.8 | 10600.0 | 11200.0 |
| 2 | 12 | 57 | M | 3532.8 | 11400.0 | 16600.0 |
| Mean: | | | | 3459.7 | 10516.7 | 12800.0 |
| SD: | | | | 147.2 | 470.8 | 2560.5 |
| 2 | 4 | 6 | F | 3209.8 | 8900.0 | 12600.0 |
| 2 | 7 | 17 | F | 2812.8 | 8000.0 | 10000.0 |
| 2 | 6 | 25 | F | 3509.4 | 9500.0 | 14300.0 |
| 2 | 2 | 31 | F | 3109.6 | 9600.0 | 12500.0 |
| 2 | 11 | 36 | F | 3090.4 | 9300.0 | 12200.0 |
| 2 | 10 | 52 | F | 2724.4 | 7600.0 | 14000.0 |
| Mean: | | | | 3076.1 | 8816.7 | 12600.0 |
| SD: | | | | 282.8 | 832.9 | 1534.9 |
| Overall Treatment Mean: | | | | 3267.9 | 9666.7 | 12700.0 |
| SD: | | | | 293.8 | 1097.4 | 2015.4 |

TABLE 1-A (Continued)

BODY WEIGHT GAINS (grams)

| | | | | PHASE | | |
|-------------------------|-----------|-----|-----|---------|---------|----------|
| Treatment Group | Replicate | Pen | Sex | Starter | Grower | Finisher |
| 3 | 1 | 3 | M | 3642.8 | 11000.0 | 12100.0 |
| 3 | 5 | 13 | M | 3059.8 | 9900.0 | 12000.0 |
| 3 | 3 | 30 | M | 2952.0 | 8900.0 | 9800.0 |
| 3 | 9 | 45 | M | 3136.0 | 10400.0 | 12400.0 |
| 3 | 8 | 47 | M | 3053.8 | 9800.0 | 16200.0 |
| 3 | 12 | 58 | M | 3256.0 | 10900.0 | 14100.0 |
| Mean: | | | | 3183.4 | 10150.0 | 12766.7 |
| SD: | | | | 246.7 | 786.8 | 2169.5 |
| 3 | 4 | 8 | F | 2884.2 | 8800.0 | 12300.0 |
| 3 | 7 | 20 | F | 2887.8 | 8500.0 | 12600.0 |
| 3 | 6 | 24 | F | 2898.4 | 6200.0 | 10100.0 |
| 3 | 2 | 35 | F | 2614.2 | 7900.0 | 11100.0 |
| 3 | 11 | 40 | F | 3001.4 | 8700.0 | 15000.0 |
| 3 | 10 | 55 | F | 2915.0 | 8800.0 | 14800.0 |
| Mean: | | | | 2866.8 | 8150.0 | 12650.0 |
| SD: | | | | 131.1 | 1013.4 | 1958.3 |
| Overall Treatment Mean: | | | | 3025.1 | 9150.0 | 12708.3 |
| SD: | | | | 250.6 | 1356.1 | 1971.4 |
| 4 | 1 | 2 | M | 3255.3 | 10000.0 | 13900.0 |
| 4 | 5 | 14 | M | 3757.0 | 11100.0 | 14200.0 |
| 4 | 3 | 28 | M | 3261.2 | 9600.0 | 15000.0 |
| 4 | 9 | 44 | M | 3659.4 | 11400.0 | 10700.0 |
| 4 | 8 | 46 | M | 3341.2 | 11000.0 | 17400.0 |
| 4 | 12 | 59 | M | 3632.2 | 11300.0 | 17300.0 |
| Mean: | | | | 3484.4 | 10733.3 | 14750.0 |
| SD: | | | | 223.4 | 747.4 | 2490.6 |
| 4 | 4 | 10 | F | 2904.4 | 8100.0 | 11800.0 |
| 4 | 7 | 18 | F | 3100.0 | 9500.0 | 12800.0 |
| 4 | 6 | 21 | F | 3011.5 | 9000.0 | 13000.0 |
| 4 | 2 | 32 | F | 3200.4 | 9600.0 | 12500.0 |
| 4 | 11 | 37 | F | 2800.4 | 8900.0 | 14100.0 |
| 4 | 10 | 54 | F | 2925.4 | 9300.0 | 13200.0 |
| Mean: | | | | 2990.4 | 9066.7 | 12900.0 |
| SD: | | | | 144.4 | 546.5 | 764.2 |
| Overall Treatment Mean: | | | | 3237.4 | 9900.0 | 13825.0 |
| SD: | | | | 314.2 | 1071.1 | 2004.6 |

TABLE 1-A (Continued)

BODY WEIGHT GAINS (grams)

| Treatment | | | | PHASE | | |
|-----------|-----------|-----|-------------------------|---------|---------|----------|
| | | | | Starter | Grower | Finisher |
| Group | Replicate | Pen | Sex | | | |
| 5 | 1 | 1 | M | 3577.1 | 9500.0 | 13800.0 |
| 5 | 5 | 11 | M | 3537.8 | 10600.0 | 9500.0 |
| 5 | 3 | 26 | M | 3540.9 | 10400.0 | 7500.0 |
| 5 | 9 | 42 | M | 3152.4 | 9800.0 | 13000.0 |
| 5 | 8 | 50 | M | 3555.0 | 10900.0 | 14200.0 |
| 5 | 12 | 60 | M | 3345.0 | 10600.0 | 13000.0 |
| | | | Mean: | 3451.4 | 10300.0 | 11833.3 |
| | | | SD: | 169.0 | 536.7 | 2698.6 |
| 5 | 4 | 9 | F | 2887.6 | 9000.0 | 12500.0 |
| 5 | 7 | 19 | F | 3192.2 | 9300.0 | 12500.0 |
| 5 | 6 | 23 | F | 3209.6 | 9300.0 | 12600.0 |
| 5 | 2 | 33 | F | 2998.2 | 8900.0 | 12300.0 |
| 5 | 11 | 38 | F | 3115.0 | 9100.0 | 15300.0 |
| 5 | 10 | 53 | F | 3027.2 | 7500.0 | 15200.0 |
| | | | Mean: | 3071.6 | 8850.0 | 13400.0 |
| | | | SD: | 123.8 | 680.4 | 1436.7 |
| | | | Overall Treatment Mean: | 3261.5 | 9575.0 | 12616.7 |
| | | | SD: | 243.5 | 956.4 | 2217.6 |

TABLE 2
FEED CONSUMPTION (g/bird/day)

| Treatment Group | Replicate | Pen | Sex | PHASE | | |
|-----------------|-----------|-----|-------------------------|--------------|-------------|---------------|
| | | | | 1 Starter | 2 Grower | 3 Finisher |
| 1 | 1 | 4 | M | 32.1 | 102.1 | 149.6 |
| 1 | 5 | 15 | M | 29.3 | 100.0 | 182.4 |
| 1 | 3 | 29 | M | 27.7 | 97.6 | 169.8 |
| 1 | 9 | 43 | M | 31.4 | 101.4 | 164.1 |
| 1 | 8 | 48 | M | 30.0 | 100.0 | 165.9 |
| 1 | 12 | 56 | M | 33.3 | 109.5 | 166.9 |
| | | | Mean: | 30.6 | 101.8 | 166.5 |
| | | | SD: | 2.0 | 4.1 | 10.5 |
| 1 | 4 | 7 | F | 30.7 | 90.7 | 157.1 |
| 1 | 7 | 16 | F | 27.9 | 90.7 | 160.0 |
| 1 | 6 | 22 | F | 27.1 | 97.9 | 162.9 |
| 1 | 2 | 34 | F | 27.9 | 97.9 | 162.9 |
| 1 | 11 | 39 | F | 27.1 | 95.7 | 162.9 |
| 1 | 10 | 51 | F | 27.9 | 102.9 | 157.9 |
| | | | Mean: | 28.1 | 96.0 | 160.6 |
| | | | SD: | 1.3 | 4.7 | 2.7 |
| | | | Overall Treatment Mean: | 29.4 | 98.9 | 163.5 |
| | | | SD: | 1.8 | 4.1 | 4.1 |
| 2 | 1 | 5 | M | 33.6 | 105.0 | 174.3 |
| 2 | 5 | 12 | M | 30.0 | 104.3 | 178.5 |
| 2 | 3 | 27 | M | 30.0 | 105.0 | 167.5 |
| 2 | 9 | 41 | M | 29.3 | 105.7 | 184.6 |
| 2 | 8 | 49 | M | 31.4 | 104.3 | 168.1 |
| 2 | 12 | 57 | M | 30.0 | 104.3 | 175.7 |
| | | | Mean: | 31.8 | 104.8 | 174.8 |
| | | | SD: | 1.6 | 0.6 | 6.5 |
| 2 | 4 | 6 | F | 30.7 | 98.6 | 160.7 |
| 2 | 7 | 17 | F | 25.7 | 88.6 | 156.1 |
| 2 | 6 | 25 | F | 29.3 | 99.3 | 157.1 |
| 2 | 2 | 31 | F | 27.1 | 96.4 | 162.9 |
| 2 | 11 | 36 | F | 24.3 | 97.1 | 162.9 |
| 2 | 10 | 52 | F | 24.3 | 96.0 | 181.0 |
| | | | Mean: | 26.9 | 96.0 | 163.5 |
| | | | S.D.: | 2.7 | 3.8 | 9.1 |
| | | | Overall Treatment Mean: | 29.4 | 100.4 | 169.1 |
| | | | S.D.: | 3.5 | 6.2 | 8.0 |

Note: When a bird dies, the corresponding data is no longer included in the body weight/total feed consumption.

TABLE 2 (Continued)

FEED CONSUMPTION (g/bird/day)

| Treatment Group | Replicate | Pen | Sex | PHASE | | |
|-----------------|-----------|-----|-------------------------|--------------|-------------|---------------|
| | | | | 1 Starter | 2 Grower | 3 Finisher |
| 3 | 1 | 3 | M | 30.0 | 105.0 | 175.7 |
| 3 | 5 | 13 | M | 30.0 | 103.6 | 179.3 |
| 3 | 3 | 30 | M | 31.2 | 103.2 | 178.5 |
| 3 | 9 | 45 | M | 28.6 | 105.7 | 172.6 |
| 3 | 8 | 47 | M | 31.4 | 101.4 | 169.3 |
| 3 | 12 | 58 | M | 27.9 | 103.6 | 180.5 |
| | | | Mean: | 29.9 | 103.8 | 176.0 |
| | | | SD: | 1.4 | 1.5 | 4.3 |
| 3 | 4 | 8 | F | 27.1 | 93.6 | 162.9 |
| 3 | 7 | 20 | F | 27.1 | 92.1 | 162.1 |
| 3 | 6 | 24 | F | 28.6 | 92.2 | 164.3 |
| 3 | 2 | 35 | F | 23.6 | 97.6 | 164.3 |
| 3 | 11 | 40 | F | 27.1 | 95.7 | 162.1 |
| 3 | 10 | 55 | F | 26.4 | 94.3 | 162.9 |
| | | | Mean: | 26.7 | 94.3 | 163.1 |
| | | | SD: | 1.7 | 2.1 | 1.0 |
| | | | Overall Treatment Mean: | 28.3 | 99.0 | 169.5 |
| | | | SD: | 2.3 | 6.7 | 9.1 |
| 4 | 1 | 2 | M | 29.3 | 100.7 | 172.9 |
| 4 | 5 | 14 | M | 30.7 | 108.6 | 177.9 |
| 4 | 3 | 28 | M | 27.9 | 102.9 | 162.9 |
| 4 | 9 | 44 | M | 29.3 | 109.3 | 175.8 |
| 4 | 8 | 46 | M | 32.9 | 106.4 | 175.0 |
| 4 | 12 | 59 | M | 30.7 | 103.6 | 184.3 |
| | | | Mean: | 30.0 | 105.3 | 174.8 |
| | | | SD: | 1.7 | 3.4 | 7.0 |
| 4 | 4 | 10 | F | 25.0 | 85.0 | 145.7 |
| 4 | 7 | 18 | F | 27.9 | 99.3 | 162.1 |
| 4 | 6 | 21 | F | 25.7 | 93.6 | 162.1 |
| 4 | 2 | 32 | F | 27.1 | 96.4 | 162.1 |
| 4 | 11 | 37 | F | 24.3 | 87.9 | 152.1 |
| 4 | 10 | 54 | F | 26.4 | 99.3 | 155.0 |
| | | | Mean: | 26.1 | 93.6 | 156.5 |
| | | | S.D.: | 1.3 | 6.0 | 6.8 |
| | | | Overall Treatment Mean: | 28.0 | 99.4 | 165.7 |
| | | | S.D.: | 2.8 | 8.2 | 12.9 |

Note: When a bird dies, the corresponding data is no longer included in the body weight/total feed consumption.

TABLE 2 (Continued)

FEED CONSUMPTION (g/bird/day)

| Treatment | | | | PHASE | | |
|-------------------------|-----------|-----|-----|---------|--------|----------|
| | | | | 1 | 2 | 3 |
| Group | Replicate | Pen | Sex | Starter | Grower | Finisher |
| 5 | 1 | 1 | M | 29.3 | 107.5 | 182.5 |
| 5 | 5 | 11 | M | 29.3 | 108.6 | 183.5 |
| 5 | 3 | 26 | M | 30.0 | 106.4 | 156.2 |
| 5 | 9 | 42 | M | 28.6 | 108.7 | 177.2 |
| 5 | 8 | 50 | M | 30.7 | 108.6 | 173.9 |
| 5 | 12 | 60 | M | 32.1 | 109.3 | 164.9 |
| Mean: | | | | 30.0 | 108.2 | 173.0 |
| SD: | | | | 1.3 | 1.0 | 10.6 |
| 5 | 4 | 9 | F | 26.4 | 90.7 | 161.4 |
| 5 | 7 | 19 | F | 27.9 | 95.7 | 158.6 |
| 5 | 6 | 23 | F | 28.6 | 99.3 | 162.9 |
| 5 | 2 | 33 | F | 25.7 | 90.7 | 154.3 |
| 5 | 11 | 38 | F | 26.4 | 92.9 | 160.7 |
| 5 | 10 | 53 | F | 26.4 | 92.9 | 145.0 |
| Mean: | | | | 26.9 | 93.7 | 157.2 |
| S.D.: | | | | 1.1 | 3.3 | 6.7 |
| Overall Treatment Mean: | | | | 28.5 | 100.9 | 165.1 |
| S.D.: | | | | 2.2 | 10.2 | 11.2 |

Note: When a bird dies, the corresponding data is no longer included in the body weight/total feed consumption.

TABLE 2-A

FEED CONSUMPTION SUMMARY

Phases 1-2

| Treatment | | | | Feed | Feed | Total Feed | Total # | Overall Feed | Feed |
|-------------------------|-----------|-----|-----|---------------|---------------|---------------|---------|--------------|--------------|
| | | | | Consumed (kg) | Consumed (kg) | Consumed (kg) | of Bird | Consumed | Consumed |
| Group | Replicate | Pen | Sex | Phase 1 | Phase 2 | Phases 1-2 | Days | (g/pen) | (g/bird/day) |
| 1 | 1 | 4 | M | 4.5 | 14.3 | 18.8 | 280 | 671.4 | 67.1 |
| 1 | 5 | 15 | M | 4.1 | 14.0 | 18.1 | 280 | 646.4 | 64.6 |
| 1 | 3 | 29 | M | 3.8 | 12.3 | 16.1 | 263 | 612.2 | 68.0 |
| 1 | 9 | 43 | M | 4.4 | 14.2 | 18.6 | 280 | 664.3 | 66.4 |
| 1 | 8 | 48 | M | 4.2 | 14.0 | 18.2 | 280 | 650.0 | 65.0 |
| 1 | 12 | 56 | M | 4.6 | 13.8 | 18.4 | 264 | 697.0 | 77.4 |
| Mean: | | | | 4.3 | 13.8 | 18.0 | 275 | 656.9 | 68.1 |
| SD: | | | | 0.3 | 0.7 | 1.0 | 8.5 | 28.4 | 4.7 |
| 1 | 4 | 7 | F | 4.3 | 12.7 | 17.0 | 280 | 607.1 | 60.7 |
| 1 | 7 | 16 | F | 3.9 | 12.7 | 16.6 | 280 | 592.9 | 59.3 |
| 1 | 6 | 22 | F | 3.8 | 13.7 | 17.5 | 280 | 625.0 | 62.5 |
| 1 | 2 | 34 | F | 3.9 | 13.7 | 17.6 | 280 | 628.6 | 62.9 |
| 1 | 11 | 39 | F | 3.8 | 13.4 | 17.2 | 280 | 614.3 | 61.4 |
| 1 | 10 | 51 | F | 3.9 | 14.4 | 18.3 | 280 | 653.6 | 65.4 |
| Mean: | | | | 3.9 | 13.4 | 17.4 | 280 | 620.2 | 62.0 |
| SD: | | | | 0.2 | 0.7 | 0.6 | 0.0 | 20.8 | 2.1 |
| Overall Treatment Mean: | | | | 4.1 | 13.6 | 17.7 | 277 | 638.6 | 65.1 |
| SD: | | | | 0.2 | 0.2 | 0.5 | 3.9 | 25.9 | 4.3 |
| | | | | | | | | | |
| 2 | 1 | 5 | M | 4.7 | 14.7 | 19.4 | 280 | 692.9 | 69.3 |
| 2 | 5 | 12 | M | 4.2 | 14.6 | 18.8 | 280 | 671.4 | 67.1 |
| 2 | 3 | 27 | M | 4.2 | 14.7 | 18.9 | 280 | 675.0 | 67.5 |
| 2 | 9 | 41 | M | 4.1 | 14.8 | 18.9 | 280 | 675.0 | 67.5 |
| 2 | 8 | 49 | M | 4.4 | 14.6 | 19.0 | 280 | 678.6 | 67.9 |
| 2 | 12 | 57 | M | 4.2 | 14.6 | 18.8 | 280 | 671.4 | 67.1 |
| Mean: | | | | 4.3 | 14.7 | 19.0 | 280 | 677.4 | 67.7 |
| SD: | | | | 0.2 | 0.1 | 0.2 | 0.0 | 8.0 | 0.8 |
| 2 | 4 | 6 | F | 4.3 | 13.8 | 18.1 | 280 | 646.4 | 64.6 |
| 2 | 7 | 17 | F | 3.6 | 12.4 | 16.0 | 280 | 571.4 | 57.1 |
| 2 | 6 | 25 | F | 4.1 | 13.9 | 18.0 | 280 | 642.9 | 64.3 |
| 2 | 2 | 31 | F | 3.8 | 13.5 | 17.3 | 280 | 617.9 | 61.8 |
| 2 | 11 | 36 | F | 3.4 | 13.6 | 17.0 | 280 | 607.1 | 60.7 |
| 2 | 10 | 52 | F | 3.4 | 12.1 | 15.5 | 266 | 593.9 | 59.4 |
| Mean: | | | | 3.8 | 13.2 | 17.0 | 278 | 613.3 | 61.3 |
| S.D.: | | | | 0.4 | 0.8 | 1.1 | 5.7 | 28.8 | 2.9 |
| Overall Treatment Mean: | | | | 4.0 | 13.9 | 18.0 | 279 | 645.3 | 64.5 |
| S.D.: | | | | 0.4 | 1.0 | 1.4 | 1.6 | 45.3 | 4.5 |

Note: When a bird dies, the corresponding data is no longer included in the total feed consumption.

TABLE 2-A (Continued)

FEED CONSUMPTION SUMMARY

Phases 1-2

| Treatment | | | | Feed | Feed | Total Feed | Total # | Overall Feed | Feed |
|-------------------------|-----------|-----|-----|---------------|---------------|---------------|---------|--------------|--------------|
| | | | | Consumed (kg) | Consumed (kg) | Consumed (kg) | of Bird | Consumed | Consumed |
| | | | | Phase 1 | Phase 2 | Phases 1-2 | Days | (g/pen) | (g/bird/day) |
| Group | Replicate | Pen | Sex | | | | | | |
| 3 | 1 | 3 | M | 4.2 | 14.7 | 18.9 | 280 | 675.0 | 67.5 |
| 3 | 5 | 13 | M | 4.2 | 14.5 | 18.7 | 280 | 667.9 | 66.8 |
| 3 | 3 | 30 | M | 4.3 | 13.0 | 17.3 | 264 | 655.3 | 72.8 |
| 3 | 9 | 45 | M | 4.0 | 14.8 | 18.8 | 280 | 671.4 | 67.1 |
| 3 | 8 | 47 | M | 4.4 | 14.2 | 18.6 | 280 | 664.3 | 66.4 |
| 3 | 12 | 58 | M | 3.9 | 14.5 | 18.4 | 280 | 657.1 | 65.7 |
| Mean: | | | | 4.2 | 14.3 | 18.5 | 277 | 665.2 | 67.7 |
| SD: | | | | 0.2 | 0.7 | 0.6 | 6.5 | 7.8 | 2.6 |
| 3 | 4 | 8 | F | 3.8 | 13.1 | 16.9 | 280 | 603.6 | 60.4 |
| 3 | 7 | 20 | F | 3.8 | 12.9 | 16.7 | 280 | 596.4 | 59.6 |
| 3 | 6 | 24 | F | 4.0 | 11.9 | 15.9 | 269 | 591.1 | 73.9 |
| 3 | 2 | 35 | F | 3.3 | 12.3 | 15.6 | 266 | 586.5 | 65.2 |
| 3 | 11 | 40 | F | 3.8 | 13.4 | 17.2 | 280 | 614.3 | 61.4 |
| 3 | 10 | 55 | F | 3.7 | 13.2 | 16.9 | 280 | 603.6 | 60.4 |
| Mean: | | | | 3.7 | 12.8 | 16.5 | 276 | 599.2 | 63.5 |
| SD: | | | | 0.2 | 0.6 | 0.6 | 6.5 | 10.0 | 5.5 |
| Overall Treatment Mean: | | | | 4.0 | 13.5 | 17.5 | 277 | 632.2 | 65.6 |
| SD: | | | | 0.3 | 1.0 | 1.4 | 1.1 | 46.6 | 3.0 |
| | | | | | | | | | |
| 4 | 1 | 2 | M | 4.1 | 14.1 | 18.2 | 280 | 650.0 | 65.0 |
| 4 | 5 | 14 | M | 4.3 | 15.2 | 19.5 | 280 | 696.4 | 69.6 |
| 4 | 3 | 28 | M | 3.9 | 14.4 | 18.3 | 280 | 653.6 | 65.4 |
| 4 | 9 | 44 | M | 4.1 | 15.3 | 19.4 | 280 | 692.9 | 69.3 |
| 4 | 8 | 46 | M | 4.6 | 14.9 | 19.5 | 280 | 696.4 | 69.6 |
| 4 | 12 | 59 | M | 4.3 | 14.5 | 18.8 | 280 | 671.4 | 67.1 |
| Mean: | | | | 4.2 | 14.7 | 19.0 | 280 | 676.8 | 67.7 |
| SD: | | | | 0.2 | 0.5 | 0.6 | 0.0 | 21.5 | 2.2 |
| 4 | 4 | 10 | F | 3.5 | 11.9 | 15.4 | 280 | 550.0 | 55.0 |
| 4 | 7 | 18 | F | 3.9 | 13.9 | 17.8 | 280 | 635.7 | 63.6 |
| 4 | 6 | 21 | F | 3.6 | 13.1 | 16.7 | 280 | 596.4 | 59.6 |
| 4 | 2 | 32 | F | 3.8 | 13.5 | 17.3 | 280 | 617.9 | 61.8 |
| 4 | 11 | 37 | F | 3.4 | 12.3 | 15.7 | 280 | 560.7 | 56.1 |
| 4 | 10 | 54 | F | 3.7 | 13.9 | 17.6 | 280 | 628.6 | 62.9 |
| Mean: | | | | 3.7 | 13.1 | 16.8 | 280 | 598.2 | 59.8 |
| S.D.: | | | | 0.2 | 0.8 | 1.0 | 0.0 | 35.9 | 3.6 |
| Overall Treatment Mean: | | | | 3.9 | 13.9 | 17.9 | 280 | 637.5 | 63.8 |
| S.D.: | | | | 0.4 | 1.2 | 1.6 | 0.0 | 55.6 | 5.6 |

Note: When a bird dies, the corresponding data is no longer included in the total feed consumption.

TABLE 2-A (Continued)

FEED CONSUMPTION SUMMARY

Phases 1-2

| Treatment | | | | Feed | Feed | Total Feed | Total # | Overall Feed | Feed |
|-------------------------|-----------|-----|-----|---------------|---------------|---------------|---------|--------------|--------------|
| | | | | Consumed (kg) | Consumed (kg) | Consumed (kg) | of Bird | Consumed | Consumed |
| Group | Replicate | Pen | Sex | Phase 1 | Phase 2 | Phases 1-2 | Days | (g/pen) | (g/bird/day) |
| 5 | 1 | 1 | M | 4.1 | 14.3 | 18.4 | 273 | 674.0 | 74.9 |
| 5 | 5 | 11 | M | 4.1 | 15.2 | 19.3 | 280 | 689.3 | 68.9 |
| 5 | 3 | 26 | M | 4.2 | 14.9 | 19.1 | 280 | 682.1 | 68.2 |
| 5 | 9 | 42 | M | 3.8 | 13.7 | 17.5 | 259 | 675.7 | 75.1 |
| 5 | 8 | 50 | M | 4.3 | 15.2 | 19.5 | 280 | 696.4 | 69.6 |
| 5 | 12 | 60 | M | 4.5 | 15.3 | 19.8 | 280 | 707.1 | 70.7 |
| Mean: | | | | 4.2 | 14.8 | 18.9 | 275 | 687.4 | 71.2 |
| SD: | | | | 0.2 | 0.6 | 0.8 | 8.5 | 12.8 | 3.0 |
| 5 | 4 | 9 | F | 3.7 | 12.7 | 16.4 | 280 | 585.7 | 58.6 |
| 5 | 7 | 19 | F | 3.9 | 13.4 | 17.3 | 280 | 617.9 | 61.8 |
| 5 | 6 | 23 | F | 4.0 | 13.9 | 17.9 | 280 | 639.3 | 63.9 |
| 5 | 2 | 33 | F | 3.6 | 12.7 | 16.3 | 280 | 582.1 | 58.2 |
| 5 | 11 | 38 | F | 3.7 | 13.0 | 16.7 | 280 | 596.4 | 59.6 |
| 5 | 10 | 53 | F | 3.7 | 13.0 | 16.7 | 280 | 596.4 | 59.6 |
| Mean: | | | | 3.8 | 13.1 | 16.9 | 280 | 603.0 | 60.3 |
| S.D.: | | | | 0.2 | 0.5 | 0.6 | 0.0 | 21.7 | 2.2 |
| Overall Treatment Mean: | | | | 4.0 | 13.9 | 17.9 | 278 | 645.2 | 65.8 |
| S.D.: | | | | 0.3 | 1.2 | 1.4 | 3.3 | 59.7 | 7.7 |

Note: When a bird dies, the corresponding data is no longer included in the total feed consumption.

TABLE 2-B

FEED CONSUMPTION SUMMARY

Phases 1-3

| Treatment | | | | Feed Consumed (kg) | | | Total Feed Consumed (kg) | Total # of Bird Days | Overall Feed Consumed (g/pen) | Feed Consumed (g/bird/day) |
|-------------------------|-----------|-----|-----|--------------------|---------|---------|--------------------------|----------------------|-------------------------------|----------------------------|
| Group | Replicate | Pen | Sex | Phase 1 | Phase 2 | Phase 3 | Phases 1-3 | | | |
| 1 | 1 | 4 | M | 4.5 | 14.3 | 17.8 | 36.6 | 399 | 917.3 | 131.0 |
| 1 | 5 | 15 | M | 4.1 | 14.0 | 24.8 | 42.9 | 416 | 1031.3 | 114.6 |
| 1 | 3 | 29 | M | 3.8 | 12.3 | 21.4 | 37.5 | 389 | 964.0 | 107.1 |
| 1 | 9 | 43 | M | 4.4 | 14.2 | 21.5 | 40.1 | 411 | 975.7 | 108.4 |
| 1 | 8 | 48 | M | 4.2 | 14.0 | 22.4 | 40.6 | 415 | 978.3 | 108.7 |
| 1 | 12 | 56 | M | 4.6 | 13.8 | 20.2 | 38.6 | 385 | 1002.6 | 125.3 |
| Mean: | | | | 4.3 | 13.8 | 21.4 | 39.4 | 403 | 978.2 | 115.9 |
| SD: | | | | 0.3 | 0.7 | 2.3 | 2.3 | 13.5 | 38.3 | 10.0 |
| 1 | 4 | 7 | F | 4.3 | 12.7 | 22.0 | 39.0 | 420 | 928.6 | 92.9 |
| 1 | 7 | 16 | F | 3.9 | 12.7 | 22.4 | 39.0 | 420 | 928.6 | 92.9 |
| 1 | 6 | 22 | F | 3.8 | 13.7 | 22.8 | 40.3 | 420 | 959.5 | 96.0 |
| 1 | 2 | 34 | F | 3.9 | 13.7 | 22.8 | 40.4 | 420 | 961.9 | 96.2 |
| 1 | 11 | 39 | F | 3.8 | 13.4 | 22.8 | 40.0 | 420 | 952.4 | 95.2 |
| 1 | 10 | 51 | F | 3.9 | 14.4 | 22.1 | 40.4 | 420 | 961.9 | 96.2 |
| Mean: | | | | 3.9 | 13.4 | 22.5 | 39.9 | 420 | 948.8 | 94.9 |
| S.D.: | | | | 0.2 | 0.7 | 0.4 | 0.7 | 0.0 | 16.1 | 1.6 |
| Overall Treatment Mean: | | | | 4.1 | 13.6 | 21.9 | 39.6 | 411 | 963.5 | 105.4 |
| S.D.: | | | | 0.2 | 0.2 | 0.8 | 0.3 | 12.4 | 20.8 | 14.8 |
| | | | | | | | | | | |
| 2 | 1 | 5 | M | 4.7 | 14.7 | 23.7 | 43.1 | 416 | 1036.1 | 115.1 |
| 2 | 5 | 12 | M | 4.2 | 14.6 | 24.1 | 42.9 | 415 | 1033.7 | 114.9 |
| 2 | 3 | 27 | M | 4.2 | 14.7 | 20.6 | 39.5 | 403 | 980.1 | 122.5 |
| 2 | 9 | 41 | M | 4.1 | 14.8 | 25.1 | 44.0 | 416 | 1057.7 | 117.5 |
| 2 | 8 | 49 | M | 4.4 | 14.6 | 22.7 | 41.7 | 415 | 1004.8 | 111.6 |
| 2 | 12 | 57 | M | 4.2 | 14.6 | 24.6 | 43.4 | 420 | 1033.3 | 103.3 |
| Mean: | | | | 4.3 | 14.7 | 23.5 | 42.4 | 414 | 1024.3 | 105.4 |
| SD: | | | | 0.2 | 0.1 | 1.6 | 1.6 | 5.8 | 27.4 | 6.4 |
| 2 | 4 | 6 | F | 4.3 | 13.8 | 22.5 | 40.6 | 420 | 966.7 | 96.7 |
| 2 | 7 | 17 | F | 3.6 | 12.4 | 21.7 | 37.7 | 419 | 899.8 | 100.0 |
| 2 | 6 | 25 | F | 4.1 | 13.9 | 22.0 | 40.0 | 420 | 952.4 | 95.2 |
| 2 | 2 | 31 | F | 3.8 | 13.5 | 22.8 | 40.1 | 420 | 954.8 | 95.5 |
| 2 | 11 | 36 | F | 3.4 | 13.6 | 22.8 | 39.8 | 420 | 947.6 | 94.8 |
| 2 | 10 | 52 | F | 3.4 | 12.1 | 22.8 | 38.3 | 392 | 977.0 | 108.6 |
| Mean: | | | | 3.8 | 13.2 | 22.4 | 39.4 | 415 | 949.7 | 98.4 |
| S.D.: | | | | 0.4 | 0.8 | 0.5 | 1.1 | 11.4 | 26.7 | 5.3 |
| Overall Treatment Mean: | | | | 4.0 | 13.9 | 23.0 | 40.9 | 415 | 987.0 | 101.9 |
| S.D.: | | | | 0.4 | 1.0 | 0.7 | 2.1 | 0.7 | 52.7 | 4.9 |

Note: When a bird dies, the corresponding data is no longer included in the total feed consumption.

TABLE 2-B (Continued)

FEED CONSUMPTION SUMMARY

Phases 1-3

| Treatment | | | | Feed Consumed (kg) | | | Total Feed Consumed (kg) | Total # of Bird Days | Overall Feed Consumed (g/pen) | Feed Consumed (g/bird/day) |
|-------------------------|-----------|-----|-----|--------------------|---------|---------|--------------------------|----------------------|-------------------------------|----------------------------|
| Group | Replicate | Pen | Sex | Phase 1 | Phase 2 | Phase 3 | Phases 1-3 | | | |
| 3 | 1 | 3 | M | 4.2 | 14.7 | 24.6 | 43.5 | 420 | 1035.7 | 103.6 |
| 3 | 5 | 13 | M | 4.2 | 14.5 | 24.2 | 42.9 | 415 | 1033.7 | 114.9 |
| 3 | 3 | 30 | M | 4.3 | 13.0 | 21.6 | 38.9 | 385 | 1010.4 | 126.3 |
| 3 | 9 | 45 | M | 4.0 | 14.8 | 23.3 | 42.1 | 415 | 1014.5 | 112.7 |
| 3 | 8 | 47 | M | 4.4 | 14.2 | 23.7 | 42.3 | 420 | 1007.1 | 100.7 |
| 3 | 12 | 58 | M | 3.9 | 14.5 | 23.1 | 41.5 | 408 | 1017.2 | 113.0 |
| Mean: | | | | 4.2 | 14.3 | 23.4 | 41.9 | 411 | 1019.8 | 111.9 |
| SD: | | | | 0.2 | 0.7 | 1.0 | 1.6 | 13.2 | 12.1 | 9.1 |
| 3 | 4 | 8 | F | 3.8 | 13.1 | 22.8 | 39.7 | 420 | 945.2 | 94.5 |
| 3 | 7 | 20 | F | 3.8 | 12.9 | 22.7 | 39.4 | 420 | 938.1 | 93.8 |
| 3 | 6 | 24 | F | 4.0 | 11.9 | 18.4 | 34.3 | 381 | 900.3 | 112.5 |
| 3 | 2 | 35 | F | 3.3 | 12.3 | 20.7 | 36.3 | 392 | 926.0 | 102.9 |
| 3 | 11 | 40 | F | 3.8 | 13.4 | 22.7 | 39.9 | 420 | 950.0 | 95.0 |
| 3 | 10 | 55 | F | 3.7 | 13.2 | 22.8 | 39.7 | 420 | 945.2 | 94.5 |
| Mean: | | | | 3.7 | 12.8 | 21.7 | 38.2 | 409 | 934.1 | 98.9 |
| SD: | | | | 0.2 | 0.6 | 1.8 | 2.4 | 17.6 | 18.6 | 7.5 |
| Overall Treatment Mean: | | | | 4.0 | 13.5 | 22.6 | 40.0 | 410 | 977.0 | 105.4 |
| SD: | | | | 0.3 | 1.0 | 1.2 | 2.6 | 1.2 | 60.5 | 9.2 |
| | | | | | | | | | | |
| 4 | 1 | 2 | M | 4.1 | 14.1 | 24.2 | 42.4 | 420 | 1009.5 | 101.0 |
| 4 | 5 | 14 | M | 4.3 | 15.2 | 24.9 | 44.4 | 420 | 1057.1 | 105.7 |
| 4 | 3 | 28 | M | 3.9 | 14.4 | 22.8 | 41.1 | 420 | 978.6 | 97.9 |
| 4 | 9 | 44 | M | 4.1 | 15.3 | 23.2 | 42.6 | 412 | 1034.0 | 129.2 |
| 4 | 8 | 46 | M | 4.6 | 14.9 | 24.5 | 44.0 | 420 | 1047.6 | 104.8 |
| 4 | 12 | 59 | M | 4.3 | 14.5 | 25.8 | 44.6 | 420 | 1061.9 | 106.2 |
| Mean: | | | | 4.2 | 14.7 | 24.2 | 43.2 | 419 | 1031.5 | 105.4 |
| SD: | | | | 0.2 | 0.5 | 1.1 | 1.4 | 3.3 | 32.0 | 11.1 |
| 4 | 4 | 10 | F | 3.5 | 11.9 | 20.4 | 35.8 | 420 | 852.4 | 85.2 |
| 4 | 7 | 18 | F | 3.9 | 13.9 | 22.7 | 40.5 | 420 | 964.3 | 96.4 |
| 4 | 6 | 21 | F | 3.6 | 13.1 | 22.7 | 39.4 | 420 | 938.1 | 93.8 |
| 4 | 2 | 32 | F | 3.8 | 13.5 | 22.7 | 40.0 | 420 | 952.4 | 95.2 |
| 4 | 11 | 37 | F | 3.4 | 12.3 | 21.3 | 37.0 | 420 | 881.0 | 88.1 |
| 4 | 10 | 54 | F | 3.7 | 13.9 | 21.7 | 39.3 | 420 | 935.7 | 93.6 |
| Mean: | | | | 3.7 | 13.1 | 21.9 | 38.7 | 420 | 920.6 | 92.1 |
| S.D.: | | | | 0.2 | 0.8 | 1.0 | 1.8 | 0.0 | 44.0 | 4.4 |
| Overall Treatment Mean: | | | | 3.9 | 13.9 | 23.1 | 40.9 | 419 | 976.0 | 98.7 |
| S.D.: | | | | 0.4 | 1.2 | 1.6 | 3.2 | 0.9 | 78.4 | 9.4 |

Note: When a bird dies, the corresponding data is no longer included in the total feed consumption.

TABLE 2-B (Continued)

FEED CONSUMPTION SUMMARY

Phases 1-3

| Treatment | | | | Feed Consumed (kg) | | | Total Feed Consumed (kg) | Total # of Bird Days | Overall Feed Consumed (g/pen) | Feed Consumed (g/bird/day) |
|-------------------------|-----------|-----|-----|--------------------|---------|---------|--------------------------|----------------------|-------------------------------|----------------------------|
| Group | Replicate | Pen | Sex | Phase 1 | Phase 2 | Phase 3 | Phases 1-3 | | | |
| 5 | 1 | 1 | M | 4.1 | 14.3 | 23.0 | 41.4 | 399 | 1037.6 | 115.3 |
| 5 | 5 | 11 | M | 4.1 | 15.2 | 24.4 | 43.7 | 413 | 1058.1 | 132.3 |
| 5 | 3 | 26 | M | 4.2 | 14.9 | 18.9 | 38.0 | 401 | 947.6 | 135.4 |
| 5 | 9 | 42 | M | 3.8 | 13.7 | 20.2 | 37.7 | 373 | 1010.7 | 126.3 |
| 5 | 8 | 50 | M | 4.3 | 15.2 | 24.0 | 43.5 | 418 | 1040.7 | 115.6 |
| 5 | 12 | 60 | M | 4.5 | 15.3 | 22.1 | 41.9 | 414 | 1012.1 | 112.5 |
| Mean: | | | | 4.2 | 14.8 | 22.1 | 41.0 | 403 | 1017.8 | 122.9 |
| SD: | | | | 0.2 | 0.6 | 2.2 | 2.6 | 16.5 | 38.8 | 9.7 |
| 5 | 4 | 9 | F | 3.7 | 12.7 | 22.6 | 39.0 | 420 | 928.6 | 92.9 |
| 5 | 7 | 19 | F | 3.9 | 13.4 | 22.2 | 39.5 | 420 | 940.5 | 94.0 |
| 5 | 6 | 23 | F | 4.0 | 13.9 | 22.8 | 40.7 | 420 | 969.0 | 96.9 |
| 5 | 2 | 33 | F | 3.6 | 12.7 | 21.6 | 37.9 | 420 | 902.4 | 90.2 |
| 5 | 11 | 38 | F | 3.7 | 13.0 | 22.5 | 39.2 | 420 | 933.3 | 93.3 |
| 5 | 10 | 53 | F | 3.7 | 13.0 | 20.3 | 37.0 | 420 | 881.0 | 88.1 |
| Mean: | | | | 3.8 | 13.1 | 22.0 | 38.9 | 420 | 925.8 | 92.6 |
| S.D.: | | | | 0.2 | 0.5 | 0.9 | 1.3 | 0.0 | 30.7 | 3.1 |
| Overall Treatment Mean: | | | | 4.0 | 13.9 | 18.4 | 40.0 | 412 | 971.8 | 107.7 |
| S.D.: | | | | 0.3 | 1.2 | 0.1 | 1.5 | 12.0 | 65.1 | 21.4 |

Note: When a bird dies, the corresponding data is no longer included in the total feed consumption.

TABLE 3-A

FEED CONVERSION - STARTER (14 DAYS)

| Treatment Group | Replicate | Pen | Sex | Average Weight (g) (9/8/10) | Average Weight (g) (9/22/10) | Average Daily Gain | Total Feed Consumption (g/bird) | Average Daily Feed Intake | Feed Conversion (Feed consumed/ 1 g weight gained) |
|-------------------------|-----------|-----|-----|--------------------------------|---------------------------------|--------------------|------------------------------------|---------------------------|--|
| 1 | 1 | 4 | M | 45.4 | 410.0 | 26.0 | 449.4 | 32.1 | 1.23 |
| 1 | 5 | 15 | M | 46.2 | 400.0 | 25.3 | 410.2 | 29.3 | 1.16 |
| 1 | 3 | 29 | M | 44.9 | 378.0 | 23.8 | 387.8 | 27.7 | 1.16 |
| 1 | 9 | 43 | M | 44.0 | 350.0 | 21.9 | 439.6 | 31.4 | 1.44 |
| 1 | 8 | 48 | M | 44.6 | 430.0 | 27.5 | 420.0 | 30.0 | 1.09 |
| 1 | 12 | 56 | M | 44.9 | 389.0 | 24.6 | 466.2 | 33.3 | 1.36 |
| Mean: | | | | 45.0 | 392.8 | 24.8 | 428.9 | 30.6 | 1.24 |
| SD: | | | | 0.7 | 27.6 | 1.9 | 28.4 | 2.0 | 0.1 |
| 1 | 4 | 7 | F | 40.8 | 350.0 | 22.1 | 429.8 | 30.7 | 1.39 |
| 1 | 7 | 16 | F | 38.6 | 340.0 | 21.5 | 390.6 | 27.9 | 1.30 |
| 1 | 6 | 22 | F | 40.8 | 370.0 | 23.5 | 379.4 | 27.1 | 1.15 |
| 1 | 2 | 34 | F | 39.3 | 370.0 | 23.6 | 390.6 | 27.9 | 1.18 |
| 1 | 11 | 39 | F | 38.6 | 340.0 | 21.5 | 379.4 | 27.1 | 1.26 |
| 1 | 10 | 51 | F | 38.8 | 320.0 | 20.1 | 390.6 | 27.9 | 1.39 |
| Mean: | | | | 39.5 | 348.3 | 22.1 | 393.4 | 28.1 | 1.28 |
| S.D.: | | | | 1.1 | 19.4 | 1.3 | 18.7 | 1.3 | 0.1 |
| Overall Treatment Mean: | | | | 42.2 | 370.6 | 23.5 | 411.1 | 29.4 | 1.26 |
| S.D.: | | | | 3.9 | 31.5 | 2.0 | 25.1 | 1.8 | 0.0 |
| 2 | 1 | 5 | M | 45.3 | 410.0 | 26.0 | 470.4 | 33.6 | 1.29 |
| 2 | 5 | 12 | M | 45.7 | 370.0 | 23.2 | 420.0 | 30.0 | 1.30 |
| 2 | 3 | 27 | M | 44.8 | 400.0 | 25.4 | 420.0 | 30.0 | 1.18 |
| 2 | 9 | 41 | M | 44.9 | 380.0 | 23.9 | 410.2 | 29.3 | 1.22 |
| 2 | 8 | 49 | M | 46.8 | 390.0 | 24.5 | 439.6 | 31.4 | 1.28 |
| 2 | 12 | 57 | M | 46.7 | 400.0 | 25.2 | 420.0 | 30.0 | 1.19 |
| Mean: | | | | 45.7 | 391.7 | 24.7 | 430.0 | 30.7 | 1.24 |
| SD: | | | | 0.9 | 14.7 | 1.0 | 22.0 | 1.6 | 0.1 |
| 2 | 4 | 6 | F | 39.0 | 360.0 | 22.9 | 429.8 | 30.7 | 1.34 |
| 2 | 7 | 17 | F | 38.7 | 320.0 | 20.1 | 359.8 | 25.7 | 1.28 |
| 2 | 6 | 25 | F | 39.1 | 390.0 | 25.1 | 410.2 | 29.3 | 1.17 |
| 2 | 2 | 31 | F | 39.0 | 350.0 | 22.2 | 379.4 | 27.1 | 1.22 |
| 2 | 11 | 36 | F | 40.9 | 350.0 | 22.1 | 340.2 | 24.3 | 1.10 |
| 2 | 10 | 52 | F | 37.6 | 310.0 | 19.5 | 340.2 | 24.3 | 1.25 |
| Mean: | | | | 39.1 | 346.7 | 22.0 | 376.6 | 26.9 | 1.23 |
| S.D.: | | | | 1.1 | 28.8 | 2.0 | 37.1 | 2.7 | 0.1 |
| Overall Treatment Mean: | | | | 42.4 | 369.2 | 23.3 | 403.3 | 28.8 | 1.24 |
| S.D.: | | | | 4.7 | 31.8 | 1.9 | 37.8 | 2.7 | 0.0 |

Note: When a bird dies, the corresponding data is no longer included in the body weight/total feed consumption.

TABLE 3-A (Continued)

FEED CONVERSION - STARTER (14 DAYS)

| Treatment Group | Replicate | Pen | Sex | Average Weight (g) (9/8/10) | Average Weight (g) (9/22/10) | Average Daily Gain | Total Feed Consumption (g/bird) | Average Daily Feed Intake | Feed Conversion (Feed consumed/ 1 g weight gained) |
|-------------------------|-----------|-----|-----|--------------------------------|---------------------------------|--------------------|------------------------------------|---------------------------|--|
| 3 | 1 | 3 | M | 45.7 | 410.0 | 26.0 | 420.0 | 30.0 | 1.15 |
| 3 | 5 | 13 | M | 44.0 | 350.0 | 21.9 | 420.0 | 30.0 | 1.37 |
| 3 | 3 | 30 | M | 44.8 | 378.0 | 23.8 | 436.8 | 31.2 | 1.31 |
| 3 | 9 | 45 | M | 46.4 | 360.0 | 22.4 | 400.4 | 28.6 | 1.28 |
| 3 | 8 | 47 | M | 44.6 | 350.0 | 21.8 | 439.6 | 31.4 | 1.44 |
| 3 | 12 | 58 | M | 44.4 | 370.0 | 23.3 | 390.6 | 27.9 | 1.20 |
| Mean: | | | | 45.0 | 369.7 | 23.2 | 417.9 | 29.9 | 1.29 |
| SD: | | | | 0.9 | 22.6 | 1.6 | 19.4 | 1.4 | 0.1 |
| 3 | 4 | 8 | F | 41.6 | 330.0 | 20.6 | 379.4 | 27.1 | 1.32 |
| 3 | 7 | 20 | F | 41.2 | 330.0 | 20.6 | 379.4 | 27.1 | 1.31 |
| 3 | 6 | 24 | F | 40.2 | 330.0 | 20.7 | 400.4 | 28.6 | 1.38 |
| 3 | 2 | 35 | F | 38.6 | 300.0 | 18.7 | 330.4 | 23.6 | 1.26 |
| 3 | 11 | 40 | F | 39.9 | 340.0 | 21.4 | 379.4 | 27.1 | 1.26 |
| 3 | 10 | 55 | F | 38.5 | 330.0 | 20.8 | 369.6 | 26.4 | 1.27 |
| Mean: | | | | 40.0 | 326.7 | 20.5 | 373.1 | 26.7 | 1.30 |
| SD: | | | | 1.3 | 13.7 | 0.9 | 23.2 | 1.7 | 0.0 |
| Overall Treatment Mean: | | | | 42.5 | 348.2 | 21.8 | 395.5 | 28.3 | 1.30 |
| SD: | | | | 3.5 | 30.4 | 1.9 | 31.7 | 2.3 | 0.0 |
| 4 | 1 | 2 | M | 44.5 | 370.0 | 23.3 | 410.2 | 29.3 | 1.26 |
| 4 | 5 | 14 | M | 44.3 | 420.0 | 26.8 | 429.8 | 30.7 | 1.14 |
| 4 | 3 | 28 | M | 43.9 | 370.0 | 23.3 | 390.6 | 27.9 | 1.20 |
| 4 | 9 | 44 | M | 44.1 | 410.0 | 26.1 | 410.2 | 29.3 | 1.12 |
| 4 | 8 | 46 | M | 45.9 | 380.0 | 23.9 | 460.6 | 32.9 | 1.38 |
| 4 | 12 | 59 | M | 46.8 | 410.0 | 25.9 | 429.8 | 30.7 | 1.18 |
| Mean: | | | | 44.9 | 393.3 | 24.9 | 421.9 | 30.1 | 1.21 |
| SD: | | | | 1.2 | 22.5 | 1.6 | 24.0 | 1.7 | 0.1 |
| 4 | 4 | 10 | F | 39.6 | 330.0 | 20.7 | 350.0 | 25.0 | 1.21 |
| 4 | 7 | 18 | F | 40.0 | 350.0 | 22.1 | 390.6 | 27.9 | 1.26 |
| 4 | 6 | 21 | F | 38.9 | 340.0 | 21.5 | 359.8 | 25.7 | 1.19 |
| 4 | 2 | 32 | F | 40.0 | 360.0 | 22.9 | 379.4 | 27.1 | 1.19 |
| 4 | 11 | 37 | F | 40.0 | 320.0 | 20.0 | 340.2 | 24.3 | 1.21 |
| 4 | 10 | 64 | F | 37.5 | 330.0 | 20.9 | 285.6 | 20.4 | 0.98 |
| Mean: | | | | 39.3 | 338.3 | 21.4 | 350.9 | 25.1 | 1.17 |
| S.D.: | | | | 1.0 | 14.7 | 1.0 | 37.0 | 2.6 | 0.1 |
| Overall Treatment Mean: | | | | 42.1 | 365.8 | 23.1 | 386.4 | 27.6 | 1.19 |
| S.D.: | | | | 3.9 | 38.9 | 2.5 | 50.2 | 3.6 | 0.0 |

Note: When a bird dies, the corresponding data is no longer included in the body weight/total feed consumption.

TABLE 3-A (Continued)

FEED CONVERSION - STARTER (14 DAYS)

| Treatment Group | Replicate | Pen | Sex | Average Weight (g) (9/8/10) | Average Weight (g) (9/22/10) | Average Daily Gain (g) | Total Feed Consumption (g/bird) | Average Daily Feed Intake | Feed Conversion (Feed consumed/ 1 g weight gained) |
|-------------------------|-----------|-----|-----|--------------------------------|---------------------------------|------------------------|------------------------------------|---------------------------|--|
| 5 | 1 | 1 | M | 42.3 | 400.0 | 25.6 | 410.2 | 29.3 | 1.15 |
| 5 | 5 | 11 | M | 46.2 | 400.0 | 25.3 | 410.2 | 29.3 | 1.16 |
| 5 | 3 | 26 | M | 45.9 | 400.0 | 25.3 | 420.0 | 30.0 | 1.19 |
| 5 | 9 | 42 | M | 44.8 | 400.0 | 25.4 | 400.4 | 28.6 | 1.13 |
| 5 | 8 | 50 | M | 44.5 | 400.0 | 25.4 | 429.8 | 30.7 | 1.21 |
| 5 | 12 | 60 | M | 45.5 | 380.0 | 23.9 | 449.4 | 32.1 | 1.34 |
| Mean: | | | | 44.9 | 396.7 | 25.1 | 420.0 | 30.0 | 1.20 |
| SD: | | | | 1.4 | 8.2 | 0.6 | 17.5 | 1.3 | 0.1 |
| 5 | 4 | 9 | F | 41.2 | 330.0 | 20.6 | 369.6 | 26.4 | 1.28 |
| 5 | 7 | 19 | F | 40.8 | 360.0 | 22.8 | 390.6 | 27.9 | 1.22 |
| 5 | 6 | 23 | F | 39.0 | 360.0 | 22.9 | 400.4 | 28.6 | 1.25 |
| 5 | 2 | 33 | F | 40.2 | 340.0 | 21.4 | 359.8 | 25.7 | 1.20 |
| 5 | 11 | 38 | F | 38.5 | 350.0 | 22.3 | 369.6 | 26.4 | 1.19 |
| 5 | 10 | 53 | F | 37.3 | 340.0 | 21.6 | 369.6 | 26.4 | 1.22 |
| Mean: | | | | 39.5 | 346.7 | 21.9 | 376.6 | 26.9 | 1.23 |
| S.D.: | | | | 1.5 | 12.1 | 0.9 | 15.4 | 1.1 | 0.0 |
| Overall Treatment Mean: | | | | 42.2 | 371.7 | 23.5 | 398.3 | 28.5 | 1.21 |
| S.D.: | | | | 3.8 | 35.4 | 2.3 | 30.7 | 2.2 | 0.0 |

Note: When a bird dies, the corresponding data is no longer included in the body weight/total feed consumption.

TABLE 3-B

FEED CONVERSION - GROWER (14 DAYS)

| Treatment Group | Replicate | Pen | Sex | Average Weight (g) (9/22/10) | Average Weight (g) (10/6/10) | Average Daily Gain | Total Feed Consumption (g/bird) | Average Daily Feed Intake | Feed Conversion (Feed consumed/ 1 g weight gained) |
|-------------------------|-----------|-----|-----|---------------------------------|---------------------------------|--------------------|------------------------------------|---------------------------|--|
| 1 | 1 | 4 | M | 410.0 | 1410.0 | 71.4 | 1429.4 | 102.1 | 1.43 |
| 1 | 5 | 15 | M | 400.0 | 1500.0 | 78.6 | 1400.0 | 100.0 | 1.27 |
| 1 | 3 | 29 | M | 377.8 | 1377.8 | 71.4 | 1366.4 | 97.6 | 1.37 |
| 1 | 9 | 43 | M | 350.0 | 1390.0 | 74.3 | 1419.6 | 101.4 | 1.37 |
| 1 | 8 | 48 | M | 430.0 | 1530.0 | 78.6 | 1400.0 | 100.0 | 1.27 |
| 1 | 12 | 56 | M | 388.9 | 1477.8 | 77.8 | 1533.0 | 109.5 | 1.41 |
| Mean: | | | | 392.8 | 1447.6 | 75.3 | 1424.7 | 101.8 | 1.35 |
| SD: | | | | 27.6 | 63.3 | 3.4 | 57.3 | 4.1 | 0.1 |
| 1 | 4 | 7 | F | 350.0 | 1240.0 | 63.6 | 1269.8 | 90.7 | 1.43 |
| 1 | 7 | 16 | F | 340.0 | 1230.0 | 63.6 | 1269.8 | 90.7 | 1.43 |
| 1 | 6 | 22 | F | 370.0 | 1310.0 | 67.1 | 1370.6 | 97.9 | 1.46 |
| 1 | 2 | 34 | F | 370.0 | 1320.0 | 67.9 | 1370.6 | 97.9 | 1.44 |
| 1 | 11 | 39 | F | 340.0 | 1260.0 | 65.7 | 1339.8 | 95.7 | 1.46 |
| 1 | 10 | 51 | F | 320.0 | 1260.0 | 67.1 | 1440.6 | 102.9 | 1.53 |
| Mean: | | | | 348.3 | 1270.0 | 65.8 | 1343.5 | 96.0 | 1.46 |
| S.D.: | | | | 19.4 | 36.9 | 1.9 | 66.0 | 4.7 | 0.0 |
| Overall Treatment Mean: | | | | 370.6 | 1358.8 | 70.6 | 1384.1 | 98.9 | 1.40 |
| S.D.: | | | | 31.4 | 125.6 | 6.7 | 57.4 | 4.1 | 0.1 |
| 2 | 1 | 5 | M | 410.0 | 1460.0 | 75.0 | 1470.0 | 105.0 | 1.40 |
| 2 | 5 | 12 | M | 370.0 | 1390.0 | 72.9 | 1460.2 | 104.3 | 1.43 |
| 2 | 3 | 27 | M | 400.0 | 1430.0 | 73.6 | 1470.0 | 105.0 | 1.43 |
| 2 | 9 | 41 | M | 380.0 | 1390.0 | 72.1 | 1479.8 | 105.7 | 1.47 |
| 2 | 8 | 49 | M | 390.0 | 1450.0 | 75.7 | 1460.2 | 104.3 | 1.38 |
| 2 | 12 | 57 | M | 400.0 | 1540.0 | 81.4 | 1460.2 | 104.3 | 1.28 |
| Mean: | | | | 391.7 | 1443.3 | 75.1 | 1466.7 | 104.8 | 1.40 |
| SD: | | | | 14.7 | 55.7 | 3.4 | 8.0 | 0.6 | 0.1 |
| 2 | 4 | 6 | F | 360.0 | 1250.0 | 63.6 | 1380.4 | 98.6 | 1.55 |
| 2 | 7 | 17 | F | 320.0 | 1120.0 | 57.1 | 1240.4 | 88.6 | 1.55 |
| 2 | 6 | 25 | F | 390.0 | 1340.0 | 67.9 | 1390.2 | 99.3 | 1.46 |
| 2 | 2 | 31 | F | 350.0 | 1310.0 | 68.6 | 1349.6 | 96.4 | 1.41 |
| 2 | 11 | 36 | F | 350.0 | 1280.0 | 66.4 | 1359.4 | 97.1 | 1.46 |
| 2 | 10 | 52 | F | 310.0 | 1189.0 | 62.8 | 1209.6 | 96.0 | 1.53 |
| Mean: | | | | 346.7 | 1248.2 | 64.4 | 1321.6 | 96.0 | 1.49 |
| S.D.: | | | | 28.8 | 81.5 | 4.2 | 76.8 | 3.8 | 0.1 |
| Overall Treatment Mean: | | | | 369.2 | 1345.8 | 69.8 | 1394.2 | 100.4 | 1.45 |
| S.D.: | | | | 31.8 | 138.0 | 7.6 | 102.6 | 6.2 | 0.1 |

Note: When a bird dies, the corresponding data is no longer included in the body weight/total feed consumption.

TABLE 3-B (Continued)

FEED CONVERSION - GROWER (14 DAYS)

| Treatment Group | Replicate | Pen | Sex | Average Weight (g) (9/22/10) | Average Weight (g) (10/6/10) | Average Daily Gain | Total Feed Consumption (g/bird) | Average Daily Feed Intake | Feed Conversion (Feed consumed/ 1 g weight gained) |
|-------------------------|-----------|-----|-----|---------------------------------|---------------------------------|--------------------|------------------------------------|---------------------------|--|
| 3 | 1 | 3 | M | 410.0 | 1510.0 | 78.6 | 1470.0 | 105.0 | 1.34 |
| 3 | 5 | 13 | M | 350.0 | 1340.0 | 70.7 | 1450.4 | 103.6 | 1.47 |
| 3 | 3 | 30 | M | 379.0 | 1367.0 | 70.6 | 1444.8 | 103.2 | 1.46 |
| 3 | 9 | 45 | M | 360.0 | 1400.0 | 74.3 | 1479.8 | 105.7 | 1.42 |
| 3 | 8 | 47 | M | 350.0 | 1330.0 | 70.0 | 1419.6 | 101.4 | 1.45 |
| 3 | 12 | 58 | M | 370.0 | 1460.0 | 77.9 | 1450.4 | 103.6 | 1.33 |
| Mean: | | | | 369.8 | 1401.2 | 73.7 | 1452.5 | 103.8 | 1.41 |
| SD: | | | | 22.7 | 71.1 | 3.8 | 21.0 | 1.5 | 0.1 |
| 3 | 4 | 8 | F | 330.0 | 1210.0 | 62.9 | 1310.4 | 93.6 | 1.49 |
| 3 | 7 | 20 | F | 330.0 | 1180.0 | 60.7 | 1289.4 | 92.1 | 1.52 |
| 3 | 6 | 24 | F | 330.0 | 1188.0 | 61.3 | 1290.8 | 92.2 | 1.51 |
| 3 | 2 | 35 | F | 300.0 | 1211.0 | 65.1 | 1366.4 | 97.6 | 1.50 |
| 3 | 11 | 40 | F | 340.0 | 1210.0 | 62.1 | 1339.8 | 95.7 | 1.54 |
| 3 | 10 | 55 | F | 330.0 | 1210.0 | 62.9 | 1320.2 | 94.3 | 1.50 |
| Mean: | | | | 326.7 | 1201.5 | 62.5 | 1319.5 | 94.3 | 1.51 |
| SD: | | | | 13.7 | 13.8 | 1.5 | 29.7 | 2.1 | 0.0 |
| Overall Treatment Mean: | | | | 348.3 | 1301.3 | 68.1 | 1386.0 | 99.0 | 1.46 |
| SD: | | | | 30.5 | 141.2 | 7.9 | 94.0 | 6.7 | 0.1 |
| 4 | 1 | 2 | M | 370.0 | 1370.0 | 71.4 | 1409.8 | 100.7 | 1.41 |
| 4 | 5 | 14 | M | 420.0 | 1530.0 | 79.3 | 1520.4 | 108.6 | 1.37 |
| 4 | 3 | 28 | M | 370.0 | 1330.0 | 68.6 | 1440.6 | 102.9 | 1.50 |
| 4 | 9 | 44 | M | 410.0 | 1550.0 | 81.4 | 1530.2 | 109.3 | 1.34 |
| 4 | 8 | 46 | M | 380.0 | 1480.0 | 78.6 | 1489.6 | 106.4 | 1.35 |
| 4 | 12 | 59 | M | 410.0 | 1540.0 | 80.7 | 1450.4 | 103.6 | 1.28 |
| Mean: | | | | 393.3 | 1466.7 | 76.7 | 1473.5 | 105.3 | 1.38 |
| SD: | | | | 22.5 | 94.4 | 5.3 | 47.6 | 3.4 | 0.1 |
| 4 | 4 | 10 | F | 330.0 | 1140.0 | 57.9 | 1190.0 | 85.0 | 1.47 |
| 4 | 7 | 18 | F | 350.0 | 1300.0 | 67.9 | 1390.2 | 99.3 | 1.46 |
| 4 | 6 | 21 | F | 340.0 | 1240.0 | 64.3 | 1310.4 | 93.6 | 1.46 |
| 4 | 2 | 32 | F | 360.0 | 1320.0 | 68.6 | 1349.6 | 96.4 | 1.41 |
| 4 | 11 | 37 | F | 320.0 | 1210.0 | 63.6 | 1230.6 | 87.9 | 1.38 |
| 4 | 10 | 64 | F | 330.0 | 1260.0 | 66.4 | 1390.2 | 99.3 | 1.49 |
| Mean: | | | | 338.3 | 1245.0 | 64.8 | 1310.2 | 93.6 | 1.45 |
| S.D.: | | | | 14.7 | 65.0 | 3.9 | 83.8 | 6.0 | 0.0 |
| Overall Treatment Mean: | | | | 365.8 | 1355.8 | 70.7 | 1391.8 | 99.4 | 1.41 |
| S.D.: | | | | 38.9 | 156.7 | 8.4 | 115.5 | 8.2 | 0.0 |

Note: When a bird dies, the corresponding data is no longer included in the body weight/total feed consumption.

TABLE 3-B (Continued)

FEED CONVERSION - GROWER (14 DAYS)

| Treatment Group | Replicate | Pen | Sex | Average Weight (g) (9/22/10) | Average Weight (g) (10/6/10) | Average Daily Gain (g) | Total Feed Consumption (g/bird) | Average Daily Feed Intake | Feed Conversion (Feed consumed/ 1 g weight gained) |
|-------------------------|-----------|-----|-----|---------------------------------|---------------------------------|------------------------|------------------------------------|---------------------------|--|
| 5 | 1 | 1 | M | 400.0 | 1500.0 | 78.6 | 1505.0 | 107.5 | 1.37 |
| 5 | 5 | 11 | M | 400.0 | 1460.0 | 75.7 | 1520.4 | 108.6 | 1.43 |
| 5 | 3 | 26 | M | 400.0 | 1440.0 | 74.3 | 1489.6 | 106.4 | 1.43 |
| 5 | 9 | 42 | M | 400.0 | 1489.0 | 77.8 | 1521.8 | 108.7 | 1.40 |
| 5 | 8 | 50 | M | 400.0 | 1490.0 | 77.9 | 1520.4 | 108.6 | 1.39 |
| 5 | 12 | 60 | M | 380.0 | 1440.0 | 75.7 | 1530.2 | 109.3 | 1.44 |
| Mean: | | | | 396.7 | 1469.8 | 76.7 | 1514.6 | 108.2 | 1.41 |
| SD: | | | | 8.2 | 26.7 | 1.7 | 14.7 | 1.0 | 0.0 |
| 5 | 4 | 9 | F | 330.0 | 1230.0 | 64.3 | 1269.8 | 90.7 | 1.41 |
| 5 | 7 | 19 | F | 360.0 | 1290.0 | 66.4 | 1339.8 | 95.7 | 1.44 |
| 5 | 6 | 23 | F | 360.0 | 1290.0 | 66.4 | 1390.2 | 99.3 | 1.49 |
| 5 | 2 | 33 | F | 340.0 | 1230.0 | 63.6 | 1269.8 | 90.7 | 1.43 |
| 5 | 11 | 38 | F | 350.0 | 1260.0 | 65.0 | 1300.6 | 92.9 | 1.43 |
| 5 | 10 | 53 | F | 340.0 | 1090.0 | 53.6 | 1300.6 | 92.9 | 1.73 |
| Mean: | | | | 346.7 | 1231.7 | 63.2 | 1311.8 | 93.7 | 1.49 |
| S.D.: | | | | 12.1 | 74.4 | 4.9 | 46.3 | 3.3 | 0.1 |
| Overall Treatment Mean: | | | | 371.7 | 1350.8 | 69.9 | 1413.2 | 100.9 | 1.45 |
| S.D.: | | | | 35.4 | 168.4 | 9.5 | 143.4 | 10.2 | 0.1 |

Note: When a bird dies, the corresponding data is no longer included in the body weight/total feed consumption.

TABLE 3-C

FEED CONVERSION - FINISHER (14 DAYS)

| Treatment Group | Replicate | Pen | Sex | Average Weight (g) (10/6/10) | Average Weight (g) (10/20/10) | Average Daily Gain | Total Feed Consumption (g/bird) | Average Daily Feed Intake | Feed Conversion (Feed consumed/ 1 g weight gained) |
|-------------------------|-----------|-----|-----|------------------------------|-------------------------------|--------------------|---------------------------------|---------------------------|--|
| 1 | 1 | 4 | M | 1410.0 | 2529.0 | 79.9 | 2094.4 | 149.6 | 1.87 |
| 1 | 5 | 15 | M | 1500.0 | 2678.0 | 84.1 | 2553.6 | 182.4 | 2.17 |
| 1 | 3 | 29 | M | 1377.8 | 3011.0 | 116.7 | 2377.2 | 169.8 | 1.46 |
| 1 | 9 | 43 | M | 1390.0 | 2911.0 | 108.7 | 2297.4 | 164.1 | 1.51 |
| 1 | 8 | 48 | M | 1530.0 | 3044.0 | 108.2 | 2322.6 | 165.9 | 1.53 |
| 1 | 12 | 56 | M | 1477.8 | 3025.0 | 110.5 | 2336.6 | 166.9 | 1.51 |
| Mean: | | | | 1447.6 | 2866.3 | 101.4 | 2330.3 | 166.5 | 1.67 |
| SD: | | | | 63.3 | 214.0 | 15.3 | 147.6 | 10.5 | 0.3 |
| 1 | 4 | 7 | F | 1240.0 | 2490.0 | 89.3 | 2199.4 | 157.1 | 1.76 |
| 1 | 7 | 16 | F | 1230.0 | 2490.0 | 90.0 | 2240.0 | 160.0 | 1.78 |
| 1 | 6 | 22 | F | 1310.0 | 2560.0 | 89.3 | 2280.6 | 162.9 | 1.82 |
| 1 | 2 | 34 | F | 1320.0 | 2540.0 | 87.1 | 2280.6 | 162.9 | 1.87 |
| 1 | 11 | 39 | F | 1260.0 | 2750.0 | 106.4 | 2280.6 | 162.9 | 1.53 |
| 1 | 10 | 51 | F | 1260.0 | 2800.0 | 110.0 | 2210.6 | 157.9 | 1.44 |
| Mean: | | | | 1270.0 | 2605.0 | 95.4 | 2248.6 | 160.6 | 1.70 |
| S.D.: | | | | 36.9 | 135.5 | 10.1 | 37.4 | 2.7 | 0.2 |
| Overall Treatment Mean: | | | | 1358.8 | 2735.7 | 98.4 | 2289.5 | 163.5 | 1.69 |
| S.D.: | | | | 125.6 | 184.8 | 4.2 | 57.7 | 4.1 | 0.0 |
| 2 | 1 | 5 | M | 1460.0 | 2844.0 | 98.9 | 2440.2 | 174.3 | 1.76 |
| 2 | 5 | 12 | M | 1390.0 | 2889.0 | 107.1 | 2499.0 | 178.5 | 1.67 |
| 2 | 3 | 27 | M | 1430.0 | 3100.0 | 119.3 | 2345.0 | 167.5 | 1.39 |
| 2 | 9 | 41 | M | 1390.0 | 3256.0 | 133.3 | 2584.4 | 184.6 | 1.38 |
| 2 | 8 | 49 | M | 1450.0 | 2856.0 | 100.4 | 2353.4 | 168.1 | 1.67 |
| 2 | 12 | 57 | M | 1540.0 | 3200.0 | 118.6 | 2459.8 | 175.7 | 1.48 |
| Mean: | | | | 1443.3 | 3024.2 | 112.9 | 2447.0 | 174.8 | 1.56 |
| SD: | | | | 55.7 | 184.1 | 13.2 | 90.5 | 6.5 | 0.2 |
| 2 | 4 | 6 | F | 1250.0 | 2510.0 | 90.0 | 2249.8 | 160.7 | 1.79 |
| 2 | 7 | 17 | F | 1120.0 | 2356.0 | 88.3 | 2185.4 | 156.1 | 1.77 |
| 2 | 6 | 25 | F | 1340.0 | 2770.0 | 102.1 | 2199.4 | 157.1 | 1.54 |
| 2 | 2 | 31 | F | 1310.0 | 2560.0 | 89.3 | 2280.6 | 162.9 | 1.82 |
| 2 | 11 | 36 | F | 1280.0 | 2500.0 | 87.1 | 2280.6 | 162.9 | 1.87 |
| 2 | 10 | 52 | F | 1189.0 | 2744.0 | 111.1 | 2534.0 | 181.0 | 1.63 |
| Mean: | | | | 1248.2 | 2573.3 | 94.7 | 2288.3 | 163.5 | 1.74 |
| S.D.: | | | | 81.5 | 157.9 | 9.7 | 126.9 | 9.1 | 0.1 |
| Overall Treatment Mean: | | | | 1345.8 | 2798.8 | 103.8 | 2367.6 | 169.1 | 1.65 |
| S.D.: | | | | 138.0 | 318.8 | 12.9 | 112.2 | 8.0 | 0.1 |

Note: When a bird dies, the corresponding data is no longer included in the body weight/total feed consumption.

TABLE 3-C (Continued)

FEED CONVERSION - FINISHER (14 DAYS)

| Treatment Group | Replicate | Pen | Sex | Average Weight (g) (10/6/10) | Average Weight (g) (10/20/10) | Average Daily Gain | Total Feed Consumption (g/bird) | Average Daily Feed Intake | Feed Conversion (Feed consumed/ 1 g weight gained) |
|-------------------------|-----------|-----|-----|------------------------------|-------------------------------|--------------------|---------------------------------|---------------------------|--|
| 3 | 1 | 3 | M | 1510.0 | 2720.0 | 86.4 | 2459.8 | 175.7 | 2.03 |
| 3 | 5 | 13 | M | 1340.0 | 2822.0 | 105.9 | 2510.2 | 179.3 | 1.69 |
| 3 | 3 | 30 | M | 1367.0 | 2763.0 | 99.7 | 2499.0 | 178.5 | 1.79 |
| 3 | 9 | 45 | M | 1400.0 | 2933.0 | 109.5 | 2416.4 | 172.6 | 1.58 |
| 3 | 8 | 47 | M | 1330.0 | 2950.0 | 115.7 | 2370.2 | 169.3 | 1.46 |
| 3 | 12 | 58 | M | 1460.0 | 3189.0 | 123.5 | 2527.0 | 180.5 | 1.46 |
| Mean: | | | | 1401.2 | 2896.2 | 106.8 | 2463.8 | 176.0 | 1.67 |
| SD: | | | | 71.1 | 169.9 | 12.9 | 60.7 | 4.3 | 0.2 |
| 3 | 4 | 8 | F | 1210.0 | 2440.0 | 87.9 | 2280.6 | 162.9 | 1.85 |
| 3 | 7 | 20 | F | 1180.0 | 2440.0 | 90.0 | 2269.4 | 162.1 | 1.80 |
| 3 | 6 | 24 | F | 1188.0 | 2450.0 | 90.2 | 2300.2 | 164.3 | 1.82 |
| 3 | 2 | 35 | F | 1211.0 | 2444.0 | 88.1 | 2300.2 | 164.3 | 1.87 |
| 3 | 11 | 40 | F | 1210.0 | 2710.0 | 107.1 | 2269.4 | 162.1 | 1.51 |
| 3 | 10 | 55 | F | 1210.0 | 2690.0 | 105.7 | 2280.6 | 162.9 | 1.54 |
| Mean: | | | | 1201.5 | 2529.0 | 94.8 | 2283.4 | 163.1 | 1.73 |
| SD: | | | | 13.8 | 132.7 | 9.0 | 13.9 | 1.0 | 0.2 |
| Overall Treatment Mean: | | | | 1301.3 | 2712.6 | 100.8 | 2373.6 | 169.5 | 1.70 |
| SD: | | | | 141.2 | 259.6 | 8.5 | 127.5 | 9.1 | 0.0 |
| 4 | 1 | 2 | M | 1370.0 | 2760.0 | 99.3 | 2420.6 | 172.9 | 1.74 |
| 4 | 5 | 14 | M | 1530.0 | 2950.0 | 101.4 | 2490.6 | 177.9 | 1.75 |
| 4 | 3 | 28 | M | 1330.0 | 2830.0 | 107.1 | 2280.6 | 162.9 | 1.52 |
| 4 | 9 | 44 | M | 1550.0 | 3275.0 | 123.2 | 2461.2 | 175.8 | 1.43 |
| 4 | 8 | 46 | M | 1480.0 | 3220.0 | 124.3 | 2450.0 | 175.0 | 1.41 |
| 4 | 12 | 59 | M | 1540.0 | 3270.0 | 123.6 | 2580.2 | 184.3 | 1.49 |
| Mean: | | | | 1466.7 | 3050.8 | 113.2 | 2447.2 | 174.8 | 1.56 |
| SD: | | | | 94.4 | 232.6 | 11.8 | 98.2 | 7.0 | 0.2 |
| 4 | 4 | 10 | F | 1140.0 | 2320.0 | 84.3 | 2039.8 | 145.7 | 1.73 |
| 4 | 7 | 18 | F | 1300.0 | 2580.0 | 91.4 | 2269.4 | 162.1 | 1.77 |
| 4 | 6 | 21 | F | 1240.0 | 2540.0 | 92.9 | 2269.4 | 162.1 | 1.75 |
| 4 | 2 | 32 | F | 1320.0 | 2570.0 | 89.3 | 2269.4 | 162.1 | 1.82 |
| 4 | 11 | 37 | F | 1210.0 | 2620.0 | 100.7 | 2129.4 | 152.1 | 1.51 |
| 4 | 10 | 64 | F | 1260.0 | 2580.0 | 94.3 | 2170.0 | 155.0 | 1.64 |
| Mean: | | | | 1245.0 | 2535.0 | 92.1 | 2191.2 | 156.5 | 1.70 |
| S.D.: | | | | 65.0 | 108.4 | 5.5 | 95.4 | 6.8 | 0.1 |
| Overall Treatment Mean: | | | | 1,355.8 | 2792.9 | 102.6 | 2319.2 | 165.7 | 1.63 |
| S.D.: | | | | 156.7 | 364.7 | 14.9 | 181.0 | 12.9 | 0.1 |

Note: When a bird dies, the corresponding data is no longer included in the body weight/total feed consumption.

TABLE 3-C (Continued)

FEED CONVERSION - FINISHER (14 DAYS)

| Treatment Group | Replicate | Pen | Sex | Average Weight (g) (10/6/10) | Average Weight (g) (10/20/10) | Average Daily Gain (g) | Total Feed Consumption (g/bird) | Average Daily Feed Intake | Feed Conversion (Feed consumed/ 1 g weight gained) |
|-------------------------|-----------|-----|-----|---------------------------------|----------------------------------|------------------------|------------------------------------|---------------------------|--|
| 5 | 1 | 1 | M | 1500.0 | 3033.0 | 109.5 | 2555.0 | 182.5 | 1.67 |
| 5 | 5 | 11 | M | 1460.0 | 3012.0 | 110.9 | 2569.0 | 183.5 | 1.65 |
| 5 | 3 | 26 | M | 1440.0 | 3128.0 | 120.6 | 2186.8 | 156.2 | 1.30 |
| 5 | 9 | 42 | M | 1489.0 | 3300.0 | 129.4 | 2480.8 | 177.2 | 1.37 |
| 5 | 8 | 50 | M | 1490.0 | 3233.0 | 124.5 | 2434.6 | 173.9 | 1.40 |
| 5 | 12 | 60 | M | 1440.0 | 3044.0 | 114.6 | 2308.6 | 164.9 | 1.44 |
| Mean: | | | | 1469.8 | 3125.0 | 118.2 | 2422.5 | 173.0 | 1.47 |
| SD: | | | | 26.7 | 118.4 | 7.9 | 149.1 | 10.6 | 0.2 |
| 5 | 4 | 9 | F | 1230.0 | 2480.0 | 89.3 | 2259.6 | 161.4 | 1.81 |
| 5 | 7 | 19 | F | 1290.0 | 2540.0 | 89.3 | 2220.4 | 158.6 | 1.78 |
| 5 | 6 | 23 | F | 1290.0 | 2550.0 | 90.0 | 2280.6 | 162.9 | 1.81 |
| 5 | 2 | 33 | F | 1230.0 | 2460.0 | 87.9 | 2160.2 | 154.3 | 1.76 |
| 5 | 11 | 38 | F | 1260.0 | 2790.0 | 109.3 | 2249.8 | 160.7 | 1.47 |
| 5 | 10 | 53 | F | 1090.0 | 2610.0 | 108.6 | 2030.0 | 145.0 | 1.34 |
| Mean: | | | | 1231.7 | 2571.7 | 95.7 | 2200.1 | 157.2 | 1.66 |
| S.D.: | | | | 74.4 | 119.6 | 10.3 | 93.2 | 6.7 | 0.2 |
| Overall Treatment Mean: | | | | 1,350.8 | 2848.3 | 107.0 | 2,311.3 | 165.1 | 1.56 |
| S.D.: | | | | 168.4 | 391.3 | 15.9 | 157.2 | 11.2 | 0.1 |

Note: When a bird dies, the corresponding data is no longer included in the body weight/total feed consumption.

TABLE 4

CARCASS MEASUREMENTS (grams)

| Treatment Group | Replicate | Pen | Sex | Live Weight | Hot Weight | Chilled Weight | Fat Pad | Liver | Breast | Wings | Thighs | Legs |
|-------------------------|-----------|-----|-----|-------------|------------|----------------|---------|-------|--------|-------|--------|-------|
| 1 | 1 | 4 | M | 2325.2 | 1803.0 | 1878.6 | 26.3 | 47.5 | 591.0 | 203.5 | 267.4 | 249.0 |
| 1 | 5 | 15 | M | 2783.5 | 2142.4 | 2212.6 | 44.7 | 55.4 | 703.5 | 234.4 | 292.2 | 295.2 |
| 1 | 3 | 29 | M | 2455.7 | 1917.2 | 1990.5 | 30.9 | 58.7 | 565.9 | 218.0 | 273.4 | 277.9 |
| 1 | 9 | 43 | M | 2416.1 | 1829.1 | 1904.3 | 34.1 | 47.9 | 592.4 | 199.2 | 262.6 | 238.6 |
| 1 | 8 | 48 | M | 2597.8 | 1975.3 | 2036.6 | 36.2 | 58.8 | 598.5 | 231.6 | 276.0 | 277.5 |
| 1 | 12 | 56 | M | 2624.6 | 2038.2 | 2108.2 | 26.6 | 52.2 | 632.0 | 230.1 | 289.5 | 297.0 |
| Mean: | | | | 2533.8 | 1950.9 | 2021.8 | 33.1 | 53.4 | 613.9 | 219.4 | 276.9 | 272.5 |
| SD: | | | | 166.2 | 128.6 | 126.0 | 6.9 | 5.0 | 48.8 | 15.2 | 11.8 | 24.0 |
| 1 | 4 | 7 | F | 2336.6 | 1867.1 | 1925.0 | 33.9 | 45.9 | 582.8 | 206.4 | 270.1 | 276.9 |
| 1 | 7 | 16 | F | 2356.0 | 1869.0 | 1954.1 | 50.4 | 47.0 | 597.8 | 193.0 | 259.8 | 242.2 |
| 1 | 6 | 22 | F | 2468.0 | 1894.1 | 1959.6 | 52.0 | 51.8 | 624.1 | 208.4 | 275.1 | 250.0 |
| 1 | 2 | 34 | F | 2377.2 | 1896.5 | 1974.5 | 47.0 | 51.4 | 642.5 | 200.6 | 274.5 | 245.4 |
| 1 | 11 | 39 | F | 2223.1 | 1746.0 | 1817.8 | 51.4 | 44.3 | 562.7 | 187.5 | 256.4 | 227.8 |
| 1 | 10 | 51 | F | 2249.4 | 1763.1 | 1822.9 | 38.9 | 41.5 | 545.7 | 195.3 | 236.1 | 236.5 |
| Mean: | | | | 2335.0 | 1839.3 | 1909.0 | 45.6 | 47.0 | 592.6 | 198.5 | 262.0 | 246.5 |
| S.D.: | | | | 89.2 | 67.0 | 70.5 | 7.5 | 4.0 | 36.6 | 8.1 | 14.8 | 16.8 |
| Overall Treatment Mean: | | | | 2434.4 | 1895.1 | 1965.4 | 39.4 | 50.2 | 603.2 | 209.0 | 269.4 | 259.5 |
| S.D.: | | | | 140.5 | 78.9 | 79.8 | 8.8 | 4.5 | 15.0 | 14.8 | 10.5 | 18.4 |
| 2 | 1 | 5 | M | 2515.0 | 2006.8 | 2069.3 | 30.1 | 43.6 | 617.7 | 216.0 | 303.8 | 281.9 |
| 2 | 5 | 12 | M | 2514.7 | 1941.3 | 2011.8 | 40.5 | 57.5 | 626.1 | 214.5 | 273.7 | 275.4 |
| 2 | 3 | 27 | M | 2570.2 | 1980.2 | 2033.4 | 38.7 | 48.6 | 626.1 | 218.9 | 289.4 | 278.7 |
| 2 | 9 | 41 | M | 2539.2 | 1983.6 | 2050.0 | 32.1 | 56.3 | 652.1 | 210.6 | 281.0 | 262.7 |
| 2 | 8 | 49 | M | 2604.3 | 2015.9 | 2071.7 | 31.2 | 49.4 | 651.1 | 221.5 | 294.3 | 285.0 |
| 2 | 12 | 57 | M | 2710.4 | 2073.1 | 2146.3 | 39.9 | 49.8 | 687.1 | 230.0 | 308.9 | 295.0 |
| Mean: | | | | 2575.7 | 2000.1 | 2063.8 | 35.4 | 50.9 | 643.4 | 218.6 | 291.8 | 279.8 |
| SD: | | | | 74.5 | 44.2 | 46.3 | 4.8 | 5.2 | 25.7 | 6.7 | 13.4 | 10.7 |
| 2 | 4 | 6 | F | 2422.4 | 1923.8 | 2000.4 | 43.5 | 48.7 | 624.8 | 212.2 | 280.7 | 248.5 |
| 2 | 7 | 17 | F | 2255.2 | 1738.9 | 1804.1 | 48.4 | 41.4 | 563.1 | 197.0 | 269.1 | 231.8 |
| 2 | 6 | 25 | F | 2374.7 | 1863.4 | 1918.6 | 49.6 | 51.7 | 601.5 | 197.8 | 262.3 | 246.6 |
| 2 | 2 | 31 | F | 2325.6 | 1843.8 | 1905.3 | 48.2 | 49.1 | 600.4 | 200.0 | 255.2 | 250.1 |
| 2 | 11 | 36 | F | 2377.6 | 1844.4 | 1901.5 | 43.4 | 47.3 | 647.1 | 189.6 | 257.0 | 233.8 |
| 2 | 10 | 52 | F | 2235.2 | 1746.0 | 1816.7 | 39.6 | 41.3 | 604.2 | 194.9 | 240.7 | 231.6 |
| Mean: | | | | 2331.8 | 1826.7 | 1891.1 | 45.4 | 46.6 | 606.8 | 198.6 | 260.8 | 240.4 |
| S.D.: | | | | 74.0 | 71.5 | 72.3 | 3.9 | 4.3 | 28.0 | 7.6 | 13.5 | 8.9 |
| Overall Treatment Mean: | | | | 2453.7 | 1913.4 | 1977.4 | 40.4 | 48.7 | 625.1 | 208.6 | 276.3 | 260.1 |
| S.D.: | | | | 172.5 | 122.6 | 122.1 | 7.1 | 3.0 | 25.8 | 14.1 | 21.9 | 27.9 |

TABLE 4 (Continued)

CARCASS MEASUREMENTS (grams)

| Treatment Group | Replicate | Pen | Sex | Live Weight | Hot Weight | Chilled Weight | Fat Pad | Liver | Breast | Wings | Thighs | Legs |
|-------------------------|-----------|-----|-----|-------------|------------|----------------|---------|-------|--------|-------|--------|-------|
| 3 | 1 | 3 | M | 2496.4 | 1935.6 | 1983.3 | 30.2 | 47.4 | 620.9 | 203.3 | 278.0 | 268.5 |
| 3 | 5 | 13 | M | 2395.0 | 1870.9 | 1922.0 | 27.9 | 51.3 | 593.6 | 207.1 | 265.2 | 269.7 |
| 3 | 3 | 30 | M | 2677.2 | 2075.0 | 2123.4 | 39.5 | 53.8 | 683.1 | 221.5 | 298.5 | 289.9 |
| 3 | 9 | 45 | M | 2400.7 | 1854.4 | 1907.9 | 37.4 | 54.8 | 577.9 | 204.5 | 277.2 | 265.9 |
| 3 | 8 | 47 | M | 2806.0 | 2190.9 | 2238.6 | 45.0 | 57.3 | 703.6 | 226.6 | 313.4 | 311.8 |
| 3 | 12 | 58 | M | 2669.4 | 2102.6 | 2167.2 | 39.8 | 51.6 | 669.5 | 223.9 | 312.6 | 299.0 |
| Mean: | | | | 2574.1 | 2004.9 | 2057.1 | 36.6 | 52.7 | 641.4 | 214.5 | 290.8 | 284.1 |
| SD: | | | | 168.3 | 137.5 | 138.2 | 6.4 | 3.4 | 51.3 | 10.6 | 20.2 | 19.0 |
| 3 | 4 | 8 | F | 2111.6 | 1662.8 | 1715.2 | 40.1 | 40.2 | 554.8 | 179.3 | 233.0 | 216.8 |
| 3 | 7 | 20 | F | 2148.2 | 1680.9 | 1737.9 | 54.5 | 39.9 | 543.9 | 174.4 | 245.1 | 210.7 |
| 3 | 6 | 24 | F | 2097.5 | 1623.1 | 1684.2 | 31.7 | 42.6 | 543.2 | 203.6 | 211.9 | 212.0 |
| 3 | 2 | 35 | F | 2242.4 | 1774.5 | 1830.1 | 33.9 | 43.4 | 617.2 | 194.9 | 249.1 | 227.2 |
| 3 | 11 | 40 | F | 2369.3 | 1864.7 | 1922.7 | 43.1 | 46.7 | 656.0 | 194.3 | 271.6 | 241.2 |
| 3 | 10 | 55 | F | 2276.0 | 1793.5 | 1844.3 | 43.5 | 43.8 | 597.4 | 189.2 | 278.0 | 236.1 |
| Mean: | | | | 2207.5 | 1733.2 | 1789.1 | 41.1 | 42.8 | 585.4 | 189.3 | 248.1 | 224.0 |
| SD: | | | | 106.7 | 92.1 | 91.3 | 8.1 | 2.5 | 46.0 | 10.8 | 24.5 | 12.9 |
| Overall Treatment Mean: | | | | 2390.8 | 1869.1 | 1923.1 | 38.9 | 47.7 | 613.4 | 201.9 | 269.5 | 254.1 |
| SD: | | | | 259.2 | 192.1 | 189.5 | 3.2 | 7.0 | 39.6 | 17.8 | 30.2 | 42.5 |
| 4 | 1 | 2 | M | 2414.1 | 1829.6 | 1887.5 | 31.0 | 50.6 | 585.0 | 212.4 | 278.7 | 267.6 |
| 4 | 5 | 14 | M | 2865.5 | 2208.8 | 2270.5 | 42.4 | 59.9 | 698.1 | 245.1 | 331.7 | 316.2 |
| 4 | 3 | 28 | M | 2387.1 | 1858.8 | 1926.5 | 21.3 | 50.2 | 590.0 | 213.0 | 294.2 | 280.4 |
| 4 | 9 | 44 | M | 2796.4 | 2180.7 | 2251.9 | 43.5 | 61.8 | 691.1 | 228.6 | 318.9 | 301.0 |
| 4 | 8 | 46 | M | 2425.3 | 1898.7 | 1961.4 | 30.2 | 52.1 | 594.9 | 211.5 | 275.3 | 284.0 |
| 4 | 12 | 59 | M | 2813.8 | 2194.4 | 2256.7 | 40.4 | 58.9 | 726.5 | 232.1 | 306.5 | 291.2 |
| Mean: | | | | 2617.0 | 2028.5 | 2092.4 | 34.8 | 55.6 | 647.6 | 223.8 | 300.9 | 290.1 |
| SD: | | | | 229.5 | 183.5 | 184.8 | 8.7 | 5.2 | 64.3 | 13.7 | 22.4 | 17.0 |
| 4 | 4 | 10 | 10 | 2286.9 | 1815.3 | 1878.1 | 45.1 | 44.4 | 630.8 | 195.5 | 269.9 | 247.9 |
| 4 | 7 | 18 | 18 | 2363.3 | 1874.3 | 1948.1 | 42.5 | 52.4 | 620.1 | 199.6 | 272.0 | 243.2 |
| 4 | 6 | 21 | 21 | 2283.1 | 1838.4 | 1904.0 | 37.4 | 40.8 | 613.7 | 195.5 | 278.4 | 236.1 |
| 4 | 2 | 32 | 32 | 2403.7 | 1894.5 | 1957.2 | 39.1 | 46.5 | 619.7 | 204.8 | 278.1 | 257.3 |
| 4 | 11 | 37 | 37 | 2174.3 | 1710.1 | 1778.1 | 43.5 | 42.8 | 580.5 | 188.5 | 263.8 | 229.2 |
| 4 | 10 | 54 | 54 | 2276.4 | 1804.3 | 1864.0 | 42.3 | 47.8 | 584.9 | 196.4 | 267.9 | 238.3 |
| Mean: | | | | 2297.9 | 1822.8 | 1888.2 | 41.6 | 45.8 | 608.3 | 196.7 | 271.7 | 242.0 |
| S.D.: | | | | 79.4 | 65.0 | 65.4 | 2.8 | 4.1 | 20.6 | 5.4 | 5.8 | 9.8 |
| Overall Treatment Mean: | | | | 2457.5 | 1925.7 | 1990.3 | 38.2 | 50.7 | 627.9 | 210.2 | 286.3 | 266.0 |
| S.D.: | | | | 225.6 | 145.4 | 144.4 | 4.8 | 6.9 | 27.8 | 19.1 | 20.7 | 34.0 |

TABLE 4 (Continued)

CARCASS MEASUREMENTS (grams)

| Treatment Group | Replicate | Pen | Sex | Live Weight | Hot Weight | Chilled Weight | Fat Pad | Liver | Breast | Wings | Thighs | Legs |
|-------------------------|-----------|-----|-----|-------------|------------|----------------|---------|-------|--------|-------|--------|-------|
| 5 | 1 | 1 | M | 2697.0 | 2095.8 | 2162.8 | 42.1 | 53.2 | 647.6 | 221.0 | 309.5 | 295.7 |
| 5 | 5 | 11 | M | 2528.7 | 1869.5 | 1928.1 | 45.4 | 46.9 | 644.9 | 202.6 | 275.8 | 239.5 |
| 5 | 3 | 26 | M | 2550.2 | 1991.6 | 2055.3 | 31.2 | 56.4 | 687.4 | 214.6 | 275.2 | 268.0 |
| 5 | 9 | 42 | M | 2968.3 | 2331.0 | 2404.4 | 49.5 | 58.7 | 720.5 | 248.0 | 329.3 | 323.1 |
| 5 | 8 | 50 | M | 2773.1 | 2170.4 | 2232.3 | 46.2 | 53.0 | 702.2 | 238.5 | 319.4 | 300.7 |
| 5 | 12 | 60 | M | 2669.2 | 2086.8 | 2148.0 | 37.3 | 46.4 | 671.4 | 226.6 | 320.6 | 291.2 |
| Mean: | | | | 2697.7 | 2090.9 | 2155.1 | 41.9 | 52.4 | 679.0 | 225.2 | 305.0 | 286.4 |
| SD: | | | | 161.3 | 156.8 | 161.1 | 6.7 | 5.0 | 30.1 | 16.4 | 23.7 | 29.0 |
| 5 | 4 | 9 | F | 2403.9 | 1904.9 | 1969.1 | 44.5 | 53.7 | 689.5 | 199.6 | 268.6 | 245.6 |
| 5 | 7 | 19 | F | 2789.7 | 2280.4 | 2344.0 | 47.5 | 58.0 | 733.8 | 252.2 | 336.3 | 323.0 |
| 5 | 6 | 23 | F | 2425.2 | 1923.2 | 2003.7 | 43.0 | 49.4 | 655.6 | 206.8 | 271.5 | 259.2 |
| 5 | 2 | 33 | F | 2245.3 | 1798.6 | 1854.7 | 32.8 | 51.3 | 623.2 | 189.9 | 250.7 | 237.3 |
| 5 | 11 | 38 | F | 2373.7 | 1885.1 | 1943.3 | 46.0 | 43.9 | 651.0 | 196.3 | 265.9 | 254.9 |
| 5 | 10 | 53 | F | 2076.8 | 1658.5 | 1716.9 | 27.6 | 34.9 | 556.5 | 186.8 | 235.9 | 227.7 |
| Mean: | | | | 2385.8 | 1908.4 | 1971.9 | 40.2 | 48.5 | 651.6 | 205.2 | 271.5 | 257.9 |
| S.D.: | | | | 236.8 | 206.7 | 209.3 | 8.1 | 8.2 | 60.1 | 24.1 | 34.5 | 33.9 |
| Overall Treatment Mean: | | | | 2541.8 | 1999.6 | 2063.5 | 41.1 | 50.5 | 665.3 | 215.2 | 288.2 | 272.1 |
| S.D.: | | | | 220.6 | 129.0 | 129.5 | 1.2 | 2.8 | 19.4 | 14.1 | 23.7 | 20.1 |

TABLE 5

SUMMARY OF GROWTH PERFORMANCE OF FEMALE AND MALE BROILERS¹

| | Soybean meal type | | | | | CV | Probability ² | | | |
|---|-------------------|---------|----------|---------------|-------------|------|--------------------------|--------|-------------|-------------|
| | 1 | 2 | 3 | 4 | 5 | | 1 vs 2 | 1 vs 3 | 1 vs 4 | 1 vs 5 |
| | GMO | Isoline | LG C3540 | Pioneer 93B82 | HiSoy 38C60 | | | | | |
| Females | | | | | | | | | | |
| No. birds started | 60 | 60 | 60 | 60 | 60 | | | | | |
| No. removed during last 2 weeks due to lameness | 0 | 0 | 0 | 0 | 0 | | | | | |
| No. birds finished | 60 | 58 | 57 | 60 | 60 | 4.70 | 0.54 | 0.22 | 1.00 | 1.00 |
| Final weight, g | 2605 | 2573 | 2529 | 2535 | 2571 | 3.77 | 0.94 | 0.48 | 0.54 | 0.93 |
| Daily gain, g | 61.1 | 60.3 | 59.3 | 59.4 | 60.3 | 3.83 | 0.94 | 0.47 | 0.54 | 0.94 |
| Daily feed intake, g | 94.9 | 95.5 | 94.7 | 92.1 | 92.6 | 3.24 | 0.99 | 0.99 | 0.33 | 0.50 |
| Feed/gain | 1.56 | 1.59 | 1.60 | 1.55 | 1.54 | 3.30 | 0.74 | 0.40 | 0.99 | 0.93 |
| Males | | | | | | | | | | |
| No. birds started | 60 | 60 | 60 | 60 | 60 | | | | | |
| No. removed during last 2 weeks due to lameness | 4 | 6 | 4 | 2 | 5 | | | | | |
| No. birds finished | 51 | 54 | 55 | 58 | 50 | 8.50 | 0.62 | 0.38 | 0.05 | 0.98 |
| Final weight, g | 2866 | 3024 | 2896 | 3050 | 3125 | 4.30 | 0.14 | 0.98 | 0.07 | 0.01 |
| Daily gain, g | 67.2 | 70.9 | 67.9 | 71.6 | 73.3 | 4.37 | 0.15 | 0.98 | 0.07 | 0.01 |
| Daily feed intake, g | 99.6 | 103.4 | 103.2 | 103.4 | 103.7 | 2.41 | 0.05 | 0.07 | 0.05 | 0.03 |
| Feed/gain | 1.49 | 1.46 | 1.52 | 1.45 | 1.42 | 3.85 | 0.82 | 0.66 | 0.57 | 0.11 |

¹ The 5 types of soybean meal were GMO, conventional isoline, and three commercial lines identified as LG C3540, Pioneer 93B82, and HiSoy 38C60.

² Four single degree of freedom treatment contrasts (based on Dunnett's test) were made between the GMO soybean meal (Treatment 1) and each of the other four soybean meals (Treatments 2, 3, 4, and 5). Probabilities of < 0.05 were considered statistically significant and are in bold.

TABLE 6

OVERALL SUMMARY OF GROWTH PERFORMANCE¹

| | Soybean meal type | | | | | CV | Probability ² | | | |
|---|-------------------|---------|----------|---------------|-------------|------|--------------------------|-------------|--------|--------|
| | 1 | 2 | 3 | 4 | 5 | | 1 vs 2 | 1 vs 3 | 1 vs 4 | 1 vs 5 |
| | GMO | Isoline | LG C3540 | Pioneer 93B82 | HiSoy 38C60 | | | | | |
| No. birds started | 120 | 120 | 120 | 120 | 120 | | | | | |
| No. birds finished | 111 | 112 | 112 | 118 | 110 | 6.70 | 0.99 | 0.99 | 0.09 | 0.99 |
| Avg. initial wt, g | 42.2 | 42.4 | 42.5 | 42.1 | 42.2 | 2.43 | 0.99 | 0.94 | 0.99 | 0.99 |
| Avg final wt, g | 2735.7 | 2798.7 | 2712.6 | 2792.9 | 2848.5 | 4.10 | 0.50 | 0.97 | 0.55 | 0.07 |
| Performance - Phase 1 | | | | | | | | | | |
| Daily gain, g | 23.5 | 23.3 | 21.8 | 23.1 | 23.5 | 5.95 | 0.99 | 0.02 | 0.94 | 0.99 |
| Daily feed intake, g | 29.4 | 28.8 | 28.3 | 28.1 | 28.5 | 5.55 | 0.80 | 0.26 | 0.17 | 0.43 |
| Feed/gain | 1.26 | 1.23 | 1.30 | 1.22 | 1.21 | 6.72 | 0.89 | 0.63 | 0.56 | 0.44 |
| Performance - Phases 1 and 2 | | | | | | | | | | |
| Daily gain, g | 47.0 | 46.5 | 45.0 | 46.9 | 46.7 | 4.65 | 0.95 | 0.08 | 0.99 | 0.99 |
| Daily feed intake, g | 64.1 | 64.6 | 63.6 | 63.8 | 64.7 | 3.40 | 0.95 | 0.95 | 0.99 | 0.90 |
| Feed/gain | 1.37 | 1.39 | 1.42 | 1.36 | 1.39 | 3.97 | 0.65 | 0.08 | 0.99 | 0.74 |
| Performance - Phases 1, 2, and 3 | | | | | | | | | | |
| Daily gain, g | 64.1 | 65.6 | 63.6 | 65.5 | 66.8 | 4.16 | 0.49 | 0.96 | 0.55 | 0.07 |
| Daily feed intake, g | 97.3 | 99.4 | 98.9 | 97.7 | 98.1 | 2.81 | 0.18 | 0.39 | 0.98 | 0.85 |
| Feed/gain | 1.52 | 1.52 | 1.56 | 1.50 | 1.48 | 3.57 | 1.00 | 0.23 | 0.68 | 0.14 |

¹ The 5 types of soybean meal were GMO, conventional isoline, and three commercial lines identified as LG C3540, Pioneer 93B82, and HiSoy 38C60.

² Four single degree of freedom treatment contrasts (based on Dunnett's test) were made between the GMO soybean meal (Treatment 1) and each of the other four soybean meals (Treatments 2, 3, 4, and 5). Probabilities of < 0.05 were considered statistically significant and are in bold.

TABLE 7
SUMMARY OF GROWTH PERFORMANCE BY SEX^{1,2}

| | Soybean meal type | | | | | Sex Average | Probability ² | |
|-----------------------------|-------------------|--------------|------------------|-----------------------|---------------------|----------------|--------------------------|-------------|
| | 1 GMO | 2 Isoline | 3 LG C3540 | 4 Pioneer 93B82 | 5 HiSoy 38C60 | | Sex | Trt x Sex |
| No. birds started | | | | | | | | |
| Females | 60 | 60 | 60 | 60 | 60 | | | |
| Males | 60 | 60 | 60 | 60 | 60 | | | |
| No. birds at end of test | | | | | | | | |
| Females | 60 | 58 | 57 | 60 | 60 | 59.0 | | |
| Males | 51 | 54 | 55 | 58 | 50 | 53.6 | 0.01 | 0.03 |
| Avg. initial wt, g | | | | | | | | |
| Females | 39.5 | 39.1 | 40.0 | 39.3 | 39.5 | 39.5 | | |
| Males | 45.0 | 45.7 | 45.0 | 44.9 | 44.9 | 45.1 | 0.01 | 0.38 |
| Avg final wt, g | | | | | | | | |
| Females | 2605 | 2573 | 2529 | 2535 | 2572 | 2563 | | |
| Males | 2866 | 3024 | 2896 | 3050 | 3125 | 2993 | 0.01 | 0.03 |
| Performance of Birds | | | | | | | | |
| Daily gain, g | | | | | | | | |
| Females | 61.1 | 60.3 | 59.3 | 59.4 | 60.3 | 60.1 | | |
| Males | 67.2 | 70.9 | 67.9 | 71.6 | 73.3 | 70.2 | 0.01 | 0.03 |
| Daily feed intake, g | | | | | | | | |
| Females | 94.9 | 95.5 | 94.7 | 92.1 | 92.6 | 93.9 | | |
| Males | 99.6 | 103.4 | 103.2 | 103.4 | 103.7 | 102.7 | 0.01 | 0.04 |
| Feed/gain | | | | | | | | |
| Females | 1.56 | 1.59 | 1.60 | 1.55 | 1.54 | 1.57 | | |
| Males | 1.49 | 1.46 | 1.52 | 1.45 | 1.42 | 1.47 | 0.02 | 0.62 |

¹ The 5 types of soybean meal were GMO, conventional isoline, and three commercial lines identified as LG C3540, Pioneer 93B82, and HiSoy 38C60.

² The sex and treatment x sex effects were considered statistically significant if the probability was < 0.05. Probability levels < 0.05 are in bold.

TABLE 8

OVERALL SUMMARY OF CARCASS DATA¹

| | Soybean meal type | | | | | CV | Probability ² | | | |
|--|-------------------|---------|----------|---------------|-------------|-------|--------------------------|-------------|-------------|-------------|
| | 1 | 2 | 3 | 4 | 5 | | 1 vs 2 | 1 vs 3 | 1 vs 4 | 1 vs 5 |
| | GMO | Isoline | LG C3540 | Pioneer 93B82 | HiSoy 38C60 | | | | | |
| No. birds | 48 | 48 | 48 | 48 | 48 | | | | | |
| Carcass Data | | | | | | | | | | |
| Live weight, g | 2434 | 2454 | 2391 | 2458 | 2542 | 6.18 | 0.99 | 0.89 | 0.99 | 0.26 |
| Hot dress weight, g | 1895 | 1913 | 1869 | 1926 | 2000 | 6.71 | 0.99 | 0.97 | 0.94 | 0.16 |
| Cold dress weight, g | 1965 | 1977 | 1923 | 1990 | 2064 | 6.53 | 0.99 | 0.84 | 0.97 | 0.21 |
| Hot dress % | 77.4 | 78.0 | 78.2 | 78.4 | 78.7 | 1.34 | 0.99 | 0.89 | 0.56 | 0.19 |
| Cold dress % | 80.8 | 80.6 | 80.4 | 81.1 | 81.2 | 1.37 | 0.99 | 0.89 | 0.93 | 0.74 |
| Weight of cuts | | | | | | | | | | |
| Breast, g | 603 | 625 | 613 | 628 | 665 | 6.97 | 0.56 | 0.94 | 0.45 | 0.01 |
| Thighs, g | 269 | 276 | 269 | 286 | 288 | 7.38 | 0.82 | 1.00 | 0.16 | 0.10 |
| Legs, g | 260 | 260 | 254 | 266 | 272 | 7.85 | 1.00 | 0.92 | 0.85 | 0.38 |
| Wings, g | 209 | 209 | 202 | 210 | 215 | 6.27 | 1.00 | 0.49 | 0.99 | 0.60 |
| Fat pad, g | 39.4 | 40.4 | 38.9 | 38.2 | 41.1 | 15.80 | 0.98 | 0.99 | 0.96 | 0.90 |
| Liver, g | 50.2 | 48.7 | 47.7 | 50.7 | 50.5 | 9.51 | 0.86 | 0.52 | 0.99 | 0.99 |
| Cuts, % of chilled carcass weight | | | | | | | | | | |
| Breast, % | 30.69 | 31.63 | 31.93 | 31.58 | 32.34 | 3.33 | 0.11 | 0.03 | 0.14 | 0.01 |
| Thighs, % | 13.71 | 13.97 | 13.99 | 14.40 | 13.95 | 3.71 | 0.58 | 0.50 | 0.01 | 0.64 |
| Legs, % | 13.19 | 13.14 | 13.17 | 13.36 | 13.16 | 3.59 | 0.99 | 0.99 | 0.79 | 0.99 |
| Wings, % | 10.63 | 10.55 | 10.50 | 10.57 | 10.43 | 3.53 | 0.96 | 0.88 | 0.99 | 0.50 |
| Fat pad, % | 2.01 | 2.06 | 2.04 | 1.93 | 1.99 | 14.25 | 0.98 | 0.99 | 0.88 | 0.99 |
| Liver, % | 2.55 | 2.46 | 2.48 | 2.54 | 2.44 | 7.26 | 0.59 | 0.73 | 0.99 | 0.42 |

¹ The 5 types of soybean meal were GMO, conventional isoline, and three commercial lines identified as LG C3540, Pioneer 93B82, and HiSoy 38C60.

² Four single degree of freedom treatment contrasts (based on Dunnett's test) were made between the GMO soybean meal (Treatment 1) and each of the other four soybean meals (Treatments 2, 3, 4, and 5). Probabilities of < 0.05 were considered statistically significant and are in bold.

TABLE 9
SUMMARY OF CARCASS DATA BY SEX^{1,2}

| | Soybean meal type | | | | | Sex Average | Probability | |
|--|-------------------|--------------|------------------|-----------------------|---------------------|----------------|-------------|-----------|
| | 1 GMO | 2 Isoline | 3 LG C3540 | 4 Pioneer 93B82 | 5 HiSoy 38C60 | | Sex | Trt x Sex |
| No. birds | | | | | | | | |
| Females | 24 | 24 | 24 | 24 | 24 | | | |
| Males | 24 | 24 | 24 | 24 | 24 | | | |
| Live weight of birds for carcass, g | | | | | | | | |
| Females | 2335 | 2332 | 2208 | 2298 | 2386 | 2312 | | |
| Males | 2534 | 2576 | 2574 | 2617 | 2698 | 2600 | 0.01 | 0.68 |
| Hot dress weight, g | | | | | | | | |
| Females | 1839 | 1827 | 1733 | 1823 | 1908 | 1826 | | |
| Males | 1951 | 2000 | 2005 | 2029 | 2091 | 2015 | 0.01 | 0.66 |
| Cold dress weight, g | | | | | | | | |
| Females | 1909 | 1891 | 1789 | 1888 | 1972 | 1890 | | |
| Males | 2022 | 2064 | 2057 | 2092 | 2155 | 2078 | 0.01 | 0.69 |
| Hot dress % | | | | | | | | |
| Females | 78.8 | 78.3 | 78.5 | 79.3 | 79.9 | 79.0 | | |
| Males | 77.0 | 77.7 | 77.9 | 77.5 | 77.5 | 77.5 | 0.01 | 0.14 |
| Cold dress % | | | | | | | | |
| Females | 81.8 | 81.1 | 81.0 | 82.2 | 82.6 | 81.7 | | |
| Males | 79.8 | 80.1 | 79.9 | 80.0 | 79.8 | 79.9 | 0.01 | 0.24 |

¹ The 5 types of soybean meal were GMO, conventional isoline, and three commercial lines identified as LG C3540, Pioneer 93B82, and HiSoy 38C60.

² The sex and treatment x sex effects were considered statistically significant if the probability was < 0.05. Probability levels < 0.05 are in bold.

TABLE 9 (Continued)

SUMMARY OF CARCASS DATA BY SEX^{1,2}

| | Soybean meal type | | | | | Sex Average | Probability | |
|--|-------------------|--------------|------------------|-----------------------|---------------------|----------------|-------------|-----------|
| | 1 GMO | 2 Isoline | 3 LG C3540 | 4 Pioneer 93B82 | 5 HiSoy 38C60 | | Sex | Trt x Sex |
| No. birds | | | | | | | | |
| Females | 24 | 24 | 24 | 24 | 24 | | | |
| Males | 24 | 24 | 24 | 24 | 24 | | | |
| Weight of cuts | | | | | | | | |
| Breast, g | | | | | | | | |
| Females | 593 | 607 | 585 | 608 | 652 | 609 | | |
| Males | 614 | 643 | 641 | 648 | 679 | 645 | 0.03 | 0.89 |
| Thighs, g | | | | | | | | |
| Females | 262 | 261 | 248 | 272 | 271 | 263 | | |
| Males | 277 | 292 | 291 | 301 | 305 | 293 | 0.01 | 0.58 |
| Legs, g | | | | | | | | |
| Females | 247 | 240 | 224 | 242 | 258 | 242 | | |
| Males | 273 | 280 | 284 | 290 | 286 | 283 | 0.01 | 0.25 |
| Wings, g | | | | | | | | |
| Females | 199 | 199 | 189 | 197 | 205 | 198 | | |
| Males | 219 | 219 | 214 | 224 | 225 | 220 | 0.01 | 0.94 |
| Fat pad, g | | | | | | | | |
| Females | 45.6 | 45.5 | 41.1 | 41.7 | 40.2 | 42.8 | | |
| Males | 33.1 | 35.4 | 36.6 | 34.8 | 42.0 | 36.4 | 0.02 | 0.08 |
| Liver, g | | | | | | | | |
| Females | 47.0 | 46.6 | 42.8 | 45.8 | 48.5 | 46.1 | | |
| Males | 53.4 | 50.9 | 52.7 | 55.6 | 52.4 | 53.0 | 0.02 | 0.35 |
| Cuts, % of chilled carcass weight | | | | | | | | |
| Breast, % | | | | | | | | |
| Females | 31.02 | 32.10 | 32.69 | 32.22 | 33.09 | 32.22 | | |
| Males | 30.36 | 31.17 | 31.16 | 30.93 | 31.59 | 31.04 | 0.01 | 0.82 |
| Thighs, % | | | | | | | | |
| Females | 13.71 | 13.80 | 13.85 | 14.40 | 13.75 | 13.90 | | |
| Males | 13.69 | 14.14 | 14.14 | 14.40 | 14.16 | 14.10 | 0.11 | 0.79 |
| Legs, % | | | | | | | | |
| Females | 12.91 | 12.72 | 12.52 | 12.82 | 13.06 | 12.80 | | |
| Males | 13.47 | 13.56 | 13.81 | 13.90 | 13.27 | 13.60 | 0.01 | 0.06 |
| Wings, % | | | | | | | | |
| Females | 10.40 | 10.51 | 10.60 | 10.42 | 10.41 | 10.47 | | |
| Males | 10.85 | 10.59 | 10.44 | 10.72 | 10.45 | 10.61 | 0.20 | 0.32 |
| Fat pad, % | | | | | | | | |
| Females | 2.39 | 2.41 | 2.30 | 2.21 | 2.03 | 2.27 | | |
| Males | 1.63 | 1.72 | 1.77 | 1.65 | 1.95 | 1.75 | 0.01 | 0.06 |
| Liver, % | | | | | | | | |
| Females | 2.46 | 2.46 | 2.39 | 2.42 | 2.46 | 2.44 | | |
| Males | 2.64 | 2.46 | 2.56 | 2.66 | 2.43 | 2.55 | 0.14 | 0.33 |

¹ The 5 types of soybean meal were GMO, conventional isoline, and three commercial lines identified as LG C3540, Pioneer 93B82, and HiSoy 38C60.

² The sex and treatment x sex effects were considered statistically significant if the probability was < 0.05. Probability levels < 0.05 are in bold.

APPENDICES

APPENDIX I

Protocol, Amendments, and Deviation

GML Study # 208-008-21**DAS Protocol # 101088****STUDY PROTOCOL**

Study Title: DAS-68416-4 (AAD-12) Soybean Feeding Study in the Broiler Chicken

Objective: To evaluate the nutritional and metabolic value of genetically modified soybean meal fed to the broiler chicken over an approximately 42-day period.

Source Soybean:

- 1) Genetically modified soybean
- 2) Genetically similar (non-transgenic) soybean
- 3) Commercial soybean 1
- 4) Commercial soybean 2
- 5) Commercial soybean 3

Test System: Broiler Chicken

Sponsor: Dow AgroSciences
9330 Zionsville Road
Indianapolis, IN 46268

Sponsor Representative: Daland R. Juberg

| | | |
|----------------------------|---|--|
| Testing Facilities: | <u>In-Life</u> Genesis Midwest Laboratories N 6230 County Road G Neillsville, WI 54456 Telephone: 715 743-4557 FAX: 715 743-4109 | <u>Diet Preparation</u> GLP Technologies 22723 State Highway 6 South Navasota, TX 77868 Telephone: 936 825-2184 FAX: 936 825-7929 |
|----------------------------|---|--|

Analytical
Regulatory Laboratories – Indianapolis Lab
Dow AgroSciences LLC
9330 Zionsville Road, Building 306
Indianapolis, IN 46268-1054
Telephone: 317 337-3000
FAX: 317 337-3255

Covance Laboratories
3301 Kinsman Boulevard
Madison, WI 53704
Telephone: 608 241-7213
FAX: 608 241-7227

GML Study # 208-008-21**DAS Protocol # 101088****Study Dates**

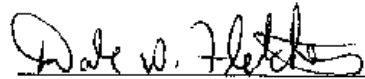
Proposed Experimental Start Date: 2nd Quarter, 2010
Proposed Experimental Termination Date: 3rd Quarter, 2010

Quality Assurance

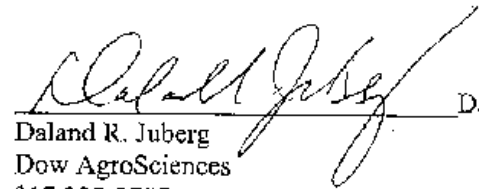
This study will be conducted and reported in accordance with EPA FIFRA Good Laboratory Practice Standards (40 CFR 160). A statement of inspections and a statement of compliance will be included with the final report. In addition to the Genesis Midwest QAU, each testing facility will be responsible for inspecting their portion of the study. The results of all QA inspections will be reported to the Study Director and Study Director's Management. Revisions to the protocol and the reasons for the changes are to be documented as protocol amendments, signed by the Study Director and Sponsor's Representative, and maintained with the protocol. All deviations from this protocol shall be documented and reported to the Study Director.

Protocol Approvals

Study Director:

 Date 5/19/2010
Dale W. Fletcher
Genesis Midwest Laboratories
715 743-4557

Sponsor
Representative:

 Date May 6, 2010
Daland R. Jueberg
Dow AgroSciences
317 337-3787

GML Study # 208-008-21

DAS Protocol # 101088

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GML Study # 208-008-21**DAS Protocol # 101088****1.1 OBJECTIVE**

The growing broiler is a very sensitive test species as a 15-fold increase in body weight occurs during the first 21 days. Therefore, the broiler is an appropriate species to detect differences in nutritional value of feedstuffs as well as for evaluation of general health.

The objective of this study is to evaluate the nutritional and metabolic value of feed containing a genetically-modified (GM) soybean meal, a non-AAD-12 near isogenic soybean meal, or standard commercially available soybean meal. Effects on mortality and weight gain, feed conversion efficiencies and market dressed carcass, muscle (breast, thigh, leg and wing), liver and abdominal fat pad weights will be evaluated in a commercial broiler chicken (*Gallus gallus domesticus*) over a 6-week period.

1.2 SUMMARY

Five treatment groups of 120 birds each, housed in 12 replicates (6 male and 6 female pens) of 10 birds/pen, will receive experimental feed formulated with soybean meal from either genetically modified soybean line, a non-modified near isogenic line, or standard commercial lines. The birds will be fed the diets from hatching until 42 days of age. During the test, all chickens will be monitored for general health and mortality. In addition, the test treatment group will be compared to the control groups by examining differences in body weight, feed consumption and feed conversion. At the termination of the test, all birds will be euthanized. Two hundred forty (240) of the six hundred (600) birds on study (4 birds/pen) will be arbitrarily selected to be necropsied, and dressed carcass, abdominal fat pad, liver and muscle (breast, thigh, leg, and wing) weights determined. Carcass yield will be recorded.

1.3 MATERIALS AND METHODS

The methods, species used, and route of administration described in this protocol are based upon common regional practice.

1.3.1 Experimental Design

In this experiment, the commercial broiler chicken (*Gallus gallus domesticus*) will be employed from hatching until 42 days of age. The methods, levels of incorporation of the test item at each growth phase, and route of administration will be based upon common regional practice. To control bias, birds will be arbitrarily placed in pens, which will be randomly assigned to treatment groups prior to

GML Study # 208-008-21**DAS Protocol # 101088**

the initiation of the test. No other potential sources of bias are expected to affect the results of the study.

This route of administration was selected because it represents the relevant route of exposure to the test species.

There will be four control groups (one near isogenic and three commercial lines) and one test group (genetically modified). Each group will consist of 60 chickens per sex (120 per treatment group), housed in 12 replicate pens (6 male pens and 6 female pens) of 10 birds/pen at the beginning of the experiment. The non-GM groups will receive feed formulated with either a non-AAD-1 control line or one of three commercial lines. One treatment group will receive feed formulated with AAD-1 GM soybean (DAS-68416-4).

Table 1: Experimental design

| Treatments | | 1 | 2 | 3 | 4 | 5 |
|---|--------------|----------------------------------|--|---------------------------------|--------------------------------------|------------------------------------|
| Feed Formulated with Crop | | GM soybean (AAD-12, DAS-68416-4) | Genetically similar soybean (non-AAD-12 control) | Commercial soybean 1 (LG C3540) | Commercial soybean 2 (Pioneer 93B82) | Commercial soybean 3 (HiSoy 38C60) |
| TSN Numbers for soybean source | | 032920-0001 | 032945-0001 | 032947-0001 | 032948-0001 | 032949-0001 |
| | | Test Substance | Control Substance | Control Substance | Control Substance | Control Substance |
| Approximate incorporation amounts(as fed) | Starter (%) | 33 | 33 | 33 | 33 | 33 |
| | Grower (%) | 33 | 33 | 33 | 33 | 33 |
| | Finisher (%) | 33 | 33 | 33 | 33 | 33 |
| Number of animals | | 120 | 120 | 120 | 120 | 120 |

1.3.2 Housing and Environmental Conditions

Groups of 10 test birds each (identical sex) will be housed indoors in specially designed pens. Each pen will be sized in line with the commercial operation or approximately 1 square foot/bird.

The study room will be cleaned as needed.

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Throughout the test, the photoperiod will be comparable to the lighting used in broiler chicken operations in the region.

The average temperature in the pens will be maintained at approximately 90°F (+ / - 4°F) at the beginning of the test (D1). This will be gradually decreased to approximately 68°F at the end of the test (D42) with outdoor ambient temperatures permitting. Temperature and relative humidity will be recorded daily during the study.

1.3.3 Identification of Animal Feeds

Diets will be formulated by Dr. Gary Cromwell, University of Kentucky, to meet all nutrient requirements as described by the National Research Council (NRC, 1994) during the three phases of the study. The same amount of soybean meal (approximately 33%) will be used in each diet during each phase. The four control diets will be mixed first before the diet containing the modified soybean meal. The soybean meal will be processed in the following order: isogenic line (TSN032945), commercial soybean meal lots (TSN032947, TSN032948 and TSN032949 in any order), and, lastly, GM line event DAS-68416-4 (TSN032920). Finished diets will be provided to Covance Laboratories labeled by treatment # and phase (starter, grower, finisher).

1.3.4 Processing and Analysis of Animal Feeds

GLP Technologies will adhere to the following, under GLP conditions:

- All grains will be reduced in size, so a majority of the ground meal will be in particle range of 800-850 micron,
- For processing the soybean meal, the most current SOPs will be utilized,
- Any whole soybeans will be devitalized by grinding. Devitalized soybeans and floor waste will be discarded as waste at a local public landfill,
- For formulation of the feed, the most current SOP, "G.25, Production of Animal Feed" will be utilized and diet formulation recipes per Dr. Gary Cromwell, University of Kentucky, will be followed,
- A compliance report, which will include soybean processing and feed preparation, will be prepared,
- The QA unit will perform a sufficient in-life inspection to ensure integrity of the feed formulation portion of the study, and
- Completed diets will be stored in refrigeration until shipment to GML (Genesis Midwest Laboratories).

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The certificates of analysis for each of the meals employed in the formulated diets will be attached to the study report. GLP Technologies will send individual samples of each of the meals (two representative 500-g samples) to Covance Laboratories for compositional analyses. The meals, both soybean and corn, will be shipped on dry ice and remain under freezing conditions at Covance, or a subcontracted laboratory, until time of analyses.

The analysis on the 5 individual soybean meals will include:

- Mycotoxin Screen (This will be outsourced by Covance to a non-GLP laboratory.)
 - Aflatoxins B1, B2, G1, and G2
 - Zearlenone
 - Deoxynivalenol
 - 3-acetyl- deoxynivalenol
 - 15-acetyl-deoxynivalenol
 - Fumonisin B1, B2, and B3
 - T-2 toxin
- Fiber
 - Crude, ADF, and NDF
- Minerals
 - Calcium, Phosphorus, Potassium, Sodium, Zinc, Copper, Iron, Magnesium, Manganese, and Selenium
- Amino Acids
 - Asp, Thr, Ser, Glu, Pro, Gly, Ala, Cys, Val, Met, Ile, Leu, Tyr, Phe, Lys, His, Arg, Trp
- Vitamins
 - Choline
- Proximates
 - Carbohydrate, Ash, Fat, Moisture, Protein
- Trypsin Inhibitor Activity
- Phytic Acid
- Lectin Activity
- Urease Activity
- Isoflavones
 - Free and conjugated Daidzein, Genistein, and Glycitoin

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The following analysis will also be performed on the common corn meal used in the diets:

- Mycotoxin Screen (This will be outsourced by Covance to a non-GLP laboratory.)
 - Aflatoxins B1, B2, G1, and G2
 - Zearlenone
 - Deoxynivalenol
 - 3-acetyl- deoxynivalenol
 - 15-acetyl-deoxynivalenol,
 - Fumonisin B1, B2, and B3
 - T-2 toxin
 - Moniliformin
 - Cyclopiazonic Acid
 - Oosporein
 - Ergosine, Ergotamine, Ergocornine, Ergocryptine, and Ergocristine
- Fiber
 - Crude, ADF, and NDF
- Minerals
 - Calcium, Phosphorus, Potassium, Sodium, Zinc, Copper, Iron, Magnesium, Manganese, and Selenium
- Amino Acids
 - Asp, Thr, Ser, Glu, Pro, Gly, Ala, Cys, Val, Met, Ile, Leu, Tyr, Phe, Lys, His, Arg, Trp
- Fatty Acids
 - 8:0 Caprylic, 10:0 Capric, 12:0 Lauric, 14:0 Myristic, 14:1 Myristoleic, 15:0 Pentadecanoic, 15:1 Pentadecenoic, 16:0 Palmitic, 16:1 Palmitoleic, 17:0 Heptadecanoic, 17:1 Heptadecenoic, 18:0 Stearic, 18:1 Oleic, 18:2 Linoleic, 18:3 Gamma Linolenic, 18:3 Linolenic, 20:0 Arachidic, 20:1 Eicosenoic, 20:2, Eicosadienoic, 20:4 Arachidonic, 20:3 Eicosatrienoic, 22:0 Behenic
- Vitamins
 - Choline
- Proximates
 - Carbohydrate, Ash, Fat, Moisture, Protein
- Trypsin Inhibitor Activity
- Phytic Acid
- Raffinose
- Furfural
- Ferulic Acid
- P-coumaric Acid

Covance Laboratories will send the above compositional analysis results to the sponsor, GLP Technologies, and Genesis Midwest, LLC. Additionally, GLP Technologies will determine urecase activity on the soybean meals.

A representative 30-g sample of soybean meal (one from each soybean meal treatment) will be collected by GLP Technologies prior to formulating feeds. A minimum of five (5) sub-samples will be collected from each meal sample with a grain probe. The probe will collect meal from all depths of the container housing the meal. The sub-samples will be composited and mixed. The 30-g sample

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will be taken from this sample and sent to the sponsor for analysis of transgenic proteins. The samples will be received by DAS sample management group and stored at -80°C until analyzed. The test and a control substance will be analyzed according to DAS AAD-12 ELISA method GRM 08.04 and PAT ELISA method 08.05; treatments 3, 4, and 5 will not be analyzed. Details for analytical methods 08.04 and 08.05 will be added by protocol amendment.

The Principal Investigator (PI) for the DAS analytical portion is Christina M. Dunville. The PI will create an analytical report from the ELISA analytical data. The raw data from this analysis will be sent to Genesis Midwest for inclusion in the Study File.

Two representative 500-g samples (composite of approximately equal sized aliquots from the top, middle and bottom) from one arbitrarily selected bag of each batch of formulated feed per treatment per phase (15 samples) will be collected at time of mixing at GLP Technologies. Samples will be stored frozen at GLP Technologies, shipped on dry ice, and stored under freezing conditions at Covance Laboratories, or a subcontracted laboratory, until initiation of the following compositional analyses:

- Mycotoxin Screen (This will be outsourced by Covance to a non-GLP laboratory.)
 - Aflatoxins B1, B2, G1, and G2
 - Zearlenone
 - Oosporein
 - Ergosine, Ergotamine, Ergocornine, Ergocryptine, and Ergocristine
 - Deoxynivalenol
 - 3-acetyl-deoxynivalenol
 - 15-acetyl-deoxynivalenol
 - Cyclopiazonic Acid
 - Fumonisin B1, B2, and B3
 - T-2 toxin
 - Moniliformin
- Metals
 - Arsenic, Mercury, Lead, and Cadmium
- Fiber
 - Crude, ADF, and NDF
- Minerals
 - Calcium, Iodine, Phosphorus, Potassium, Sodium, Zinc, Copper, Iron, Magnesium, Manganese, Fluoride, Cobalt, Chromium, Sulfur, Selenium, and Chloride
- Amino Acids
 - Asp, Thr, Ser, Glu, Pro, Gly, Ala, Cys, Val, Met, Ile, Leu, Tyr, Phe, Lys, His, Arg, Trp
- Vitamins
 - B1, B6, B12, A, D3, Folic Acid, Niacin, Pantothenic Acid, E (all tocopherols), Beta Carotene, Biotin, and Choline

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- Proximates
 - Carbohydrate, Ash, Fat, Moisture, Protein
- Calories kcal/100 g
- Pesticide Screen
 - Chlorinated Hydrocarbons: Aldrin, BHC (Alpha, Beta, and Delta), Chlordane, DDT Related substances, Dieldrin, Endrin, HCB, Heptachlor, Heptachlor Epoxide, Lindane, Methoxychlor, Mirex, and PCB
 - Organophosphates: Diazinon, Disulfotol, Ethion, Malathion, Methyl Parathion, Parathion (Ethyl), Thimet, Thiodan (total of endosulfan II and endosulfan sulfate), and Trithion

Covance Laboratories will send the above compositional analysis results to the sponsor, GLP Technologies, and Genesis Midwest, LLC.

Also, a representative 500-g sample (composite of approximately equal sized aliquots from the top, middle and bottom) from one arbitrarily selected bag of each batch of formulated feed per treatment per phase (15 samples) will be collected at the time of mixing at GLP Technologies. Samples will be stored refrigerated once prepared, shipped on ice and placed in a -80°C freezer once received by the sponsor for internal analysis; the analysis of protein expression may occur.

One representative 500-g sample (composite of approximately equal sized aliquots from the top, middle and bottom) from one arbitrarily selected bag of each of the fifteen animal feeds at the termination of the starter, grower, or finisher phase will be collected by GML. These samples will be held frozen until study termination at which time they will be shipped frozen to the sponsor. If transgenic proteins are detectable in the diet samples (as described above), samples will be used for expression measurements to test for stability.

1.3.5 Incineration of Animal Feeds

At the end of the in-life phase of the study, the remaining animal feeds except for one bag/phase/treatment group will be incinerated and documentation of incineration will be included in the study file unless instructed otherwise by the sponsor.

1.3.6 Precautions Related to the Handling of Animal Feeds

No specific precautions have to be taken beyond the individual protection equipment and processes already operational on the site.

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For each of the animal feeds:

- Mash will be given to the animals during the starter, grower and finisher phases (approximately D1 to D42).

1.3.8 Sampling of the Animal Feeds

On approximately days 0, 14, and 28 (initiation of each phase: starter, grower and finisher), a 500-g sample (composite of top, middle and bottom) will be collected from one arbitrarily selected bag of each of the animal feeds before presenting to the birds. These samples will be shipped to Covance Laboratories for the following analysis:

- Weende analysis (dry matter, crude protein, crude fat, crude fiber, ash)
- Ca
- P
- Gross energy

1.3.9 Destruction of Stored Animal Feed Samples

Once the biological phase report is approved by the sponsor, all the stored animal feed samples and the one bag/phase/treatment group retained at the termination of the in-life phase will be destroyed by incineration or will be returned to the sponsor if requested.

1.3.10 Duration

The study duration will be 42 days. This study will be divided into 3 phases:

- Starting phase – Day 1 to Day 14
- Growing phase – Day 15 to Day 28
- Finishing phase – Day 29 to Day 42

1.3.11 Reception, Trial and Identification of Chickens

All birds will be from the same hatch (700-800 chicken, 1/2 males, 1/2 females) and will be delivered to the test facility. The name and address of the chicken breeder/hatchery providing the birds will be documented. Any vaccinations will be documented. Any birds exhibiting signs of debilitating physical injury or abnormal behavior will be rejected for use. The visually lightest and heaviest chickens will not be utilized, leaving 600 (300 males and 300 females) 1-day-old birds for the test.

The pens will be identified on D1 with a card bearing the GML study number, sponsor number, treatment group, sex of birds and date received. The chickens will be arbitrarily assigned to a pen and a random treatment group (10 birds/pen). There will be 6 pens per sex in a treatment group and cages

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will be arranged in a randomized complete block design. The pens will be identified by a label that will specify at a minimum the study number, the number characterizing the treatment (1, 2, 3, 4 or 5) and the initials corresponding to the sex of the animals.

1.3.12 Feeding Design

Diets will be stored in a cool room until presented to the birds. As of the day of arrival, the chickens will receive their respective diet. Feed and water will be provided *ad libitum* for the first 5 days of the study. Thereafter, feed consumption will be controlled through the use of a 12-hour light/12-hour dark photoperiod. Fresh feed will be provided as needed with measurement of feed consumption/pen calculated at the end of each phase.

The birds will receive antibiotic medication mixed in the diets during the study for prevention of disease. Type of antibiotic(s) administered will be documented.

1.3.13 Observations

All chickens will be observed at least daily for mortality, general condition, unexpected effects and abnormal behavior. All observations will be recorded.

1.3.14 Animal Body Weight & Growth Performance

The pen will be the experimental unit. Pen weights will be recorded on Days 1, 14, 28 and 42. Aggregate body weights will be measured at approximately the same time of the day. The aggregate body weights, pen number, and general appearance of any bird found dead during the study will be recorded.

1.3.15 Feed Consumption

Feed consumption of the birds will be measured and reported by pen on the days that the birds are weighed. Birds will receive fresh feed at least weekly. Feed consumption will be measured by weighing the feed placed in the feeder at each diet change, recording any additional feed added, and weighing the feed remaining at each diet change.

The accuracy of feed consumption values may be affected by unavoidable wastage of feed by birds. No attempt will be made to quantify the amount of wasted feed as it is normally scattered and mixed with water and excreta.

GML Study # 208-008-21**DAS Protocol # 101088****1.3.16 Sacrifice and Measurements**

All birds will be euthanized by an AVMA-approved method. Four birds per pen will be selected for carcass measurements. The viscera of these birds will be examined macroscopically and any abnormalities will be recorded.

The market dressed carcass, muscle (breast, thigh, leg, wing), liver and abdominal fat pad weight will be recorded. Carcass yield will be recorded.

1.3.17 Necropsy

All birds that die during the study will be weighed and subjected to a gross necropsy. All macroscopic findings will be recorded. The cause of death will be identified if possible. Birds that survive until the termination of the study will be euthanized by an AVMA-approved method.

1.3.18 Incineration of Remaining Test Birds and Carcasses

At the termination of the study, all carcasses will be disposed of by incineration. Documentation of incineration of all birds will be maintained in the study records and appended to the final report.

1.3.19 Principal variables

Weight gain = Final weight/pen – Initial weight/pen for survivors

Feed consumption = Weight of given feed – Weight of remaining feed

Feed conversion ratio = Feed consumption / weight gain.

1.3.20 Statistical Analyses

The experimental unit will be the pen for the body weight, feed consumption and feed conversion as well as for all tissue and carcass measurements.

Upon completion of the test, an analysis of the variance (ANCOVA or ANOVA methods), will be performed to determine statistically significant differences between the groups. Statistical analysis will take place for body weight, feed consumption and feed conversion as well as for carcass, liver, abdominal fat pad, breast, thigh, wing and leg muscle weights.

The data will be analyzed as a randomized complete block design taking into account treatment and block. A block will consist of sex and replication within sex. Treatment effects will be separated by Dunnett's test and will be used to compare the genetically modified corn grain group to each of the other groups. Block x treatment will be the error term.

GML Study # 208-008-21**DAS Protocol # 101088****1.4 CHANGING OF PROTOCOL**

Planned changes to the protocol will be in the form of written amendments signed by the Study Director and the Sponsor's Representative. Amendments will be considered as part of the protocol and will be attached to the final protocol. Any other changes will be in the form of written deviations signed by the Study Director and filed with the raw data. All changes to the protocol will be indicated in the final report.

1.5 RECORDS TO BE MAINTAINED

Records to be maintained for data generated at the laboratory will include:

1. Copy of the signed protocol and all signed amendments.
2. Identification and characterization of the test items, provided by the Sponsor.
3. Experimental start date, critical phases, and termination of the test.
4. Animal history.
5. Husbandry and environmental conditions.
6. Dietary calculations and test vehicles preparation.
7. Body weight measurements.
8. Feed consumption measurements.
9. Daily observations.
10. Necropsy findings.
11. Carcass, abdominal fat pad and muscle (breast, wing, leg, thigh) weight (bone-in).
12. Statistical calculations.
13. Copy of the final report.
14. Incineration certificates
15. Identification and characterization of the test vehicles
16. All external reports as appropriate
17. Cleaning certificate.

Study data will be shipped to the Sponsor after the finalization of the study report. GML will not archive the study data. A copy of the final report will be retained and archived at GML.

GML Study # 208-008-21**DAS Protocol # 101088****1.6 FINAL REPORT**

The facility will prepare a final report of the results of the study. The report will include, but not be limited to the following:

1. Name and address of the facility performing the study, the sponsor, the feed supplier (if external), the analytical laboratories and animal supplier.
2. Experimental start, experimental termination and study completion dates.
3. Objectives and procedures stated in the approved protocol, including any changes in the original protocol.
5. Statistical methods employed for analyzing the data, when applicable.
6. The test items and vehicles identified by name, code number, and composition or other appropriate characteristics, if provided by the Sponsor.
7. Certificate of analysis of the test items that specify identity and purity of each item, if provided by the Sponsor.
8. A description of the methods used.
9. A description of the test system used. Where applicable, the final report shall include the number of animals used, sex, body weight range, source of supply, species, age, and procedure used for identification.
10. A description of the dosage, route of administration, and duration.
11. A description of all circumstances that may have affected the quality or integrity of the data.
12. The name of the Study Director, the names of other scientists or professionals, and the names of all supervisory personnel, involved in the study.
13. A description of the transformations, calculations, or operations performed on the data, a summary and analysis of the data, and a statement of the conclusions drawn from the analysis.
14. The signed and dated reports of each of the individual scientists or other professionals involved in the study, if applicable.
15. The location where all specimens, raw data and the final report are to be stored.
16. If it is necessary to make corrections or additions to a final report after it has been accepted, such changes shall be in the form of amendment by the Study Director. The amendment should clearly identify the part of the final report that is being added to or corrected and the reasons for the correction or addition. Amendments shall be signed and dated by the Study Director.
17. A statement of compliance signed by the study director addressing any exceptions to Good Laboratory Practice Standards.

GML Study # 208-008-21**DAS Protocol # 101088****1.7 GOOD LABORATORY PRACTICES**

This study will be conducted in accordance with Good Laboratory Practice Standards for EPA (40 CFR Part 160). Each study conducted by the laboratory is routinely examined by the laboratory's Quality Assurance Unit for compliance with Good Laboratory Practices, Standard Operating Procedures and the specified protocol. A statement of compliance with Good Laboratory Practices will be prepared for all portions of the study conducted by the laboratory. The Sponsor will be responsible for compliance with Good Laboratory Practices for procedures performed by other laboratories (e.g., residue analyses or pathology). Raw data for all work performed will be returned to the sponsor. A copy of the final report will be filed by project number in the GML Archives.

1.7.1 SOPs

GML has numerous Standard Operating Procedures intended to define the methods to be employed in the conduct of all phases of this study so as to ensure compliance with Good Laboratory Practice Standards. A list of the SOPs will be included in the raw data.

1.7.2 Archives

Raw data for all work performed will be returned to the sponsor. A copy of the final report will be filed by project number in archives located on the GML premises.

Genesis Midwest

Form SI-3.02A 3/15/04

PROTOCOL AMENDMENT NUMBER 1

1. **STUDY NUMBER** GML Study 208-008-21
DAS Study 101088
2. **STUDY TITLE** DAS-68416-4 (AAD-12) Soybean Feeding Study in the Broiler Chicken
3. **SPONSOR** Dow AgroSciences
4. **AMENDMENT**
- 1.3.4 Processing and Analysis of Animal Feeds (formulated feed analyses – page 9)

- Metals
 - Arsenic, Mercury, Lead, Cadmium, and Molybdenum

Reason for the amendment

To list an analyte that will be included in the compositional analyses.

5. **EFFECT OF THE AMENDMENT**
No adverse impact.
6. **SPONSOR/SPONSOR REPRESENTATIVE INFORMED:** By: DWF Date: 5/18/10
Method: Verbal/Written/Fax/E-Mail

7. APPROVAL OF AMENDMENT

Dale W. Fletcher
Study Director

Robert J. Gabe
Sponsor/Sponsor Representative

24 May 2010
Date

18 May 2010
Date

Protocol Number 208-008-21 / 101088
Amendment Number 2

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Protocol Amendment 2

- 1. STUDY NUMBER** GML Study 208-008-21
DAS Study 101088
- 2. STUDY TITLE** DAS-68416-4 (AAD-12) Soybean Feeding Study in the Broiler Chicken
- 3. SPONSOR** Dow AgroSciences
- 4. AMENDMENT**

4.1 Reason for the amendment

This amendment supplies information on the method that will be used to generate the analytical data for soluble, extractable AAD-12 and PAT proteins in soybean meal (grain) and poultry feed, containing the soybean meal (grain).

1.3.4. Processing and Analysis of Animal Feeds

1.3.4. Processing and Analysis of Animal

AAD-12 and PAT Analysis:

Soybean meal (grain) and possibly poultry feed containing the meal (grain) will be analyzed for expression levels of the soluble, extractable AAD-12 and PAT proteins using the Dow AgroSciences analytical method GRM 08.04 and GRM 08.05, respectively. Any modifications to these methods will be documented and placed in the study file.

2. Reference Standard

AAD-12 Protein:

Name: AAD-12 Protein Standard
TSN number: 030732-0002
Biot: BIOT09-203009
Purity: 35.3%

PAT Protein:

Name: PAT Protein Standard
TSN number: 105742
Biot: BIOT063302
Purity: 99%

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Amendment Number 2

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Standard solutions will use the standard purity on the date of preparation for the length of the solution use. If the analytical standards are re-assayed during the course of the study and the assay changes, the standard solutions prepared after the new assay date will be corrected for the new purity value.

3. Procedures

a. Sample Identification

Each sample will be identified with a unique sample identifier. This number will be used to track the sample during analysis and reporting.

b. Analytical Set

An analytical set will consist of calibration standards and study samples.

c. Limits of Detection and Quantitation (LOD and LOQ)

| Matrix | AAD12 ng/mg | | PAT ng/mg | |
|--------|-------------|-----|-----------|------|
| | LOD | LOQ | LOD | LOQ |
| Grain | 0.5 | 1.0 | 0.06 | 0.12 |

d. Duplicate Analyses

All sample extracts will be analyzed in duplicate and results averaged to obtain the final result.

e. Statistical Methods

Statistical treatments such as descriptive statistics (mean, standard deviation, etc.) and regression analysis of ELISA standard curves may be used to evaluate data in this study.

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Amendment Number 2

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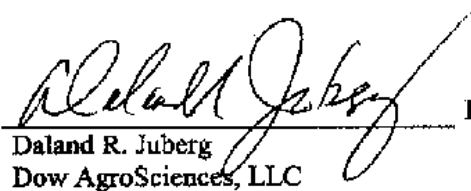
f. Protein Analysis Requirements:

| TSN Number | Sample Description | AAD-12 and PAT Protein Assays Required |
|---------------|--------------------------------------|--|
| 032920-0001 | GM Soybean (AAD-12, DAS68416-4) | Yes |
| 032945-0001 | Non-AAD-12 Control | Yes |
| 032947-0001 | Commercial soybean 1 (LG C3540) | No |
| 032948-0001 | Commercial soybean 2 (Pioneer 93B82) | No |
| 032949-0001 | Commercial soybean 3 (HiSoy 38C60) | No |

4. Reporting

An analytical summary will be issued summarizing analytical methodology and results obtained from this analysis. This analytical summary will include, but not be limited to, a summary of sample preparation, tests performed (including the method reference and a brief description of the method), a quality assurance statement and the results.

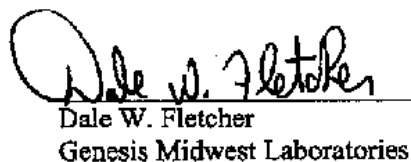
Sponsor
Representative:


Daland R. Jueberg
Dow AgroSciences, LLC

Date:

6-18-10

Study Director:


Dale W. Fletcher
Genesis Midwest Laboratories

Date:

6-21-10

Genesis Midwest

Form SI-3.02A 3/15/04

PROTOCOL AMENDMENT NUMBER 3

1. **STUDY NUMBER** GML Study 208-008-21
DAS Study 101088
2. **STUDY TITLE** DAS-68416-4 (AAD-12) Soybean Feeding Study in the Broiler Chicken
3. **SPONSOR** Dow AgroSciences
4. **AMENDMENT**

1.3.1 Experimental Design

There will be four control groups (one near isogenic and three commercial lines) and one test group (genetically modified). Each group will consist of 60 chickens per sex (120 per treatment group), housed in 12 replicate pens (6 male pens and 6 female pens) of 10 birds/pen at the beginning of the experiment. The non-GM groups will receive feed formulated with either a non-AAD-12 control line or one of three commercial lines. One treatment group will receive feed formulated with AAD-12 GM soybean (DAS-68416-4).

5. REASON FOR THE AMENDMENT

To correctly identify the trait AAD-12 in this study.

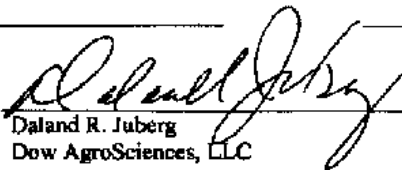
6. EFFECT OF THE AMENDMENT

This amendment has a positive impact on the study as it provides corrected information.

7. **SPONSOR/SPONSOR REPRESENTATIVE INFORMED:** By: DWF Date: 10/15/10
Method: Verbal/Written/Fax/E-Mail

8. APPROVAL OF AMENDMENT

Sponsor
Representative:


Daland R. Jueberg
Dow AgroSciences, LLC

Date:

19 October 2010

Study Director:


Dale W. Fletcher
Genesis Midwest Laboratories

Date:

22 October 2010

9-0-2
10/22/10
R.E.

Genesis Midwest

Form SI-3.02A 3/15/04

PROTOCOL AMENDMENT NUMBER 4

1. **STUDY NUMBER** GML Study 208-008-21
DAS Study 101088
2. **STUDY TITLE** DAS-68416-4 (AAD-12) Soybean Feeding Study in the Broiler Chicken
3. **SPONSOR** Dow AgroSciences
4. **AMENDMENT**

1.3.4 Processing and Analysis of Animal Feeds**o Pesticide Screen**

- Chlorinated Hydrocarbons: Aldrin, BHC (Alpha, Beta, and Delta), Chlordane, DDT Related substances, Dieldrin, Endrin, HCB, Heptachlor, Heptachlor Epoxide, Lindane, Methoxychlor, Mirex, PCB, and **Thiodan (total of endosulfan II and endosulfan sulfate)**
- Organophosphates: Diazinon, Disulfotol, Ethion, Malathion, Methyl Parathion, Parathion (Ethyl), Thimet, and Trithion

5. REASON FOR THE AMENDMENT

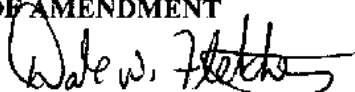
To correctly list Thiodan as a chlorinated hydrocarbon and not an organophosphate.

6. EFFECT OF THE AMENDMENT

This amendment has a positive impact on the study as it provides corrected information.

7. SPONSOR/SPONSOR REPRESENTATIVE INFORMED: By: DWF Date: 11/11/10**Method:** Verbal/Written/Fax/E-Mail**8. APPROVAL OF AMENDMENT**

Study Director:

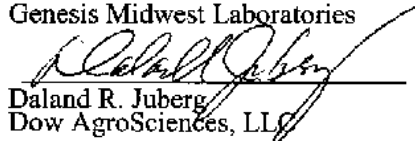


Date:

11/15/2010Dale W. Fletcher
Genesis Midwest Laboratories

Sponsor

Representative:


Daland R. Juberg
Dow AgroSciences, LLC

Date:

10 November 2010

Genesis Midwest

Form SI-3.02B 3/15/04

PROTOCOL DEVIATION NUMBER 1

1. **STUDY NUMBER** GML Study 208-008-21
DAS Study 101088
2. **STUDY TITLE** DAS-68416-4 (AAD-12) Soybean Feeding Study in the Broiler Chicken
3. **SPONSOR** Dow AgroSciences
4. **DEVIATION**

Description of Deviation:

In section 1.3.4 Processing and Analysis of Animal Feeds, the protocol alludes to the analysis of soybean meal and poultry feed containing the meal, but is written as meal (grain). The soybean grain used for Treatments 1 and 2 were analyzed for the protein expression of PAT under Protocol 101088. Protein expression of AAD-12 in soybean grain used for Treatments 1 and 2 was analyzed under BIOT10-241515 and BIOT10-242913, respectively. In addition, the meal from TSN032920-0001 and TSN032945-0001 were analyzed for AAD-12 and PAT under Protocol 101088.

Deviated Protocol Section:**1.3.4. Processing and Analysis of Animal Feeds****AAD-12 and PAT Analysis:**

Soybean meal (grain) and possibly poultry feed containing the meal (grain) will be analyzed for expression levels of the soluble, extractable AAD-12 and PAT proteins using the Dow AgroSciences analytical method GRM 08.04 and GRM 08.05, respectively. Any modifications to these methods will be documented and placed in the study file.

5. REASON FOR THE DEVIATION

Use of meal (grain) in the protocol was used for the analysis because the methods for AAD-12 and PAT are validated for grain and meal is ground grain. For further clarification, the sentence "Soybean meal (grain) and possibly poultry feed containing the meal (grain) will be analyzed for expression levels of the soluble, extractable AAD-12 and PAT proteins using the Dow AgroSciences analytical method GRM 08.04 and GRM 08.05, respectively" should be further clarified. The poultry feed containing meal from TSN032920-0001 and TSN032945-0001 will not be analyzed if the meal does not express AAD-12 or PAT proteins.

GML Study 208-008-21
DAS Study 101088
Deviation #1
Page 2

6. EFFECT OF THE DEVIATION

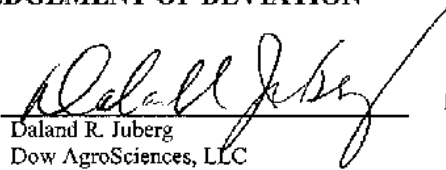
This deviation will have a positive impact on the study because it adds clarity to what matrix is being analyzed. Also, reporting of the protein expression in the grain confirms that the *aad12* and *pat* genes were present and expressing prior to processing.

7. SPONSOR/SPONSOR REPRESENTATIVE INFORMED: Date: 5-November-2010

Method: Verbal/Written/Fax/E-Mail

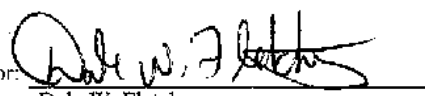
8. ACKNOWLEDGEMENT OF DEVIATION

Sponsor
Representative:


Daland R. Jueberg
Dow AgroSciences, LLC

Date: 5 November 2010

Study Director:


Dale W. Fletcher
Genesis Midwest Laboratories

Date: 11/10/2010

APPENDIX II

Corn Grains Utilized

| Group / TSN | Variety | Lot | Location | Production Practices |
|---|---------------|--|---------------|---|
| Genetically Modified Soybean 032945-0001 | DAS-68416-4 | YW09EW000467, -469, -471, -475, -477, -479. | Fowler, IN | Weed control applied to plants. Planted May 11, 2009 and harvested October 20 and 21, 2009. |
| Genetically Similar Soybean Control 032920-0001 | Maverick | YW09EW000011-17 | Fowler, IN | Weed control applied to plants. Planted May 11, 2009 and harvested October 20 and 21, 2009. |
| Commercial Soybean 1 032947-0001 | LG C3540 | Lot# 2208049 | Brunswick, NE | Weed control applied to plants. Overhead sprinkler was used for irrigation purposes. Planted May 21, 2009 and harvested November 6, 2009. |
| Commercial Soybean 2 032948-0001 | Pioneer 93B82 | P3W0011009-00-0649 (961649) | Deerfield, MI | Weed control applied to plants. Planted May 22, 2009 and harvested October 26, 2009. |
| Commercial Soybean 3 032949-0001 | HiSoy 38C60 | Lot# SZU90151 | York, NE | Weed and insect control applied to plants. Overhead sprinkler was used for irrigation purposes. Planted May 19, 2009 and harvested October 19, 2009. |

APPENDIX III

Feed Formulation and Composition of Diets

Title: DAS-68416-4 (AAD-12) Soybean Feeding Study in the Broiler Chicken

Sponsor: Dow AgroSciences, LLC, Indianapolis, IN

Processing Principal Investigator: Dick L. Dusek

Processing Facility: GLP Technologies, 22723 State Highway 6 South, Navasota, TX 77868

Study Number: 208-008-21

Sample Description: Soybeans supplied by Dow AgroSciences LLC

Sample Receipt Date: Soybeans for treatment 5 – October 29, 2009
Soybeans for treatment 4 – November 3, 2009
Soybeans for treatment 3 – November 24, 2009
Soybeans for treatments 1 and 2 – January 13 & 14, 2010

Processing Start Date: May 18, 2010

Processing Termination Date: August 12, 2010

SPONSOR:

Dow AgroSciences (DAS)
9330 Zionsville Road
Indianapolis, Indiana 46268

STUDY DIRECTOR/TESTING FACILITY:

Dale W. Fletcher
Genesis Midwest Laboratories (GML)
N 6230 County Road G
Neillsville, Wisconsin 54456

STUDY TITLE:

DAS-68416-4 (AAD-12) Soybean Feeding Study in the Broiler Chicken

STUDY IDENTIFICATION:

DAS Protocol Number: 101088 GML Study Number: 208-008-21

PROCESSING REPORT:

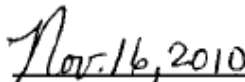
Small Scale Soybean Processing and Formulation of Poultry Feed

AUTHOR:

Dick L. Dusek
GLP Technologies
22723 State Highway 6 South
Navasota, Texas 77868



Signature



Date

PROCESSING FACILITY:

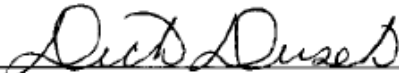
GLP Technologies
22723 State Highway 6 South
Navasota, Texas 77868

DAS Protocol Number: 101088 GML Study Number: 208-008-21

GLP COMPLIANCE STATEMENT

STUDY TITLE: DAS-68416-4 (AAD-12) Soybean Feeding Study in the Broiler Chicken

This processing study was conducted and reported in accordance with the Environmental Protection Agency's Good Laboratory Practice Standards, 40 CFR 160, Federal Register, effective date October 16, 1989.



Dick L. Dusek
Processing Principal Investigator

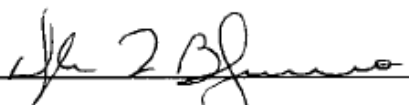


Date

QUALITY ASSURANCE STATEMENT

STUDY TITLE: DAS-68416-4 (AAD-12) Soybean Feeding Study in the Broiler Chicken

In compliance with the Good Laboratory Practice regulations an inspector with the Quality Assurance Unit has inspected at least one phase of this study. Inspection findings were reported to GLP Technologies management, the study director and the study director's management. The Quality Assurance Unit has reviewed the processing report and certifies that it accurately describes the methods and standard operating procedures used, and the reported results accurately reflect the raw data generated during this processing phase.

Signed:  Date: 16 Nov 2010
 Doyle L. Borchardt
 Quality Assurance Coordinator
 GLP Technologies

| INSPECTION | | DATES REPORTED TO: | |
|--|----------------------------------|-----------------------------|--|
| TYPE | DATE | GLP TECHNOLOGIES MANAGER | STUDY DIRECTOR & STUDY DIRECTOR'S MANAGEMENT |
| 1) Process Phase SOP G.2 R05 Sec. 5: "Use of Expander/Extruder" | 26 May, 01 and 07 Jun 2010 | 25 Jun 2010 | 30 Jun 2010 |
| 2) Process Phase SOP G.25 R01 Sec. 3: "Formulation of Feed Ration" | 11 and 12 Aug 2010 | 23 Aug 2010 | 07 Sep 2010 |
| 2) Process Report | 12 thru 14 Nov 2010 | 14 Nov 2010 | 16 Nov 2010 |

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STUDY TITLE: DAS-68416-4 (AAD-12) Soybean Feeding Study in the Broiler Chicken

SPONSOR: Dow AgroSciences (DAS)
Indianapolis, Indiana 46268

**STUDY DIRECTOR
/TESTING FACILITY:** Dale W. Fletcher
Genesis Midwest Laboratories (GML)
Neillsville, Wisconsin 54456

PROCESSING PRINCIPAL INVESTIGATOR: Dick L. Dusek
GLP Technologies
Navasota, Texas 77868

PROCESSING, DATA RECORDING

& SHIPPING TECHNICIANS: Timothy R. Adams, Dick L. Dusek, Theodore F. Dusek Jr., K. Todd Hausman, Patrick w. Simecek, Andrew D. Dusek, Joseph M. Gibson, C. Lee Jordan and Evan J. Vanderpool

SAMPLE RECEIPT DATE: October 29, 2009 (HiSoy 38C60)
November 3, 2009 (Pioneer 93B82)
November 24, 2009 (LG C3540)
January 13 & 14, 2010 (Maverick)
January 13 & 14, 2010 (pDAB4468-4116)

PROCESSING START DATE: May 18, 2010

PROCESSING COMPLETION DATE: August 12, 2010

FRACTION SHIPMENT DATE: August 20, 2010 (Bulk Feed Rations)
August 17, 2010 (Rep. Feed Fractions)
July 15, 2010 (Soybean Meal)
June 10, 2010 (Soybean Meal & Corn Meal)

INTRODUCTION:

Five soybean seed samples received from various locations were processed into commercially representative toasted meal. This meal was used to commercially representative poultry diets. These feed rations were shipped to Genesis Midwest in Neillsville, Wisconsin.

TEST SYSTEM: [From protocol]

Broiler Chickens

Crop: Soybean

| | |
|-----------------|-----------------------|
| Test Substance: | (AAD-12, DAS-68416-4) |
| Control: | (non-AAD-12 control) |
| Control: | (LG C3540) |
| Control: | (Pioneer 93B82) |
| Control: | (HiSoy 38C60) |

OBJECTIVE:

GLP Technologies objective was to produce and collect commercially representative toasted soybean meal from the soybean seed samples received from the field. This soybean meal was used in commercially representative poultry diets.

METHODS & MATERIALS:**Receipt of Test Commodities:**

Soybean seed samples (RAC [Raw Agricultural Commodity]) were received from the field trials listed in the table below. All samples were delivered ambient by Federal Express. After receipt and inventory, the samples were placed into frozen storage.

| Sample | Grower | Date Received |
|---------------|---|-----------------------|
| HiSoy 38C60 | Ag Research Associates 3605 N. Delaware Avenue York, Nebraska 68467 | October 29, 2009 |
| Pioneer 93B82 | Ag Research Associates 2450 Hoagland Hwy Deerfield, Michigan 49238 | November 3, 2009 |
| LG C3540 | Ag Research Associates 3605 N. Delaware Avenue York, Nebraska 68467 | November 24, 3009 |
| Maverick | Mycogen Seed 1736 N. 1200 E. Fowler, Indiana 47944 | January 13 & 14, 2010 |
| pDAB4468-416 | Mycogen Seed 1736 N. 1200 E. Fowler, Indiana 47944 | January 13 & 14, 2010 |

Storage Conditions:

GLP Technologies SOP E.2 "Storage of Samples in Freezers" requires that freezer temperatures be maintained at or below 10 degrees Fahrenheit with the exception of the defrost cycle and removal and placement of samples in the freezers. Recorded in the data are the times and dates for removal or placement of samples/fractions in freezers or coolers.

Sample/Fraction Handling:

Samples were handled in a manner that minimizes the possibility of contamination. It is this facility's policy to use only containers and utensils washed with detergent and rinsed with water.

Processing Methods:

Soybean samples were identified and processed in the following order: Maverick, LG 3540, Pioneer 93B82, HiSoy 38C60, pDAB4468-416

Moisture content of the incoming soybean was determined. If the moisture content was greater than 13.5%, samples were dried in a Steelman Industries oven at 130-160°F to a moisture content of 10-13.5%. Following drying (if necessary), samples were cleaned by aspiration and screening. Light impurities were separated from the sample using a Kice aspirator. After aspiration, a Hance Corporation cleaner was used to screen the soybean sample. Large and small foreign particles (screenings) were removed from the cleaned sample. Sample TSN032947 (LG C3540) was screened before aspiration.

Cleaned whole soybeans were fed into an A. T. Ferrell roller mill to crack the hull and liberate the kernel. After hulling, the material was passed through the Kice aspirator to separate hull and kernel material. The moisture of the kernel material was adjusted to 13.5 percent and allowed to temper for at least twelve hours. Moisture adjusted kernel material was heated to 160-175°F in a Marion mixer and flaked in an A. T. Ferrell flaking roll with a gap setting of 0.008-0.013".

Flakes were extruded in a Readco/Teledyne continuous processor, where they were turned into collets by direct steam injection and compression. Collets exited the processor at 200-250°F. After extrusion, the collets were dried in the oven at 150-180°F for 30-40 minutes and ground in a C. S. Bell disc mill.

For solvent extraction, ground collets were placed in stainless steel batch extractors and submerged in 120-140°F hexane (solvent). Samples were extracted using fresh and reclaimed hexane. After 30 minutes, the miscella (crude oil and hexane) was drained and fresh hexane was added to repeat the cycle two more times. Final two washes were for 15 minutes each.

Following the final draining, extracted material were toasted in the Reliance Industries paddle mixer. Steam was injected directly on the material until the vapor temperature reached 200-210°F. Steam injection was stopped and the material heated to 220-240°F and held for 30 to 60 minutes. After toasting, the product was cooled to room temperature and screened over a 1/8 inch screen to remove large particles that may not be fully toasted. Resulting fraction through the 1/8" screen was toasted soybean meal.

Miscella was passed through a laboratory vacuum evaporator unit to separate the crude oil and hexane. Crude oil was heated to 195-205°F for hexane removal. Crude oil was discarded per facility SOP.

Production of toasted soybean meal is outlined in form H.202 "Soybean Processing Material Balance" and is described in detail in SOP G.2 Revision 05, "Soybean: Batch

Processing Method".

Toasted meal samples were used to formulate starter, grower, and finisher poultry diets. Each diet was formulated using the following ingredients: toasted soybean meal, corn meal, methionine, lysine HCl, threonine, soybean oil, dicalcium phosphate, limestone, iodized salt, vitamin-trace mineral mix for poultry, BMD-60, Bio-Cox 60 Granular and Stafac-20. Material balances show the specific amounts of ingredients used in each diet. All minor ingredients except the soybean meal, corn meal and soybean oil were pre-mixed in the 3.5 cubic foot mixer for five minutes. All ingredients were mixed in a Readco Model 15CT Mixer for ten minutes. Finished diets were placed in plastic lined paper feed sacks. Approximately 50 pounds was placed into each sack. Sacks were sealed (sewn), stacked on pallets, and shrink wrapped.

Production of the poultry diets is outlined in form H.202 "Soybean Processing Material Balance" and is described in detail in SOP G.25 Revision 01, "Production of Animal Feed."

Comparison to Industrial Practice:

Soybeans were processed in a way that simulates industrial practice as closely as possible. Because of compliance monitoring requirements and sample size, the samples were processed by batch rather than continuous, as in commercial operation.

Processing Results:

Whole soybean seed samples were processed into hulls, crude oil, and toasted meal. Toasted meal was incorporated into starter, grower, and finisher poultry diets.

Other Circumstances Pertaining to Study:

The Study Director was notified of the following deviations via email:

Protocol deviations:

1. Diet formulation recipes per Dr. Gary Cromwell, University of Kentucky, were to be followed. Due to size (1000 lbs.) and equipment limitations, finisher diets were mixed in two batches. For Maverick (TSN032945), the recipe requested 15.50 lbs. (7.75 lbs. per batch) of dicalcium phosphate be added to the diet. For batch 1, the processor added 7.6 lbs.
2. Individual samples of the soybean meal as well as the corn meal used in the preparation of poultry diets was to be shipped on dry ice to Covance. Samples were shipped ambient on June 10, 2010.

3. Completed diets were to be stored in refrigeration until shipment to GML. Diets were stored ambient before shipment.
4. Representative 500 gram samples of each formulated diets for Dow AgroSciences were to be stored refrigerated and shipped on ice to Dow. Diets were stored frozen and shipped frozen with dry ice to Dow.

Facility SOP deviations:

1. (SOP G.25) A National Bulk Equipment, Incorporated (NBE) vertical mixer was to be used for mixing the poultry diets. A Readco ribbon blender was used to mix all diets.
2. (SOP C.3) Designated individuals shall be classified as processor, if documented job training, reading of applicable SOP(s), raw data collection training from QAU and handling of process deviations from QAU are on record. Processor for the formulation and mixing of the feed rations was Theodore F. Dusek Jr. He did not have documented job training for this procedure.
3. (SOP E.2) Temperature in freezers are to be maintained at or below 10°F with exception of defrost cycle and removal or placement of samples in freezer. Maximum recorded temperature during storage of unprocessed grain for freezer F2 was approximately 57°F on April 14, 2010. Temperature was above 10°F for about 72 hours. Freezer was above 32° for about 21 hours.
4. (SOP G.2) During toasting, the meal is held between 220-240°F for 30-60 minutes. Maximum recorded temperatures were 244.8°F (Maverick), 242.9°F (LG C3540), 240.1°F (Pioneer 93B82) 242.1°F (HiSoy 38C60) and 240.7°F (pDAB4468-416).
5. (SOP G.2) During toasting, steam pressure to the Reliance Industries mixer is 20-60 psi and steam is injected directly on the product at 5 to 15 psi. For sample TSN032920 (pDAB4468-416), the pressures are unknown.
6. (SOP G.2) Expanded material is solvent extracted for three cycles at 120-140 °F for 30 minutes (1 cycle) and 15 minutes (2nd and 3rd cycles). For sample 032948 (Pioneer 93B82), the maximum temperatures for each of the three cycles is unknown for batch 16.
7. (SOP D.11) "Pre-Process Verification will be completed prior to processing samples. This ensures that a visual inspection of the machine was performed and that it is clean and operational. The processing personnel will record the date, unique identifying number (test or protocol number pertinent to study and sample number [if applicable]), and commodity to be processed, and will initial

the entries. Cleaning will be performed and documented prior to the next processing study." For this trial no pre-process verification or cleaning is documented for the Steelman Industries oven # 1 used to dry two of the whole soybean samples.

During urease analysis, temperature of the water bath is to be maintained at 29.5-30.5°C. Maximum recorded temperature for several of the samples was 30.8°C. Analysis is performed according to AOCS (American Oil Chemists Society) procedure and is not a part of facility SOP.

Maximum recovery temperature for crude oil 205°F. There are several instances of the maximum recorded temperature exceeding 205°F. A deviation was not written for this occurrence as crude oil was not requested or further processed.

Fraction Shipment:

Toasted meal fractions from the five samples were shipped ambient via Federal Express to Christy Dunville at Dow AgroSciences in Indianapolis, Indiana on June 10, 2010. Duplicate toasted meal fractions from the five samples and duplicate fractions of the corn meal to be used in feed diet formulation were shipped ambient via Federal Express to Jane Sabbatini at Covance Labs in Madison, Wisconsin on June 10, 2010. Toasted meal fractions from the five samples were shipped ambient via Federal Express to Heather Proctor at PMI in Richmond, Indiana on July 15, 2010. Fractions of the completed feed rations from all samples were shipped frozen on dry ice via Federal Express to Jane Sabbatini at Covance Labs and Christy Dunville at Dow AgroSciences on August 17, 2010. The bulk feed rations from all samples were shipped ambient via Federal Express Freight to Dale Fletcher at Genesis Midwest Laboratories in Neillsville, Wisconsin on August 20, 2010. A Shipment of Fractions (Chain of Custody) and Fraction Shipment and Packing List forms accompanied each shipment.

CONCLUSIONS:

Commercially representative poultry diets were formulated and collected using the toasted soybean meal produced from the whole soybean seeds received from the field.

DATA ARCHIVAL:

Record Transfer and Retention:

This processing report and raw data has been transferred to the Study Director, Dale W. Fletcher at Genesis Midwest Laboratories in Neillsville, Wisconsin.

GLP Technologies will archive the following study specific data:

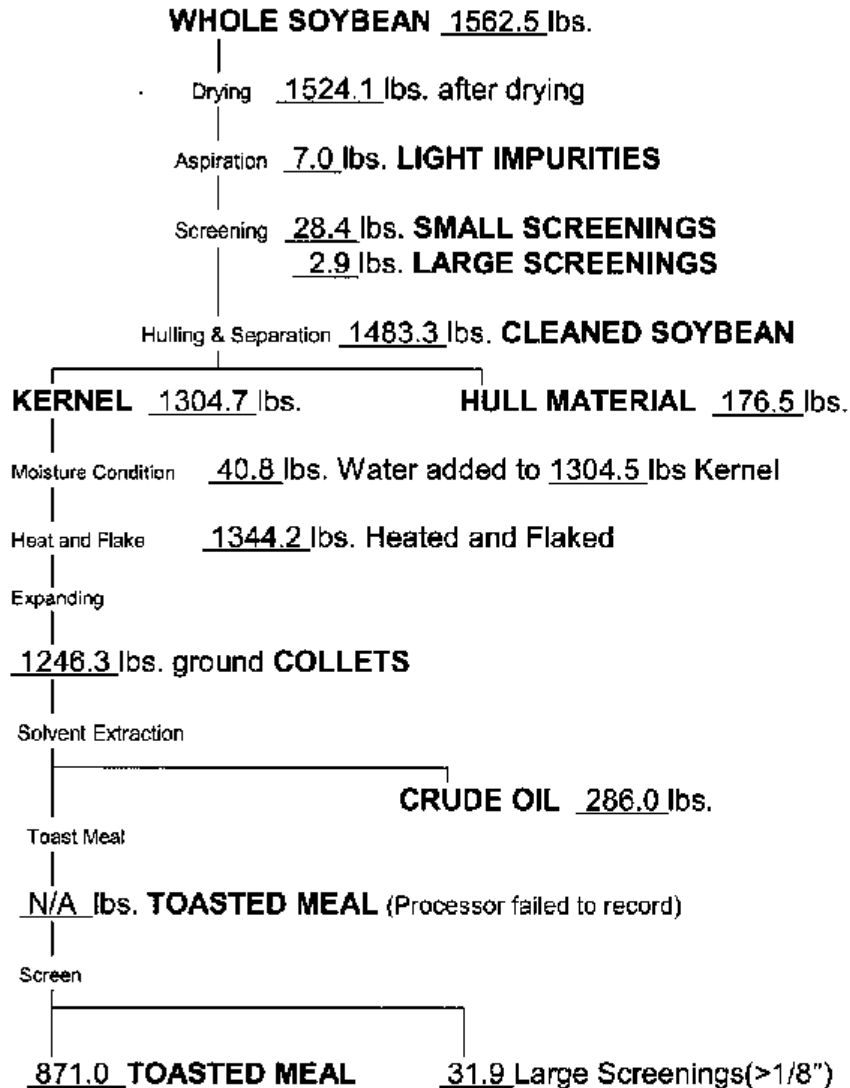
- copy of the sponsor processing protocol
- exact copy of the processing report (main body)
- exact copy of the compliance statement
- exact copy of the sample material balance
- exact copy of the original raw processing data (includes communication logs, calculations, and deviation forms, when applicable)
- exact copy of personnel records (names and initials of personnel with processing study duties)
- exact copy of receiving record(s)
- exact copy of shipping record(s)
- exact copy of shipping bills of lading

GLP Technologies will archive the following non-study specific data indefinitely:

- original freezer and cooler temperature records
- original equipment logs (includes scales, temperature recording devices, and processing equipment records)
- CVs of personnel and training records

**FORM H.202 Revision 00
SOYBEAN PROCESSING MATERIAL BALANCE**

Sample # 1 (Isogenic Control) Code # TSN032945 (Maverick)



Urease Activity(3 analysis): 0.20; 0.19; 0.16

FORM H.202 Revision 00
SOYBEAN PROCESSING MATERIAL BALANCE

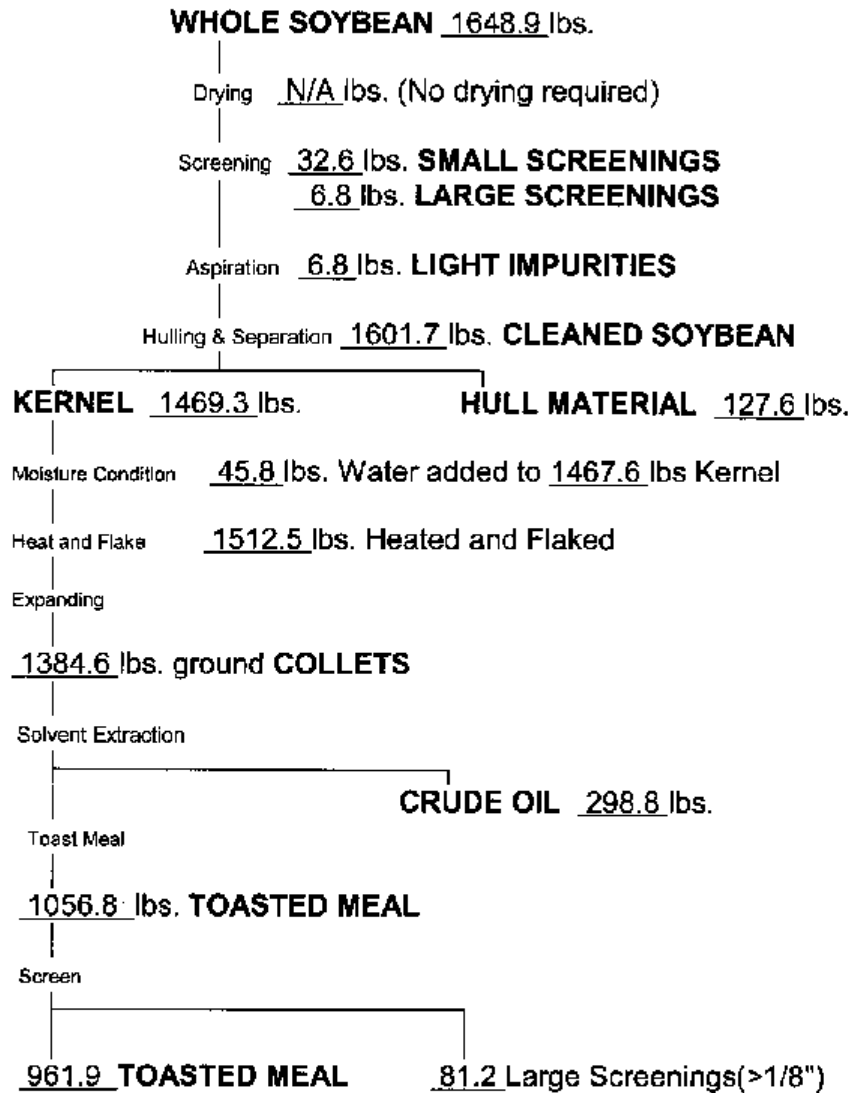
Sample # 1 (Isogenic Control) Code # TSN032945 (Maverick)

FEED MIXING

| | Starter Diet | Grower Diet | Finisher Diet |
|---------------------------|--------------|-------------|---------------|
| Soybean Meal | 121.2 lbs. | 218.4 lbs. | 315.0 lbs. |
| Corn Meal | 150.1 lbs. | 327.1 lbs. | 597.0 lbs. |
| DL-Methionine | 408.6 g | 762.7 g | 1135.0 g |
| L-Lysine HCL | 81.7 g | 163.4 g | 227.0 g |
| Threonine | n/a | n/a | n/a |
| Soybean Oil | 15.2 lbs. | 30.3 lbs. | 50.4 lbs. |
| Dicalcium Phosphate | 6.0 lbs. | 10.5 lbs. | 15.4 lbs. |
| Limestone | 3.9 lbs. | 6.6 lbs. | 11.4 lbs. |
| Iodized Salt | 1.5 lbs. | 3.0 lbs. | 5.0 lbs. |
| Vitamin-Trace Mineral Mix | 340.5 g | 681.0 g | 1135.0 g |
| BMD 60 | 56.8 g | 113.5 g | n/a |
| Bio-Cox 60 Granular | 68.1 g | 136.2 g | n/a |
| Stafac 20 | n/a | n/a | 72.6 g |

FORM H.202 Revision 00
SOYBEAN PROCESSING MATERIAL BALANCE

Sample # 2 (Commercial Soybean) Code # TSN032947 (LG C3540)



Urease Activity(3 analysis): 0.31; 0.31; 0.30

FORM H.202 Revision 00
SOYBEAN PROCESSING MATERIAL BALANCE

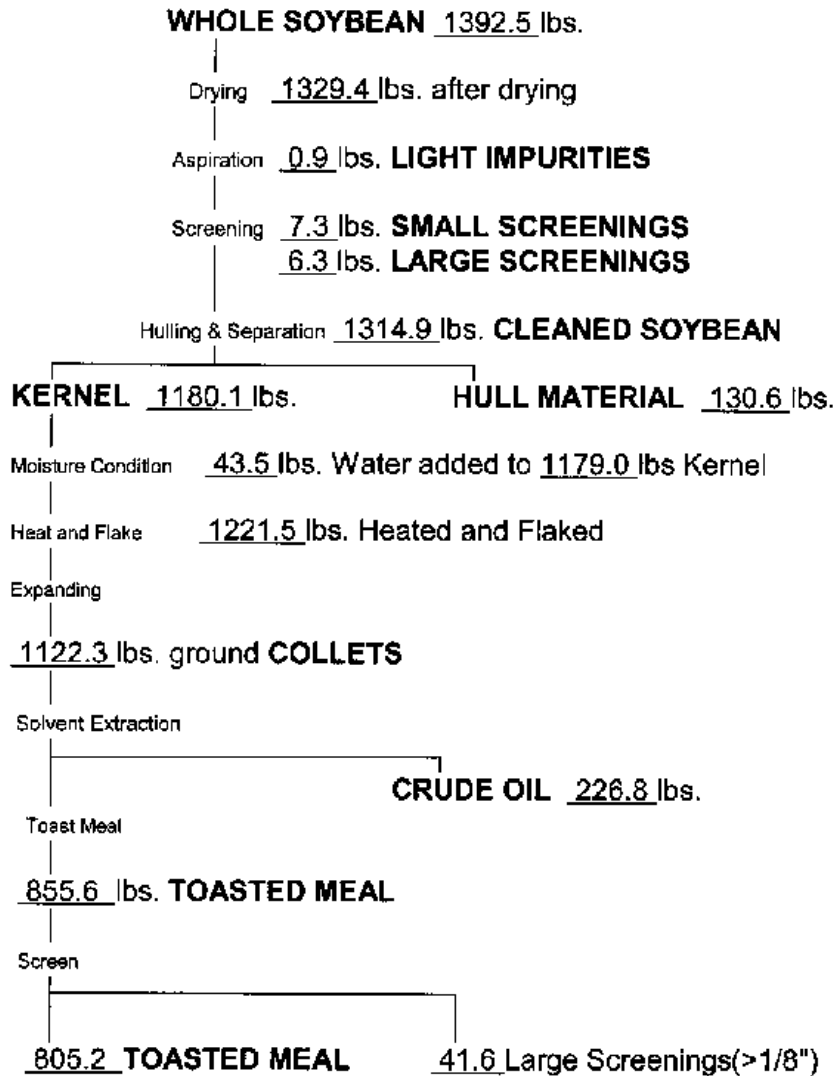
Sample # 2 (Commercial Soybean) Code # TSN032947 (LG C3540)

FEED MIXING

| | Starter Diet | Grower Diet | Finisher Diet |
|---------------------------|--------------|-------------|---------------|
| Soybean Meal | 121.2 lbs. | 218.4 lbs. | 315.0 lbs. |
| Corn Meal | 149.7 lbs. | 326.5 lbs. | 596.0 lbs. |
| DL-Methionine | 463.1 g | 871.7 g | 1271.2 g |
| L-Lysine HCL | 204.3 g | 354.1 g | 544.8 g |
| Threonine | 27.2 g | 54.5 g | 136.2 g |
| Soybean Oil | 14.8 lbs. | 29.7 lbs. | 49.6 lbs. |
| Dicalcium Phosphate | 6.0 lbs. | 10.7 lbs. | 15.6 lbs. |
| Limestone | 4.2 lbs. | 6.9 lbs. | 12.0 lbs. |
| Iodized Salt | 1.5 lbs. | 3.0 lbs. | 5.0 lbs. |
| Vitamin-Trace Mineral Mix | 340.5 g | 681.0 g | 1135.0 g |
| BMD 60 | 56.8 g | 113.5 g | n/a |
| Bio-Cox 60 Granular | 68.1 g | 136.2 g | n/a |
| Stafac 20 | n/a | n/a | 72.6 g |

FORM H.202 Revision 00
SOYBEAN PROCESSING MATERIAL BALANCE

Sample # 3 (Commercial Soybean) Code # TSN032948 (Pioneer 93B82)



Urease Activity(3 analysis): 0.08; 0.07; 0.07

FORM H.202 Revision 00
SOYBEAN PROCESSING MATERIAL BALANCE

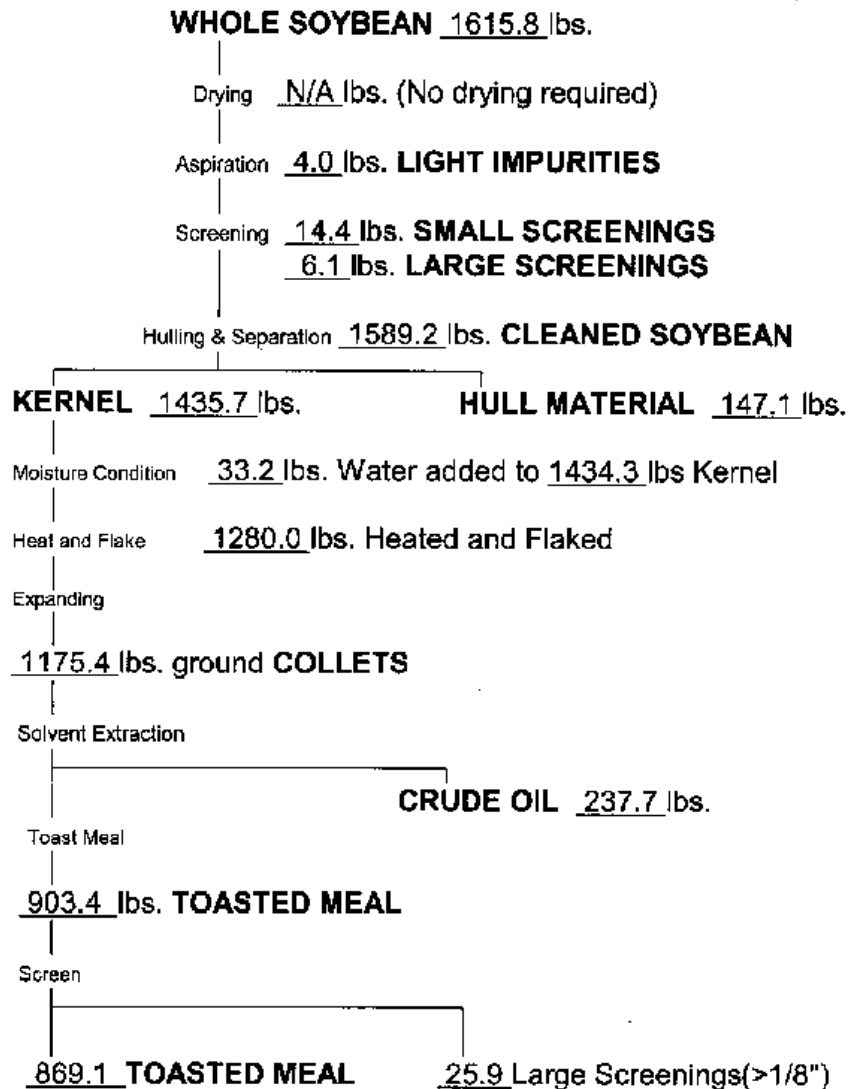
Sample # 3 (Commercial Soybean) Code # TSN032948 (Pioneer 93B82)

FEED MIXING

| | Starter Diet | Grower Diet | Finisher Diet |
|---------------------------|--------------|-------------|---------------|
| Soybean Meal | 121.2 lbs. | 218.4 lbs. | 315.0 lbs. |
| Corn Meal | 150.2 lbs. | 327.2 lbs. | 597.2 lbs. |
| DL-Methionine | 463.1 g | 871.7 g | 1271.2 g |
| L-Lysine HCL | n/a | n/a | n/a |
| Threonine | n/a | n/a | n/a |
| Soybean Oil | 14.9 lbs. | 29.8 lbs. | 49.8 lbs. |
| Dicalcium Phosphate | 6.2 lbs. | 10.8 lbs. | 16.0 lbs. |
| Limestone | 4.1 lbs. | 6.8 lbs. | 11.6 lbs. |
| Iodized Salt | 1.5 lbs. | 3.0 lbs. | 5.0 lbs. |
| Vitamin-Trace Mineral Mix | 340.5 g | 681.0g | 1135.0 g |
| BMD 60 | 56.8 g | 113.5 g | n/a |
| Bio-Cox 60 Granular | 68.1 g | 136.2 g | n/a |
| Stafac 20 | n/a | n/a | 72.6 g |

FORM H.202 Revision 00
SOYBEAN PROCESSING MATERIAL BALANCE

Sample # 4 (Commercial Soybean) Code # TSN032949 (HiSoy 38C60)



Urease Activity(3 analysis): 0.09; 0.10; 0.10

FORM H.202 Revision 00
SOYBEAN PROCESSING MATERIAL BALANCE

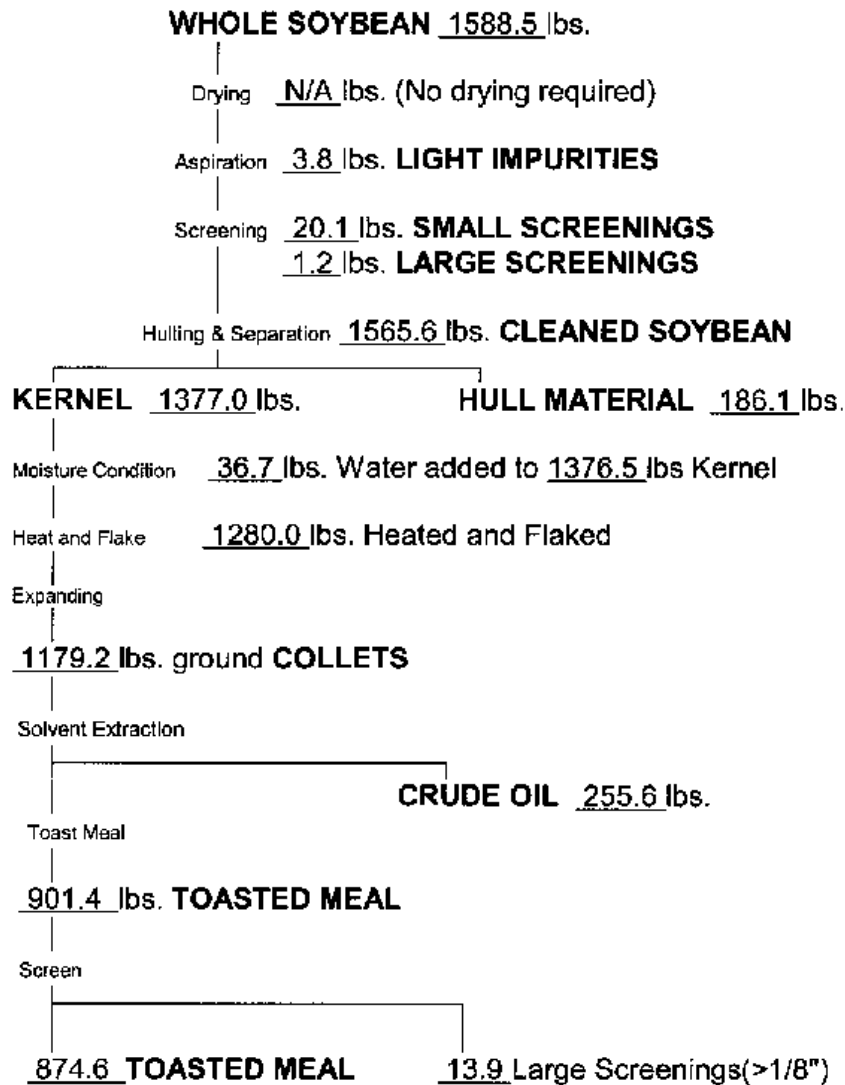
Sample # **4 (Commercial Soybean)** Code # **TSN032949 (HiSoy 38C60)**

FEED MIXING

| | Starter Diet | Grower Diet | Finisher Diet |
|---------------------------|--------------|-------------|---------------|
| Soybean Meal | 121.2 lbs. | 218.4 lbs. | 315.0 lbs. |
| Corn Meal | 150.0 lbs. | 326.8 lbs. | 596.4 lbs. |
| DL-Methionine | 490.3 g | 926.2 g | 1362.0 g |
| L-Lysine HCL | 109.0 g | 190.7 g | 317.8 g |
| Threonine | n/a | n/a | n/a |
| Soybean Oil | 14.9 lbs. | 29.9 lbs. | 50.0 lbs. |
| Dicalcium Phosphate | 5.9 lbs. | 10.5 lbs. | 15.0 lbs. |
| Limestone | 4.2 lbs. | 7.0 lbs. | 12.2 lbs. |
| Iodized Salt | 681.0 g | 1362.0 g | 2270.0 g |
| Vitamin-Trace Mineral Mix | 340.5 g | 681.0 g | 1135.0 g |
| BMD 60 | 56.8 g | 113.5 g | n/a |
| Bio-Cox 60 Granular | 68.1 g | 136.2 g | n/a |
| Stafac 20 | n/a | n/a | 72.5 g |

FORM H.202 Revision 00
SOYBEAN PROCESSING MATERIAL BALANCE

Sample # 5 (Test Substance) Code # TSN032920 (pDAB4468-416)



Urease Activity(3 analysis): 0.07; 0.08; 0.09

FORM H.202 Revision 00
SOYBEAN PROCESSING MATERIAL BALANCE

Sample # 5 (Test Substance) Code # TSN032920 (pDAB4468-416)

FEED MIXING

| | Starter Diet | Grower Diet | Finisher Diet |
|---------------------------|--------------|-------------|---------------|
| Soybean Meal | 121.2 lbs. | 218.4 lbs. | 315.0 lbs. |
| Corn Meal | 150.1 lbs. | 327.0 lbs. | 597.0 lbs. |
| DL-Methionine | 449.5 g | 844.4 g | 1225.8 g |
| L-Lysine HCL | 163.4 g | 272.4 g | 408.6 g |
| Threonine | n/a | n/a | n/a |
| Soybean Oil | 15.0 lbs. | 30.0 lbs. | 50.0 lbs. |
| Dicalcium Phosphate | 6.0 lbs. | 10.8 lbs. | 15.6 lbs. |
| Limestone | 3.8 lbs. | 6.3 lbs. | 11.2 lbs. |
| Iodized Salt | 681.0 g | 1362.0 g | 2270.0 g |
| Vitamin-Trace Mineral Mix | 340.5 g | 681.0 g | 1135.0 g |
| BMD 60 | 56.8 g | 113.5 g | n/a |
| Bio-Cox 60 Granular | 68.1 g | 136.2 g | n/a |
| Stafac 20 | n/a | n/a | 72.6 g |

Compositional Analyses of Soybean Meal (Fresh Weight)

| | 1 | 2 | 3 | 4 | 5 |
|-----------------------------|----------------------|-----------------------|----------------------------|--------------|----------------------|
| TSN # | TSN032945 | TSN032947 | TSN032948 | TSN032949 | TSN032920 |
| | | | | HiSoy 38C60 | AAD-12, DAS- |
| Sample Description | Isoline Soybean Meal | LG C3540 Soybean Meal | Pioneer 93B82 Soybean Meal | Soybean Meal | 68416-4 Soybean Meal |
| Covance LIMS # | 00600146 | 00600147 | 00600148 | 00600149 | 00600150 |
| Proximate (%) | | | | | |
| Moisture | 4.91 | 6.01 | 5.31 | 5.33 | 5.57 |
| Protein | 50.7 | 46.3 | 53.1 | 48.5 | 49.3 |
| Total Fat | 0.600 | 0.879 | 0.820 | 0.760 | 0.735 |
| Ash | 6.60 | 6.37 | 6.40 | 6.61 | 6.63 |
| Carbohydrates | 37.2 | 40.4 | 34.4 | 38.8 | 37.8 |
| Acid Detergent Fiber (%) | 3.39 | 4.61 | 3.60 | 4.67 | 4.28 |
| Neutral Detergent Fiber (%) | 8.59 | 7.84 | 5.99 | 7.53 | 7.16 |
| Crude Fiber (%) | 2.97 | 3.82 | 3.38 | 4.41 | 3.45 |
| Isoflavones (ppm) | | | | | |
| Daidzein | 43.6 | 55.0 | 57.8 | 42.8 | 47.2 |
| Glycitein | 17.8 | < 10.0 | < 10.0 | 14.4 | 15.7 |
| Genistein | 46.7 | 45.1 | 49.8 | 44.1 | 50.1 |
| Daidzin (as aglycone) | 971 | 1760 | 1350 | 1720 | 1150 |
| Glycitin (as aglycone) | 235 | 153 | 124 | 298 | 338 |
| Genistin (as aglycone) | 1260 | 1770 | 1360 | 1940 | 1430 |
| Choline-Free (mg/100g) | 235 | 246 | 226 | 256 | 232 |
| Trypsin Inhibitor (TIU/mg)* | 1.51 | 1.47 | 2.21 | 3.15 | 2.94 |
| Phytic Acid (%) | 1.30 | 1.40 | 1.09 | 1.31 | 1.31 |
| Lectin (H.U./mg)** | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Minerals (ppm) | | | | | |
| Calcium | 2950 | 2230 | 2300 | 2340 | 3180 |
| Copper | 14.0 | 11.2 | 10.4 | 15.8 | 13.1 |
| Iron | 77.4 | 77.7 | 73.2 | 75.5 | 78.4 |
| Magnesium | 2820 | 2930 | 2740 | 2520 | 2860 |
| Manganese | 22.8 | 34.0 | 23.6 | 36.2 | 24.4 |
| Phosphorus | 6830 | 6860 | 5970 | 7250 | 6590 |
| Potassium | 22600 | 24400 | 23200 | 23800 | 2300 |
| Sodium | < 100 | < 100 | 177 | < 100 | < 100 |
| Zinc | 48.8 | 39.8 | 37.3 | 45.7 | 47.4 |
| Selenium (ppb) | 226 | 515 | 444 | 1010 | 251 |

* TIU - Trypsin Inhibitor Units

** H.U. - Hemagglutinating Unit

Compositional Analyses of Soybean Meal (Fresh Weight)

| | 1 | 2 | 3 | 4 | 5 |
|-------------------------------------|-----------------|--------------|---------------|-------------|--------------|
| TSN # | TSN032945 | TSN032947 | TSN032948 | TSN032949 | TSN032920 |
| | | | | HiSoy 38C60 | AAD-12, |
| Sample Description | Isoline Soybean | LG C3540 | Pioneer 93B82 | Soybean | DAS-68416-4 |
| Covance LIMS # | Meal | Soybean Meal | Soybean Meal | Meal | Soybean Meal |
| | 00600146 | 00600147 | 00600148 | 00600149 | 00600150 |
| Amino Acids (mg/g) | | | | | |
| Aspartic Acid | 54.8 | 51.8 | 58.6 | 54.5 | 55.3 |
| Threonine | 20.7 | 18.5 | 20.6 | 19.2 | 20.3 |
| Serine | 25.6 | 23.6 | 25.6 | 23.9 | 25.5 |
| Glutamic Acid | 85.3 | 80.3 | 91.5 | 83.0 | 83.7 |
| Proline | 25.6 | 22.7 | 26.4 | 23.8 | 23.7 |
| Glycine | 21.2 | 19.0 | 21.5 | 20.0 | 20.8 |
| Alanine | 21.8 | 19.9 | 22.2 | 20.7 | 21.5 |
| Cystine | 7.08 | 6.88 | 6.58 | 6.61 | 6.89 |
| Valine | 23.7 | 21.3 | 24.1 | 21.8 | 22.3 |
| Methionine | 7.03 | 6.16 | 6.43 | 5.94 | 6.47 |
| Isoleucine | 22.6 | 20.7 | 23.2 | 20.9 | 21.8 |
| Leucine | 38.5 | 35.0 | 39.7 | 36.3 | 37.4 |
| Tyrosine | 18.7 | 16.6 | 18.8 | 17.3 | 18.0 |
| Phenylalanine | 25.5 | 22.9 | 26.6 | 24.5 | 24.6 |
| Lysine | 30.7 | 29.0 | 32.0 | 30.3 | 29.7 |
| Histidine ⁴ | 13.5 | 11.9 | 13.5 | 12.6 | 12.4 |
| Arginine | 35.9 | 33.7 | 39.4 | 35.1 | 34.7 |
| Tryptophan | 8.43 | 7.43 | 8.48 | 7.62 | 8.23 |
| Mycotoxin Screen¹ | | | | | |
| Aflatoxin B1 (ppb) | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Aflatoxin B2 (ppb) | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Aflatoxin G1 (ppb) | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Aflatoxin G2 (ppb) | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Zearalenone (ppb) | < 100 | < 100 | < 100 | < 100 | < 100 |
| Fumonisin B1 (ppm) | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Fumonisin B2 (ppm) | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Fumonisin B3 (ppm) ² | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Deoxynivalenol (ppm) | 0.7 | 0.7 | 0.7 | 0.4 | 0.7 |
| 3-Acetyl DON (ppm) | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 15-Acetyl DON (ppm) | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| T-2 Toxin (ppm) | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |

DON - Deoxynivalenol

ND - none detected

¹ Assays performed in non-GLP facility² Matrix spike recovery of 122.0%

Feed Formulation Recipes (Continued)

| Grower Diets - 07-26-10 | GML Study 208-008-21 DAS Protocol 101088 | | | | | | | | | 600 lb | |
|---------------------------|--|-------------|--------|--------|--------|--|---------------------|--------|--------|--------|--------|
| | | Formulas, % | | | | | Mixing Formulas, lb | | | | |
| Diet: | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| Corn | | 54.50 | 54.52 | 54.41 | 54.54 | 54.44 | 326.99 | 327.11 | 326.45 | 327.23 | 326.63 |
| Soybean - GMO | 32920 | 36.40 | | | | | 218.40 | | | | |
| Soybean - Isoline | 32945 | | 36.40 | | | | | 218.40 | | | |
| Soybean - LG C3540 | 32947 | | | 36.40 | | | | | 218.40 | | |
| Soybean - Pioneer 93B82 | 32948 | | | | 36.40 | | | | | 218.40 | |
| Soybean - HiSoy 38C60 | 32949 | | | | | 36.40 | | | | | 218.40 |
| Methionine | | 0.31 | 0.28 | 0.32 | 0.32 | 0.34 | 1.86 | 1.68 | 1.92 | 1.92 | 2.04 |
| Lysine HCl | | 0.10 | 0.06 | 0.13 | | 0.07 | 0.60 | 0.36 | 0.78 | | 0.42 |
| Threonine | | | | 0.02 | | | | | 0.12 | | |
| Corn oil | | 5.00 | 5.05 | 4.95 | 4.97 | 4.99 | 30.00 | 30.30 | 29.70 | 29.82 | 29.94 |
| Dicalcium phosphate | | 1.80 | 1.75 | 1.78 | 1.80 | 1.75 | 10.80 | 10.50 | 10.68 | 10.80 | 10.50 |
| Limestone | | 1.05 | 1.10 | 1.15 | 1.13 | 1.17 | 6.30 | 6.60 | 6.90 | 6.78 | 7.02 |
| Salt, iodized | | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 |
| Vitamin-trace mineral mix | | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| BMD-60 | | 0.0417 | 0.0417 | 0.0417 | 0.0417 | 0.0417 | 0.250 | 0.250 | 0.250 | 0.250 | 0.250 |
| Bio-Cox 60 Granular | | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| Stafac-20 | | | | | | | | | | | |
| | | | | | | | | | | | |
| Total | | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 600.0 | 600.0 | 600.0 | 600.0 | 600.0 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| Calculated Analysis | | | | | | | | | | | |
| | Req. | | | | | | | | | | |
| Protein, % | 20.00 | 21.86 | 22.37 | 20.77 | 23.25 | 21.57 | | | | | |
| Lysine, % | 1.26 | 1.27 | 1.27 | 1.27 | 1.27 | 1.27 | 1.00 | | | | |
| Threonine, % | 0.83 | 0.88 | 0.89 | 0.83 | 0.89 | 0.84 | 0.74 | | | | |
| Tryptophan, % | 0.20 | 0.33 | 0.34 | 0.30 | 0.34 | 0.31 | 0.18 | | | | |
| Methionine, % | | 0.62 | 0.61 | 0.62 | 0.63 | 0.63 | 0.38 | | | | |
| Methionine+Cystine, % | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.72 | | | | |
| Isoleucine, % | 0.82 | 0.93 | 0.96 | 0.89 | 0.98 | 0.90 | 0.73 | | | | |
| Valine, % | 0.96 | 0.99 | 1.04 | 0.96 | 1.06 | 0.97 | 0.82 | | | | |
| Fat, % | | 7.10 | 7.10 | 7.10 | 7.10 | 7.10 | | | | | |
| Ca, % | 0.90 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | | | | | |
| Total P, % | 0.60 | 0.69 | 0.69 | 0.70 | 0.67 | 0.71 | | | | | |
| Nonphytate P, % | 0.35 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | | | | | |
| ME, kcal/lb | 1,453 | 1435 | 1437 | 1431 | 1434 | 1433 | | | | | |
| | | | | | | | | | | | |
| BMD-60 | (60 g of bacitracin MD/lb) | | | | | 0.834 lb/ton supplies 50 g of bacitracin/ton | | | | | |
| Bio-Cox 60 Granular | (60 g of salinomycin/lb) | | | | | 1 lb/ton supplies 60 g of salinomycin/ton | | | | | |
| Stafac-20 | (20 g of virginiamycin/lb) | | | | | 0.3 lb/ton supplies 6 g of virginiamycin/ton | | | | | |

Feed Formulation Recipes (Continued)

| Finisher Diets - 07-26-10 | | GML Study 208-008-21 DAS Protocol 101088 | | | | | | | | 1000 lb | |
|---------------------------|----------------------------|--|--------|--------|--------|--|---------------------|--------|--------|---------|--------|
| | | Formulas, % | | | | | Mixing Formulas, lb | | | | |
| Diet: | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| | | | | | | | | | | | |
| Corn | | 59.71 | 59.71 | 59.60 | 59.73 | 59.65 | 597.05 | 597.05 | 595.95 | 597.25 | 596.45 |
| Soybean - GMO | 32920 | 31.50 | | | | | 315.00 | | | | |
| Soybean - Isoline | 32945 | | 31.50 | | | | | 315.00 | | | |
| Soybean - LG C3540 | 32947 | | | 31.50 | | | | | 315.00 | | |
| Soybean - Pioneer 93B82 | 32948 | | | | 31.50 | | | | | 315.00 | |
| Soybean - HiSoy 38C60 | 32949 | | | | | 31.50 | | | | | 315.00 |
| Methionine | | 0.27 | 0.25 | 0.28 | 0.28 | 0.30 | 2.70 | 2.50 | 2.80 | 2.80 | 3.00 |
| Lysine HCl | | 0.09 | 0.05 | 0.12 | | 0.07 | 0.90 | 0.50 | 1.20 | | 0.70 |
| Threonine | | | | 0.03 | | | | | 0.30 | | |
| Corn oil | | 5.00 | 5.04 | 4.96 | 4.97 | 5.00 | 50.00 | 50.40 | 49.60 | 49.70 | 50.00 |
| Dicalcium phosphate | | 1.55 | 1.55 | 1.55 | 1.60 | 1.50 | 15.50 | 15.50 | 15.50 | 16.00 | 15.00 |
| Limestone | | 1.12 | 1.14 | 1.20 | 1.16 | 1.22 | 11.20 | 11.40 | 12.00 | 11.60 | 12.20 |
| Salt, iodized | | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| Vitamin-trace mineral mix | | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 |
| BMD-60 | | | | | | | | | | | |
| Bio-Cox 60 Granular | | | | | | | | | | | |
| Stafac-20 | | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| | | | | | | | | | | | |
| Total | | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 1000.0 | 1000.0 | 1000.0 | 1000.0 | 1000.0 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| Calculated Analysis | | | | | | | | | | | |
| | Req. | | | | | | | | | | |
| Protein, % | 18.00 | 19.82 | 20.26 | 18.87 | 21.02 | 19.57 | | | | | |
| Lysine, % | 1.13 | 1.13 | 1.13 | 1.13 | 1.13 | 1.13 | 0.85 | | | | |
| Threonine, % | 0.76 | 0.79 | 0.80 | 0.76 | 0.80 | 0.76 | 0.68 | | | | |
| Tryptophan, % | 0.18 | 0.30 | 0.30 | 0.27 | 0.30 | 0.28 | 0.16 | | | | |
| Methionine, % | | 0.55 | 0.55 | 0.55 | 0.56 | 0.57 | 0.32 | | | | |
| Methionine+Cystine, % | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.60 | | | | |
| Isoleucine, % | 0.73 | 0.84 | 0.87 | 0.81 | 0.88 | 0.81 | 0.62 | | | | |
| Valine, % | 0.87 | 0.90 | 0.94 | 0.87 | 0.96 | 0.88 | 0.70 | | | | |
| Fat, % | | 7.24 | 7.24 | 7.24 | 7.24 | 7.24 | | | | | |
| Ca, % | 0.80 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | | | | | |
| Total P, % | 0.55 | 0.63 | 0.64 | 0.64 | 0.62 | 0.64 | | | | | |
| Nonphytate P, % | 0.30 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | | | | | |
| ME, kcal/lb | 1,453 | 1460 | 1461 | 1456 | 1459 | 1459 | | | | | |
| | | | | | | | | | | | |
| BMD-60 | (60 g of bacitracin MD/lb) | | | | | 0.834 lb/ton supplies 50 g of bacitracin/ton | | | | | |
| Bio-Cox 60 Granular | (60 g of salinomycin/lb) | | | | | 1 lb/ton supplies 60 g of salinomycin/ton | | | | | |
| Stafac-20 | (20 g of virginiamycin/lb) | | | | | 0.3 lb/ton supplies 6 g of virginiamycin/ton | | | | | |

APPENDIX IV

Analytical Reports

APPENDIX IV-A

Analytical Report -

Dow AgroSciences LLC

Analytical Summary Report for 101088 –

DAS-68416-4 (AAD-12) Soybean Feeding Study in the Broiler Chicken

Dow AgroSciences LLC
Study ID: 101088
Page 1 of 2

SUMMARY

(In accordance with 40 CFR part 152, this summary is available
for public release after registration)

STUDY TITLE

Analytical Summary Report for 101088 - DAS-68416-4 (AAD-12) Soybean Feeding Study in
the Broiler Chicken

DATA REQUIREMENTS

NA

AUTHOR(S)

C. M. Dunville

ANALYTICAL SUMMARY REPORT COMPLETED ON

PERFORMING LABORATORY

Regulatory Sciences and Government Affairs—Indianapolis Lab
Dow AgroSciences LLC
9330 Zionsville Road
Indianapolis, Indiana 46268-1054

LABORATORY STUDY ID

101088

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Dow AgroSciences LLC
Study ID: 101088
Page 2 of 2

**Analytical Summary Report for 101088 - DAS-68416-4 (AAD-12) Soybean Feeding Study in
the Broiler Chicken**

SUMMARY

A study to evaluate the nutritional and metabolic value of poultry feed containing a non-transgenic control and transgenic soybean DAS-68416-4 containing *aad-12* and *pat* genes is being conducted at Genesis Midwest Laboratories (protocol number 208-008-21). This report summarizes the expression levels of AAD-12 and PAT proteins in control and DAS-68416-4 soybean grain and meal samples.

The soluble, extractable AAD-12 and PAT proteins were measured using a quantitative enzyme-linked immunosorbent assay (ELISA) method for soybean grain and meal. AAD-12 and PAT protein expression was found in the DAS-68416-4 grain but not in the control grain. No AAD-12 or PAT protein expression was detected in the control or DAS-68416-4 meal samples.

Dow AgroSciences LLC
Study ID: 101088
Page 1 of 22

STUDY TITLE

Analytical Summary Report for 101088 - DAS-68416-4 (AAD-12) Soybean Feeding Study in
the Broiler Chicken

DATA REQUIREMENTS

NA

AUTHOR(S)

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ANALYTICAL SUMMARY REPORT COMPLETED ON

PERFORMING LABORATORY

Regulatory Sciences and Government Affairs—Indianapolis Lab
Dow AgroSciences LLC
9330 Zionsville Road
Indianapolis, Indiana 46268-1054

ANALYTICAL SUMMARY STUDY ID

101088

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Dow AgroSciences LLC
Study ID: 101088
Page 2

STATEMENT OF NO DATA CONFIDENTIALITY CLAIMS

Compound: AAD-12

Title: Analytical Summary Report for 101088 - DAS-68416-4 (AAD-12) Soybean Feeding Study in the Broiler Chicken

- **STATEMENT OF NO DATA CONFIDENTIALITY CLAIMS:**

No claim of confidentiality, on any basis whatsoever, is made for any information contained in this document. I acknowledge that information not designated as within the scope of FIFRA sec. 10(d)(1)(A), (B), or (C) and which pertains to a registered or previously registered pesticide is not entitled to confidential treatment and may be released to the public, subject to the provisions regarding disclosure to multinational entities under FIFRA sec. 10(g).

Company: Dow AgroSciences LLC

Company Agent: M. S. Krieger

Title: Regulatory Manager

Signature: 

Date: 9 November 2011

THIS DATA MAY BE CONSIDERED CONFIDENTIAL IN COUNTRIES OUTSIDE THE UNITED STATES.

Dow AgroSciences LLC
Study ID: 101088
Page 3

STATEMENT OF COMPLIANCE WITH GOOD LABORATORY PRACTICE STANDARDS

Title: Analytical Summary Report for 101088 - DAS-68416-4 (AAD-12) Soybean Feeding
Study in the Broiler Chicken

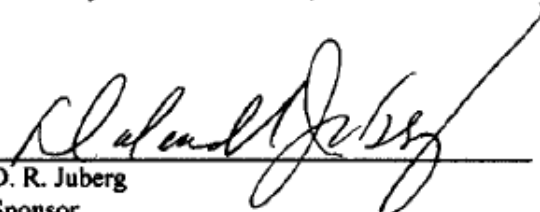
Study Initiation Date: 10-May-2010

This report represents data generated after the effective date of the EPA FIFRA Good Laboratory
Practice Standards.

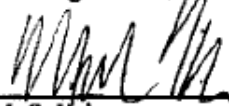
United States Environmental Protection Agency
Title 40 Code of Federal Regulations Part 160
FEDERAL REGISTER, August 17, 1989

Organisation for Economic Co-Operation and Development
ENV/MC/CHEM(98)17, Paris January 26, 1998

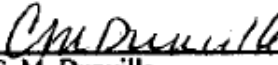
All aspects of this study were conducted in accordance with the requirements for Good
Laboratory Practice Standards, 40 CFR 160.


D. R. Juberg
Sponsor
Dow AgroSciences LLC

9 November 2010
Date


M. S. Krieger
Submitter
Dow AgroSciences LLC

9 November 2010
Date


C. M. Dunville
Principal Investigator/Author
Dow AgroSciences LLC

1 December 2010
Analytical Phase Completion Date

Dow AgroSciences LLC
Study ID: 101088
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**Dow AgroSciences Quality Assurance Unit
Good Laboratory Practice Statement Page**

Study ID: 101088

Title: DAS-68416-4 (AAD-12) Soybean Feeding Study in the Broiler Chicken

Study Initiation Date: 10-May-2010

**Analytical Summary
Completion Date:**

01-Dec-2010

GLP Quality Assurance Inspections

| Date of GLP Inspection(s) | Date Reported to the Study Director and to Management | Phases that have received a GLP Inspection by the Quality Assurance Unit |
|--------------------------------------|--|---|
| 05-Aug-2010 | 06-Aug-2010 | Protocol Review |
| 26-Jul-2010 | 03-Aug-2010 | ELISA Assay |
| 19-Nov-2010 | 15, 18-Nov-2010 | Analytical Summary, Raw Data, Reference Substance Retain Verification |

QUALITY ASSURANCE STATEMENT:

The Quality Assurance Unit has reviewed the analytical summary and has determined that the summary reflects the raw data generated during the analytical portion of this study.



Tempest Johnson
Dow AgroSciences, Quality Assurance

01-Dec-2010
Date

Dow AgroSciences LLC
Study ID: 101088
Page 5

SIGNATURE PAGE



C. M. Dunville
Author
Dow AgroSciences LLC

09-NOV-2010

Date



G. L. Heady
Principal Analyst
Dow AgroSciences LLC

09 - Nov - 10

Date



Guomin Shan
Reviewer
Dow AgroSciences LLC

09 Nov 2010

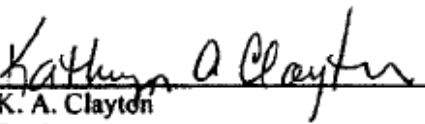
Date



B. W. Schäfer
Reviewer
Dow AgroSciences LLC

09-NOV-2010

Date



K. A. Clayton
Reviewer
Dow AgroSciences LLC

09 Nov 2010

Date

Dow AgroSciences LLC
Study ID: 101088
Page 6

STUDY PERSONNEL

Title: Analytical Summary Report for 101088 - DAS-68416-4 (AAD-12) Soybean
Feeding Study in the Broiler Chicken

Principle Investigator: C. M. Dunville

Principal Analyst: G. L. Heady

Dow AgroSciences LLC
 Study ID: 101088
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**Analytical Summary Report for 101088 - DAS-68416-4 (AAD-12) Soybean Feeding Study in
the Broiler Chicken**

ABSTRACT

A study to evaluate the nutritional and metabolic value of poultry feed containing a non-transgenic control and transgenic soybean DAS-68416-4 containing *aad-12* and *pat* genes is being conducted at Genesis Midwest Laboratories (protocol number 208-008-21). This report summarizes the expression levels of AAD-12 and PAT proteins in control and DAS-68416-4 soybean grain and meal samples.

The soluble, extractable AAD-12 and PAT proteins were measured using a quantitative enzyme-linked immunosorbent assay (ELISA) method for soybean grain and meal. AAD-12 and PAT protein expression was found in the DAS-68416-4 grain but not in the control grain. No AAD-12 or PAT protein expression was detected in the control or DAS-68416-4 meal samples.

INTRODUCTION

A feeding study with broiler chickens is taking place at Genesis Midwest Laboratories in Neillsville, WI. This study evaluated the nutritional and metabolic value of feed formulated with control and DAS-68416-4 soybean meal.

Analysis of the grain and meal was performed at the Dow AgroSciences Regulatory Sciences and Government Affairs labs in Indianapolis, Indiana. This summary describes the analysis of the soybean grain and meal expression of the AAD-12 and PAT proteins.

METHODS AND MATERIALS

Test Substances/Test Systems

The test substances for this study were the control substance, non-AAD12 grain and DAS-68416-4 grain. The test system used for this study was soybean. Grain harvested from soybean plants grown at a DAS field site was processed into toasted soybean meal and then formulated into three poultry feed mixes, starter, grower, and finisher, for use in the broiler chicken feeding study. Immunoassay was used to determine the levels of AAD-12 and PAT proteins in the grain and meal samples.

All samples were assigned unique sample numbers that were used to track the samples throughout sampling, receipt, storage, and analysis. All meal samples were shipped on dry ice and upon receipt at Dow AgroSciences, samples were inspected for physical condition. The samples were then logged into an electronic tracking system referred to as Regulatory Laboratory Information Management System (RLIMS). No sample preparation was necessary for the grain or meal. While at Dow AgroSciences, all meal samples were stored in temperature monitored freezers at approximately -80 °C, and only removed for weighing and analysis

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purposes. The grain samples were shipped without temperature controlling materials and stored at room temperature (approximately 70°F). Prior to analysis, all samples were verified as having the correct pre-assigned unique sample numbers.

The treatment codes for the meal samples in this study are described in the table below:

| Treatment | TSN Number for soybean source | Sample Description |
|-----------|----------------------------------|----------------------|
| 1 | 032920-0001 | AAD-12 (DAS-68416-4) |
| 2 | 032945-0001 | Non-AAD-12 Control |

Reference Materials/Analytical Standards

The reference substances employed in this study were purified PAT and AAD-12 proteins used as calibration standards in the ELISA analysis.

Characterization of the reference standards and documentation of the source is located on file at Dow AgroSciences, LLC archives.

| Protein | TSN | Purity | Reference |
|---------|----------|--------|-------------------|
| AAD-12 | 030732-2 | 35.3% | BIOT 09-203009(1) |
| PAT | 031116-1 | 94% | BIOT 09-203839(2) |

Determination of AAD-12 Protein in Soybean Meal Samples

Samples of soybean meal were analyzed for the amount of AAD-12 protein using the Dow AgroSciences validated method GRM 08.04(3) with validated limit of quantitation (LOQ) of 1.0 ng/mg that was established for the AAD-12 protein in soybean grain. In this method, the soluble

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extractable AAD-12 protein is quantified using an enzyme-linked immunosorbent assay (ELISA) kit purchased from Beacon Analytical Systems Inc., Portland, ME

In the analytical method, the protein from the meal sample was extracted with a PBST buffer containing 0.1% Triton-100 (TRITON). The meal extracts were centrifuged; the aqueous supernatant was collected, diluted with appropriate buffer if necessary, and analyzed using an AAD-12 ELISA kit in a sandwich format. Briefly, an aliquot of the diluted sample and a horseradish peroxidase (HRP)/anti-AAD-12 monoclonal antibody conjugate are incubated in the wells of a microtiter plate coated with an immobilized anti-AAD-12 polyclonal antibody. These antibodies bind with AAD-12 protein in the wells and form a "sandwich" with AAD-12 protein bound between soluble and the immobilized antibodies. The unbound samples and conjugate are then removed from the plate by washing with PBST. Subsequent addition of an enzyme substrate generated a colored product. The reaction was stopped by adding a dilute acid solution. Since the AAD-12 was bound in the antibody sandwich, the level of color development was related to the concentration of AAD-12 in the sample (i.e., lower protein concentrations result in lower color development). The absorbance at 450 nm minus 650 nm was measured using a Molecular Devices Spectra Max M2 plate reader. A calibration curve was generated and the AAD-12 concentration in unknown samples was calculated from the polynomial regression equation using Soft-MAX Pro™ software which was compatible with the plate reader. Samples were analyzed in duplicate wells with the average concentration of the duplicate wells being reported.

The protein expression is reported in ng/mg fresh weight. To convert the data reported in ng/mL fresh weight to ng/mg fresh weight, the following equation was used:

$$\frac{\text{Adjusted Result (ng)}}{\text{mL}} \times \frac{\text{Extraction Buffer (mL)}}{\text{Tissue Extracted (mg)}} = \text{Protein Expression (ng/mg)}$$

Determination of PAT Protein in Soybean Grain and Meal Samples

Soybean grain and meal samples were analyzed to determine the expression levels of the PAT protein. Samples were analyzed using the Dow AgroSciences validated method GRM 08.05 (4). In this method, the soluble extractable PAT protein is quantified using an enzyme-linked immunosorbent assay (ELISA) kit purchased from Envirologix Inc.

In the analytical method, the PAT protein was extracted from soybean grain and meal with a phosphate buffered saline solution containing the detergent Tween (PBST) and polyvinylpyrrolidone (PVP). The extract was centrifuged; the aqueous supernatant was collected, diluted with PBST/1% PVP, and analyzed using a PAT ELISA kit. Briefly, an aliquot of the diluted sample was incubated with enzyme-conjugated anti-PAT antibody and anti-PAT antibodies coated in the wells of a 96-well plate in a sandwich ELISA format. At the end of the incubation period, the unbound reagents were removed from the plate by washing with PBST. Subsequent addition of an enzyme substrate generated a colored product. The reaction was stopped by adding a dilute acid solution. Since the PAT was bound in the antibody sandwich, the level of color development was related to the concentration of PAT in the sample (i.e., lower protein concentrations result in lower color development). The absorbance at 450 minus 650 nm was measured using a Molecular Devices Spectra Max 190 or Spectra max M2 plate reader. A calibration curve was generated and the PAT concentration in unknown samples was calculated from the polynomial regression equation using Soft-MAX Pro™ software which was compatible with the plate reader. Samples were analyzed in duplicate wells with the average concentration of the duplicate wells being reported.

Limit of Detection/Quantitation for Soybean Samples

The limit of detection (LOD) and the limit of quantitation (LOQ) for each soybean grain and meal were determined during the method validation for the methods described above. Samples were reported as not detectable (ND) if the sample concentration was less than the LOD.

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Reported sample concentrations that are less than the method LOQ are of lower precision compared with results reported above the LOQ values (5).

| Matrix | PAT (ng/mg sample dry weight) | | AAD-12 (ng/mg sample dry weight) | |
|--------|-------------------------------|------|----------------------------------|-----|
| | LOD | LOQ | LOD | LOQ |
| Grain | 0.06 | 0.12 | 0.5 | 1.0 |

Statistical Treatment

Mean calculations, standard deviations, and regression analysis were performed for the expression analyses. Acceptance criteria of the calibration curves for each ELISA plate was detailed in the analytical methods report for the method described above.

RESULTS AND DISCUSSION

Soybean grain and meal was analyzed for protein expression levels of AAD-12 and PAT. Protein concentrations in the matrices (ng/mg) are expressed on a fresh-tissue-weight basis.

The protein expression values of AAD-12 and PAT in the DAS-68416-4 grain sample are 16.6 ng/mg ([Appendix A](#)) and 1.6 ng/mg (Table 1), respectively. No AAD-12 or PAT protein expression was detected in the DAS-68416-4 meal, the control grain ([Appendix B](#)), or the control meal (Table 1). During the processing of soybean grain, the soybean undergoes toasting at approximately 220-240°F (6). At this temperature, the protein is denatured, resulting in a lack of AAD-12 and PAT enzyme activity and ELISA reactivity.

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ARCHIVING

All raw data supporting the Analytical Summary will be sent to Genesis Midwest for inclusion in the study file for the study report. After finalization of the study report, all study data and report will be returned to the Sponsor for archival in the Dow AgroSciences facility archives, Indianapolis, Indiana.

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REFERENCES

1. Embrey, S. K., Schafer, B. W., "Certificate of Analysis of the Test/Reference/Controls Substances: Aryloxyalkanoate Dioxygenase-12 (AAD-12) – TSN030732", BIOT09-203009, 2009, unpublished report of Dow AgroSciences LLC.
2. Embrey, S. K., Schafer, B. W., "Certificate of Analysis for Test/Reference/Control Substance: Phosphinothricin AcetylTransferase (PAT – TSN031116-0001)", BIOT 09-203839, 2009, unpublished report of Dow AgroSciences LLC.
3. Smith-Drake, J. K., Sosa, M. J., Shan, G., "Method Validation for the Determination of Aryloxyalkanoate Dioxygenase (AAD-12) in Soybean Tissues Using an Enzyme-Linked Immunosorbent Assay (ELISA)", 081008, 2009, unpublished report of Dow AgroSciences LLC.
4. Smith-Drake, J. K., Sosa, M. J., Shan, G., "Method Validation for the Determination of Phosphinothricin Acetyltransferase (PAT) Protein in Soybean Tissues Using and Enzyme-Linked Immunosorbent Assay (ELISA)", 081022, 2009, unpublished report of Dow AgroSciences LLC.
5. Keith, L. H., Crummett, W., Deegan, J., Jr., Libby, R. A., Taylor, J. K., Wentler, G., Principles of Environmental Analysis, *Anal Chem.* 1983, 55, 2210 – 2218.
6. Standard Operating Procedure for GLP Technologies. SOP Number G.2, Revision Number 05, "Soybean Batch Processing Method."

Table 1. AAD-12 and PAT Protein Expression

| DAS Sample Number | Sample Description | Date of Analysis | Sample Weight (mg) | Extraction Volume (mL) | Adjusted Result (ng/mL) | AAD-12 Final Results (ng/mg) |
|--------------------|------------------------------------|------------------|--------------------|------------------------|-------------------------|------------------------------|
| 101088-001-0001 R2 | TSN032920-0001 DAS-68416-4 meal | 26-Jul-10 | 15.5 | 1.5 | 0.172 | ND |
| 101088-001-0002 R2 | TSN032945-0001 Control meal | 26-Jul-10 | 14.8 | 1.5 | ND | ND |

| DAS Sample Number | Sample Description | Date of Analysis | Sample Weight (mg) | Extraction Volume (mL) | Adjusted Result (ng/mL) | PAT Final Results (ng/mg) |
|--------------------|------------------------------------|------------------|--------------------|------------------------|-------------------------|---------------------------|
| TSN032920-0001 R1 | Transgenic soybean grain | 28-Oct-2010 | 15.2 | 1.5 | 16.81 | 1.66 |
| TSN032945-0001 R1 | Maverick grain (Non-transgenic) | 28-Oct-2010 | 15.4 | 1.5 | ND | ND |
| 101088-001-0001 R3 | TSN032920-0001 DAS-68416-4 meal | 28-Oct-2010 | 15.5 | 1.5 | ND | ND |
| 101088-001-0002 R3 | TSN032945-0001 Control meal | 28-Oct-2010 | 15.4 | 1.5 | ND | ND |

Data for the AAD-12 protein expression in the transgenic and control soybean grain can be found in Appendix A and B, respectively.

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**APPENDIX A – BIOT10-241515 CERTIFICATE OF ANALYSIS OF THE
TEST/REFERENCE/CONTROL SUBSTANCE: DAS-68416-4 SOYBEAN SEED –
TSN032920-0001**

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Study ID: 101088
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Report: BIOT10-241515

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**CERTIFICATE OF ANALYSIS OF THE TEST/REFERENCE/CONTROL SUBSTANCE:
DAS-68416-4 SOYBEAN SEED – TSN032920-0001**

TITLE/OBJECTIVE Certification of purity and identity of the following test/reference/control substance for use in a study.

TEST/REFERENCE/CONTROL SUBSTANCE

| | |
|--------------------------|--|
| TSN | TSN032920-0001 |
| Source ID Number: | GX08KX092175 |
| Material Description | pDAB4468[4]-0416.001-523-3-38-B-B (Soybean seed containing the AAD-12 gene) |
| Reference Substance Used | 1. Control Seed, Source ID Number: GX08KX092040 Material Description: Maverick (non-GLP) 2. AAD-12, Dow AgroSciences TSN030732-0001, 0.2 mg/mL |

INITIATION DATE:

20 Jan 2010

METHODS USED

PURITY/CONCENTRATION:

IDENTIFICATION:

ELISA

Event specific PCR

X **PURITY**

Results from the AAD-12 ELISA (Acadia BioSciences LLC., Catalog# ABS-031) confirmed that the average of 10 replicates of DAS-68416-4 soybean seed (TSN032920-0001) was 16.6 ng/mg AAD-12 protein. In addition, 10 replicates of control soybean seed (GX08KX092040) were tested indicating the samples were negative for the AAD-12 protein and the ELISA assay functioned as expected.

X **IDENTIFICATION**

Event-specific PCR (one primer was specific to the 3' integration junction for event 416), using genomic DNA extracted from soybean seeds, confirmed that TSN032920-0001 was positive for event 416.

X **CALCULATIONS**

A curve was generated using quadratic function fit of the absorbance readings from the AAD-12 standard (TSN030732-0001) via SOFTmax®Pro software (version 5.3, Molecular Devices Corporation, Sunnyvale, California). Dilutions were selected within the appropriate range of the standard curve to calculate the AAD-12 protein concentration. The final concentration of DAS-68416-4 soybean seed TSN032920-0001 was the average of 10 replicates.

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| Sample ID | Weight (mg) | Extraction Volume (mL) | ng/mL | ng/mg |
|----------------|-------------|------------------------|---------|--------|
| TSN032920-0001 | 14.5 | 1.5 | 142.695 | 14.762 |
| TSN032920-0001 | 14.8 | 1.5 | 178.691 | 18.111 |
| TSN032920-0001 | 15.5 | 1.5 | 168.468 | 16.303 |
| TSN032920-0001 | 14.9 | 1.5 | 167.438 | 16.856 |
| TSN032920-0001 | 14.5 | 1.5 | 140.229 | 14.506 |
| TSN032920-0001 | 15.4 | 1.5 | 161.297 | 15.711 |
| TSN032920-0001 | 14.6 | 1.5 | 157.635 | 16.195 |
| TSN032920-0001 | 14.7 | 1.5 | 188.182 | 19.202 |
| TSN032920-0001 | 15.5 | 1.5 | 180.667 | 17.484 |
| TSN032920-0001 | 15.5 | 1.5 | 178.124 | 17.238 |
| Average: | | | 16.6 | |

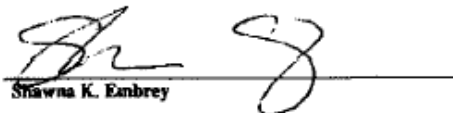
RE-CERTIFICATION DUE DATE:

April 01, 2015

STUDY COMPLETION DATE:

April 01, 2010

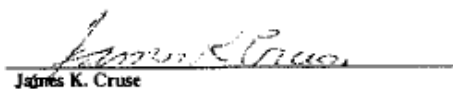
STUDY DIRECTOR SIGNATURE:


Shawna K. Embrey

STUDY COMPLETION DATE:

01-Apr-2010

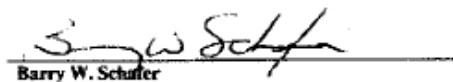
CO-AUTHOR SIGNATURE::


James K. Cruse

DATE:

01-Apr-2010

PEER REVIEWER SIGNATURE::


Barry W. Schaffer

DATE:

01-Apr-2010

TESTING FACILITY

Regulatory Sciences and Government Affairs
Dow AgroSciences LLC
9330 Zionsville Road
Indianapolis, Indiana 46268

All raw data associated with this study will be recorded in the Dow AgroSciences archive. This study was conducted in accordance with the Good Laboratory Practice Standard, 40 CFR Part 160.135 (b) unless otherwise noted. The GLP status of the commercial molecular ladder from Invitrogen was unknown as its chain of custody was not monitored. Transgenic soybean seed TSN032945-0001 and control soybean seed TSN032920-0001 were not processed under GLP.

Deviation 1- Added reference substance TSN030732-0001 to the reference substances used section.

Dow AgroSciences LLC
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**APPENDIX B – BIOT10-242913 CERTIFICATE OF ANALYSIS OF THE
TEST/REFERENCE/CONTROL SUBSTANCE: NON-TRANSGENIC SOYBEAN SEED –
TSN032920-0001**

Report: BIOT10-242913

Page 1 of 2

**CERTIFICATE OF ANALYSIS OF THE TEST/REFERENCE/CONTROL SUBSTANCE:
NON-TRANSGENIC SOYBEAN SEED – TSN032945-0001****TITLE/OBJECTIVE** Certification of purity and identity of the following test/reference/control substance for use in a study.**TEST/REFERENCE/CONTROL SUBSTANCE**

| | |
|---------------------------------|---|
| <i>TSN</i> | TSN032945-0001 |
| <i>Source ID Number:</i> | GX08KX092040 |
| <i>Material Description</i> | Maverick (Non-Transgenic) |
| <i>Reference Substance Used</i> | 1. DAS-68416-4 Soybean Seed, TSN032920-0001 (Non-GLP) 2. Control Seed, TSN032949-0001 (Non-GLP) 3. Dow AgroSciences TSN030732-0001, 0.2 mg/mL |

INITIATION DATE:

28 Jan 2010

METHODS USED**PURITY/CONCENTRATION:**

ELISA

IDENTIFICATION:

Event specific PCR

☒ **PURITY**

The AAD-12 ELISA (Acadia BioSciences LLC., Catalog# ABS-031) confirmed that all 10 replicates of soybean seed tested (TSN032945-0001) were negative for the AAD-12 protein. In addition, 10 replicates of both control (TSN032949-0001) and transgenic soybean seed (TSN032920-0001) produced expected negative and positive results for the AAD-12 protein confirming that the ELISA assay functioned as expected.

☒ **IDENTIFICATION**

Event-specific PCR (one primer was specific to the 3' integration junction for event 416), using genomic DNA extracted from soybean seeds, confirmed that TSN032945-0001 was negative for event 416.

RE-CERTIFICATION DUE DATE:

April 01, 2015

STUDY COMPLETION DATE:

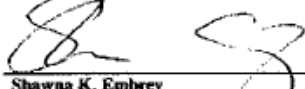
April 01, 2010

Dow AgroSciences LLC
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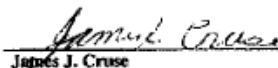
Report: BIOT10-242913

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STUDY DIRECTOR SIGNATURE:


Shawna K. Embrey

CO-AUTHOR SIGNATURE:


James J. Cruise

PEER REVIEWER SIGNATURE:


Barry W. Schafer

STUDY COMPLETION DATE:

01 - Apr - 2010

DATE:

01 - Apr - 2010

DATE:

01 - Apr - 2010

TESTING FACILITY

Regulatory Sciences and Government Affairs
Dow AgroSciences LLC
9330 Zionsville Road
Indianapolis, Indiana 46268

All raw data associated with this study will be recorded in the Dow AgroSciences archive. This study was conducted in accordance with the Good Laboratory Practice Standard, 40 CFR Part 160.135 (b) unless otherwise noted. The GLP status of the commercial molecular ladder from Invitrogen was unknown as its chain of custody was not monitored. Transgenic soybean seed TSN032945-0001 and control soybean seed TSN032920-0001 were not processed under GLP.

Deviation 1- Identified Control Seed, TSN032949-0001 as Non-GLP.

Deviation 2- Added reference substance TSN030732-0001 to the reference substances used section.

APPENDIX IV-B

Analytical Report -

Covance Laboratories Inc.

Compositional Analysis of Soybean Based Poultry Diets and Meal Ingredients

for DAS Protocol No. 101088



Analytical Subreport

| | |
|-------------------------------|--|
| Analytical Study Title | Compositional Analysis of Soybean Based Poultry Diets and Meal Ingredients for DAS Protocol No. 101088 |
| Study Director | Dale W. Fletcher Genesis Midwest Laboratories Telephone No. 715.743.4557 E-mail: dwfletcher@genesismidwest.com |
| Principal Investigator | Jane Z. Sabbatini Covance Laboratories Inc. (Covance) 3301 Kinsman Boulevard Madison, WI 53704 Telephone No. 608.395.3604 Fax: 608.310.8200 E-mail: jane.sabbatini@covance.com |
| Sponsor | Dow AgroSciences LLC 9330 Zionsville Road Indianapolis, IN 46268 |
| Sponsor's Representative | Daland R. Juberg Dow AgroSciences LLC 9330 Zionsville Road Indianapolis, IN 46268 Telephone No. 317.337.3787 |
| Analytical Testing Site | Covance Laboratories Inc. 3301 Kinsman Boulevard Madison, Wisconsin 53704 USA |
| Sponsor Reference Number | DAS Protocol No. 101088 |
| Covance Study Identification | 8223-016 |
| Covance Client Identification | 1002382 |
| Version | Final |
| Analytical Subreport Issued | 16 Nov 2010 |
| Page Number | 1 of 96 |

DAS Protocol No.: 101088
Covance Client Identification: 1002382
Covance No.: 8223-016

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DAS Protocol No.: 101088
Covance Client Identification: 1002382
Covance No.: 8223-016

QUALITY ASSURANCE STATEMENT

This report has been reviewed by the Quality Assurance Unit of Covance Laboratories Inc. and accurately reflects the raw data. The following study specific inspections were conducted and findings reported to the principal investigator (PI), study director (SD), and associated management.

| Inspection Dates | | Phase | Date Reported to PI and PI Management | Date Reported to SD and SD Management |
|------------------|-------------|------------------------------|---|---|
| From | To | | | |
| 01 Sep 2010 | 01 Sep 2010 | Analytical Chemistry | 01 Sep 2010 | 01 Sep 2010 |
| 05 Oct 2010 | 18 Oct 2010 | Data/Table Review | 18 Oct 2010 | 11 Nov 2010 |
| 02 Nov 2010 | 03 Nov 2010 | Draft Report and Data Review | 03 Nov 2010 | 11 Nov 2010 |
| 10 Nov 2010 | 10 Nov 2010 | Revised Draft Report Review | 10 Nov 2010 | 16 Nov 2010 |


Representative
Quality Assurance Unit

16 Nov 10
Date

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SIGNATURE



Jane Z. Sabbatini
Principal Investigator
Covance Laboratories Inc.

16-Nov-2010

Date

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INTRODUCTION

The objective of this portion of the study was to conduct compositional analyses of the formulated diets and of the meal ingredients employed in the formulated diets.

STUDY TIMETABLE

Analytical Start Date: 14 Jun 2010

Analytical End Date: 22 Oct 2010

REGULATORY COMPLIANCE

This study was conducted in accordance with the Environmental Protection Agency (EPA) Good Laboratory Practice (GLP) Standards, 40 CFR 160 with the following exceptions:

- Reference standards (if applicable) were not listed in the protocol or characterized according to GLP standards and retainer samples from each batch of the reference standards will not be retained.
- Stability of the test, control and reference substances were not verified analytically; however, that was not within the stated purpose of this portion of the study as defined by the protocol.
- Mycotoxin testing was conducted and reported by non-GLP laboratories (Romer Labs, Inc. and Veterinary Medical Diagnostic Laboratory). The raw data for the non-GLP portions of the study will not be archived in a GLP facility.

These exceptions had no effect on the integrity or quality of the study.

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MAJOR COMPUTING SYSTEMS

The major computer systems used on this study included, but were not limited to, the following systems:

- Balance (balance weight capture system)
- PCCalc (result calculation system)
- Waters Empower[®] Chromatography Manager (data acquisition and result calculation system)
- ICP WinLab32[™] (ICP spectrometry)
- Laboratory Information Management System (sample and assay tracking)
- LabWare Laboratory Information Management System (NIMS) (reagent and solution preparation tracking)
- Metasys or REES (monitor and document facility storage conditions)
- Eian (ICP-MS)
- UV-Visible Chemstation (data acquisition)
- eNotes (official study communication system)
- MADCAP (dilution calculation system)
- WINGZ (calculation of standard curve)

[®] Empower is a registered trademark of Waters Corporation

All version numbers of the applications are maintained in the logbook for the applications.

TEST SAMPLES

Test Sample Identification

The test samples were as follows:

- Common corn meal
- Soybean meal
- Representative (500 g) feed samples
- Animal feeds collected at initiation of each phase (starter, grower, finisher)

Storage Condition

Upon receipt, the test samples were stored in a freezer set to maintain $-20 \pm 10^{\circ}\text{C}$.

According to information provided by Romer Labs, Inc., samples that were sent to Romer Labs, Inc. were stored at room temperature until being analyzed then stored at approximately 32°C . Samples sent to Veterinary Medical Diagnostic Laboratory were stored at room temperature.

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Characterization, Purity, and Stability

The purpose of this portion of the study was to determine the composition of the test samples. The sponsor has deemed that the test samples, when stored frozen, are stable for the duration of the experimental phase of this study.

Certificates of analysis of the reference standards, when applicable, will be archived at Covance. When applicable, reference standard stability [e.g., expiration, shelf life, retest date, re-certification date, or equivalent] was documented in the raw data.

Disposition

Any remaining prepared dilutions or extractions of the test samples (if applicable) will be discarded at Covance. Any remaining test samples will be archived at Covance for one year or until the final disposition is directed by the sponsor. Any remaining reference standards may be used for other testing.

Samples sent to Romer Labs, Inc. and Veterinary Medical Diagnostic Laboratory will be disposed of according to each facilities local procedures.

SAFETY

Safety precautions were taken as outlined in the Environmental, Health, and Safety section of the Covance Policies and Procedures Manual.

RESERVE (ARCHIVE) SAMPLES

Reserve samples were not required for this portion of the study.

SAMPLE RECEIPT AND HANDLING

The samples were entered into the Covance Laboratory Information Management System (LIMS) with unique LIMS numbers. Each sample identification was matched with the Covance LIMS information. Documentation of the samples upon receipt at Covance was maintained in the raw data. Samples were ground prior to being analyzed. Any additional sample processing was documented in the raw data.

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EXPERIMENTAL DESIGN

This study was conducted in accordance with Dow AgroSciences LLC DAS Protocol No. 101088 using approved methods to determine the composition of the test samples. See Tables 1 through 4 for the methods used for analyses. See Tables 5 through 8 for the results. Mycotoxin analyses were subcontracted to Romer Labs, Inc. (a non-GLP test site). Samples were sent to the following address:

Romer Labs, Inc
1301 Stylemaster Drive
Union, MO 63084-1156
Telephone No.: 636.583.8600
Responsible person: Christy Brewe, Laboratory Manager

Romer Labs, Inc. subsequently subcontracted the ergot screen and oosporein testing to the Veterinary Medical Diagnostic Laboratory at the University of Missouri. The address was as follows:

Veterinary Medical Diagnostic Laboratory
College of Veterinary Medicine
University of Missouri
Columbia, MO 65211
Responsible person: George Rottinghaus, Ph.D.

See Appendix A for a summary of the Covance analytical methods referenced by the Covance method mnemonic. See Appendix B for the analytical methods used by Romer Labs, Inc. and Veterinary Medical Diagnostic Laboratory.

The samples were analyzed singly unless otherwise determined by Covance methods and/or standard operating procedures. Quality control samples (duplicates, recoveries, certified reference standards, blanks, or validated control samples) were prepared and analyzed with each analytical run. Any additional analyses or re-analyses were documented and justified in the raw data.

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Table 1. Analyses Required for Common Corn Meal Samples

| Analyte | Method Mnemonic ¹ |
|--|--------------------------------|
| Crude fiber | CFIB |
| ADF | ADFA |
| NDF | NDFA |
| Minerals (Ca, P, K, Na, Zn, Cu, Fe, Mg, Mn) | ICPS |
| Selenium | MSI |
| Amino acid profile (Aspartic Acid, Threonine, Serine, Glutamic Acid, Proline, Glycine, Alanine, Cystine, Valine, Methionine, Isoleucine, Leucine, Tyrosine, Phenylalanine, Lysine, Histidine, Arginine, Tryptophan) | TALC/TPLC |
| Fatty acid profile | FAPM |
| Choline | COL4 |
| Moisture | M100 |
| Fat | FSOX |
| Protein | PGEN |
| Ash | ASHM |
| Carbohydrates | CHO |
| Trypsin inhibitor | TRIP |
| Phytic acid | PHYT |
| Raffinose | SUGT |
| Furfural | FURF |
| Ferulic/coumaric acids | ACID |
| Mycotoxin screen | Document Identification |
| Aflatoxins B1, B2, G1, and G2 | CAM-000164-0 |
| Zearalenone | CAM-000239-0 |
| Deoxynivalenol, 3-acetyl-deoxynivalenol, 15-acetyl-deoxynivalenol, T-2 toxin | CAM-000031-2 |
| Fumonisin B1, B2, and B3 | CAM-XXXXXX-X ² |
| Moniliformin | mon-tl-01-00.1 |
| Cyclopiazonic Acid | AM-000299-0 |
| Oosporein | TOX-MET-750.01 |
| Ergot screen: Ergosine, Ergotamine, Ergocornine, Ergocryptine, and Ergocristine | TOX-MET-700.03 |

¹ Analytical methods (except Mycotoxin methods) are kept on file at Covance.

² Method title is Multitoxin LC-MS/MS detection in grains and pet food.

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Table 2. Analyses Required for Soybean Meal

| Analyte | Method Mnemonic ¹ |
|--|--------------------------------|
| Crude fiber | CFIB |
| ADF | ADFA |
| NDF | NDFA |
| Minerals (Ca, P, K, Na, Zn, Cu, Fe, Mg, Mn) | ICPS |
| Selenium | MS1 |
| Amino acid profile (Aspartic Acid, Threonine, Serine, Glutamic Acid, Proline, Glycine, Alanine, Cystine, Valine, Methionine, Isoleucine, Leucine, Tyrosine, Phenylalanine, Lysine, Histidine, Arginine, Tryptophan) | TALC/TPLC |
| Choline | COL4 |
| Moisture | MI00 |
| Fat | FSOX |
| Protein | PGEN |
| Ash | ASHM |
| Carbohydrates | CHO |
| Trypsin inhibitor | TRIP |
| Phytic acid | PHYT |
| Lectin | LECT |
| Isoflavones, free and conjugated Daidzein, Genistein & Glycitein | ASOF |
| Mycotoxin screen | Document Identification |
| Aflatoxins B1, B2, G1, and G2 | CAM-000263-1 |
| Zearlenone | CAM-000239-0 |
| Deoxynivalenol, 3-acetyl- deoxynivalenol, 15-acetyl- deoxynivalenol, T-2 toxin | CAM-000031-2 |
| Fumonisin B1, B2, and B3 | CAM-XXXXXX-X ² |

¹ Analytical methods (except Mycotoxin methods) are kept on file at Covance.

² Method title is Multitoxin LC-MS/MS detection in grains and pet food.

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Table 3. Analyses Required for Representative (500 g) Feed Samples

| Analyte | Method Mnemonic ¹ |
|--|------------------------------|
| Crude fiber | CFIB |
| ADF | ADFA |
| NDF | NDFa |
| Heavy metals (As, Cd, Hg, Pb), Se, S, Mo, Co, Cr | MSX |
| Minerals (Ca, P, K, Na, Zn, Cu, Fe, Mg, Mn) | ICPS |
| Fluoride | FLUR |
| Chloride | CL |
| Iodine | IOL |
| Amino acid profile (Aspartic Acid, Threonine, Serine, Glutamic Acid, Proline, Glycine, Alanine, Cystine, Valine, Methionine, Isoleucine, Leucine, Tyrosine, Phenylalanine, Lysine, Histidine, Arginine, Tryptophan) | TALC/TPLC |
| Vitamin A & Beta-carotene | AFD1/BCLC |
| Vitamin B1 (Thiamine) | BIDE |
| Vitamin B6 (Pyridoxine) | B6A |
| Vitamin B12 | B12F |
| Vitamin D3 | DFD1 |
| Niacin (Nicotinic acid) | NIAP |
| Folic acid | FOAN |
| Pantothenic acid | PANN |
| Tocopherols | TTLC |
| Biotin | BIOM |
| Choline | COL4 |
| Moisture | M100 |
| Fat | FSOX |
| Protein | PGEN |
| Ash | ASHM |
| Carbohydrates | CHO |
| Calories | CALC |
| Chlorinated Hydrocarbon pesticides [Aldrin, BHC (Alpha), BHC (Beta), BHC (Delta), Chlordane, DDT Related substances, Dieldrin, Endrin, Thiodan, HCB, Heptachlor, Heptachlor Epoxide, Lindane, Methoxychlor, Mirex, PCB] | OPCL |
| Organophosphate pesticides (Diazinon, Disulfoton, Ethion, Malathion, Methyl Parathion, Ethyl Parathion, Thimet, Trithion) | OPCL |
| Document Identification | |
| Mycotoxin screen | |
| Aflatoxins B1, B2, G1, and G2 | CAM-000263-1 |
| Zearlenone | CAM-000239-0 |
| Deoxynivalenol, 3-acetyl-deoxynivalenol, 15-acetyl-deoxynivalenol, T-2 toxin | CAM-000031-2 |
| Fumonisin B1, B2, and B3 | CAM-XXXXXX-X ² |
| Moniliformin | mon-01-00.1 |
| Cyclopiazonic Acid | AM-000299-0 |
| Oosporein | TOX-MET-750.01 |
| Ergot screen: Ergosine, Ergotamine, Ergocornine, Ergocryptine, and Ergocristine | TOX-MET-700.03 |

¹Analytical methods (except Mycotoxin methods) are kept on file at Covance.

²Method title is Multitoxin LC-MS/MS detection in grains and pet food.

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Table 4. Analyses Required for Animal Feeds Collected at Initiation of Each Phase

| Analyte | Method Mnemonic ¹ |
|-------------------------|------------------------------|
| Dry Matter ² | M100 |
| Fat | FSOX |
| Protein | PGEN |
| Ash | ASHM |
| Crude Fiber | CFIB |
| Carbohydrates | CHO |
| Calories (Gross Energy) | CALC |
| Minerals (Ca, P) | ICPS |

¹Analytical methods are kept on file at Covance.

²Dry matter was calculated according to the following equation:
 Dry Matter = 100 - %Moisture

CONTROL OF BIAS

All samples were treated identically during analysis to minimize assay bias.

STATISTICAL EVALUATION

No statistical evaluations will be made.

RECORD RETENTION

All raw data generated at Romer Labs, Inc. and Veterinary Medical Diagnostic Laboratory will be archived at the performing laboratories per their local procedures.

All documentation, records, protocol, protocol amendments, sample analysis outline, and final sub-report generated at the Covance site as a result of this study will be archived in the storage facilities of Covance. These materials will be retained by the Covance site at which the work was performed. The Covance archives staff will contact the sponsor after at least 1 year following report finalization to determine disposition of the archived materials (except for the raw data on durable media, study correspondence, and final sub-report which will be kept by Covance). The sponsor will then authorize the transport of the materials to their site (or that of their designee), or authorize the transport of the materials to the archive facilities of EPL Archives, Inc., Sterling, VA (EPL). If the sponsor chooses to transfer materials to EPL, Covance staff will have access to those materials for continued research or regulatory audit.

In the event the sponsor fails to indicate disposition, Covance materials will be transferred to the EPL storage facilities. The sponsor will be charged annual fees by EPL for the use of their archive facilities.

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The supporting records to be retained at Covance but not archived with the study data will include, but not be limited to, the following items:

1. Certificates of Analysis of the reference standards (if applicable)
2. Durable media records
3. Employee training records
4. Instrument calibration and maintenance records
5. Storage temperature records
6. Standard Operating Procedures
7. Reference standard logbooks

RESULTS

The analytical results are in Tables 5 through 8. All of the results are reported on a fresh-weight basis and are deemed acceptable.

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PROTOCOL DEVIATIONS

| Protocol | Actual Procedure |
|---|--|
| Protocol Section 1.3.4 lists the analytes to be analyzed for the mycotoxin screen. | <p>The following analytes were tested but were not requested by the protocol:</p> <p>Ochratoxin A HT-2 toxin Diacetoxyscirpenol Neosalanol Fusarenon X Nivalenol Citrinin</p> <p>The results for these analytes are not tabled in the Covance subreport.</p> |
| Protocol Section 1.3.8 lists the analyses to be done for the animal feeds. | <p>Although it was not required by the protocol, data were also generated for copper, iron, magnesium, manganese, potassium, sodium and zinc.</p> <p>The reference standards and results for these analytes are not tabled in the Covance subreport.</p> |
| Protocol Section 1.6 indicates that signed and dated reports of other professionals involved in the study will be included in the final report. | For the subcontracted work performed by Romer Labs, Inc. and Veterinary Medical Diagnostic Laboratory, an unsigned (no wet signature) report was issued by Romer Labs, Inc. |
| These deviations had no effect on the integrity or quality of the study. | |

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Table 5
Analyses of Common
Corn Meal-Fresh Weight

| Sample Description | Commercial Corn |
|-----------------------------|------------------------|
| Covance LIMS # | 00600151 |
| Proximate (%) | |
| Moisture | 14.6 |
| Protein | 7.19 |
| Total Fat | 3.36 |
| Ash | 1.13 |
| Carbohydrates | 73.7 |
| Acid Detergent Fiber (%) | 1.53 |
| Neutral Detergent Fiber (%) | 6.22 |
| Crude Fiber (%) | 1.34 |
| Choline-Free (mg/100g) | 41.8 |
| Trypsin Inhibitor (TIU/mg)* | 5.33 |
| Phytic Acid (%) | 0.705 |
| Furfural (ppm) | 0.968 |
| Ferulic Acid (ppm) | 1470 |
| p-Coumaric Acid (ppm) | 162 |
| Raffinose (%) | 0.147 |
| Minerals (ppm) | |
| Calcium | 46.8 |
| Copper | 1.71 |
| Iron | 16.5 |
| Magnesium | 823 |
| Manganese | 3.94 |
| Phosphorus | 2240 |
| Potassium | 2860 |
| Sodium | < 100 |
| Zinc | 17.3 |
| Selenium (ppb) | 96.0 |

* TIU - Trypsin Inhibitor Units

Table 5
Analyses of Common
Corn Meal-Fresh Weight

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| Sample Description | Commercial Corn |
|---------------------------|------------------------|
| Covance LIMS # | 00600151 |
| Amino Acids (mg/g) | |
| Aspartic Acid | 4.51 |
| Threonine | 2.52 |
| Serine | 3.20 |
| Glutamic Acid | 12.3 |
| Proline | 5.88 |
| Glycine | 2.80 |
| Alanine | 5.16 |
| Cystine | 1.47 |
| Valine | 3.32 |
| Methionine | 1.39 |
| Isoleucine | 2.57 |
| Leucine | 8.41 |
| Tyrosine | 2.66 |
| Phenylalanine | 3.43 |
| Lysine | 2.02 |
| Histidine | 1.75 |
| Arginine | 3.50 |
| Tryptophan | 0.616 |

Table 5
Analyses of Common
Corn Meal-Fresh Weight

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| Sample Description | Commercial Corn |
|---------------------------|------------------------|
| Covance LIMS # | 00600151 |
| Fatty Acids (%) | |
| 8:0 Caprylic | < 0.00400 |
| 10:0 Capric | < 0.00400 |
| 12:0 Lauric | < 0.00400 |
| 14:0 Myristic | < 0.00400 |
| 14:1 Myristoleic | < 0.00400 |
| 15:0 Pentadecanoic | < 0.00400 |
| 15:1 Pentadecenoic | < 0.00400 |
| 16:0 Palmitic | 0.331 |
| 16:1 Palmitoleic | 0.00490 |
| 17:0 Heptadecanoic | < 0.00400 |
| 17:1 Heptadecenoic | < 0.00400 |
| 18:0 Stearic | 0.0624 |
| 18:1 Oleic | 0.852 |
| 18:2 Linoleic | 1.70 |
| 18:3 Gamma Linolenic | < 0.00400 |
| 18:3 Linolenic | 0.0361 |
| 20:0 Arachidic | 0.0128 |
| 20:1 Eicosenoic | 0.00725 |
| 20:2 Eicosadienoic | < 0.00400 |
| 20:4 Arachidonic | < 0.00400 |
| 20:3 Eicosatrienoic | < 0.00400 |
| 22:0 Behenic | 0.00445 |

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Table 5
Analyses of Common
Corn Meal-Fresh Weight

| Sample Description | Commercial Corn |
|---------------------------------------|------------------------|
| Covance LIMS # | 00600151 |
| Mycotoxin Screen¹ | |
| Alfatoxin B1 (ppb) | <1.0 |
| Alfatoxin B2 (ppb) | <1.0 |
| Alfatoxin G1 (ppb) | <1.0 |
| Alfatoxin G2 (ppb) | <1.0 |
| Zearalenone (ppb) | <100 |
| Fumonisin B1 (ppm) | 0.8 |
| Fumonisin B2 (ppm) | 0.2 |
| Fumonisin B3 (ppm) ² | 0.2 |
| Deoxynivalenol (ppm) | 0.1 |
| 3-Acetyl DON (ppm) | <0.1 |
| 15-Acetyl DON (ppm) | <0.1 |
| T-2 Toxin (ppm) | <0.1 |
| Ergot Screen (ppb)¹ | |
| Ergosine | <5 |
| Ergotamine | <5 |
| Ergocornine | <5 |
| Ergocryptine | <5 |
| Ergocristine | <5 |
| Cyclopiazonic Acid (ppm) ¹ | <0.5 |
| Oosporein Screen (ppm) ¹ | <2 |
| Moniliformin (ppm) ¹ | <0.1 |

DON = Deoxynivalenol

ND = Not detected

¹ Assays performed in non-GLP facility

² Matrix spike recovery of 122.0%.

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Table 6
Analyses of
Soybean Meal-Fresh Weight

| Sample Description | Soybean Meal | Soybean Meal | Soybean Meal | Soybean Meal | Soybean Meal |
|-----------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Client Sample # | TSN032945 | TSN032947 | TSN032948 | TSN032949 | TSN032920 |
| Covance LIMS # | 00600146 | 00600147 | 00600148 | 00600149 | 00600150 |
| Proximate (%) | | | | | |
| Moisture | 4.91 | 6.01 | 5.31 | 5.33 | 5.57 |
| Protein | 50.7 | 46.3 | 53.1 | 48.5 | 49.3 |
| Total Fat | 0.600 | 0.879 | 0.820 | 0.760 | 0.735 |
| Ash | 6.60 | 6.37 | 6.40 | 6.61 | 6.63 |
| Carbohydrates | 37.2 | 40.4 | 34.4 | 38.8 | 37.8 |
| Acid Detergent Fiber (%) | 3.39 | 4.61 | 3.60 | 4.67 | 4.28 |
| Neutral Detergent Fiber (%) | 8.59 | 7.84 | 5.99 | 7.53 | 7.16 |
| Crude Fiber (%) | 2.97 | 3.82 | 3.38 | 4.41 | 3.45 |
| Isoflavones (ppm) | | | | | |
| Daidzein | 43.6 | 55.0 | 57.8 | 42.8 | 47.2 |
| Glycitein | 17.8 | <10.0 | <10.0 | 14.4 | 15.7 |
| Genistein | 46.7 | 45.1 | 49.8 | 44.1 | 50.1 |
| Daidzin (as aglycone) | 971 | 1760 | 1350 | 1720 | 1150 |
| Glycitin (as aglycone) | 235 | 153 | 124 | 298 | 338 |
| Genistin (as aglycone) | 1260 | 1770 | 1360 | 1940 | 1430 |
| Choline-Free (mg/100g) | 235 | 246 | 226 | 256 | 232 |
| Trypsin Inhibitor (TIU/mg)* | 1.51 | 1.47 | 2.21 | 3.15 | 2.94 |
| Phytic Acid (%) | 1.30 | 1.40 | 1.09 | 1.31 | 1.31 |
| Lectin (H.U./mg)** | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 |
| Minerals (ppm) | | | | | |
| Calcium | 2950 | 2230 | 2300 | 2340 | 3180 |
| Copper | 14.0 | 11.2 | 10.4 | 15.8 | 13.1 |
| Iron | 77.4 | 77.7 | 73.2 | 75.5 | 78.4 |
| Magnesium | 2820 | 2930 | 2740 | 2520 | 2860 |
| Manganese | 22.8 | 34.0 | 23.6 | 36.2 | 24.4 |
| Phosphorus | 6830 | 6860 | 5970 | 7250 | 6590 |
| Potassium | 22600 | 24400 | 23200 | 23800 | 23000 |
| Sodium | < 100 | < 100 | 177 | < 100 | < 100 |
| Zinc | 48.8 | 39.8 | 37.3 | 45.7 | 47.4 |
| Selenium (ppb) | 226 | 515 | 444 | 1010 | 251 |

* TIU - Trypsin Inhibitor Units

**H.U. - Hemagglutinating Unit

Table 6
Analyses of
Soybean Meal-Fresh Weight

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| Sample Description | Soybean Meal | Soybean Meal | Soybean Meal | Soybean Meal | Soybean Meal |
|---------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Client Sample # | TSN032945 | TSN032947 | TSN032948 | TSN032949 | TSN032920 |
| Covance LIMS # | 00600146 | 00600147 | 00600148 | 00600149 | 00600150 |
| Amino Acids (mg/g) | | | | | |
| Aspartic Acid | 54.8 | 51.8 | 58.6 | 54.5 | 55.3 |
| Threonine | 20.7 | 18.5 | 20.6 | 19.2 | 20.3 |
| Serine | 25.6 | 23.6 | 25.6 | 23.9 | 25.5 |
| Glutamic Acid | 85.3 | 80.3 | 91.5 | 83.0 | 83.7 |
| Proline | 25.6 | 22.7 | 26.4 | 23.8 | 23.7 |
| Glycine | 21.2 | 19.0 | 21.5 | 20.0 | 20.8 |
| Alanine | 21.8 | 19.9 | 22.2 | 20.7 | 21.5 |
| Cystine | 7.08 | 6.88 | 6.58 | 6.61 | 6.89 |
| Valine | 23.7 | 21.3 | 24.1 | 21.8 | 22.3 |
| Methionine | 7.03 | 6.16 | 6.43 | 5.94 | 6.47 |
| Isoleucine | 22.6 | 20.7 | 23.2 | 20.9 | 21.8 |
| Leucine | 38.5 | 35.0 | 39.7 | 36.3 | 37.4 |
| Tyrosine | 18.7 | 16.6 | 18.8 | 17.3 | 18.0 |
| Phenylalanine | 25.5 | 22.9 | 26.6 | 24.5 | 24.6 |
| Lysine | 30.7 | 29.0 | 32.0 | 30.3 | 29.7 |
| Histidine | 13.5 | 11.9 | 13.5 | 12.6 | 12.4 |
| Arginine | 35.9 | 33.7 | 39.4 | 35.1 | 34.7 |
| Tryptophan | 8.43 | 7.43 | 8.48 | 7.62 | 8.23 |

Table 6
Analyses of
Soybean Meal-Fresh Weight

Covance 8223-016
DAS Protocol 101088

| Sample Description | Soybean Meal | Soybean Meal | Soybean Meal | Soybean Meal | Soybean Meal |
|-------------------------------------|--------------|--------------|--------------|--------------|--------------|
| Client Sample # | TSN032945 | TSN032947 | TSN032948 | TSN032949 | TSN032920 |
| Covance LIMS # | 00600146 | 00600147 | 00600148 | 00600149 | 00600150 |
| Mycotoxin Screen¹ | | | | | |
| Aflatoxin B1 (ppb) | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Aflatoxin B2 (ppb) | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Aflatoxin G1 (ppb) | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Aflatoxin G2 (ppb) | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Zearalenone (ppb) | <100 | <100 | <100 | <100 | <100 |
| Fumonisin B1 (ppm) | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Fumonisin B2 (ppm) | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Fumonisin B3 (ppm) ² | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Deoxynivalenol (ppm) | 0.7 | 0.7 | 0.7 | 0.4 | 0.7 |
| 3-Acetyl DON (ppm) | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 15-Acetyl DON (ppm) | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| T-2 Toxin (ppm) | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |

DON = Deoxynivalenol

ND - none detected

¹Assays performed in non-GLP facility

²Matrix spike recovery of 122.0%.

Covance 8223-016
DAS Protocol 101088

Table 7
Analyses of Representative
(500 g) Feed Samples
-Fresh Weight

| Sample Description | Maverick Starter TSN032945 | Maverick Grower TSN032945 | Maverick Finisher TSN032945 |
|-----------------------------------|---|--|--|
| Covance LIMS # | 00800139 | 00800140 | 00800141 |
| Proximate (%) | | | |
| Moisture | 9.67 | 10.0 | 10.3 |
| Protein | 23.7 | 22.6 | 20.1 |
| Total Fat | 7.04 | 7.20 | 7.34 |
| Ash | 6.52 | 6.04 | 5.22 |
| Carbohydrates | 53.1 | 54.2 | 57.0 |
| Calories (kcal/100g) | 371 | 372 | 374 |
| Fibers (%) | | | |
| Acid Detergent Fiber | 2.49 | 2.36 | 2.51 |
| Neutral Detergent Fiber | 7.10 | 6.89 | 6.67 |
| Crude Fiber | 2.00 | 1.97 | 1.84 |
| Vitamins | | | |
| Biotin (mcg/g) | 0.321 | 0.244 | 0.296 |
| Choline-Free (mg/100g) | 151 | 143 | 133 |
| Folic Acid (mcg/g) | 1.61 | 1.51 | 1.29 |
| Niacin (mcg/g) | 87.3 | 74.9 | 57.8 |
| Panthenic Acid (mcg/g) | 32.8 | 31.2 | 28.0 |
| Vitamin A (IU/g) | 14.1 | 6.90 | 14.9 |
| Beta Carotene (mg/100g) | 0.0267 | 0.0293 | 0.0304 |
| Vitamin B1/Thiamine HCl (mg/100g) | 0.357 | 0.345 | 0.345 |
| Vitamin B6/Pyridoxine HCl (mcg/g) | 11.0 | 13.3 | 12.9 |
| Vitamin B12 (mcg/g) | 0.0187 | 0.0236 | 0.0255 |
| Vitamin D3 IU/g | 3.70 | 3.52 | 3.38 |
| Alpha Tocopherol (mg/100g) | 3.54 | 3.51 | 3.72 |
| Beta Tocopherol (mg/100g) | <0.500 | <0.500 | <0.500 |
| Gamma Tocopherol (mg/100g) | 4.05 | 4.09 | 4.11 |
| Delta Tocopherol (mg/100g) | 1.12 | 1.10 | 1.06 |
| Metals (ppb) | | | |
| Arsenic | 234 | 182 | 173 |
| Cadmium | 126 | 90.0 | 85.5 |
| Lead | 55.2 | 64.8 | 49.3 |
| Mercury | <10.0 | <10.0 | <10.0 |

Covance 8223-016
DAS Protocol 101088

Table 7
Analyses of Representative
(500 g) Feed Samples
-Fresh Weight

| Sample Description | Maverick Starter TSN032945 | Maverick Grower TSN032945 | Maverick Finisher TSN032945 |
|-----------------------------|---|--|--|
| Covance LIMS # | 00800139 | 00800140 | 00800141 |
| Minerals (ppm) | | | |
| Calcium | 11700 | 10600 | 9190 |
| Copper | 15.9 | 13.8 | 16.0 |
| Iron | 348 | 308 | 252 |
| Magnesium | 1630 | 1580 | 1430 |
| Manganese | 72.2 | 84.9 | 75.3 |
| Phosphorus | 9210 | 7890 | 6750 |
| Potassium | 10800 | 10300 | 8980 |
| Sodium | 1960 | 1980 | 1910 |
| Zinc | 97.1 | 113 | 101 |
| Trace Minerals (ppb) | | | |
| Cobalt | 186 | 272 | 233 |
| Chromium | 2330 | 1420 | 1320 |
| Molybdenum | 3790 | 3170 | 2880 |
| Selenium | 410 | 468 | 437 |
| Other inorganics | | | |
| Chloride (%) | 0.389 | 0.410 | 0.373 |
| Fluoride (ppm) | 45.0 | 30.3 | 32.0 |
| Iodine (ppm) | 3.06 | 1.90 | 1.54 |
| Sulfur (%) | 0.357 | 0.335 | 0.292 |

Covance 8223-016
DAS Protocol 101088

Table 7
Analyses of Representative
(500 g) Feed Samples
-Fresh Weight

| Sample Description | Maverick Starter | Maverick Grower | Maverick Finisher |
|---------------------------|-----------------------------|----------------------------|------------------------------|
| Covance LIMS # | TSN032945 00800139 | TSN032945 00800140 | TSN032945 00800141 |
| Amino Acids (mg/g) | | | |
| Aspartic Acid | 23.0 | 23.1 | 21.4 |
| Threonine | 9.07 | 9.01 | 8.40 |
| Serine | 11.3 | 11.3 | 10.5 |
| Glutamic Acid | 39.1 | 39.2 | 37.2 |
| Proline | 12.9 | 12.8 | 12.6 |
| Glycine | 9.29 | 9.41 | 8.65 |
| Alanine | 11.2 | 11.1 | 10.8 |
| Cystine | 3.13 | 3.12 | 3.09 |
| Valine | 11.1 | 11.1 | 10.7 |
| Methionine | 5.83 | 6.12 | 5.46 |
| Isoleucine | 9.89 | 9.97 | 9.71 |
| Leucine | 18.8 | 18.8 | 18.0 |
| Tyrosine | 8.25 | 8.20 | 7.72 |
| Phenylalanine | 11.5 | 11.4 | 10.5 |
| Lysine | 11.8 | 12.0 | 11.0 |
| Histidine | 6.03 | 5.90 | 5.78 |
| Arginine | 15.0 | 14.8 | 14.1 |
| Tryptophan | 3.17 | 2.82 | 2.68 |

Covance 8223-016
DAS Protocol 101088

Table 7
Analyses of Representative
(500 g) Feed Samples
-Fresh Weight

| Sample Description | Maverick Starter TSN032945 | Maverick Grower TSN032945 | Maverick Finisher TSN032945 |
|---------------------------------------|---|--|--|
| Covance LIMS # | 00800139 | 00800140 | 00800141 |
| Mycotoxin Screen¹ | | | |
| Alfatoxin B1 (ppb) | <1.0 | <1.0 | <1.0 |
| Alfatoxin B2 (ppb) | <1.0 | <1.0 | <1.0 |
| Alfatoxin G1 (ppb) | <1.0 | <1.0 | <1.0 |
| Alfatoxin G2 (ppb) | <1.0 | <1.0 | <1.0 |
| Zearalenone (ppb) | <100 | <100 | <100 |
| Fumonisin B1 (ppm) | 0.4 | 0.3 | 0.4 |
| Fumonisin B2 (ppm) | <0.1 | <0.1 | <0.1 |
| Fumonisin B3 (ppm) | <0.1 | <0.1 | <0.1 |
| Deoxynivalenol (ppm) | 0.1 | 0.2 | 0.2 |
| 3-Acetyl DON (ppm) | <0.1 | <0.1 | <0.1 |
| 15-Acetyl DON (ppm) | <0.1 | <0.1 | <0.1 |
| T-2 Toxin (ppm) | <0.1 | <0.1 | <0.1 |
| Ergot Screen (ppb)¹ | | | |
| Ergosine | <5 | <5 | <5 |
| Ergotamine | <5 | <5 | <5 |
| Ergocornine | <5 | <5 | <5 |
| Ergocryptine | <5 | <5 | <5 |
| Ergocristine | <5 | <5 | <5 |
| Cyclopiazonic Acid (ppm) ¹ | <0.5 | <0.5 | <0.5 |
| Oosporein Screen (ppm) ¹ | <2 | <2 | <2 |
| Moniliformin (ppm) ¹ | <0.2 | <0.2 | <0.2 |

DON = Deoxynivalenol

ND = Not detected

¹ Assays performed in non-GLP facility

Covance 8223-016
DAS Protocol 101088

Table 7
Analyses of Representative
(500 g) Feed Samples
-Fresh Weight

| Sample Description | Maverick Starter TSN032945 | Maverick Grower TSN032945 | Maverick Finisher TSN032945 |
|---|---|--|--|
| Covance LIMS # | 00800139 | 00800140 | 00800141 |
| Organochlorinated Screen (ppb) | | | |
| HCB | < 6.50 | < 6.50 | < 6.50 |
| Alpha-BHC | < 12.5 | < 12.5 | < 12.5 |
| Lindane (Gamma-BHC) | < 12.5 | < 12.5 | < 12.5 |
| Beta-BHC | < 12.5 | < 12.5 | < 12.5 |
| Heptachlor | < 12.5 | < 12.5 | < 12.5 |
| Delta-BHC | < 12.5 | < 12.5 | < 12.5 |
| Aldrin | < 12.5 | < 12.5 | < 12.5 |
| Heptachlor Epoxide | < 12.5 | < 12.5 | < 12.5 |
| Dieldrin | < 12.5 | < 12.5 | < 12.5 |
| p,p'-DDE | < 12.5 | < 12.5 | < 12.5 |
| Endrin | < 18.5 | < 18.5 | < 18.5 |
| p,p'-DDD | < 18.5 | < 18.5 | < 18.5 |
| p,p'-DDT | < 25.0 | < 25.0 | < 25.0 |
| Mirex | < 12.5 | < 12.5 | < 12.5 |
| Methoxychlor | < 31.5 | < 31.5 | < 31.5 |
| PCB (Arochlor 1254) | < 250 | < 250 | < 250 |
| Tech Chlordane | < 50.0 | < 50.0 | < 50.0 |
| Thiodan (total of endosulfan II, and endosulfan sulfate) | < 37.0 | < 37.0 | < 37.0 |
| Organophosphate Screen (ppb) | | | |
| Thimet | < 20.0 | < 20.0 | < 20.0 |
| Diazinon | < 20.0 | < 20.0 | < 20.0 |
| Disulfoton | < 25.0 | < 25.0 | < 25.0 |
| Parathion-Methyl | < 25.0 | < 25.0 | < 25.0 |
| Malathion | < 20.0 | < 20.0 | < 20.0 |
| Parathion-Ethyl | < 30.0 | < 30.0 | < 30.0 |
| Ethion | < 20.0 | < 20.0 | < 20.0 |
| Trithion | < 30.0 | < 30.0 | < 30.0 |

Covance 8223-016
DAS Protocol 101088

Table 7
Analyses of Representative
(500 g) Feed Samples
-Fresh Weight

| Sample Description | LG C3540 | LG C3540 Grower | |
|-----------------------------------|-----------|-----------------|-----------|
| | Starter | TSN032947 | Finisher |
| Covance LIMS # | TSN032947 | TSN032947 | TSN032947 |
| | 00800142 | 00800143 | 00800144 |
| Proximate (%) | | | |
| Moisture | 9.86 | 10.2 | 10.6 |
| Protein | 22.1 | 21.0 | 18.8 |
| Total Fat | 7.00 | 7.18 | 6.85 |
| Ash | 6.50 | 5.82 | 5.51 |
| Carbohydrates | 54.5 | 55.8 | 58.2 |
| Calories (kcal/100g) | 369 | 372 | 370 |
| Fibers (%) | | | |
| Acid Detergent Fiber | 3.35 | 2.90 | 2.91 |
| Neutral Detergent Fiber | 6.54 | 6.21 | 6.44 |
| Crude Fiber | 2.48 | 2.37 | 2.27 |
| Vitamins | | | |
| Biotin (mcg/g) | 0.292 | 0.399 | 0.240 |
| Choline-Free (mg/100g) | 135 | 157 | 149 |
| Folic Acid (mcg/g) | 2.21 | 1.99 | 1.64 |
| Niacin (mcg/g) | 60.6 | 67.6 | 65.0 |
| Panthenic Acid (mcg/g) | 33.6 | 31.7 | 33.9 |
| Vitamin A (IU/g) | 12.5 | 14.7 | 10.9 |
| Beta Carotene (mg/100g) | 0.0285 | 0.0274 | 0.0329 |
| Vitamin B1/Thiamine HCl (mg/100g) | 0.350 | 0.382 | 0.372 |
| Vitamin B6/Pyridoxine HCl (mcg/g) | 11.2 | 11.7 | 12.6 |
| Vitamin B12 (mcg/g) | 0.0207 | 0.0216 | 0.0173 |
| Vitamin D3 IU/g | 4.83 | 3.46 | 3.85 |
| Alpha Tocopherol (mg/100g) | 3.43 | 3.42 | 3.64 |
| Beta Tocopherol (mg/100g) | <0.500 | <0.500 | <0.500 |
| Gamma Tocopherol (mg/100g) | 4.29 | 4.27 | 4.25 |
| Delta Tocopherol (mg/100g) | 1.37 | 1.34 | 1.24 |
| Metals (ppb) | | | |
| Arsenic | 197 | 204 | 171 |
| Cadmium | 119 | 123 | 103 |
| Lead | 57.2 | 63.8 | 43.4 |
| Mercury | <10.0 | <10.0 | <10.0 |

Covance 8223-016
DAS Protocol 101088

Table 7
Analyses of Representative
(500 g) Feed Samples
-Fresh Weight

| Sample Description | LG C3540 | LG C3540 Grower | LG C3540 |
|-----------------------------|-----------|-----------------|-----------|
| | Starter | | Finisher |
| | TSN032947 | TSN032947 | TSN032947 |
| Covance LIMS # | 00800142 | 00800143 | 00800144 |
| Minerals (ppm) | | | |
| Calcium | 11200 | 9880 | 9380 |
| Copper | 14.9 | 16.5 | 14.3 |
| Iron | 311 | 282 | 242 |
| Magnesium | 1700 | 1580 | 1480 |
| Manganese | 79.4 | 90.0 | 84.6 |
| Phosphorus | 8230 | 7580 | 6760 |
| Potassium | 11100 | 9840 | 9220 |
| Sodium | 2040 | 2090 | 2040 |
| Zinc | 92.8 | 109 | 107 |
| Trace Minerals (ppb) | | | |
| Cobalt | 239 | 238 | 240 |
| Chromium | 1490 | 1750 | 1300 |
| Molybdenum | 1100 | 1090 | 912 |
| Selenium | 547 | 502 | 512 |
| Other inorganics | | | |
| Chloride (%) | 0.415 | 0.403 | 0.378 |
| Fluoride (ppm) | 34.1 | 31.7 | 31.9 |
| Iodine (ppm) | 1.17 | 1.65 | 1.13 |
| Sulfur (%) | 0.362 | 0.344 | 0.289 |

Covance 8223-016
DAS Protocol 101088

Table 7
Analyses of Representative
(500 g) Feed Samples
-Fresh Weight

| Sample Description | LG C3540 | LG C3540 Grower | LG C3540 |
|---------------------------|-----------|-----------------|-----------|
| | Starter | | Finisher |
| | TSN032947 | TSN032947 | TSN032947 |
| Covance LIMS # | 00800142 | 00800143 | 00800144 |
| Amino Acids (mg/g) | | | |
| Aspartic Acid | 22.7 | 21.5 | 19.1 |
| Threonine | 8.64 | 8.41 | 7.63 |
| Serine | 11.0 | 10.6 | 9.34 |
| Glutamic Acid | 38.7 | 37.0 | 33.5 |
| Proline | 12.3 | 11.9 | 11.1 |
| Glycine | 9.17 | 8.69 | 7.91 |
| Alanine | 10.7 | 10.4 | 9.51 |
| Cystine | 3.04 | 3.06 | 2.75 |
| Valine | 10.6 | 9.99 | 9.41 |
| Methionine | 6.88 | 6.21 | 5.10 |
| Isoleucine | 9.78 | 9.28 | 8.40 |
| Leucine | 18.0 | 17.5 | 16.2 |
| Tyrosine | 7.71 | 7.72 | 6.78 |
| Phenylalanine | 10.9 | 10.4 | 9.53 |
| Lysine | 13.0 | 11.8 | 10.5 |
| Histidine | 5.68 | 5.24 | 4.82 |
| Arginine | 14.7 | 14.2 | 12.6 |
| Tryptophan | 2.93 | 2.66 | 2.40 |

Covance 8223-016
DAS Protocol 101088

Table 7
Analyses of Representative
(500 g) Feed Samples
-Fresh Weight

| Sample Description | LG C3540 | LG C3540 Grower | LG C3540 |
|---------------------------------------|-----------|-----------------|-----------|
| | Starter | | Finisher |
| | TSN032947 | TSN032947 | TSN032947 |
| Covance LIMS # | 00800142 | 00800143 | 00800144 |
| Mycotoxin Screen¹ | | | |
| Alfatoxin B1 (ppb) | <1.0 | <1.0 | <1.0 |
| Alfatoxin B2 (ppb) | <1.0 | <1.0 | <1.0 |
| Alfatoxin G1 (ppb) | <1.0 | <1.0 | <1.0 |
| Alfatoxin G2 (ppb) | <1.0 | <1.0 | <1.0 |
| Zearalenone (ppb) | <100 | <100 | <100 |
| Fumonisin B1 (ppm) | 0.3 | 0.5 | 0.4 |
| Fumonisin B2 (ppm) | <0.1 | <0.1 | <0.1 |
| Fumonisin B3 (ppm) | <0.1 | <0.1 | <0.1 |
| Deoxynivalenol (ppm) | 0.2 | 0.1 | 0.1 |
| 3-Acetyl DON (ppm) | <0.1 | <0.1 | <0.1 |
| 15-Acetyl DON (ppm) | <0.1 | <0.1 | <0.1 |
| T-2 Toxin (ppm) | <0.1 | <0.1 | <0.1 |
| Ergot Screen (ppb)¹ | | | |
| Ergosine | <5 | <5 | <5 |
| Ergotamine | <5 | <5 | <5 |
| Ergocornine | <5 | <5 | <5 |
| Ergocryptine | <5 | <5 | <5 |
| Ergocristine | <5 | <5 | <5 |
| Cyclopiazonic Acid (ppm) ¹ | <0.5 | <0.5 | <0.5 |
| Oosporein Screen (ppm) ¹ | <2 | <2 | <2 |
| Moniliformin (ppm) ¹ | <0.2 | <0.2 | <0.2 |

DON = Deoxynivalenol

ND = Not detected

¹ Assays performed in non-GLP facility

Covance 8223-016
DAS Protocol 101088

Table 7
Analyses of Representative
(500 g) Feed Samples
-Fresh Weight

| Sample Description | LG C3540 | LG C3540 Grower | LG C3540 |
|---|-----------|-----------------|-----------|
| | Starter | | Finisher |
| | TSN032947 | TSN032947 | TSN032947 |
| Covance LIMS # | 00800142 | 00800143 | 00800144 |
| Organochlorinated Screen (ppb) | | | |
| HCB | < 6.50 | < 6.50 | < 6.50 |
| Alpha-BHC | < 12.5 | < 12.5 | < 12.5 |
| Lindane (Gamma-BHC) | < 12.5 | < 12.5 | < 12.5 |
| Beta-BHC | < 12.5 | < 12.5 | < 12.5 |
| Heptachlor | < 12.5 | < 12.5 | < 12.5 |
| Delta-BHC | < 12.5 | < 12.5 | < 12.5 |
| Aldrin | < 12.5 | < 12.5 | < 12.5 |
| Heptachlor Epoxide | < 12.5 | < 12.5 | < 12.5 |
| Dieldrin | < 12.5 | < 12.5 | < 12.5 |
| p,p'-DDE | < 12.5 | < 12.5 | < 12.5 |
| Endrin | < 18.5 | < 18.5 | < 18.5 |
| p,p'-DDD | < 18.5 | < 18.5 | < 18.5 |
| p,p'-DDT | < 25.0 | < 25.0 | < 25.0 |
| Mirex | < 12.5 | < 12.5 | < 12.5 |
| Methoxychlor | < 31.5 | < 31.5 | < 31.5 |
| PCB (Arochlor 1254) | < 250 | < 250 | < 250 |
| Tech Chlordane | < 50.0 | < 50.0 | < 50.0 |
| Thiodan (total of endosulfan II, and endosulfan sulfate) | < 37.0 | < 37.0 | < 37.0 |
| Organophosphate Screen (ppb) | | | |
| Thimet | < 20.0 | < 20.0 | < 20.0 |
| Diazinon | < 20.0 | < 20.0 | < 20.0 |
| Disulfaton | < 25.0 | < 25.0 | < 25.0 |
| Parathion-Methyl | < 25.0 | < 25.0 | < 25.0 |
| Malathion | < 20.0 | < 20.0 | < 20.0 |
| Parathion-Ethyl | < 30.0 | < 30.0 | < 30.0 |
| Ethion | < 20.0 | < 20.0 | < 20.0 |
| Trithion | < 30.0 | < 30.0 | < 30.0 |

Covance 8223-016
DAS Protocol 101088

Table 7
Analyses of Representative
(500 g) Feed Samples
-Fresh Weight

| Sample Description | Pioneer 93B82 Starter TSN032948 | Pioneer 93B82 Grower TSN032948 | Pioneer 93B82 Finisher TSN032948 |
|-----------------------------------|--|---|---|
| Covance LIMS # | 00800145 | 00800146 | 00800147 |
| Proximate (%) | | | |
| Moisture | 9.40 | 9.64 | 10.1 |
| Protein | 25.3 | 23.1 | 21.6 |
| Total Fat | 7.06 | 7.15 | 7.57 |
| Ash | 6.30 | 5.62 | 5.29 |
| Carbohydrates | 51.9 | 54.5 | 55.4 |
| Calories (kcal/100g) | 372 | 375 | 376 |
| Fibers (%) | | | |
| Acid Detergent Fiber | 2.77 | 2.58 | 2.42 |
| Neutral Detergent Fiber | 6.00 | 5.86 | 5.77 |
| Crude Fiber | 2.19 | 2.09 | 2.06 |
| Vitamins | | | |
| Biotin (mcg/g) | 0.389 | 0.402 | 0.291 |
| Choline-Free (mg/100g) | 148 | 144 | 136 |
| Folic Acid (mcg/g) | 2.19 | 1.95 | 2.22 |
| Niacin (mcg/g) | 105 | 108 | 97.1 |
| Panthenic Acid (mcg/g) | 29.0 | 28.8 | 28.0 |
| Vitamin A (IU/g) | 17.2 | 11.5 | 8.57 |
| Beta Carotene (mg/100g) | 0.0280 | 0.0311 | 0.0331 |
| Vitamin B1/Thiamine HCl (mg/100g) | 0.327 | 0.384 | 0.359 |
| Vitamin B6/Pyridoxine HCl (mcg/g) | 10.9 | 11.3 | 11.2 |
| Vitamin B12 (mcg/g) | 0.0146 | 0.0183 | 0.0183 |
| Vitamin D3 IU/g | 3.28 | 3.28 | 3.57 |
| Alpha Tocopherol (mg/100g) | 3.33 | 3.45 | 3.45 |
| Beta Tocopherol (mg/100g) | <0.500 | <0.500 | <0.500 |
| Gamma Tocopherol (mg/100g) | 4.56 | 4.69 | 4.97 |
| Delta Tocopherol (mg/100g) | 1.41 | 1.43 | 1.51 |
| Metals (ppb) | | | |
| Arsenic | 186 | 225 | 173 |
| Cadmium | 115 | 117 | 95.2 |
| Lead | 61.1 | 57.1 | 53.8 |
| Mercury | <10.0 | <10.0 | <10.0 |

Covance 8223-016
DAS Protocol 101088

Table 7
Analyses of Representative
(500 g) Feed Samples
-Fresh Weight

| Sample Description | Pioneer 93B82 Starter TSN032948 | Pioneer 93B82 Grower TSN032948 | Pioneer 93B82 Finisher TSN032948 |
|-----------------------------|--|---|---|
| Covance LIMS # | 00800145 | 00800146 | 00800147 |
| Minerals (ppm) | | | |
| Calcium | 11200 | 10100 | 9430 |
| Copper | 16.7 | 15.2 | 15.7 |
| Iron | 310 | 283 | 287 |
| Magnesium | 1660 | 1530 | 1460 |
| Manganese | 82.9 | 83.5 | 75.6 |
| Phosphorus | 7870 | 7460 | 6880 |
| Potassium | 11300 | 10400 | 9480 |
| Sodium | 1990 | 2060 | 1950 |
| Zinc | 88.9 | 107 | 101 |
| Trace Minerals (ppb) | | | |
| Cobalt | 261 | 230 | 236 |
| Chromium | 1740 | 1860 | 1330 |
| Molybdenum | 3990 | 3380 | 3120 |
| Selenium | 557 | 547 | 502 |
| Other inorganics | | | |
| Chloride (%) | 0.359 | 0.383 | 0.372 |
| Fluoride (ppm) | 36.5 | 34.9 | 28.9 |
| Iodine (ppm) | 2.20 | 0.839 | 1.19 |
| Sulfur (%) | 0.366 | 0.340 | 0.304 |

Covance 8223-016
DAS Protocol 101088

Table 7
Analyses of Representative
(500 g) Feed Samples
-Fresh Weight

| Sample Description | Pioneer 93B82 Starter TSN032948 | Pioneer 93B82 Grower TSN032948 | Pioneer 93B82 Finisher TSN032948 |
|---------------------------|--|---|---|
| Covance LIMS # | 00800145 | 00800146 | 00800147 |
| Amino Acids (mg/g) | | | |
| Aspartic Acid | 27.2 | 24.3 | 22.3 |
| Threonine | 9.84 | 9.21 | 8.41 |
| Serine | 12.7 | 11.9 | 11.0 |
| Glutamic Acid | 46.5 | 42.4 | 39.2 |
| Proline | 14.5 | 13.5 | 12.7 |
| Glycine | 10.8 | 9.68 | 9.05 |
| Alanine | 12.0 | 11.4 | 10.5 |
| Cystine | 3.10 | 3.09 | 2.82 |
| Valine | 12.8 | 11.1 | 10.3 |
| Methionine | 6.28 | 6.28 | 5.77 |
| Isoleucine | 11.6 | 10.3 | 9.38 |
| Leucine | 20.9 | 19.4 | 18.0 |
| Tyrosine | 8.97 | 8.38 | 7.52 |
| Phenylalanine | 13.2 | 11.8 | 11.1 |
| Lysine | 13.6 | 12.4 | 10.8 |
| Histidine | 6.57 | 6.10 | 5.39 |
| Arginine | 18.0 | 16.2 | 14.9 |
| Tryptophan | 3.29 | 2.96 | 2.57 |

Covance 8223-016
DAS Protocol 101088

Table 7
Analyses of Representative
(500 g) Feed Samples
-Fresh Weight

| Sample Description | Pioneer 93B82 Starter TSN032948 | Pioneer 93B82 Grower TSN032948 | Pioneer 93B82 Finisher TSN032948 |
|---------------------------------------|--|---|---|
| Covance LIMS # | 00800145 | 00800146 | 00800147 |
| Mycotoxin Screen¹ | | | |
| Alfatoxin B1 (ppb) | <1.0 | <1.0 | <1.0 |
| Alfatoxin B2 (ppb) | <1.0 | <1.0 | <1.0 |
| Alfatoxin G1 (ppb) | <1.0 | <1.0 | <1.0 |
| Alfatoxin G2 (ppb) | <1.0 | <1.0 | <1.0 |
| Zearalenone (ppb) | <100 | <100 | <100 |
| Fumonisin B1 (ppm) | 0.3 | 0.3 | 0.3 |
| Fumonisin B2 (ppm) | <0.1 | <0.1 | <0.1 |
| Fumonisin B3 (ppm) | <0.1 | <0.1 | <0.1 |
| Deoxynivalenol (ppm) | 0.1 | 0.1 | 0.2 |
| 3-Acetyl DON (ppm) | <0.1 | <0.1 | <0.1 |
| 15-Acetyl DON (ppm) | <0.1 | <0.1 | <0.1 |
| T-2 Toxin (ppm) | <0.1 | <0.1 | <0.1 |
| Ergot Screen (ppb)¹ | | | |
| Ergosine | <5 | <5 | <5 |
| Ergotamine | <5 | <5 | <5 |
| Ergocornine | <5 | <5 | <5 |
| Ergocryptine | <5 | <5 | <5 |
| Ergocristine | <5 | <5 | <5 |
| Cyclopiazonic Acid (ppm) ¹ | <0.5 | <0.5 | <0.5 |
| Oosporein Screen (ppm) ¹ | <2 | <2 | <2 |
| Moniliformin (ppm) ¹ | <0.2 | <0.2 | <0.2 |

DON = Deoxynivalenol

ND = Not detected

¹ Assays performed in non-GLP facility

Covance 8223-016
DAS Protocol 101088

Table 7
Analyses of Representative
(500 g) Feed Samples
-Fresh Weight

| Sample Description | Pioneer 93B82 Starter TSN032948 | Pioneer 93B82 Grower TSN032948 | Pioneer 93B82 Finisher TSN032948 |
|---|---------------------------------------|--------------------------------------|--|
| Covance LIMS # | 00800145 | 00800146 | 00800147 |
| Organochlorinated Screen (ppb) | | | |
| HCB | < 6.50 | < 6.50 | < 6.50 |
| Alpha-BHC | < 12.5 | < 12.5 | < 12.5 |
| Lindane (Gamma-BHC) | < 12.5 | < 12.5 | < 12.5 |
| Beta-BHC | < 12.5 | < 12.5 | < 12.5 |
| Heptachlor | < 12.5 | < 12.5 | < 12.5 |
| Delta-BHC | < 12.5 | < 12.5 | < 12.5 |
| Aldrin | < 12.5 | < 12.5 | < 12.5 |
| Heptachlor Epoxide | < 12.5 | < 12.5 | < 12.5 |
| Dieldrin | < 12.5 | < 12.5 | < 12.5 |
| p,p'-DDE | < 12.5 | < 12.5 | < 12.5 |
| Endrin | < 18.5 | < 18.5 | < 18.5 |
| p,p'-DDD | < 18.5 | < 18.5 | < 18.5 |
| p,p'-DD'I' | < 25.0 | < 25.0 | < 25.0 |
| Mirex | < 12.5 | < 12.5 | < 12.5 |
| Methoxychlor | < 31.5 | < 31.5 | < 31.5 |
| PCB (Arochlor 1254) | < 250 | < 250 | < 250 |
| Tech Chlordane | < 50.0 | < 50.0 | < 50.0 |
| Thiodan (total of endosulfan II, and endosulfan sulfate) | < 37.0 | < 37.0 | < 37.0 |
| Organophosphate Screen (ppb) | | | |
| Thimet | < 20.0 | < 20.0 | < 20.0 |
| Diazinon | < 20.0 | < 20.0 | < 20.0 |
| Disulfaton | < 25.0 | < 25.0 | < 25.0 |
| Parathion-Methyl | < 25.0 | < 25.0 | < 25.0 |
| Malathion | < 20.0 | < 20.0 | < 20.0 |
| Parathion-Ethyl | < 30.0 | < 30.0 | < 30.0 |
| Ethion | < 20.0 | < 20.0 | < 20.0 |
| Trithion | < 30.0 | < 30.0 | < 30.0 |

Covance 8223-016
DAS Protocol 101088**Table 7**
Analyses of Representative
(500 g) Feed Samples
-Fresh Weight

| Sample Description | HISOY 38C60 Starter TSN032949 | HISOY 38C60 Grower TSN032949 | HISOY 38C60 Finisher TSN032949 |
|-----------------------------------|--|---|---|
| Covance LIMS # | 00800148 | 00800149 | 00800150 |
| Proximate (%) | | | |
| Moisture | 9.51 | 9.70 | 10.1 |
| Protein | 23.1 | 21.7 | 19.8 |
| Total Fat | 7.10 | 7.13 | 7.46 |
| Ash | 6.42 | 5.92 | 5.52 |
| Carbohydrates | 53.9 | 55.6 | 57.1 |
| Calories (kcal/100g) | 372 | 373 | 375 |
| Fibers (%) | | | |
| Acid Detergent Fiber | 2.99 | 3.11 | 2.83 |
| Neutral Detergent Fiber | 6.48 | 6.62 | 6.48 |
| Crude Fiber | 2.56 | 2.35 | 2.33 |
| Vitamins | | | |
| Biotin (mcg/g) | 0.342 | 0.290 | 0.256 |
| Choline-Free (mg/100g) | 160 | 150 | 139 |
| Folic Acid (mcg/g) | 2.03 | 1.90 | 1.88 |
| Niacin (mcg/g) | 71.6 | 59.8 | 80.2 |
| Panthenic Acid (mcg/g) | 29.3 | 37.2 | 30.8 |
| Vitamin A (IU/g) | 10.4 | 13.2 | 8.57 |
| Beta Carotene (mg/100g) | 0.0309 | 0.0291 | 0.0305 |
| Vitamin B1/Thiamine HCl (mg/100g) | 0.331 | 0.369 | 0.365 |
| Vitamin B6/Pyridoxine HCl (mcg/g) | 13.0 | 11.9 | 14.5 |
| Vitamin B12 (mcg/g) | 0.0215 | 0.0222 | 0.0198 |
| Vitamin D3 IU/g | 3.19 | 3.39 | 3.33 |
| Alpha Tocopherol (mg/100g) | 3.60 | 3.56 | 3.64 |
| Beta Tocopherol (mg/100g) | <0.500 | <0.500 | <0.500 |
| Gamma Tocopherol (mg/100g) | 4.38 | 4.44 | 4.70 |
| Delta Tocopherol (mg/100g) | 1.52 | 1.51 | 1.43 |
| Metals (ppb) | | | |
| Arsenic | 121 | 209 | 152 |
| Cadmium | 146 | 134 | 97.1 |
| Lead | 61.9 | 48.3 | 44.9 |
| Mercury | <10.0 | <10.0 | <10.0 |

Covance 8223-016
DAS Protocol 101088

Table 7
Analyses of Representative
(500 g) Feed Samples
-Fresh Weight

| Sample Description | HISOY 38C60 Starter TSN032949 | HISOY 38C60 Grower TSN032949 | HISOY 38C60 Finisher TSN032949 |
|-----------------------------|--|---|---|
| Covance LIMS # | 00800148 | 00800149 | 00800150 |
| Minerals (ppm) | | | |
| Calcium | 11500 | 9790 | 9180 |
| Copper | 17.9 | 17.9 | 16.7 |
| Iron | 314 | 261 | 230 |
| Magnesium | 1450 | 1430 | 1320 |
| Manganese | 89.5 | 95.8 | 83.3 |
| Phosphorus | 8210 | 7350 | 6630 |
| Potassium | 10700 | 10600 | 9370 |
| Sodium | 2090 | 1820 | 1960 |
| Zinc | 103 | 112 | 102 |
| Trace Minerals (ppb) | | | |
| Cobalt | 410 | 247 | 236 |
| Chromium | 801 | 1810 | 1180 |
| Molybdenum | 1800 | 1780 | 1430 |
| Selenium | 901 | 834 | 780 |
| Other inorganics | | | |
| Chloride (%) | 0.402 | 0.363 | 0.381 |
| Fluoride (ppm) | 35.2 | 29.1 | 28.5 |
| Iodine (ppm) | 0.878 | 1.05 | 1.60 |
| Sulfur (%) | 0.373 | 0.365 | 0.318 |

Covance 8223-016
DAS Protocol 101088

Table 7
Analyses of Representative
(500 g) Feed Samples
-Fresh Weight

| Sample Description | HISOY 38C60 Starter TSN032949 | HISOY 38C60 Grower TSN032949 | HISOY 38C60 Finisher TSN032949 |
|---------------------------|--|---|---|
| Covance LIMS # | 00800148 | 00800149 | 00800150 |
| Amino Acids (mg/g) | | | |
| Aspartic Acid | 23.3 | 21.3 | 20.0 |
| Threonine | 8.80 | 8.21 | 7.65 |
| Serine | 11.5 | 10.7 | 10.0 |
| Glutamic Acid | 39.9 | 36.8 | 34.8 |
| Proline | 12.8 | 11.8 | 11.5 |
| Glycine | 9.47 | 8.60 | 8.22 |
| Alanine | 10.9 | 10.3 | 9.74 |
| Cystine | 3.25 | 2.98 | 2.84 |
| Valine | 10.8 | 10.1 | 9.49 |
| Methionine | 6.54 | 5.82 | 5.82 |
| Isoleucine | 9.78 | 9.25 | 8.44 |
| Leucine | 18.4 | 17.2 | 16.4 |
| Tyrosine | 8.23 | 7.58 | 7.01 |
| Phenylalanine | 11.4 | 10.3 | 9.99 |
| Lysine | 12.1 | 10.8 | 10.2 |
| Histidine | 5.71 | 5.40 | 5.02 |
| Arginine | 15.6 | 14.2 | 13.4 |
| Tryptophan | 2.89 | 2.70 | 2.44 |

Covance 8223-016
DAS Protocol 101088

Table 7
Analyses of Representative
(500 g) Feed Samples
-Fresh Weight

| Sample Description | HISOY 38C60 Starter TSN032949 | HISOY 38C60 Grower TSN032949 | HISOY 38C60 Finisher TSN032949 |
|---------------------------------------|--|---|---|
| Covance LIMS # | 00800148 | 00800149 | 00800150 |
| Mycotoxin Screen¹ | | | |
| Alfatoxin B1 (ppb) | <1.0 | <1.0 | <1.0 |
| Alfatoxin B2 (ppb) | <1.0 | <1.0 | <1.0 |
| Alfatoxin G1 (ppb) | <1.0 | <1.0 | <1.0 |
| Alfatoxin G2 (ppb) | <1.0 | <1.0 | <1.0 |
| Zearalenone (ppb) | <100 | <100 | <100 |
| Fumonisin B1 (ppm) | 0.3 | 0.4 | 0.3 |
| Fumonisin B2 (ppm) | <0.1 | <0.1 | <0.1 |
| Fumonisin B3 (ppm) | <0.1 | <0.1 | <0.1 |
| Deoxynivalenol (ppm) | 0.2 | 0.1 | <0.1 |
| 3-Acetyl DON (ppm) | <0.1 | <0.1 | <0.1 |
| 15-Acetyl DON (ppm) | <0.1 | <0.1 | <0.1 |
| T-2 Toxin (ppm) | <0.1 | <0.1 | <0.1 |
| Ergot Screen (ppb)¹ | | | |
| Ergosine | <5 | <5 | <5 |
| Ergotamine | <5 | <5 | <5 |
| Ergocornine | <5 | <5 | <5 |
| Ergocryptine | <5 | <5 | <5 |
| Ergocristine | <5 | <5 | <5 |
| Cyclopiazonic Acid (ppm) ¹ | <0.5 | <0.5 | <0.5 |
| Oosporein Screen (ppm) ¹ | <2 | <2 | <2 |
| Moniliformin (ppm) ¹ | <0.2 | <0.2 | <0.2 |

DON = Deoxynivalenol

ND = Not detected

¹ Assays performed in non-GLP facility

Covance 8223-016
DAS Protocol 101088**Table 7**
Analyses of Representative
(500 g) Feed Samples
-Fresh Weight

| Sample Description | HISOY 38C60 Starter TSN032949 | HISOY 38C60 Grower TSN032949 | HISOY 38C60 Finisher TSN032949 |
|---|--|---|---|
| Covance LIMS # | 00800148 | 00800149 | 00800150 |
| Organochlorinated Screen (ppb) | | | |
| HCB | < 6.50 | < 6.50 | < 6.50 |
| Alpha-BHC | < 12.5 | < 12.5 | < 12.5 |
| Lindane (Gamma-BHC) | < 12.5 | < 12.5 | < 12.5 |
| Beta-BHC | < 12.5 | < 12.5 | < 12.5 |
| Heptachlor | < 12.5 | < 12.5 | < 12.5 |
| Delta-BHC | < 12.5 | < 12.5 | < 12.5 |
| Aldrin | < 12.5 | < 12.5 | < 12.5 |
| Heptachlor Epoxide | < 12.5 | < 12.5 | < 12.5 |
| Dieldrin | < 12.5 | < 12.5 | < 12.5 |
| p,p'-DDE | < 12.5 | < 12.5 | < 12.5 |
| Endrin | < 18.5 | < 18.5 | < 18.5 |
| p,p'-DDD | < 18.5 | < 18.5 | < 18.5 |
| p,p'-DDT | < 25.0 | < 25.0 | < 25.0 |
| Mirex | < 12.5 | < 12.5 | < 12.5 |
| Methoxychlor | < 31.5 | < 31.5 | < 31.5 |
| PCB (Arochlor 1254) | < 250 | < 250 | < 250 |
| Tech Chlordane | < 50.0 | < 50.0 | < 50.0 |
| Thiodan (total of endosulfan II, and endosulfan sulfate) | < 37.0 | < 37.0 | < 37.0 |
| Organophosphate Screen (ppb) | | | |
| Thimet | < 20.0 | < 20.0 | < 20.0 |
| Diazinon | < 20.0 | < 20.0 | < 20.0 |
| Disulfaton | < 25.0 | < 25.0 | < 25.0 |
| Parathion-Methyl | < 25.0 | < 25.0 | < 25.0 |
| Malathion | < 20.0 | < 20.0 | < 20.0 |
| Parathion-Ethyl | < 30.0 | < 30.0 | < 30.0 |
| Ethion | < 20.0 | < 20.0 | < 20.0 |
| Trithion | < 30.0 | < 30.0 | < 30.0 |

Covance 8223-016
DAS Protocol 101088

Table 7
Analyses of Representative
(500 g) Feed Samples
-Fresh Weight

| Sample Description | pDAB4468-416 Starter TSN032920 | pDAB4468-416 Grower TSN032920 | pDAB4468-416 Finisher TSN032920 |
|-----------------------------------|--------------------------------------|-------------------------------------|---------------------------------------|
| Covance LIMS # | 00800151 | 00800152 | 00800153 |
| Proximate (%) | | | |
| Moisture | 9.49 | 9.66 | 9.99 |
| Protein | 23.6 | 22.6 | 20.1 |
| Total Fat | 6.86 | 7.14 | 7.35 |
| Ash | 6.27 | 5.69 | 5.47 |
| Carbohydrates | 53.8 | 54.9 | 57.1 |
| Calories (kcal/100g) | 371 | 374 | 375 |
| Fibers (%) | | | |
| Acid Detergent Fiber | 2.82 | 2.68 | 2.43 |
| Neutral Detergent Fiber | 6.04 | 6.00 | 5.96 |
| Crude Fiber | 2.24 | 2.20 | 2.07 |
| Vitamins | | | |
| Biotin (mcg/g) | 0.271 | 0.261 | 0.208 |
| Choline-Free (mg/100g) | 145 | 145 | 134 |
| Folic Acid (mcg/g) | 2.19 | 1.67 | 1.74 |
| Niacin (mcg/g) | 113 | 59.9 | 67.4 |
| Panathenic Acid (mcg/g) | 37.3 | 35.0 | 34.3 |
| Vitamin A (IU/g) | 12.2 | 10.0 | 9.97 |
| Beta Carotene (mg/100g) | 0.0277 | 0.0299 | 0.0316 |
| Vitamin B1/Thiamine HCl (mg/100g) | 0.368 | 0.403 | 0.381 |
| Vitamin B6/Pyridoxine HCl (mcg/g) | 11.3 | 12.5 | 11.0 |
| Vitamin B12 (mcg/g) | 0.0207 | 0.0195 | 0.0164 |
| Vitamin D3 IU/g | 2.92 | 3.72 | 4.02 |
| Alpha Tocopherol (mg/100g) | 3.48 | 3.45 | 3.41 |
| Beta Tocopherol (mg/100g) | <0.500 | <0.500 | <0.500 |
| Gamma Tocopherol (mg/100g) | 4.32 | 4.39 | 4.46 |
| Delta Tocopherol (mg/100g) | 1.26 | 1.25 | 1.20 |
| Metals (ppb) | | | |
| Arsenic | 182 | 224 | 153 |
| Cadmium | 101 | 113 | 84.5 |
| Lead | 48.6 | 52.0 | 61.0 |
| Mercury | <10.0 | <10.0 | <10.0 |

Covance 8223-016
DAS Protocol 101088

Table 7
Analyses of Representative
(500 g) Feed Samples
-Fresh Weight

| Sample Description | pDAB4468-416 Starter TSN032920 | pDAB4468-416 Grower TSN032920 | pDAB4468-416 Finisher TSN032920 |
|-----------------------------|--------------------------------------|-------------------------------------|---------------------------------------|
| Covance LIMS # | 00800151 | 00800152 | 00800153 |
| Minerals (ppm) | | | |
| Calcium | 11000 | 9690 | 9410 |
| Copper | 17.5 | 15.0 | 16.7 |
| Iron | 314 | 293 | 260 |
| Magnesium | 1610 | 1560 | 1440 |
| Manganese | 87.3 | 81.6 | 85.0 |
| Phosphorus | 7750 | 7240 | 6610 |
| Potassium | 10600 | 10500 | 9200 |
| Sodium | 2150 | 1970 | 2130 |
| Zinc | 105 | 106 | 107 |
| Trace Minerals (ppb) | | | |
| Cobalt | 267 | 231 | 225 |
| Chromium | 1490 | 1880 | 1380 |
| Molybdenum | 3810 | 3390 | 2850 |
| Selenium | 485 | 419 | 390 |
| Other inorganics | | | |
| Chloride (%) | 0.408 | 0.391 | 0.394 |
| Fluoride (ppm) | 39.3 | 38.9 | 31.5 |
| Iodine (ppm) | 1.66 | 1.61 | 1.48 |
| Sulfur (%) | 0.369 | 0.361 | 0.317 |

Covance 8223-016
DAS Protocol 101088

Table 7
Analyses of Representative
(500 g) Feed Samples
-Fresh Weight

| Sample Description | pDAB4468-416 Starter TSN032920 | pDAB4468-416 Grower TSN032920 | pDAB4468-416 Finisher TSN032920 |
|---------------------------|---|--|--|
| Covance LIMS # | 00800151 | 00800152 | 00800153 |
| Amino Acids (mg/g) | | | |
| Aspartic Acid | 24.7 | 22.9 | 20.4 |
| Threonine | 9.58 | 8.99 | 7.96 |
| Serine | 12.3 | 11.5 | 10.4 |
| Glutamic Acid | 41.4 | 38.7 | 35.2 |
| Proline | 13.3 | 12.5 | 11.6 |
| Glycine | 10.1 | 9.39 | 8.53 |
| Alanine | 11.4 | 10.9 | 10.1 |
| Cystine | 3.41 | 3.14 | 3.00 |
| Valine | 11.7 | 10.8 | 9.89 |
| Methionine | 6.28 | 6.22 | 5.51 |
| Isoleucine | 10.8 | 9.85 | 9.01 |
| Leucine | 19.6 | 18.5 | 17.3 |
| Tyrosine | 8.81 | 8.21 | 7.60 |
| Phenylalanine | 11.9 | 11.4 | 10.1 |
| Lysine | 12.8 | 11.7 | 10.4 |
| Histidine | 6.22 | 5.84 | 5.34 |
| Arginine | 15.9 | 14.8 | 13.3 |
| Tryptophan | 3.25 | 3.00 | 2.69 |

Covance 8223-016
DAS Protocol 101088

Table 7
Analyses of Representative
(500 g) Feed Samples
-Fresh Weight

| Sample Description | pDAB4468-416 Starter TSN032920 | pDAB4468-416 Grower TSN032920 | pDAB4468-416 Finisher TSN032920 |
|---------------------------------------|---|--|--|
| Covance LIMS # | 00800151 | 00800152 | 00800153 |
| Mycotoxin Screen¹ | | | |
| Alfatoxin B1 (ppb) | <1.0 | <1.0 | <1.0 |
| Alfatoxin B2 (ppb) | <1.0 | <1.0 | <1.0 |
| Alfatoxin G1 (ppb) | <1.0 | <1.0 | <1.0 |
| Alfatoxin G2 (ppb) | <1.0 | <1.0 | <1.0 |
| Zearalenone (ppb) | <100 | <100 | <100 |
| Fumonisin B1 (ppm) | 0.3 | 0.3 | 0.3 |
| Fumonisin B2 (ppm) | <0.1 | <0.1 | <0.1 |
| Fumonisin B3 (ppm) | <0.1 | <0.1 | <0.1 |
| Deoxynivalenol (ppm) | 0.2 | 0.1 | 0.2 |
| 3-Acetyl DON (ppm) | <0.1 | <0.1 | <0.1 |
| 15-Acetyl DON (ppm) | <0.1 | <0.1 | <0.1 |
| T-2 Toxin (ppm) | <0.1 | <0.1 | <0.1 |
| Ergot Screen (ppb)¹ | | | |
| Ergosine | <5 | <5 | <5 |
| Ergotamine | <5 | <5 | <5 |
| Ergocornine | <5 | <5 | <5 |
| Ergocryptine | <5 | <5 | <5 |
| Ergocristine | <5 | <5 | <5 |
| Cyclopiazonic Acid (ppm) ¹ | <0.5 | <0.5 | <0.5 |
| Oosporein Screen (ppm) ¹ | <2 | <2 | <2 |
| Moniliformin (ppm) ¹ | <0.2 | <0.2 | <0.2 |

DON = Deoxynivalenol

ND = Not detected

¹Assays performed in non-GLP facility

Covance 8223-016
DAS Protocol 101088

Table 7
Analyses of Representative
(500 g) Feed Samples
-Fresh Weight

| Sample Description | pDAB4468-416 Starter TSN032920 | pDAB4468-416 Grower TSN032920 | pDAB4468-416 Finisher TSN032920 |
|---|--------------------------------------|-------------------------------------|---------------------------------------|
| Covance LIMS # | 00800151 | 00800152 | 00800153 |
| Organochlorinated Screen (ppb) | | | |
| HCB | < 6.50 | < 6.50 | < 6.50 |
| Alpha-BHC | < 12.5 | < 12.5 | < 12.5 |
| Lindane (Gamma-BHC) | < 12.5 | < 12.5 | < 12.5 |
| Beta-BHC | < 12.5 | < 12.5 | < 12.5 |
| Heptachlor | < 12.5 | < 12.5 | < 12.5 |
| Delta-BHC | < 12.5 | < 12.5 | < 12.5 |
| Aldrin | < 12.5 | < 12.5 | < 12.5 |
| Heptachlor Epoxide | < 12.5 | < 12.5 | < 12.5 |
| Dieldrin | < 12.5 | < 12.5 | < 12.5 |
| p,p'-DDE | < 12.5 | < 12.5 | < 12.5 |
| Endrin | < 18.5 | < 18.5 | < 18.5 |
| p,p'-DDD | < 18.5 | < 18.5 | < 18.5 |
| p,p'-DDT | < 25.0 | < 25.0 | < 25.0 |
| Mirex | < 12.5 | < 12.5 | < 12.5 |
| Methoxychlor | < 31.5 | < 31.5 | < 31.5 |
| PCB (Arochlor 1254) | < 250 | < 250 | < 250 |
| Tech Chlordane | < 50.0 | < 50.0 | < 50.0 |
| Thiodan (total of endosulfan II, and endosulfan sulfate) | < 37.0 | < 37.0 | < 37.0 |
| Organophosphate Screen (ppb) | | | |
| Thimet | < 20.0 | < 20.0 | < 20.0 |
| Diazinon | < 20.0 | < 20.0 | < 20.0 |
| Disulfaton | < 25.0 | < 25.0 | < 25.0 |
| Parathion-Methyl | < 25.0 | < 25.0 | < 25.0 |
| Malathion | < 20.0 | < 20.0 | < 20.0 |
| Parathion-Ethyl | < 30.0 | < 30.0 | < 30.0 |
| Ethion | < 20.0 | < 20.0 | < 20.0 |
| Trithion | < 30.0 | < 30.0 | < 30.0 |

DAS Protocol No.: 101088
 Covance Client Identification: 1002382
 Covance No.: 8223-016

Table 8
Analyses of Animal Feeds Collected at Initiation of Each Phase-Fresh Weight

| Sample Description | Phase I-Starter 20800821001 | Phase I-Starter 20800821002 | Phase I-Starter 20800821003 | Phase I-Starter 20800821004 | Phase I-Starter 20800821005 |
|-------------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Covance LIMS # | 01000305 | 01000306 | 01000307 | 01000308 | 01000309 |
| Proximate (%) | | | | | |
| Moisture | 9.59 | 9.43 | 9.72 | 9.30 | 9.35 |
| Protein | 23.4 | 24.0 | 22.5 | 25.2 | 23.0 |
| Total Fat | 6.84 | 6.79 | 6.88 | 6.87 | 6.64 |
| Ash | 6.20 | 6.23 | 6.23 | 6.02 | 6.25 |
| Carbohydrates | 54.0 | 53.6 | 54.7 | 52.6 | 54.8 |
| Calories [Gross Energy (kcal/100g)] | 371 | 372 | 371 | 373 | 371 |
| Dry Matter (%) | 90.4 | 90.6 | 90.3 | 90.7 | 90.7 |
| Rude Fiber (%) | 2.30 | 2.22 | 2.68 | 2.17 | 2.71 |
| Minerals (ppm) | | | | | |
| Calcium | 10700 | 11200 | 10500 | 10900 | 11200 |
| Phosphorous | 7580 | 8130 | 7430 | 7580 | 8250 |

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Table 8
Analyses of Animal Feeds Collected at Initiation of Each Phase-Fresh Weight

| | Phase 2- Grower | Phase 2- Grower | Phase 2- Grower | Phase 2- Grower | Phase 2- Grower |
|-------------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Sample Description | 20800821011 | 20800821012 | 20800821013 | 20800821014 | 20800821015 |
| Covance LIMS # | 01000310 | 01000311 | 01000312 | 01000313 | 01000314 |
| Proximate (%) | | | | | |
| Moisture | 9.70 | 9.97 | 9.74 | 9.26 | 9.41 |
| Protein | 21.9 | 23.4 | 21.9 | 23.7 | 22.2 |
| Total Fat | 7.21 | 6.71 | 6.43 | 6.81 | 6.91 |
| Ash | 5.53 | 5.73 | 6.03 | 5.49 | 5.98 |
| Carbohydrates | 55.7 | 54.2 | 55.9 | 54.7 | 55.5 |
| Calories [Gross Energy (kcal/100g)] | 375 | 371 | 369 | 375 | 373 |
| Dry Matter (%) | 90.3 | 90.0 | 90.3 | 90.7 | 90.6 |
| Crude Fiber (%) | 2.17 | 2.07 | 2.53 | 2.28 | 2.67 |
| Minerals (ppm) | | | | | |
| Calcium | 9870 | 9270 | 9180 | 8700 | 8980 |
| Phosphorous | 7250 | 7070 | 7200 | 6620 | 7170 |

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Table 8
Analyses of Animal Feeds Collected at Initiation of Each Phase-Fresh Weight

| | Phase 3- Finisher | Phase 3- Finisher | Phase 3- Finisher | Phase 3- Finisher | Phase 3- Finisher |
|-------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Sample Description | 20800821021 | 20800821022 | 20800821023 | 20800821024 | 20800821025 |
| Covance LIMS # | 01000315 | 01000316 | 01000317 | 01000318 | 01000319 |
| Proximate (%) | | | | | |
| Moisture | 10.1 | 9.75 | 10.1 | 9.57 | 9.73 |
| Protein | 20.4 | 21.5 | 19.7 | 20.8 | 19.6 |
| Total Fat | 6.82 | 6.73 | 6.44 | 7.10 | 6.92 |
| Ash | 5.31 | 5.41 | 5.43 | 5.41 | 5.06 |
| Carbohydrates | 57.4 | 56.6 | 58.3 | 57.1 | 58.7 |
| Calories [Gross Energy (kcal/100g)] | 373 | 373 | 370 | 376 | 375 |
| Dry Matter (%) | 89.9 | 90.3 | 89.9 | 90.4 | 90.3 |
| Crude Fiber (%) | 2.02 | 2.03 | 2.32 | 2.12 | 2.34 |
| Minerals (ppm) | | | | | |
| Calcium | 8510 | 9320 | 9060 | 9360 | 9150 |
| Phosphorous | 6470 | 7220 | 7050 | 6670 | 6810 |

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APPENDIX A
Analytical Method Summaries and Reference Standards

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2-Furaldehyde (FURF)

The ground sample was extracted with 4% trichloroacetic acid and injected directly on a high-performance liquid chromatography system for quantitation of free furfurals by ultraviolet detection. The limit of quantitation was calculated as 0.500 ppm on a fresh weight basis.

Reference Standard:

ACROS 2-Furaldehyde, 99.2%, Lot Number A0269245

Reference:

Albala-Hurtado S., Veciana-Nogues, M. T., Izquierdo-Pulido, M., and Vidal-Carou, M. C., "Determination of Free and Total Furfural Compounds In Infant Milk Formulas By High-Performance Liquid Chromatography," *Journal of Agricultural and Food Chemistry*, 45:2128-2133, (1997).

Acid Detergent Fiber (ADFA) using Ankom

The ANKOM2000 Fiber Analyzer automated the process of removal of proteins, carbohydrates, and ash. Fats and pigments were removed with an acetone wash prior to analysis. The fibrous residue that was primarily cellulose and lignin and insoluble protein complexes remained in the Ankom filter bag, and was determined gravimetrically. The limit of quantitation was calculated as 0.100% on a fresh weight basis.

References:

Forage and Fiber Analyses, Agriculture Handbook No.379, United States Department of Agriculture, Washington, D.C. (1970).

Komarek, A. R., Robertson J. B., and Van Soest, P. J., "A Comparison of Methods for Determining ADF Using the Filter Bag Technique versus Conventional Filtration," *Journal of Dairy Science* Vol. 77 Supplement 1 (1993).

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Amino Acid Composition (TALC/TPLC)

Total aspartic acid (including asparagine)

Total threonine

Total serine

Total glutamic acid (including glutamine)

Total proline

Total glycine

Total alanine

Total valine

Total isoleucine

Total leucine

Total tyrosine

Total phenylalanine

Total histidine

Total lysine

Total arginine

Total tryptophan

Total methionine

Total cystine (including cysteine)

The samples are hydrolyzed in 6N hydrochloric acid for 24 hours at approximately 110°C. Phenol was added to the 6N hydrochloric acid to prevent halogenation of tyrosine. Cystine and cysteine are converted to S-2-carboxyethylthiocysteine by the addition of dithiodipropionic acid. Tryptophan was hydrolyzed from proteins by heating at approximately 110°C in 4.2N sodium hydroxide for 20 hours.

The samples are analyzed by HPLC after pre-injection derivatization. The primary amino acids are derivatized with o-phthalaldehyde (OPA) and the secondary amino acids are derivatized with fluorenylmethyl chloroformate (FMOC) before injection. The limit of quantitation for this study was calculated as 0.100 mg/g on a fresh weight basis.

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Reference Standards:

| Component | Manufacturer | Lot Number | Purity(%) |
|---|---------------|------------|-----------|
| L-Alanine | Fluka | 1388605 | 99.8 |
| L-Arginine Monohydrochloride | Fluka | 1361811 | 100.0 |
| L-Aspartic Acid | Fluka | 1337624 | 99.9 |
| L-Cystine | Fluka | 1386158 | 100.1 |
| L-Glutamic Acid | Fluka | 1423805 | 100.2 |
| Glycine | Fluka | 1119375 | 100.0 |
| L-Histidine Monohydrochloride Monohydrate | Fluka | 1388486 | 99.9 |
| L-Isoleucine | Fluka | 1423806 | 100.0 |
| L-Leucine | Fluka | 028K0027 | 100 |
| L-Lysine Monohydrochloride | Fluka | 1362380 | 100.2 |
| L-Methionine | Fluka | 1423807 | 99.9 |
| L-Phenylalanine | Fluka | 048K0662 | >99 |
| L-Proline | Fluka | 1414414 | 99.7 |
| L-Serine | Fluka | 1336081 | 99.9 |
| L-Threonine | Fluka | 1234249 | 100.0 |
| L-Tryptophan | Sigma-Aldrich | 097K0119 | 100 |
| L-Tyrosine | Fluka | 1419640 | 100 |
| L-Valine | Fluka | 1352709 | 100.0 |

References:

R. Schuster "Determination of Amino Acids in Biological, Pharmaceutical, Plant and Food Samples by Automated Precolumn Derivatization and HPLC", J. Chromatogr., 1988, 431, 271-284.

Henderson, J.W., Ricker, R.D., Bidlingmeyer, B.A., Woodward, C., "Rapid, Accurate, Sensitive, and Reproducible HPLC Analysis of Amino Acids, Amino Acid Analysis Using Zorbax Eclipse-AAA columns and the Agilent 1100 HPLC," Agilent Publication, 2000.

Barkholt and Jensen, "Amino Acid Analysis: Determination of Cysteine plus Half-Cystine in Proteins after Hydrochloric Acid Hydrolysis with a Disulfide Compound as Additive," Analytical Biochemistry, 1989, 177, 318-322.

AOAC International, AOAC Official Method 988.15. Tryptophan in Foods and Food and Feed Ingredients.

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Ash (ASHM)

The sample was placed in an electric furnace at 550°C and ignited. The nonvolatile matter remaining was quantitated gravimetrically and calculated to determine percent ash. The limit of quantitation was calculated as 0.100% on a fresh weight basis.

Reference:

Official Methods of Analysis of AOAC INTERNATIONAL, 18th Ed., Method 923.03, AOAC INTERNATIONAL: Gaithersburg, Maryland, (2005).

Beta Carotene (BCLC)

The samples were saponified and extracted with hexane. The samples were then injected on a reverse phase high-performance liquid chromatography system with ultraviolet light detection. Quantitation was achieved with a linear regression analysis. The limit of quantitation was calculated as 0.0200 mg/100g on a fresh weight basis.

Reference Standard:

Sigma, Beta Carotene, 100%, Lot Number 079K1729

References:

Official Methods of Analysis of AOAC INTERNATIONAL, 18th Ed., Method 941.15, AOAC INTERNATIONAL: Gaithersburg, Maryland, (2005).

Quackenbush, F. W., Reverse Phase HPLC Separation of cis- and trans-Carotenoids and it's Application to Beta Carotenes in Food Materials," *Journal of Liquid Chromatography*, 10: 643-653 (1987).

Biotin (BIOM)

The sample was diluted with water or extracted with dilute sulfuric acid (H₂SO₄). The amount of d-biotin was determined by comparing the growth response of the sample, using the bacteria *Lactobacillus plantarum*, with the growth response of a biotin standard. This response was measured turbidimetrically. The limit of quantitation for biotin was 0.005 µg/g on a fresh weight basis.

Reference Standard:

USP, Biotin, 99.3%, Lot Number 10D114

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References:

Wright & Skeggs, *Procedures of the Society of Experimental Biology and Medicine*, 56:95 (1944). (Modified)

Schiner & Deritter, "Biotin Content of Feed Stuffs," *Journal of Agricultural and Food Chemistry*, 23:1157-1162, (1975). (Modified)

Methods of Analysis for Infant Formulas, Infant Formula Council, (1985). (Modified)

Calories (CALC)

Calories were calculated using the Atwater factors with the fresh weight-derived data and the following equation:

$$\text{calories (Kcal/100g)} = (4 \times \% \text{ protein}) + (9 \times \% \text{ fat}) + (4 \times \% \text{ carbohydrates})$$

The limit of quantitation was calculated as 2.00 Kcalories/100g on a fresh weight basis.

Reference:

Code of Federal Regulation, Title 21, Part 101.9, pp. 24-25.

Carbohydrate (CHO)

The total carbohydrate level was calculated by difference using the fresh weight-derived data and the following equation:

$$\% \text{ carbohydrates} = 100 \% - (\% \text{ protein} + \% \text{ fat} + \% \text{ moisture} + \% \text{ ash})$$

The limit of quantitation was calculated as 0.100% on a fresh weight basis.

Reference:

United States Department of Agriculture, "Energy Value of Foods", *Agriculture Handbook No. 74*, pp. 2-11, (1973).

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Choline (COL4)

The product was hydrolyzed at 70° C to release most of the bound choline. Following pH adjustment, residual choline phospholipids are cleaved with phospholipase D and free choline was subjected to choline oxidase with liberation of peroxide. In the presence of peroxidase, phenol was oxidized and a quinoneimine chromophore was formed with 4-aminoantipyrine. Absorbance was measured and choline content calculated by interpolation from a multilevel calibration. Choline was reported as free choline. The limit of quantitation was calculated as 6.91 mg/100g on a fresh weight basis.

Reference Standard:

Sigma, Choline dihydrogen citrate salt, 100%, Lot Number 019K1041

Reference:

Official Methods of Analysis of AOAC INTERNATIONAL (2005) 18th Ed., AOAC INTERNATIONAL, Gaithersburg, MD, USA, Official Method 999.14.

Chloride (CL)

The samples were put into solution with double-deionized water and then made acidic with nitric acid. Chloride was determined potentiometrically by titrating with a standard silver nitrate solution to a predetermined endpoint. The limit of quantitation was calculated as 0.004% on a fresh weight basis.

Reference Standard:

Fisher Scientific, Sodium chloride, 99.9% purity, Lot Number 097128

References:

Official Methods of Analysis of AOAC INTERNATIONAL, Current Ed., Methods 963.05, 971.27, and 986.26, AOAC INTERNATIONAL, Gaithersburg, MD, USA.

Crude Fiber (CFIB)

Crude fiber was quantitated as the loss on ignition of dried residue remaining after digestion of the sample with 1.25% sulfuric acid and 1.25% sodium hydroxide solutions under specific conditions. The limit of quantitation was calculated as 0.100% on a fresh weight basis.

References:

Official Methods of Analysis of AOAC INTERNATIONAL, 17th Ed., Method 962.09, AOAC INTERNATIONAL: Gaithersburg, Maryland.

Official Methods and Practices of the American Oil Chemists' Society 5th Edition, AOCS Method Ba 6a-05, American Oil Chemists' Society, IL (2006).

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Fatty Acids (FAPM)

The lipid was extracted and saponified with 0.5N sodium hydroxide in methanol. The saponification mixture was methylated with 14% boron trifluoride in methanol. The resulting methyl esters were extracted with heptane containing an internal standard. The methyl esters of the fatty acids were analyzed by gas chromatography using external standards for quantitation. The limit of quantitation was calculated as 0.0400% on a fresh weight basis.

Reference Standards:

| Component | Lot Number | Component | Weight (%) | Purity (%) |
|--|--------------|---------------------------------|----------------|------------|
| Nu-Chek Prep GLC Reference Standard Hazelton No. 1 | MA30-U | Methyl Octanoate | 16.66 | 99.6 |
| | | Methyl Decanoate | 16.66 | 99.5 |
| | | Methyl Laurate | 16.66 | 99.8 |
| | | Methyl Myristate | 16.66 | 99.8 |
| | | Methyl Palmitoleate | 16.66 | 99.7 |
| | | Methyl Linolenate | 16.66 | 99.4 |
| Nu-Chek Prep GLC Reference Standard Hazelton No. 2 | AU24-T | Methyl Arachidate | 33.33 | 99.6 |
| | | Methyl 11-Eicosenoate | 33.33 | 99.5 |
| | | Methyl Arachidonate | 33.33 | 99.6 |
| Nu-Chek Prep GLC Reference Standard Hazelton No. 3 | JY17-T | Methyl Myristoleate | 12.5 | 99.6 |
| | | Methyl Pentadecanoate | 12.5 | 99.6 |
| | | Methyl 10-Pentadecenoate | 12.5 | 99.5 |
| | | Methyl Heptadecanoate | 12.5 | 99.7 |
| | | Methyl 10-Heptadecenoate | 12.5 | 99.6 |
| | | Methyl 11-14 Eicosadienoate | 12.5 | 99.6 |
| | | Methyl Behenate | 12.5 | 99.8 |
| Nu-Chek Prep GLC Reference Standard Hazelton No. 4 | MA30-U | Methyl 11-14-17 Eicosatrienoate | 12.5 | 99.5 |
| | | Methyl Palmitate | 27.0 | 99.6 |
| | | Methyl Stearate | 19.0 | 99.5 |
| | | Methyl Oleate | 27.0 | 99.8 |
| Nu-Chek Prep Methyl Gamma Linolenate | U-63M-08-T | Methyl Linoleate | 27.0 | 99.8 |
| Nu-Chek Prep Methyl Tridecanoate | N-13M-MA25-T | Not applicable | Not applicable | >99 |
| | | Not applicable | Not applicable | >99 |

References:

Official Methods and Recommended Practices of the AOCS, Official methods Ce 2-66, Ce 1e-91 (1997), and Ce 1k-07 (2007), The American Oil Chemists' Society, Champaign, IL.

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Fat by Soxhlet Extraction (FSOX)

The sample was weighed into a cellulose thimble containing sodium sulfate and dried to remove excess moisture. Pentane was dripped through the sample to remove the fat. The extract was then evaporated, dried, and weighed. The limit of quantitation was calculated as 0.100% on a fresh weight basis.

Reference:

Official Methods of Analysis of AOAC INTERNATIONAL, 18th Ed., Methods 960.39 and 948.22, AOAC INTERNATIONAL: Gaithersburg, Maryland, (2005).

Fluoride (FLUR)

The sample was weighed into a platinum dish along with a small amount of calcium hydroxide and phenolphthalein to ensure the sample was alkaline. The sample was mixed with double-deionized water to form a slurry. It was then dried on a hot plate, and ashed for at least 4 hours at 550°C in a muffle furnace. The ashed portion was then transferred into a distillation apparatus where the fluoride was steam distilled with perchloric acid. Fluoride levels were then determined titrimetrically. The limit of quantitation was calculated as 0.20 ppm on a fresh weight basis.

Reference Standard:

Sigma, Sodium fluoride, 99.996%, Lot Number 13108TI

Reference:

Official Methods of Analysis of AOAC INTERNATIONAL(2005) 18th Ed., AOAC INTERNATIONAL, Gaithersburg, MD, USA, Official Method 944.08. (Modified)

Folic acid (FOAN)

The sample was hydrolyzed in a potassium phosphate buffer with the addition of ascorbic acid to protect the folic acid during autoclaving. Following hydrolysis by autoclaving, the sample was treated with a chicken-pancreas enzyme and incubated approximately 18 hours to liberate the bound folic acid. The amount of folic acid was determined by comparing the growth response of the sample, using the bacteria *Lactobacillus casei*, with the growth response of a folic acid standard. This response was measured turbidimetrically. The limit of quantitation was calculated as 0.0600 µg/g on a fresh weight basis.

Reference Standard:

USP, Folic acid, 98.9%, Lot Number Q0G151

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References:

Official Methods of Analysis of AOAC INTERNATIONAL, 18th Ed., Method 992.05 and 960.46, AOAC INTERNATIONAL, Gaithersburg, Maryland, (2005).

Methods of Analysis for Infant Formulas, Infant Formula Council, Atlanta, Georgia, Section C-2, (1985).

ICP Emission Spectrometry (ICPS)

The sample was dried, precharred, and ashed overnight in a muffle set to maintain 500°C. The ashed sample was re-ashed with nitric acid, treated with hydrochloric acid, taken to dryness, and put into a solution of 5% hydrochloric acid. The amount of each element was determined at appropriate wavelengths by comparing the emission of the unknown sample, measured on the inductively coupled plasma spectrometer, with the emission of the standard solutions. The following limits of quantitation were calculated on a fresh weight basis:

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Reference Standards and Limits of Quantitation:

| Mineral | Lot Numbers | Manufacturer | Concentration (µg/ml) | Limit of Quantitation (ppm) |
|------------|-------------------------------------|--------------------|-------------------------------|-----------------------------|
| Calcium | D2-MEB322092MCA, D2-MEB322094 | Inorganic Ventures | 200.00, 1000.00 | 20.0 |
| | D2-MEB329109MCA, D2-MEB329111 | | 200.00, 1000.00 | |
| Copper | D2-MEB322092MCA, D2-MEB322093MCA | Inorganic Ventures | 2.00, 10.00 | 0.500 |
| | D2-MEB329109MCA, D2-MEB329110MCA | | 2.00, 10.00 | |
| Iron | D2-MEB322092MCA, D2-MEB322095 | Inorganic Ventures | 10.00, 50.00 | 2.00 |
| | D2-MEB329109MCA, D2-MEB329112 | | 10.00, 50.00 | |
| Magnesium | D2-MEB322092MCA, D2-MEB322093MCA | Inorganic Ventures | 50.00, 250.00 | 20.0 |
| | D2-MEB329109MCA, D2-MEB329110MCA | | 50.00, 250.00 | |
| Manganese | D2-MEB322092MCA, D2-MEB322093MCA | Inorganic Ventures | 2.00, 10.00 | 0.300 |
| | D2-MEB329109MCA, D2-MEB329110MCA | | 2.00, 10.00 | |
| Phosphorus | D2-MEB322092MCA, D2-MEB322094 | Inorganic Ventures | 200.00, 1000.00 | 20.0 |
| | D2-MEB329109MCA, D2-MEB329111 | | 200.00, 1000.00 | |
| Potassium | D2-MEB322092MCA, D2-MEB322094 | Inorganic Ventures | 200.00, 1000.00 | 100 |
| | D2-MEB329109MCA, D2-MEB329111 | | 200.00, 1000.00 | |
| | AC11-228K | SPEX | 10000 (diluted to 1500 µg/mL) | |
| Sodium | D2-MEB322092MCA, D2-MEB322094 | Inorganic Ventures | 200.00, 1000.00 | 100 |
| | D2-MEB329109MCA, D2-MEB329111 | | 200.00, 1000.00 | |
| Zinc | D2-MEB322092MCA, D2-MEB322093MCA | Inorganic Ventures | 10.00, 50.00 | 0.400 |
| | D2-MEB329109MCA, D2-MEB329110MCA | | 10.00, 50.00 | |

References:

Official Methods of Analysis of AOAC INTERNATIONAL, 18th Ed., Methods 984.27 and 985.01, AOAC INTERNATIONAL: Gaithersburg, Maryland, (2005).

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ICP-Mass Spectrometry (MSI/MSX)

The sample was wet-ashed with nitric acid using microwave digestion. Using inductively coupled plasma mass spectrometry, the amount of each element was determined by comparing the counts generated by the unknowns to those generated by standard solutions of known concentrations. The following limits of quantitation were calculated on a fresh weight basis:

Spex CertiPrep Reference Standards and Limits of Quantitation:

| Mineral | Lot Numbers | Purity | Limit of Quantitation |
|------------|-------------|-----------|-----------------------|
| Mercury | CL4-120HG | 10 mg/L | 10.0 ppb |
| Sulfur | 15-118S | 1000 mg/L | 10.0 ppm |
| Arsenic | 15-120JB | 100 mg/L | 10.0 ppb |
| Cadmium | 15-120JB | 100 mg/L | 10.0 ppb |
| Cobalt | 15-120JB | 100 mg/L | 10.0 ppb |
| Chromium | 15-120JB | 100 mg/L | 10.0 ppb |
| Lead | 15-120JB | 100 mg/L | 10.0 ppb |
| Selenium | 15-120JB | 100 mg/L | 50.0 ppb |
| Molybdenum | 15-120JB | 100 mg/L | 10.0 ppb |

Note: Instrument calibration standard 2 was manufactured by Spex, 100 mg/L purity, Lot Number 15-120JB.

Reference:

Official Methods of Analysis of AOAC INTERNATIONAL, 18th Ed., Method 993.14, AOAC INTERNATIONAL: Gaithersburg, Maryland, (2005).

Iodine (IOL)

The sample was digested with a combination of alcoholic potassium hydroxide, sodium carbonate, and alcoholic magnesium nitrate, whereby the iodide was converted to potassium iodide. In the case of organic iodides, the conversion was the result of a dehydrohalogenation reaction. After preliminary charring on a hot plate with heat lamps, the sample was placed in a muffle set for 90 minutes to complete the combustion of organic material. The iodide was then extracted from the ash with hot water and filtered. The analysis was completed by colorimetrically measuring the extent of the reaction between arsenic and cerium as catalyzed by the presence of iodide. The greater the amount of iodide present, the greater the rate of reaction as determined by the difference in absorbance for a 15-minute interval. The results are reported on fresh weight basis. The limit of quantitation was calculated as 0.500 ppm on a fresh weight basis.

Reference Standard:

Fisher, Potassium Iodide, 100.1%, Lot Number 090445

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References:

Official Methods of Analysis of AOAC INTERNATIONAL, 18th Ed., Method 932.21, AOAC INTERNATIONAL: Gaithersburg, Maryland, (2005).

Binnerts, W. T., "Determination of Iodine in Milk", *Analytica Chimica Acta*, 10:78-80, (1954).

Heerspink, W., Op Deweeagh, G. J., *Clinica Chimica Acta*, 39:327-338, (1972).

Isoflavones (ASOF)

The samples were extracted at approximately 65°C with a 80/20 methanol:water solution and the extracts were saponified with dilute NaOH solution. The extracts were then acidified, filtered, and diluted. The samples were analyzed on a high-performance liquid chromatography system with ultraviolet spectrophotometric detection and were compared against an external standard curve. The limit of quantitation was calculated as 10.0 ppm (µg/g) for each component on a fresh weight basis.

Reference Standards:

Chromadex, Daidzein, 97.5%, Lot Number: 00004007-121

Chromadex, Glycitein, 96.3%, Lot Number: 07344-571

Indofine, Genistein, 99.35%, Lot Number: 0604043

Indofine, Daidzin, 96%, Lot Number: C1803

Indofine, Glycitin, 98+%, Lot Number: 0310179

Indofine, Genistin, >99%, Lot Number: 0701006

Reference:

Official Methods of Analysis of AOAC INTERNATIONAL, 18th Ed., Official Methods 2001.10, AOAC INTERNATIONAL: Gaithersburg, Maryland, (2005).

Lectin (LECT)

The sample was suspended in phosphate buffered saline (PBS), shaken, and filtered. An aliquot of the resulting extract was serially diluted in 10 cuvettes containing PBS. A 10% hematocrit of lyophilized rabbit blood in PBS was added to each dilution. After 2.5 hours, the absorbance of each dilution of the sample and lectin control was measured on a spectrophotometer at 620 nm, using PBS to zero the instrument. One hemagglutinating unit (H.U.) was defined as the level that caused 50% of the standard cell suspension to sediment in 2.5 hours. The limit of quantitation was calculated as 0.10 H.U./mg based on a 2 g equivalent sample on a fresh weight basis.

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References:

Klurfeld, D. M. and Kritchevsky, D., "Isolation and Quantitation of Lectins from Vegetable Oils," *Lipids*, 22:667-668, (1987).

Liener, I. E., "The Photometric Determination of the Hemagglutinating Activity of Soyin and Crude Soybean Extracts," *Archives of Biochemistry and Biophysics*, 54:223-231, (1955).

Moisture (M100)

The sample was dried in a vacuum oven at approximately 100°C. The moisture weight loss was determined and converted to percent moisture. The limit of quantitation was calculated as 0.100% on a fresh weight basis.

References:

Official Methods of Analysis of AOAC INTERNATIONAL, Current Ed., Methods 926.08 and 925.09, AOAC INTERNATIONAL: Gaithersburg, Maryland.

Neutral Detergent Fiber, Ankom Method (NDFa)

The ANKOM2000 Fiber Analyzer automated the process of the removal of protein, carbohydrate, and ash. Fats and pigments were removed with an acetone wash prior to analysis. Hemicellulose, cellulose, lignin and insoluble protein fraction was left in the filter bag and determined gravimetrically. The limit of quantitation was calculated as 0.100% on a fresh weight basis.

References:

Approved Methods of the American Association of Cereal Chemists, 9th Ed., Method 32.20, (1998).

Forage and Fiber Analyses, Agriculture Handbook No. 379, United States Department of Agriculture, (1970).

Komarek, A. R., Robertson, J. B., and Van Soest, P. J., "Comparison of the Filter Bag Technique to Conventional Filtration in the Van Soest NDF Analysis of 21 Feeds," Presented at National Conference on Forage Quality, Evaluation and Utilization Proceedings (University of Nebraska) (1994).

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Covance No.: 8223-016

Niacin (NIAP)

The sample was hydrolyzed with sulfuric acid and the pH was adjusted to remove interferences. The amount of niacin was determined by comparing the growth response of the sample, using the bacteria *Lactobacillus plantarum*, with the growth response of a niacin standard. This response was measured turbidimetrically. The limit of quantitation was calculated as 0.300 µg/g on a fresh weight basis.

Reference Standard:

USP, Niacin, 99.8%, Lot Number 10E295

References:

Official Methods of Analysis of AOAC INTERNATIONAL, 18th Ed., Methods 944.13, 960.46. AOAC INTERNATIONAL: Gaithersburg, Maryland, (2005).

Organophosphates and Chlorinated Insecticides (OPCL)

The sample was extracted with ethyl acetate, concentrated, and cleaned up with gel permeation chromatography. For organophosphate insecticides, the sample was injected on a gas chromatography (GC) system. Florisil column chromatography was used to clean up the chlorinated insecticides. The sample was concentrated and injected on a GC system. The limits of quantitation are equal to the reported less than values and were calculated on a fresh weight basis.

Reference Standards:

Restek Corporation Organochlorine Pesticide Mix, 97-99%, Lot Number A049024

Restek Corporation Organophosphorus Pesticides Mix, 89-99%, Lot
Number A049015

Chemservice, Technical Chlordane, mix of isomers (no actual purity), Lot Number
409-120A

Chemservice, Arochlor 1254, mix of isomers (no actual purity), Lot Number 408-1A

References:

Pesticide Analytical Manual, Volume 1: Multiresidue Methods, 3rd Ed., Chapter 3, "Multiclass Multiresidue Methods: 304 Method for Fatty Foods", Food and Drug Administration, (1999).

Hopper, M. L. and Griffitt, K. R., "Evaluation of an Automated Permeation Cleanup and Evaporation Systems for Determining Pesticides Residues in Fatty Samples," *Journal of the Association of Official Analytical Chemists*, 70(4):724-726, (1987).

DAS Protocol No.: 101088
Covance Client Identification: 1002382
Covance No.: 8223-016

p-Coumaric Acid and Ferulic Acid (ACID)

The ground sample was extracted with methanol followed by alkaline hydrolysis and buffering prior to injection on an analytical high-performance liquid chromatography (HPLC) system for quantification of p-coumaric acid and ferulic acid by ultra violet (UV) detection. The limit of quantitation for the p-coumaric acid and ferulic acid assays was calculated as 16.7 ppm on a fresh weight basis.

Reference Standards:

ACROS p-Hydroxycinnamic Acid (p-Coumaric Acid), 99.4%, Lot Number A0236839
ACROS 4-Hydroxy-3-methoxycinnamic Acid (Ferulic Acid), 99.4%, Lot Number A0261354

References:

Hagerman, A. E. and Nicholson, R. L., "High-Performance Liquid Chromatographic Determination of Hydroxycinnamic Acids in Maize Mesocotyl," *Journal of Agricultural and Food Chemistry*, 30 (No. 6):1098-1102, (1982).

Covance 2100-924, "Analytical Method Validation of Ferulic Acid, p-Coumaric Acid, Sinapic Acid, and Caffeic Acid in Canola Seed and Corn Grain."

Pantothenic Acid (PANN)

The sample was diluted with water or treated with an enzyme mixture to liberate the pantothenic acid from coenzyme A and the pH was adjusted to remove interferences. The amount of pantothenic acid was determined by comparing the growth response of the sample, using the bacteria *Lactobacillus plantarum*, with the growth response of a calcium pantothenate standard. This growth response was measured turbidimetrically. The limit of quantitation was calculated as 0.4 µg/g on a fresh weight basis.

Reference Standard:

USP, Pantothenic Acid, 99.0%, Lot Number O1H081

References:

Official Methods of Analysis of AOAC INTERNATIONAL, 18th Ed., Methods 945.74 and 960.46, AOAC INTERNATIONAL: Gaithersburg, Maryland, (2005).

Phytic Acid (PHYT)

The sample was extracted using 0.5M HCl with ultrasonication. Purification and concentration were accomplished on a silica-based anion-exchange column. The sample was analyzed on a polymer high-performance liquid chromatography column PRP-1, 5µm (150 x 4.1mm) with a refractive index detector. The limit of quantitation was calculated as 0.100% on a fresh weight basis.

DAS Protocol No.: 101088
Covance Client Identification: 1002382
Covance No.: 8223-016

Reference Standard:

Sigma-Aldrich, Phytic Acid Sodium Salt Hydrate, 96%, Lot Number 089K0159

References:

Lehrfeld, Jacob, "HPLC Separation and Quantitation of Phytic Acid and Some Inositol Phosphates in Foods: Problem and Solutions," *Journal of Agricultural and Food Chemistry*, 42:2726-2731, (1994).

Lehrfeld, Jacob, "High-Performance Liquid Chromatography Analysis of Phytic Acid on a pH-Stable, Macroporous Polymer Column," *Cereal Chemistry*, 66(6):510-515, (1989).

Protein (PGEN)

The protein and other organic nitrogen in the sample were converted to ammonia by digesting the sample with sulfuric acid containing a catalyst mixture. The acid digest was made alkaline. The ammonia was distilled and then titrated with a previously standardized acid. The percent nitrogen was calculated and converted to equivalent protein using the factor 6.25. The limit of quantitation was calculated as 0.100% on a fresh weight basis.

References:

Official Methods of Analysis of AOAC INTERNATIONAL, 18th Ed., Methods 955.04 and 979.09, AOAC INTERNATIONAL, Gaithersburg, Maryland, (2005).

Official Methods and Recommended Practices of the AOCS, 5th Edition, Method Ac 4-91, American Oil Chemists' Society: Champaign, Illinois.

Raffinose (SUGT)

Sugars in the sample were extracted with a 50:50 water:methanol solution. Aliquots were taken, dried under inert gas, and then reconstituted with a hydroxylamine hydrochloride solution in pyridine containing phenyl- β -D-glucopyranoside as the internal standard. The resulting oximes were converted to silyl derivatives by treatment with hexamethyldisilazane and trifluoroacetic acid treatment, and then analyzed by gas chromatography using a flame ionization detector. The limit of quantitation was calculated as 0.0500% on a fresh weight basis.

Reference Standards:

Sigma-Aldrich, D-(+)-Raffinose pentahydrate, 99%, Lot Number 037K1059

DAS Protocol No.: 101088
Covance Client Identification: 1002382
Covance No.: 8223-016

References:

Brobst, K. M., "Gas-Liquid Chromatography of Trimethylsilyl Derivatives," *Methods in Carbohydrate Chemistry*, Volume 6, Academic Press: New York, New York, (1972).

Mason, B. S., and Slover, H. T., "A Gas Chromatographic Method for the Determination of Sugars in Foods," *Journal of Agricultural and Food Chemistry*, 19(3):551-554, (1971).

Total Tocopherols (TTLC)

The product was saponified to break down any fat and release vitamin E. The saponified mixture was extracted with an organic solvent, dried down and brought to a suitable volume in hexane. The sample was then quantitated by high-performance liquid chromatography using a silica column. The limit of quantitation for this study was calculated as 0.500 mg/100g on a fresh weight basis.

Reference Standard:

USP, Alpha Tocopherol, 98.9%, Lot Number N0F068

Matreya, rac-beta Tocopherol, >98% (gas chromatography), Lot Number 22902

ACROS, D-gamma Tocopherol, 99.4%, Lot Number A0083534

Sigma-Aldrich, Delta Tocopherol, 95%, Lot Number 126K1307

References:

Speck, A. J., Schijver, J., and Schreurs, W. H. P., "Vitamin E Composition of Some Seed Oils as Determined by High-Performance Liquid Chromatography with Fluorometric Quantitation," *Journal of Food Science*, 50(1):121-124, (1985).

Cort, W. M., Vincente, T. S., Waysek, E. H., and Williams, B. D., "Vitamin E Content of Feedstuffs Determined by High-Performance Liquid Chromatographic Fluorescence," *Journal of Agricultural and Food Chemistry*, 31:1330-1333, (1983).

McMurray, C. H., Blanchflower, W. J., and Rice, D. A., "Influence of Extraction Techniques on Determination of α -Tocopherol in Animal Feedstuffs," *Journal of the Association of Official Analytical Chemists*, 63(6):1258-1261, (1980).

DAS Protocol No.: 101088
Covance Client Identification: 1002382
Covance No.: 8223-016

Trypsin Inhibitor (TRIP)

The sample was ground and defatted with petroleum ether. A sample of matrix was extracted with 0.01N sodium hydroxide. Varying aliquots of the sample suspension were exposed to a known amount of trypsin and benzoyl-DL-arginine-p-nitroanilide hydrochloride. The sample was allowed to react for 10 minutes at 37°C. After 10 minutes, the reaction was halted by the addition of acetic acid. The solution was centrifuged, then the absorbance was determined at 410 nm. Trypsin inhibitor activity was determined by photometrically measuring the inhibition of trypsin's reaction with benzoyl-DL-arginine-p-nitroanilide hydrochloride. The limit of quantitation was calculated as 1.00 Trypsin Inhibitor Units (TIU)/mg on a fresh weight basis.

References:

Official Methods and Recommended Practices of the American Oil Chemists' Society, 5th Ed., Method Ba 12-75, American Oil Chemists' Society: Champaign, Illinois, (1997).

Kakade et. al., "Determination of Trypsin Inhibitor Activity of Soy Products: A Collaborative Analysis of an Improved Procedure", *Cereal Chemistry*, Vol. 51, No. 3, pp 376-384 (1974).

Vitamin A (AFD1)

The sample was saponified to digest any lipids and convert all forms of vitamin A to retinol. The digest was extracted with an organic solvent. The vitamin A was quantitated directly as all-trans retinol and 13-cis retinol by HPLC. The limit of quantitation was calculated as 1.00 International Units (IU/g) on a fresh weight basis.

Reference Standard:

USP, Vitamin A, Lot Number: W0F126

Purity of Reference Standard: Each ampule contained about 0.5 g of a solution of Vitamin A Acetate in peanut oil. Each gram of oil contained 30.0 mg of Vitamin A Acetate consisting of approximately 95% all-trans retinyl acetate and 4% cis-retinyl acetate.

References:

Official Methods of Analysis of AOAC INTERNATIONAL, 18th Ed., Methods 974.29, 992.04, and 992.06, AOAC INTERNATIONAL: Gaithersburg, Maryland, (2005).

Thompson, J. N. and Duval, S., "Determination of Vitamin A in Milk and Infant Formula by HPLC," *Journal of Micronutrient Analysis*, 6:147-159, (1989).

DAS Protocol No.: 101088
Covance Client Identification: 1002382
Covance No.: 8223-016

Thiamine Hydrochloride (B1DE)

The sample was autoclaved under weak acid conditions to extract the thiamine. The resulting solution was incubated with a buffered enzyme solution to release any bound thiamine. The solution was purified on a cation-exchange column. An aliquot was reacted with potassium ferricyanide to convert thiamine to thiochrome. The thiochrome was extracted into isobutyl alcohol, measured on a fluorometer, and quantitated by comparison to a known standard. The results are reported as thiamine hydrochloride. The limit of quantitation was calculated as 0.010 mg/100g on a fresh weight basis.

Reference Standard:

USP, Thiamine hydrochloride, 99.8%, Lot Number 01F236

References:

Official Methods of Analysis of AOAC INTERNATIONAL, 18th Ed., Methods 942.23, 953.17, and 957.17, AOAC INTERNATIONAL: Gaithersburg, Maryland, (2005).

Pyridoxine Hydrochloride (B6A)

The sample was hydrolyzed with dilute sulfuric acid in the autoclave and the pH was adjusted to remove interferences. The amount of pyridoxine was determined by comparing the growth response of the sample, using the yeast *Saccharomyces cerevisiae*, with the growth response of a pyridoxine standard. The response was measured turbidimetrically. Results were reported as pyridoxine hydrochloride. The limit of quantitation was calculated as 0.0700 µg/g on a fresh weight basis.

Reference Standard:

USP, Pyridoxine hydrochloride, 99.8%, Lot Number: Q0G409

References:

Official Methods of Analysis of AOAC INTERNATIONAL, 18th Ed., Method 961.15, AOAC INTERNATIONAL: Gaithersburg, Maryland, (2005).

Atkins, L., Schultz, A. S., Williams, W. L., and Frey, C. N., "Yeast Microbiological Methods for Determination of Vitamins," *Industrial and Engineering Chemistry, Analytical Edition*, 15:141-144, (1943).

Vitamin B₁₂ (B12F)

Vitamin B₁₂ was extracted from the sample into a buffer by heating in an autoclave. Utilizing the bacteria *Lactobacillus delbrueckii*, the amount of vitamin B₁₂ was determined turbidimetrically by comparing the growth response of a sample against the growth response of a vitamin B₁₂ standard. The limit of quantitation was calculated as 0.00120 µg/g on a fresh weight basis.

DAS Protocol No.: 101088
Covance Client Identification: 1002382
Covance No.: 8223-016

Reference Standard:

USP, Cyanocobalamin, 1 mg dried standard equivalent to 10.4 µg, Lot Number: O0H288

References:

Official Methods of Analysis of AOAC INTERNATIONAL, 18th Ed., Methods 952.20 and 960.46, AOAC INTERNATIONAL: Gaithersburg, Maryland, (2005).

The United States Pharmacopeia, Twenty-Ninth Revision, pp. 603-4, United States Pharmacopeial Convention, Inc.: Rockville, Maryland, (2005).

Methods of Analysis for Infant Formulas, Infant Formula Council, Atlanta, Georgia, Section C-2, (1985).

Vitamin D3 (DFD1)

A sample was weighed and saponified to break down fat and release the vitamin D. The vitamin D was extracted from the digest with hexane. Interferences are removed from the extract by open column chromatography on aluminum oxide. The vitamin D was further isolated from interferences on a silica high-performance liquid chromatography (HPLC) column. The eluant fraction from the silica column containing the vitamin D was injected on a HPLC system. Vitamin D was determined by comparison with known standards. The limit of quantitation was calculated as 0.200 IU/g on a fresh weight basis

Reference Standard:

USP, Cholecalciferol, 99.8%, Lot Number: O0H413

Reference:

Official Methods of Analysis of AOAC INTERNATIONAL (2000) 17th Ed., AOAC INTERNATIONAL, Gaithersburg, MD, USA, Official Method 982.29.

DAS Protocol No.: 101088
Covance Client Identification: 1002382
Covance No.: 8223-016

APPENDIX B
Analytical Methods for Romer Labs, Inc. and Veterinary Medical Diagnostic
Laboratory

Notes: The Romer Labs, Inc. method for the quantitation of Zearalenone (CAM-000239-0) has an incorrect title and CAM number listed on page 2 of the method.

The Romer Labs, Inc. method for the quantitation of Type A and B Trichothecenes (CAM-000031-2) has an incorrect CAM number listed on page 2 of the method.

DAS Protocol No.: 101088
 Covance Client Identification: 1002382
 Covance No.: 8223-016



Aflatoxin B1, B2, G1, & G2 Analysis by HPLC using a Kobra Cell

Use a MycoSep®224 Afla, MycoSep®226 Afla+, or MycoSep®228 AflaPat clean-up column

CAN-000164-G

Application brief for corn, feeds, and complex sample matrices

Aspergillus flavus and *Aspergillus parasiticus* are the major fungi associated with production of aflatoxins. Warm temperatures with drought-like conditions cause grains to become more susceptible to aflatoxin formation. Corn, cottonseed, peanuts, and tree nuts are the main crops affected with aflatoxin. Aflatoxin can cause liver disease in animals and humans. They can cause a decrease in milk production and are immunosuppressive, carcinogenic, and mutagenic.

Extraction:

Solid: Extract 25 g ground sample^Q and QC sample^Q with 100 mL 84+16 acetonitrile-water. Shake for a minimum of 1 hour or blend for a minimum of 2 minutes.

Aqueous: Combine 4 mL of sample^Q with 21 mL acetonitrile. Vortex for a minimum of 1 minute.

Filter supernatant.

^QQC samples are naturally contaminated samples with a known concentration of the analyte which are treated as unknown samples as a check of the HPLC system.

Standard and Matrix Spike Preparation:

Standard: Prepare a diluted standard^Q. Transfer 100 µL of the prepared diluted standard into an autosampler vial. Add 440 µL of water. The final standard concentration is 40 µg/kg total Aflatoxin.

Spike: Add aflatoxin standard^Q to 25 g of ground sample prior to extraction. Treat as sample. Spike recovery of 100% equals 40 ppb total aflatoxin.

Clean-up & Purification:

Pipet approx. 5 mL of sample extract into 15 x 85 mm test tube. Push 500 µL of sample through the applicable column depending on the sample matrix.

Solid: Transfer 100 µL of purified extract into autosampler vial. Add 440 µL of water.

Aqueous: Transfer 156 µL of purified extraction into autosampler vial. Add 384 µL of water.

Inject onto HPLC system.

Method performance:

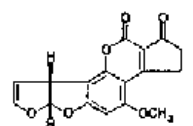
Limit of detection: 1.0 µg/kg aflatoxin B1, B2, G1, & G2 individually

Recovery rates and variability for Aflatoxin B1:

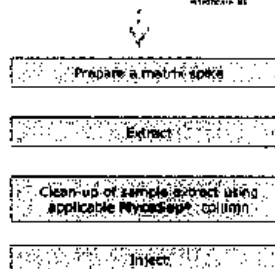
| Column Type | Average % Recovery | Average %RSD |
|-------------|--------------------|--------------|
| 224 | 106.9 | 1.9 |
| 226 | 104.8 | 2.5 |
| 228 | 97.6 | 3.8 |

References:

Journal of Chromatography A, 932 (2001) 153-157
 Journal of AOAC International Vol. 77, No. 6, 1994
 AOAC Official Method 994.06



Aflatoxin B1



Applicable commodities for the different columns:

MycoSep®224 Afla - grains

MycoSep®226 Afla+ - feeds, corn Syrup, oil

MycoSep®228 AflaPat - complex sample matrices such as silage, corn gluten by products, herbs, spices, and chocolate

For other applications:

www.romerlabs.com
 Or contact your local distributor

For standard information:

www.biopure.nl [biopure](http://www.biopure.nl)
 Or contact your local distributor

Additional information regarding components, calculations, and directions for making reagents and buffers is located on page 2.

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DAS Protocol No.: 101088
 Covance Client Identification: 1002382
 Covance No.: 8223-016



Aflatoxin B1, B2, G1, & G2 Analysis by HPLC using a Kobra Cell

Use a MycoSep®224 Afla, MycoSep®226 Afla+, or MycoSep®228 AflaPat clean-up column

CAN 900164-9

Required Components

Chemicals

- Acetonitrile
- Methanol
- Nitric Acid
- Potassium bromide
- Deionized water

Analytical Method System Parameters

- HPLC: RF-10AX fluorescence detector, SIL-10AXi autosampler and a LC-600 pump.
- Column: Brownlee, 4.6 mm x 10 cm, C-18
- Mobile phase: 5+1+1 water+ acetonitrile+ methanol. Add 100 µL nitric acid and 0.2 g potassium bromide to each liter of mobile phase for post column bromine derivatization with Kobra Cell.
- Flow Rate: 2.0 mL/min
- Injection volume: 100 µL
- Excitation: 360 nm
- Emission: 440 nm
- Kobra Cell: 200 uA
- Detection Limit: 1.0 ug/kg individually

Equipment*

- Romer Series IX MH (Order #: EQMMR2010(110V) & EQMMR2015(220V))
- Romer HAS MH (Order #: EQMMR1010 (110V) & EQMMR1015 (220V))
- Romer Evap-System (Order #: EQQEV1030 (12 port) & EQQEV1040 (24 port))
- Balance, 400g (Order #: EQOLE1010)
- 100 mL graduated cylinders (Order #: EQOLE1050)
- Timer (Order #: EQOLE1300)
- 4000 mL graduated cylinder
- 1000 mL graduated cylinder
- Eberbach gyratory shaker
- Funnels (Order #: EQOLE1350)
- 50 µL glass syringe (Order #: EQCAS1030)
- Pipette tips 1-5 mL (Order #: EQOLE180)
- Pipette tips 200-1000 µL (Order #: EQOLE1130)
- Pipette tips 40-200 µL
- Test Tube Rack (Order #: EQOLE1210)
- Vortex mixer-110 volt (Order #: EQOLE1330)
- Sample containers
- Kobra Cell 110 Volt
- Kobra Cell Membrane
- Kobra Cell AC power adapter
- *Other suitable equipment can be substituted.

Consumables

- MycoSep®224 Afla columns (Order #: C0CMY2224)
- MycoSep®226 Afla+ columns (Order #: C0CMY2226)
- MycoSep®228 AflaPat columns (Order #: C0CMY2228)
- Pipette tips (1-5 mL) (Order #: C0OLS1133)
- Pipette tips (200-1000 µL) (Order #: C0OLS1132)
- Pipette tips (40-200 µL) (Order #: C0OLS1139)
- Filter paper or equivalent
- 15 x 85 mm test tubes (Order #: C0OLS1041)

Calculations: Samples[®]:

$$\frac{25 \text{ g sample}}{100 \text{ mL extraction solution}} \times \frac{0.1 \text{ mL purified extract}}{0.540 \text{ mL total volume}} \times 0.100 \text{ mL injected sample} = 0.00463 \text{ g sample equivalent}$$

Aqueous solutions[®]:

$$\frac{4.0 \text{ mL sample}}{25.0 \text{ mL extraction solution}} \times \frac{0.156 \text{ mL purified extract}}{0.540 \text{ mL total}} \times 0.100 \text{ mL injected sample} = 0.00463 \text{ g sample equivalent}$$

Matrix Spikes[®]:

$$\frac{(\quad) \text{ mL} \times (\quad) \mu\text{g/mL std}}{100 \text{ mL extraction solution}} \times \frac{0.1 \text{ mL purified extract}}{0.540 \text{ mL total volume}} \times 0.100 \text{ mL injected sample} = 0.000185 \text{ ug or 40 ppb}$$

Standards[®]:

$$\frac{0.01 \mu\text{g/mL final conc.} \times 50 \text{ mL solution}}{(\quad) \mu\text{g/mL conc. of standard}} \times \frac{1000 \mu\text{L}}{1 \text{ mL}} = (\quad) \text{ uL of standard needed}$$

Page 2 of 2

DAS Protocol No.: 101088
 Covance Client Identification: 1002382
 Covance No.: 8223-016



Quantitation of Aflatoxin B1, B2, G1, & G2 in Difficult Matrices using an AflaStar® Immunoaffinity Column and a MycoSep® 228 AflaPat Column

CAN-00023-1

Application brief for complex and processed matrices

Aspergillus flavus and *Aspergillus parasiticus* are the major fungi associated with production of aflatoxins. Warm temperatures with drought like conditions cause grain to become more susceptible to aflatoxin formation. Corn, cottonseed, peanuts, and tree nuts are the main crops affected with aflatoxin. Aflatoxin can cause liver disease in animals and humans. They can cause a decrease in milk production and are immunosuppressive, carcinogenic, and mutagenic.

Extraction:

Solid: Extract 25 g ground sample^Q and QC sample^Q with 1.00 mL 84/16 acetonitrile/water. Shake for a minimum of 1 hour or blend for a minimum of 2 minutes.

Auxilioids: Combine 4 mL of sample^Q with 21 mL acetonitrile. Vortex for a minimum of 1 minute.

Filter supernatant.

^QQC samples are naturally contaminated samples with a known concentration of the analyte which are treated as unknown samples as a check of the analytical method and HPLC system.

Standard and Matrix Spike Preparation:

Standard: Prepare a diluted standard^Q. Transfer 100 µL of the prepared diluted standard into an autosampler vial. Add 220 µL of deionized water and 220 µL of methanol. The final standard concentration is 40 µg/kg total aflatoxin.

Spike: Add aflatoxin standard^Q to 25 g of ground sample or 4 mL liquid sample prior to extraction. Treat as sample. Spike recovery of 100% equals 40 µg/kg total aflatoxin.

Clean-up & Purification:

Pipet 5 mL of sample extract into 15 x 85 mm test tube. Push 1000 µL of sample through a **MycoSep® 228 AflaPat** column. Transfer 910 µL of the purified extract into a clean 15 x 85 mm test tube. Add 30 mL PBS Buffer^Q.

Attach a 10 mL syringe barrel to the **AflaStar®** IAC column with an adapter. Transfer the diluted sample extract to the **AflaStar®** column. Maintain the flow rate at 1 mL per minute. Rinse column with 2 10 mL portions of deionized water. Elute the aflatoxins from the column into a clean 15 x 85 mm cuvette with 2 mL methanol. After solution has drained add 2 mL deionized water and collect in same cuvette. Vortex to mix.

Transfer 440 µL of elution to a polypropylene autosampler vial. Add 100 µL of 84/16 acetonitrile/deionized water to vial. Cap and vortex to mix.

Inject onto HPLC system.

Method performance:

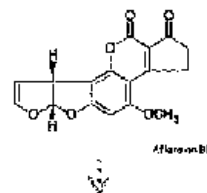
Limit of detection: 1.0 µg/kg aflatoxin B1, B2, G1, & G2 individually

Recovery rates and variability for Aflatoxin B1:

| Column type | Average %Recovery | Average %RSD |
|-------------|-------------------|--------------|
| 228 | 97.6 | 3.8 |

References:

Journal of Chromatography A, 932 (2001) 153-157
 Journal of AOAC International Vol. 77, No. 6, 1994



Prepare a matrix spike.

Extract

Clean-up of sample extract using a
MycoSep® 228 AflaPat column


Purify sample using an **AflaStar®**
 IAC column

Elute

Inject

For other applications:
www.romerlabs.com
 Or contact your local distributor

For standard information:
www.biopure.at 
 Or contact your local distributor

Additional information regarding
 components, calculations, and directions
 for making reagents and buffers is located
 on page 7 

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DAS Protocol No.: 101088
 Covance Client Identification: 1002382
 Covance No.: 8223-016



Quantitation of Aflatoxin B1, B2, G1, & G2 in Difficult Matrices using an AflaStar® Immunoaffinity Column and a MycoSep® 228 AflaPat Column

CAM-00763-1

Required Components

Chemicals

- Acetonitrile, HPLC grade
- Methanol, HPLC grade
- Nitric Acid
- Potassium bromide
- Deionized water
- Sodium Chloride
- Sodium Phosphate, dibasic anhydrous
- Potassium chloride
- Hydrochloric Acid
- Potassium Phosphate

Preparation of Reagents and Buffers

PBS Buffer: 8.0 g sodium chloride; 1.2 g sodium phosphate, dibasic anhydrous; 0.2 g potassium phosphate, monobasic anhydrous; 0.2 g potassium chloride in 1 L of deionized water. pH to 7.4 with hydrochloric acid.

Analytical Method System Parameters

- HPLC: RF-10AXI fluorescence detector, GIL-10AXI autosampler and a LC-6000 pump.
- Column: Brownlee, 4.6 mm x 10 cm, C-18
- Mobile phase: 5+1+1 water+ acetonitrile+ methanol. Add 100 µL nitric acid and 0.3 g potassium bromide to each liter of mobile phase for post column bromine derivatization with Kobra Cell.
- Flow Rate: 2.0 mL/min
- Injection volume: 100 µL
- Excitation: 360 nm
- Emission: 440 nm
- Kobra Cell: 200 uA
- Detection Limit: 1.0 µg/kg Individually

Equipment*

- Romer Series II MFI (Order #: EQMMR2010(110V) & EQMMR2015(220V))
- Romer RAS MFI (Order #: EQMNR1010 (110V) & EQMNR1015 (220V))
- Balance, 400g (Order #: EQOLE1010)
- 100 mL graduated cylinders (Order #: EQOLE1050)
- Timer (Order #: EQOLE1300)
- 4000 mL graduated cylinder
- 1000 mL graduated cylinder
- Eberbach gyratory shaker
- Funnels (Order #: EQOLE1350)
- 50 µL glass syringe (Order #: EQOAS1030)
- Finnaspipette 1-5 mL (Order #: EQOLE1130)
- Finnaspipette 200-1000 µL (Order #: EQOLE1130)
- Finnaspipette 40-200 µL
- Test Tube Rack (Order #: EQOLE1210)
- Vortex mixer-110 volt (Order #: EQOLE1330)
- Sample containers
- Kobra Cell 110 Volt
- Kobra Cell Membrane
- Kobra Cell AC power adapter

* Other suitable equipment can be substituted.

Consumables

- AflaStar® IAC columns (Order #: COIACXXXX)
- MycoSep® 228 AflaPat columns (Order #: COCHY2228)
- Pipette tips (1-5 mL) (Order #: COOLS1133)
- Pipette tips (200-1000 µL) (Order #: COOLS1132)
- Pipette tips (40-200 µL) (Order #: COOLS1133)
- Filter paper or equivalent
- 15 x 85 mm test tubes (Order #: COOLS1041)

Calculations:

Samples[®]:

$$\frac{25 \text{ g sample}}{100 \text{ mL extract}} \times \frac{0.910 \text{ mL extract}}{30 \text{ mL dil. extract}} \times \frac{30 \text{ mL dilute}}{4 \text{ mL elution}} \times \frac{0.440 \text{ mL elution}}{0.540 \text{ mL total}} \times 0.100 \text{ mL injected} = 0.00463 \text{ g sample equiv.}$$

Aqueous solutions[®]:

$$\frac{4 \text{ mL sample}}{25 \text{ mL extract}} \times \frac{0.910 \text{ mL extract}}{30 \text{ mL dil. extract}} \times \frac{30 \text{ mL dilute}}{2 \text{ mL elution}} \times \frac{0.440 \text{ mL elution}}{0.540 \text{ mL total}} \times 0.100 \text{ mL injected} = 0.00463 \text{ g sample equiv.}$$

Matrix Spikes[®]:

$$\frac{(_) \text{ mL } x (_) \text{ µg/mL std.}}{100 \text{ mL extract}} \times \frac{0.910 \text{ mL extract}}{30 \text{ mL dil. extract}} \times \frac{30 \text{ mL dilute}}{4 \text{ mL elution}} \times \frac{0.440 \text{ mL elution}}{0.540 \text{ mL total}} \times 0.100 \text{ mL injected} = \dots \text{ µg or } \dots \text{ ppb}$$

Standards[®]:

$$\frac{0.01 \text{ µg/mL final conc.} \times 50 \text{ mL solution}}{(_) \text{ µg/mL conc. of standard}} \times \frac{1000 \text{ µL}}{1 \text{ mL}} = (_) \text{ µL of standard needed}$$

Page 2 of 2

DAS Protocol No.: 101088
 Covance Client Identification: 1002382
 Covance No.: 8223-016



Quantitation of Zearalenone by HPLC Using a ZearaStar® IAC Column

CAN-000219-0

Application brief for complex sample matrices, feed, and aqueous solutions

Fusarium graminearum is the major species of fungi responsible for producing zearalenone. Most often the compound is found in corn; however such crops as wheat, barley, sorghum, and rye can become contaminated. This fungi favors pre-harvest conditions that are moist and cool. Grains that had contamination pre-harvest can see a rise in contamination levels during storage if the grain is not sufficiently dried and stored. Swine appear to be the animals most affected and are considerably more sensitive to the toxin than other animals. The most noticeable effect is precocious development of mammary and other estrogenic effects in young gilts as well as prepubertal enlargement in young barrows.

Extraction:

Solid: Extract 25 g ground sample^① and QC sample^② with 100 mL 84+16 acetonitrile+DI water. Shake for a minimum of 1 hour or blend for a minimum of 7 minutes.
Aqueous: Combine 4 mL of sample^③ with 21 mL acetonitrile. Vortex for a minimum of 1 minute.

Filter supernatant.

QC samples are naturally contaminated samples with a known concentration of the analyte which are treated as unknown samples as a check of the HPLC system.

Standard and Matrix Spike Preparation:

Standard: Prepare a diluted standard^④. Transfer to three separate autosampler vials. The final standard concentration is 500 µg/kg zearalenone.

Spike: Add zearalenone standard^⑤ to 25 g ground sample prior to extraction. Treat as sample. Spike recovery of 100% is equal to 500 µg/kg zearalenone.

Clean-up & Purification:

Pipet 10 mL of sample extract into a 15 x 85 mm test tube. Add 100 µL of acetic acid to test tube.

Solid: Push just over 4 mL of sample extract through a MycoSep®226 Affa+ column. Transfer 2 mL of purified extract to a 16 x 125 mm cuvette.

Aqueous: Push just over 4 mL of sample extract through a MycoSep®226 Affa+ column. Transfer 3.125 mL of purified extract to a 16 x 125 mm cuvette.

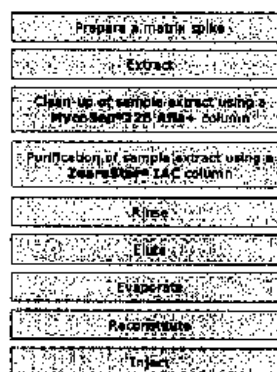
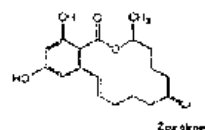
Dilute the 2 mL of purified extract with 12 mL PBS buffer. Pass the entire diluted sample over a ZearaStar® IAC column. Rinse the IAC column with two 10 mL portions of deionized water. Elute column with 2 mL acetonitrile into a 12 x 75 mm cuvette. Evaporate cuvettes to dryness. Reconstitute with 500 µL mobile phase. Mix well and transfer to an autosampler vial. Inject onto HPLC system.

Method performance:

Limit of detection: 100 µg/kg
 Recovery rates: Average 95.0%
 Variability: Average 4.4%

References:

Romer Zen-KC-02-00.1
 Food Additives and Contaminants, 2001, Vol. 18, No. 1, 38-45



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*Additional information regarding components, calculations, and directions for making reagents and buffers is located on page 2.

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DAS Protocol No.: 101088
 Covance Client Identification: 1002382
 Covance No.: 8223-016



Quantitation of Zearalenone by HPLC using a MycoSep® 226 Affa+ Column

CAN-400226-0

Required Components

Chemicals

- Acetic acid, glacial
- Acetonitrile
- Methanol
- Deionized water

Preparation of Reagents and Buffers

PBS Buffer: 8.0 g sodium chloride; 1.2 g sodium phosphate, dibasic anhydrous; 0.2 g potassium phosphate, monobasic anhydrous; 0.2 g potassium chloride in 1 L of deionized water. pH to 7.4 with hydrochloric acid.

Analytical Method System Parameters

- HPLC: Shimadzu SCL 10A system controller, RF-10AXI fluorescence detector, SIL-10A autosampler and a CL-10AD pump.
- Column: Brownlee, 4.6 mm x 10 cm, C-18 47/52/1 (v/v/v) Acetonitrile/2% H₂O/HoAc
- Flow Rate: 2.0 mL/min
- Injection volume: 150 µL
- Excitation: 420 nm
- Emission: 500 nm
- Retention time: 17.0 minutes (times are approximate)
- Detection limit: 100 µg/kg

Equipment*

- Romer Series II HPL (Order #: EQMMR2010(110V) & EQMMR2019(220V))
- Romer RAS HPL (Order #: EQMMR1010 (110V) & EQMMR1019 (220V))
- Romer Evap-System (Order #: EQQEV1030 (12 port) & EQQEV1040 (24 port))
- Balance, 400g (Order #: EQOLE1010)
- 100 mL graduated cylinders (Order #: EQOLE1050)
- Timer (Order #: EQOLE1300)
- 4000 mL graduated cylinder
- 1000 mL graduated cylinder
- Eberbach gyratory shaker
- Funnels (Order #: EQOLE1350)
- 50 µL glass syringe (Order #: EQCAS1030)
- Flinnpipette 1-5 mL (Order #: EQOLE1180)
- Flinnpipette 200-1000 µL (Order #: EQOLE1120)
- 250 mL sidearm Erlenmeyer flasks with #6 stoppers with 18-gauge syringe, attach to vacuum
- Test Tube Rack (Order #: EQOLE1210)
- Water bath with vacuum source
- Vortex mixer-110 volt (Order #: EQOLE1330)
- Sample containers
- Other suitable equipment can be substituted.

Consumables

- MycoSep® 226 Affa+ columns (Order #: COCHV2226)
- ZearaStart IAC columns (Order #: COIAC4000)
- Pipette tips (1-5 mL) (Order #: COOLS1133)
- Pipette tips (200-1000 µL) (Order #: COOLS1132)
- Filter paper or equivalent
- 15 x 85 mm test tubes (Order #: COOLS1041)
- 12 x 75 mm cuvettes (Order #: COOLS1051)

Calculations:

Samples[®]:

$$\frac{25 \text{ g sample}}{100 \text{ mL extraction solution}} \times \frac{2 \text{ mL purified extract}}{0.500 \text{ mL mobile phase}} \times 0.150 \text{ mL injected sample} = 0.15 \text{ g sample equivalent}$$

Aqueous solutions[®]:

$$\frac{4 \text{ mL sample}}{25 \text{ mL extraction solution}} \times \frac{3.125 \text{ mL purified extract}}{0.500 \text{ mL mobile phase}} \times 0.150 \text{ mL injected sample} = 0.15 \text{ mL sample equivalent}$$

Matrix Spikes[®]:

$$\frac{(\quad) \text{ mL} \times (\quad) \text{ ug/mL std}}{100 \text{ mL extraction solution}} \times \frac{2 \text{ mL purified extract}}{0.500 \text{ mL mobile phase}} \times 0.150 \text{ mL injected sample} = 0.075 \text{ ug or 500 ppb injected}$$

Aqueous matrix spike[®]:

$$\frac{(\quad) \text{ mL} \times (\quad) \text{ ug/mL std}}{25 \text{ mL sample extract}} \times \frac{3.125 \text{ mL purified extract}}{0.500 \text{ mL mobile phase}} \times 0.150 \text{ mL injected sample} = 0.075 \text{ ug or 500 ppb injected}$$

Standards[®]:

$$\frac{(\quad) \text{ mL} \times (\quad) \text{ ug/mL standard}}{10 \text{ mL methanol}} \times 0.150 \text{ mL injected sample} = 0.075 \text{ ug or 500 ppb injected}$$

Page 2 of 2

DAS Protocol No.: 101088
Covance Client Identification: 1002382
Covance No.: 8223-016

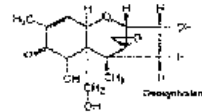


Quantitation of Type A and B Trichothecenes Dual Column Quantitative TLC Method

GML-000631-2

Application brief for corn, some feeds, and aqueous solutions

Fusarium sporotrichoides is the principle type A trichothecenes producer (T-2, MT-2, diacetoxyscirpenol (DAS), neosolaniol (NEOS)) and *Fusarium graminearum*, the principle type B trichothecenes producer (3-acetyl deoxynivalenol, 15-acetyl deoxynivalenol, fusarenon-X, deoxynivalenol (DON), nivalenol) although a variety of species are capable of producing the toxins. Corn, wheat, oats, and barley are the primary commodities affected by this group of toxins. Trichothecenes are immunosuppressive and lead to losses in animal production due to reduced feed intake. The organism does well in cool moist conditions.



Extraction:

Solid: Extract 25 g ground sample[®] with 100 mL 84+16 acetonitrile+DI H₂O. Shake for a minimum of 1.5 hour or blend for a minimum of 3 minutes.
Aqueous: Combine 4 mL of sample[®] with 21 mL acetonitrile. Vortex for a minimum of 2 minutes.

Matrix Spike Preparation:

Spike: Add spiking standard[®] to 25 g of ground sample so that the final concentration on a TLC plate is 200 ng. Extract and treat as a sample.

Clean-up & Purification:

Precondition a **Multisep[®] 216** Trich column with 6 mL of 84+16 acetonitrile+DI H₂O.

Solid: Transfer 10 mL of extract into culture tube. Push slightly over 4 mL through a **MycoSep[®] 225** Trich or **227** Trich+ column. Transfer 4 mL of purified extract to the preconditioned **Multisep[®] 216** Trich column and collect.

Aqueous: Transfer 10 mL of extract into culture tube. Push slightly over 5.25 mL through a **MycoSep[®] 225** Trich or **227** Trich+ column. Transfer 6.25 mL of purified extract to the preconditioned **Multisep[®] 216** Trich column and collect.

After purified extract has drained thru **Multisep[®] 216** Trich column rinse with 12 mL of 84+16 acetonitrile+DI H₂O and collect. Evaporate to dryness under vacuum in a 60°C water bath.

TLC Determination:

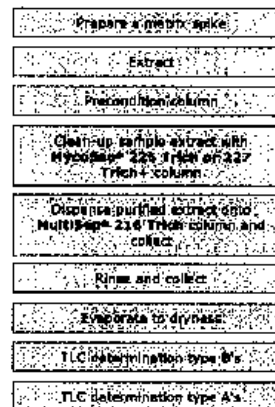
Standard: Spot 100, 200, 300, and 400ng of the TLC spotting standard on a TLC plate.

Type B Trichothecenes:

Dissolve residue with 400 µL of 2+1 acetone+methanol. Spot 60 µL of sample and matrix spike along with standards on a silica gel TLC plate. Develop plate with 1+2 toluene+acetone until solvent front reaches 1 cm from top of plate. Let air dry then spray plate with 15% aluminum chloride in methanol. Heat plate at 150°C until standard spots are fully visible under long wave UV light then remove from heat. Quantify samples using the standards[®]. Toxins will appear blue with the following R_f values, (3-acetyl DON 0.25, 15-acetyl DON 0.8, F-X 0.7, DON 0.5, and MTX 0.2).

After spotting the type B trichothecenes evaporate to dryness the remaining 2+1 acetone+methanol.

(Continued on page 2)



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Additional information regarding components, calculations, and directions for making reagents and buffers is located on page 2. ☐☐☐☐

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DAS Protocol No.: 101088
 Covance Client Identification: 1002382
 Covance No.: 8223-016



Quantitation of Type A and B Trichothecenes Dual Column Quantitative TLC Method

Trich_1c_141004_v04 14102004

Procedure Continued and Required Components

TLC Determination: (cont.)

Type A Trichothecenes:

Dissolve residue with 320 μ L of 97+3 toluene+acetonitrile. Spot 80 μ L of sample and matrix spike along with standards on a reverse phase C-18 TLC plate. Develop plate with 25+15+1 methanol+DI water+acetic acid until solvent front reaches 1 cm from top of plate. Let air dry then spray plate with 10% sulfuric acid in methanol. Heat plate at 150°C until standard spots are fully visible under long wave UV light then remove from heat. Quantify samples using the standards⁶. Toxins will appear blue with the exception of DAS which will appear purple and will have the following R_f values, (NEOS 0.6, DAS 0.5, HT-2 0.4, and T-2 0.3).

Method performance:

Limit of detection: 3-acetyl DON, 15-acetyl DON, Deoxynivalenol, Neosolaniol, HT-2, and T-2 (0.1 μ g/g)
 Fusarenon-X, and Mycosterol (0.5 μ g/g)
 Deoxonystrophenol (0.3 μ g/g)

References:

CAM-00031-1
 Journal of Chromatography A, 968 (2002) 125-142

| Chemicals | Equipment* |
|---|---|
| <ul style="list-style-type: none"> Acetic acid Acetone Acetonitrile Aluminum chloride Methanol Sulfuric acid Toluene Water, deionized | <ul style="list-style-type: none"> Romer® Labs TLC Autospotter™ (Order #: EQOAS1010) with 100 μL Autospotter™ syringes (Order #: EQOAS1020) Balance, 400 g (Order #: EQOLE1010) 100 mL graduated cylinder (Order #: EQOLE1050) Timer (RJE Order #: EQOLE1309) Eberbach gyratory shaker, or blender (Order #: EQOLE1020) 250 mL Erlenmeyer flasks with #6 Neoprene stoppers, or half-pint jars (Order #: EQOLE1025), blender bases (Order #: EQOLE1022), blades (Order #: EQOLE1023), and gaskets (Order #: EQOLE1024) Sample jars with lids Funnels (Order #: EQOLE1350) 25 μL syringes (Order #: EQOAS1030) Pipettors Pipipette 1-5 mL (Order #: EQOLE1180) Pipipette 200-1000 μL (Order #: EQOLE1130) Test tube rack (Order #: EQOLE1210) 250 mL side-arm Erlenmeyer flasks with #6 stopper and a 18-gauge syringe, attach to vacuum source Water bath with vacuum source Vortex mixer-110 volt (Order #: EQOLE1330) Developing tank (Order #: EQOLE1280) Long wave UV light-115 volt (Order #: EQOLE1090) or viewing box (Order #: EQOLE1320) Hot plate 12 x 12 in (Order #: EQOLE1061) Reagent spray bottle (Order #: EQOLE1090) Yongs (Order #: EQOLE1310) |
| <p>Consumables</p> <ul style="list-style-type: none"> Mycosep® 225 Trich columns (Order #: COCMY2225) or Mycosep® 327 Trich+ columns (Order #: COCMY2237) Multisep® 218 Trich columns (Order #: COCMU2216) 16x125 mm culture tubes (Order #: COOLS1042) 18 x 85 mm culture tubes (Order #: COOLS1041) Pipette tips (1-5 mL) (Order #: COOLS1133) Pipette tips (200-1000 μL) (Order #: COOLS1132) Filter paper, qualitative (Order #: COOLS1082) Silica gel TLC plates (Order #: COOLS1111) Reverse phase C-18 silica gel TLC plates (Order #: COOLS1110) Disposable/graduated/conical 50 mL centrifuge tubes with screw caps | <p>*Other suitable equipment can be substituted.</p> |

Calculations:

Samples⁶:
$$\frac{25 \text{ g sample}}{100 \text{ mL extraction solution}} \times \frac{4 \text{ mL extract}}{0.4 \text{ mL}} \times 0.080 \text{ mL spot} = 0.2 \text{ g sample equivalent}$$

Aqueous solutions⁶:

$$\frac{4.0 \text{ mL sample}}{25 \text{ mL extraction solution}} \times \frac{6.25 \text{ mL extract}}{0.4 \text{ mL}} \times 0.080 \text{ mL injected sample} = 0.2 \text{ g sample equivalent}$$

Matrix Spikes⁶:

$$\frac{(\text{ng/mL}) \times (\text{ng/mL std})}{100 \text{ mL extraction solution}} \times \frac{(\text{mL extract})}{0.4 \text{ mL}} \times (1000 \text{ mL spot}) = \text{ng} \times \frac{1000 \text{ ng}}{1 \text{ ng}} = \text{ng on TLC plate}$$

ppm Calculation⁶:

$$\frac{(\text{ng on plate})}{0.2 \text{ g sample equivalent}} \times \frac{1 \text{ ppm}}{1000 \text{ ppb}} = \text{ppm}$$

Page 2 of 2

DAS Protocol No.: 101088
 Covance Client Identification: 1002382
 Covance No.: 8223-016



Application Brief

CAM 102000X-X

Multitoxin LC-MS/MS detection in grains and pet food

Important Information:

The use of good internal standards (IS) are very important in order to obtain robust and quantitative methods for LC-MS/MS analyses. The optimal internal standard in MS has the same chemical structure as the toxin of interest, but a different m/z ratio. Thus ¹⁴C labeled mycotoxins or similar are ideal for LC-MS/MS methods. The internal standard can be added at any stage; for example into the solid sample before extraction or into the purified sample extract prior to LC injection. Depending on the step of addition, the internal standard can be used to account for losses during the whole procedure or for losses in the Mass Spec.

Extraction:

Sample: Extract 25 g sample and QC sample¹ with 100 mL of 84/16 Acetonitrile/DI H₂O or 50/50 Acetonitrile/DI H₂O for extraction of Fumonigins. Shake for a minimum of 90 minutes on a gyratory shaker or blend for a minimum of 3 minutes.

Filter supernatant:

¹QC samples are naturally contaminated samples with a known concentration of the analyte which are treated as unknown samples as a check of the analytical method and LC-MS/MS system.

Clean-up & Purification:

Take 200 µL of each filtered sample to dryness in a cuvette. (Be careful not to overdry.) Reconstitute in 200 µL of Ammonium Formate solution containing the Internal Standards for positive mode analysis. Reconstitute in 200 µL of Ammonium Acetate solution containing the Internal Standards for negative mode analysis. Vortex to mix. Transfer contents to HPLC autosampler vials. Inject 40 µL onto the LC-MS/MS system. The use of a clean-up column might be necessary for complex and difficult matrices.

Calibration:

Prepare different concentrations of mixed standard stock solutions in either a 5 mM Ammonium Formate with 0.1% Formic Acid solution in 50/50 Acetonitrile/DI H₂O or a 5 mM Ammonium Acetate with 0.1% Acetic Acid solution in 50/50 Acetonitrile/DI H₂O. Dry down the standard solutions. Reconstitute in. Construct calibration curves for each analyte by plotting the analyte concentration versus the signal intensity. When using internal standards plot the concentration of the internal standard versus the area of the analyte divided by the area of the internal standard.

Separation method:

Shimadzu HPLC

Phenomenex Gemini HPLC C18 column, 4.6 x 150 mm, 5 µm

Mobile Phase A:

55% 5 mM Ammonium Formate with 0.1% Formic Acid in DI H₂O

55% 5 mM Ammonium Acetate with 0.1% Acetic Acid in DI H₂O

Mobile Phase B:

Acetonitrile

Injection Volume: 40 µL

Flow Rate: 1.0 mL/min; Column Temperature: 40 °C

Gradient:

| Min | 2 | 14 | 15 | 15.1 | 16.0 |
|-----|----|----|----|------|------|
| %B | 10 | 97 | 97 | 10 | stop |

Grind and weigh 25 g sample

Extract with 100 mL 84/16
ACN/DI H₂O or 50/50 ACN/DI H₂O

Filter supernatant

Remove 200 µL, as appropriate to
dryness

Reconstitute in Positive or Negative
Mode LC-MS/MS mobile phase

Inject 40 µL

Analyze using LC-MS/MS


References:

M. Sulyok, Rapid Commun. Mass Spectrom. 2006; 20: 2649–2659
 E.M. Binder; Romer SpotNight ver.8

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DAS Protocol No.: 101088
 Covance Client Identification: 1002382
 Covance No.: 8223-016



Application Brief

LAM-20000283

Mafitoxin LC-MS/MS detection in grains and pet food

MS/MS detection method:

Instrument: Applied Biosystems 3200 QTrap with ESI+ and ESI- sources.

| Analyte | Parent Ion (m/z) | Primary Transition (m/z) | Collision Energy (eV) | Secondary Transition (m/z) | Collision Energy (eV) | Ionization Mode |
|-----------------------|------------------|--------------------------|-----------------------|----------------------------|-----------------------|-----------------|
| Aflatoxin B1 | 313.1 | 241.1 | 49 | 285.0 | 37 | ESI+ |
| Aflatoxin B2 | 315.2 | 287.0 | 37 | 259.0 | 43 | ESI+ |
| Aflatoxin G1 | 329.1 | 243.1 | 37 | 115.1 | 69 | ESI+ |
| Aflatoxin G2 | 331.1 | 313.0 | 41 | 115.1 | 61 | ESI+ |
| Fumonisin B1 | 722.4 | 334.4 | 55 | 352.4 | 51 | ESI+ |
| Fumonisin B2 | 706.8 | 336.4 | 51 | 318.4 | 51 | ESI+ |
| Fumonisin B3 | 706.4 | 336.4 | 45 | 318.5 | 47 | ESI+ |
| Ochratoxin A | 404.0 | 239.0 | 27 | 102.1 | 93 | ESI+ |
| T2 Toxin | 484.3 | 305.1 | 19 | 215.2 | 23 | ESI+ |
| H12 Toxin | 442.2 | 263.2 | 19 | 215.2 | 19 | ESI+ |
| Neosolaniol | 400.6 | 305.2 | 17 | 215.1 | 21 | ESI+ |
| Diacetoxyscirpenol | 384.6 | 307.2 | 17 | 105.1 | 51 | ESI+ |
| Deoxynivalenol | 355.1 | 285.0 | -12 | 59.2 | -38 | ESI+ |
| Acetyl Deoxynivalenol | 397.1 | 337.1 | -10 | 59.0 | -34 | ESI+ |
| Zearalenone | 317.1 | 131.0 | -40 | 175.0 | -34 | ESI+ |
| Nivalenol | 371.1 | 281.1 | -18 | 58.9 | -38 | ESI+ |
| Fusarenol X | 413.4 | 353.0 | -12 | 58.9 | -36 | ESI+ |
| Patulin | 152.9 | 108.9 | -10 | 81.0 | -16 | ESI+ |

Chemicals

- Acetonitrile, HPLC grade or higher purity
- Acetic Acid
- Deionized Water
- Ammonium Acetate, LCMS grade
- Ammonium Formate, LCMS grade
- Formic Acid

Consumables

- Mafitoxin Kit Order No: COCHM226
- Internal Standards
- Reference Materials: Type B Trichothecenes, Type A Trichothecenes, Zearalenone, Aflatoxins, and Deoxynivalenol

Equipment*

- Romer Series II Mill (Order #: EQMMR2010 (110V) & EQMMR2015(220V))
- Romer RAS Mill (Order #: EQMMR1010 (110V) & EQMMR1015 (220V))
- Romer Evap-System (Order #: EQQEV1030 (12 port) & EQQEV1040 (24 port))

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DAS Protocol No.: 101088
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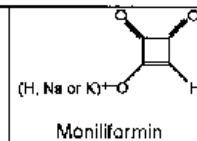


Moniliformin Quantitative TLC Method

Method Code: mon-tl-01-00.1

Introduction: This is a TLC method for quantification of moniliformin.

Applicable Commodities: Grains, some feeds.



GENERAL INFORMATION

Storage conditions

The solutions used in this method should be stored appropriately in properly sealed containers. The columns should be stored where they will not become contaminated.

Washing the equipment

Extraction equipment should be washed after each use with soap and hot water. Rinse thoroughly with cold tap water, then dry completely.

Waste disposal

Dispose of all waste appropriately according to local, state and federal laws.

Safety

It is recommended that a lab coat, disposable nitrile gloves and safety glasses be worn while performing this method.

DAS Protocol No.: 101088
Covance Client Identification: 1002382
Covance No.: 8223-016

mon-01-00.1



Romer™ Labs Methods

Procedure

Extraction

1. Weigh out 25 g of ground sample into a 250 ml Erlenmeyer flask or a half-pint blender jar.
2. Add 100 ml of 84/16 acetonitrile/water and stopper flask or seal jar.
3. Shake for 1 hour on gyratory shaker or blend on high speed for 3 minutes.
4. Using a funnel, filter extract into a sample jar through qualitative filter paper.

Cleanup preparation

1. Prepare both a matrix and neat spike by adding 12.5 μ l of 100 μ g/ml moniliformin spiking standard to 5 ml of sample extract and 5 ml of 84/16 acetonitrile/water, respectively. Mix well and treat as a sample through the rest of the method. Spike recovery of 100% results in 200 ng of moniliformin on the TLC plate.
2. Pipet 5 ml of extract into a 15 x 85 mm culture tube.

Purification

1. Push just over 2 ml of sample through a MycoSep™ 240 clean-up column.
2. Transfer 2 ml of purified extract to a silanized 12 x 75 mm cuvette.
3. Evaporate to dryness under vacuum in a 60° C water bath or using the Romer-Evap™ system. Do not over dry samples.

TLC Determination

1. Dissolve residue in 200 μ l of methanol. Cap and vortex for 30 seconds.
2. Spot 80 μ l of each sample and spike, along with 10, 20, 40 and 60 μ l of 10 μ g/ml moniliformin working standard (respectively 100, 200, 400 and 600 ng of moniliformin on the TLC plate) on a silica gel TLC plate.
3. Develop in 6/3/5 toluene/acetone/methanol until solvent front is about 1 cm from the top of the plate. Let the plate air dry.

Specified equipment is not restrictive.
Other suitable equipment can be substituted.

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mon-d-01-001

Bomer™ Labs Methods

4. Spray plate with o-phenylenediamine spray reagent (1 mg of phenylenediamine per 1 ml of 1 N hydrochloric acid in methanol). Let the plate air dry.
5. Heat the plate at 150° C until standard spots are fully visible under long wave UV light. Moniliformin will appear yellow with an R_f of approximately 0.4.
6. View plate under UV light and estimate toxin in samples and spikes as compared to the standards. The standards will migrate higher on the plate than samples. Use the standards for quantification and the matrix spike to determine migration of moniliformin.
7. Calculate the level, in ppm, of moniliformin in the initial sample by dividing the number of nanograms seen on the TLC plate by the sample equivalent (0.2 g) and dividing by 1000.

$$\frac{\text{ng on plate}}{0.2 \text{ g sample equivalent}} \times \frac{1 \text{ ppm}}{1000 \text{ ppb}} = \text{ppm in sample}$$

Detection limit: Most commodities 0.1 ppm
 Mixed feeds 0.2 ppm

Calculations

Samples:

$$\frac{25 \text{ g sample}}{100 \text{ ml extraction solution}} \times \frac{2 \text{ ml extract}}{0.2 \text{ ml spotting solvent}} \times 0.08 \text{ ml spot} = 0.2 \text{ g sample equivalent}$$

Spike:

$$\frac{0.0125 \text{ ml} \times 100 \text{ ug/ml standard}}{5 \text{ ml extract}} \times \frac{2 \text{ ml extract}}{0.2 \text{ ml spotting solvent}} \times 0.08 \text{ ml spot} = 0.2 \text{ ug or } 200 \text{ ng spotted}$$

Specified equipment is not restrictive,
 Other suitable equipment can be substituted.

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mon-rl-01-001

Romar™ Labs Methods

| NECESSARY EQUIPMENT | CONSUMABLES |
|--|--|
| <ul style="list-style-type: none"> Balance, 400 g (RLI Order #: EQOLE1010) 100 ml graduated cylinder (RLI Order #: EQOLE1050) Timer (RLI Order #: EQOLE1300) Eberbach gyratory shaker or blender (RLI Order #: EQOLE1020) 250 ml Erlenmeyer flasks with #6 Neoprene stoppers or half-pint jars (RLI Order #: EQOLE1025), blender bases (RLI Order #: EQOLE1022), blades (RLI Order #: EQOLE1023), and gaskets (RLI Order #: EQOLE1024) Sample jars with lids Funnels (RLI Order #: EQOLE1350) Pipettors <ul style="list-style-type: none"> Finnpipette 1–5 ml (RLI Order #: EQOLE1180) Finnpipette 200–1000 µl (RLI Order #: EQOLE1130) 25 µl syringe (RLI Order #: EQOAS1030) Test tube rack (RLI Order #: EQOLE1210) Cuvette rack (RLI Order #: EQOLE1230) Water bath with vacuum source or Romar-Evap system, 12-port (RLI Order #: EQOEV1030) Romar Labs TLC Autospotter (RLI Order #: EQOAS1010) with 100 µl autospotter syringes (RLI Order #: EQOAS1020) Developing tank (RLI Order #: EQOLE1280) Long wave UV light–115 volt (RLI Order #: EQOLE1090) or viewing box (RLI Order #: EQOLE1320) Hot plate 12 x 12 in (RLI Order #: EQOLE1061) Reagent spray bottle (RLI Order #: EQOLE1030) Tongs (RLI Order #: EQOLE1310) Vortex mixer–110 volt (RLI Order #: | <ul style="list-style-type: none"> 15 x 85 mm culture tubes (RLI Order #: COOLS1041) 12 x 75 mm cuvettes (RLI Order #: COOLS1051), silanized with cuvette caps (RLI Order #: COKFS1010) Mycosep 240 clean-up columns (RLI Order #: COCMY2240) Pipette tips (1–5 ml) (RLI Order #: COOLS1133) Pipette tips (200–1000 µl) (RLI Order #: COOLS1132) Filter paper, qualitative (RLI Order #: COOLS1082) Silica gel TLC plates 10 x 20 cm (RLI Order #: COOLS1111) |

Specified equipment is not restrictive.
 Other suitable equipment can be substituted.

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mon-11-01-00.1  Romer™ Labs Methods

| EQOLE1330 | |
|--|---|
| STANDARDS | REAGENTS |
| <ul style="list-style-type: none">• 5 ml Moniliformin Spiking Standard: 100 µg/ml in methanol (RLJ Order #: COSST1261)• 5 ml Moniliformin Working Standard: 10 µg/ml in methanol (RLJ Order #: COSST1260) | <ul style="list-style-type: none">• Acetone• Acetonitrile• Hydrochloric acid• Methanol• Phenylenediamine• Toluene• Water, deionized |

For further information please contact:

Technical Services
Romer Labs, Inc.
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Union, MO 63084-1156

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Fax: (636) 583 - 6559
www.romerlabs.com
techserv@romerlabs.com

Version 00.1, June 2000

Specified equipment is not restrictive,
Other suitable equipment can be substituted

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 Covance No.: 8223-016



Cycloplazonic Acid (CPA) TLC Method

AM-000259-01

Application brief for grains and some feeds

The compound was originally described from *Penicillium cyclopium*, thus the name. Cycloplazonic acid (CPA) is a toxic compound produced by several fungi. They are not fluorescent and must be visualized on thin layer chromatography plates by spray reagents. CPA may be important as a single mycotoxin or as a co-contaminant. CPA accumulates in skeletal muscle of selected animals and human exposure may occur through ingestion on contaminated muscle tissue.

Extraction:

Solid: Extract 25 g ground sample[Ⓐ] and QC sample[Ⓒ] with 125 mL 20/80 methanol/chloroform. Add 250 µL of phosphoric acid and cap flask. Shake for a minimum of 1 hour.

Filter supernatant.

[Ⓒ]QC samples are naturally contaminated samples with a known concentration of the analyte which are treated as unknown samples as a check of the TLC method and system. QC samples are used when available.

Standard and Matrix Spike Preparation:

Standard: Spot 10, 20, 40, and 80 µL of a 10 µg/mL CPA working standard. Respectively 100, 200, 400, and 800 ng on the TLC plate.

[Ⓐ]Prespike: Add 100 µL of a 250 µg/mL CPA standard to 25 g sample prior to extraction. Prespike concentration is equal to 200 ng on TLC plate.

[Ⓐ]Postspike: Add 20 µL of a 250 µg/mL CPA standard to 25 mL of filtered extract. Postspike concentration is equal to 200 ng on TLC plate.

Clean-up & Purification:

Measure out 25 mL of extract and pour into a 125 mL separatory funnel. Add 25 mL of 0.5 M aqueous sodium bicarbonate to each separatory funnel. Shake for 30 seconds. Allow the layers to separate, then drain and discard the lower layer.

Slowly add 7 mL of concentrated hydrochloric acid over time to the remaining solution. **Caution: The sample may boil and pop vigorously if too much is added at one time.**

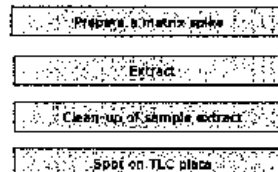
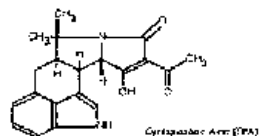
Add 15 mL of chloroform to the separatory funnel and shake for 15 seconds. Allow layers to separate and then collect lower layer into a 40 mL conical tube. Add another 15 mL chloroform to the separatory funnel and shake for 15 seconds. Allow layers to separate and again collect lower layer into the same 40 mL conical tube. Evaporate to dryness under vacuum in a 60°C water bath.

TLC Determination:

Spray a silica gel TLC plate with 2% aqueous oxalic acid. Let the plate air dry, then heat on a hot plate at 38°C for 45-60 minutes. Dissolve sample residue in 40 mL conical tube with 250 µL chloroform. Stopper and vortex for 30 seconds.

Spot 10 µL of each sample and spike, along with 10, 20, 40, and 80 µL of the 10 µg/mL CPA working standard.

Develop plate in 4/1 chloroform/methylisobutylketone until solvent front is about 1 cm from top of plate. Let the plate air dry. (cont)



TLC Determination: (cont)

Spray plate with Ehrlich's spray reagent and let air dry for 10 minutes. View plate in visible light. CPA will appear purple with an R_f of approximately 0.7. Estimate toxin in samples and spikes as compared to the standards.

Determine the level, in ppm, of toxin in original sample by dividing the number of ng seen on the TLC plate by the sample equivalent and dividing by 1000 ng.

For other applications:

www.romerlabs.com
 Or contact your local distributor

For standard information:

www.biopure.net biopure.com
 Or contact your local distributor

Additional information regarding components, calculations, and directions for making reagents and buffers is located on page 2. ☐ ☐ ☐ ☐

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DAS Protocol No.: 101088
 Covance Client Identification: 1002382
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Cycloplazonic Acid (CPA) TLC Method

AW-000099.0

Required Components

Chemicals

- 4-dimethylaminobenzaldehyde
- Chloroform
- Ethanol
- Hydrochloric acid
- Methanol
- Methylisobutylketone
- Oxalic acid
- Phosphoric acid
- Sodium bicarbonate
- Water, deionized

Preparation of Reagents and Buffers

- Ehrlich's spray reagent: Dissolve 1 g of 4-dimethylaminobenzaldehyde in 75 mL of ethanol and add 25 mL of hydrochloric acid.
- 2% aqueous oxalic acid: Add 2 g oxalic acid to 100 mL deionized water.
- 0.5N aqueous sodium bicarbonate: Add 42g sodium bicarbonate to 1L deionized water.

Equipment*

- Romer Series II MM (Order #: EQMMR2010(110V) & EQMMR2015(120V))
- Romer RAS MIB (Order #: EQMMR1010 (110V) & EQMMR1015 (120V))
- Romer Labs TLC Autospotter (Order #: EQDAS1010) with 100 µL autospotter syringes (Order #: EQDAS1020)
- Balance, 400g (Order #: EQOLE1010)
- 100 mL graduated cylinders (Order #: EQOLE1050)
- Timer (Order #: EQOLE1300)
- Eberbach gyratory shaker
- Funnels (Order #: EQOLE1350)
- 125 mL separatory funnels with stopcocks and a rack
- Finnpiette 1-5 mL (Order #: EQOLE1180)
- Finnpiette 200-1000 µL (Order #: EQOLE1130)
- Test Tube Rack (Order #: EQOLE1210)
- Vortex mixer-110 volt (Order #: EQOLE1330)
- Sample containers
- 250 mL screw-top flasks with Teflon lined caps
- Water bath with vacuum source
- 40 mL conical tubes (Order #: LABSP(239)
- Hot plate 12 x 12 in (Order #: EQOLE1061)
- *Other suitable equipment can be substituted.

Consumables

- Filter paper, qualitative (Order #: COOLS1062)
- Pipette tips (1-5 mL) (Order #: COOLS1133)
- Pipette tips (200-1000 µL) (Order #: COOLS1132)
- Silica gel TLC plates (COOLS1111)

Calculations: Samples[®]:

$$\frac{25 \text{ g sample}}{125 \text{ mL extraction solvent}} \times \frac{25 \text{ mL extract}}{0.25 \text{ mL spotting solvent}} \times 0.01 \text{ mL samples spotted} = 0.2 \text{ g sample equivalent}$$

Matrix Spikes - post[®]:

$$\frac{0.020 \text{ mL} \times 250 \text{ ug/mL standard}}{25.0 \text{ mL extract}} \times \frac{25 \text{ mL extract}}{0.25 \text{ mL spotting solvent}} \times 0.01 \text{ mL spotted sample} = 0.2 \text{ ug or } 200 \text{ ng spotted}$$

Matrix Spikes - pre[®]:

$$\frac{0.100 \text{ mL} \times 250 \text{ ug/mL standard}}{125.0 \text{ mL extract}} \times \frac{25 \text{ mL extract}}{0.25 \text{ mL spotting solvent}} \times 0.01 \text{ mL spotted sample} = 0.2 \text{ ug or } 200 \text{ ng spotted}$$

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 Covance Client Identification: 1002382
 Covance No.: 8223-016

| | | | |
|--------------------|--|--------------------------------------|--|
| TOXICOPROF | | SCIENTIFIC NAME | |
| 999-0012 | | TOXICOLOGY | |
| OOSPOREIN IN FEEDS | | SUBSTRATE TYPE / POSSIBLE FUNCTION # | |
| PREPARED BY | | APPROVED BY (SIGNATURE) | |
| CHARLES COATNEY | | George Rottinghaus | |
| FILE DATE | | APPROVED BY (SIGNATURE) | |
| | | Margaret Dunsmore | |
| DATE ADDED: | | LABORATORY ADDRESS (WALTON 50 PE | |
| 3/30/06 | | New | |

PURPOSE AND SCOPE:

This screening procedure is for the qualitative detection of oosporein in corn and corn products by thin layer chromatography (TLC). Samples are extracted and then cleaned up on quaternary amine SPE columns. Oosporein is methylated with diazomethane and then analyzed by silica gel thin layer chromatography. The TLC plate is sprayed with sodium metabisulfite and oosporein appears as a bright yellow spot under longwave UV light. The detection limit for oosporein is 50 ppb.

PREPARATION:

Oosporein primary standard (1,000 ppm) - weigh out 4-5 mg of oosporein (purity was confirmed by NMR and MS.) and add an equal volume of acetonitrile to give a 1,000 µg/mL primary standard solution. Place in a 15 mL Falcon tube and store in freezer.

Oosporein intermediate standard solution (100 ppm) - add 1 mL of the oosporein primary standard to a 10 mL volumetric flask and dilute to volume with acetonitrile and transfer to a 15 mL Falcon tube and store in freezer.

Extraction solvent - Acetonitrile:1% aqueous sodium bicarbonate (1:1).

SPE quaternary amine clean up column - Bakerbond solid phase extraction quaternary amine columns, 3 mL (Part # 7091-03 J. T. Baker). The cleanup columns are washed with 5 mL methanol followed by 5 mL water prior to sample cleanup.

Thin-layer chromatography plates - Analtech 10 X 20 cm prescored silica gel III₁ plates

Mobile phase - toluene:ethyl acetate:formic acid (7:3:1). Using 50 mL of mobile phase would be 35 mL toluene, 15 mL ethyl acetate, and 0.5 mL formic acid.

Diazomethane methylating reagent - pipette 5 mL of 20% sodium hydroxide into a 20 mL test tube and add 5 mL of ethyl ether. N-methyl-N'-nitro-N-nitrosoguanidine (Sigma-Aldrich) is slowly added until a constant yellow color is obtained.

TLC developing spray - 20 gm of sodium metabisulfite is dissolved in 100 mL distilled water.

Rotator shaker - Thermo-Fisher Scientific or equivalent

Balance - Ohaus-Brainweigh B1500D- scale or equivalent

Heating module - Pierce ReactiTherm or equivalent

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DAS Protocol No.: 101088
 Covance Client Identification: 1002382
 Covance No.: 8223-016

| | | | |
|--------------------------|--|--|--|
| COMPONENT | | | SECTION NAME |
| TEST TITLE | | | TOXICOLOGY |
| OOSPOREIN IN FEEDS | | | FOR VOUCHER USE: RETAINED REVISION NO. |
| PREPARED BY | | | TOX-MET-750.01 |
| CHARLES COATNEY | | | APPROVED BY AND SIGNED BY |
| APPROVED BY SECTION HEAD | | | Margaret Dunsmore |
| DATE APPROVED | | | UNDER REVIEW/UNLESS STAMPED HERE |
| 3/30/06 | | | |
| LAB. IT. CHECK DATE | | | |
| New | | | |

UV light - Mineralight Model UVSL-58 or equivalent

Analytical balance - Mettler AE 100 or equivalent

Feed grinder - Stein Mill or equivalent

Centrifuge - Clinical Rotator (Thermo-Fischer Scientific) or equivalent

Additional laboratory forms - Toxicology laboratory bench sheet is used to record data, such as sample weight, volume solvent used, and final volume.

PROCEDURE AND ANALYSIS:

1. Weigh 50 gm of a finely ground feed sample into an 8 oz wide mouth polypropylene bottle and add 100 mL extraction solvent. Tightly secure the lid and place on a rotational shaker for 30 min.
2. Filter approximately 50 mL of the extract through Whatman #4 filter paper into a 50 mL screw cap polypropylene bottle.
3. Apply 10 mL of the filtered extract to a pretreated quaternary amine column and wash the column with 10 mL methanol followed by 5 mL acetone:acetic acid (75:1) and discard the eluent. Run a spiked feed extract (1-2 ppm oosporein) in the same manner.
4. Elute the oosporein from the cleanup column with 10 mL acetone:formic acid (9:1) and evaporate the sample column eluant, spike, and standards to dryness on a heating module with low heat and a gentle stream of air.
5. Dissolve the sample residue, spike and standards in 100 µL acetone and add 200 µL methylating agent or until a yellow color persists. Let the solution stand for 5 minutes in the dark and evaporate to dryness on the heating module.
6. Dissolve the methylated sample residue in 100 µL acetone and spot 10 µL on a silica gel TLC plate along with appropriate methylated oosporein standards. Develop the plate in the mobile phase.
7. The methylated extract, spike, and appropriate methylated standards are spotted on a silica gel HPL plate and developed with toluene:ethyl acetate:formic acid (7:3:1). The plate is removed, dried and sprayed with 20% aqueous sodium metabisulfite. The plate is placed in a 100° C oven heated and observed under longwave UV light, oosporein appears as a bright yellow fluorescent spot (the fluorescence disappears with continued heating).

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Covance No.: 8223-016

| | | |
|--------------------|-----------------------------|----------------------------------|
| TEST NAME | | TOXICOLOGY |
| SOP TITLE | | COVANCE FILE NUMBER REGISTRATION |
| COSPOREIN IN FEEDS | | TOX-MET-750.01 |
| PREPARED BY | APPROVED BY (SOP SIGNATURE) | APPROVED BY (SOP OFFICIAL) |
| CHARLES COATNEY | George Rottinghaus | Margaret Dunsmore |
| REVISION | DATE ADDED TO | LAST REVIEW/UPDATE |
| | 3/30/06 | New |

Calculations:

Results are reported as positive or none detected. Semi-quantitation may be used by re-spotting standards and sample using TOX-MET-768 "Mycotoxin TLC Semi-Quantitation".

Criteria for acceptance:

Spike is visible on the TLC plate

REFERENCE:

Rottinghaus GE, Skelbar HT, Senter LH, and Brown TP. A rapid screening procedure for detecting the mycotoxin cosporein in poultry rations. J Vet Diagn Invest 1:174-175, 1989.

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DAS Protocol No.: 101088
 Covance Client Identification: 1002382
 Covance No.: 8223-016

| | | | |
|--|------------------------|--------------------------------------|-------------------------|
| DEPARTMENT | | SECTION NAME | |
| SOP TITLE | | TOXICOLOGY | |
| DETERMINATION OF ERGOPEPTINE ALKALOIDS IN FEEDSTUFFS | | SOP CREATOR TYPE, NUMBER, REVISION # | |
| | | TON-MET-700.03 | |
| PREPARED BY | APPROVED BY (OPTIONAL) | | APPROVED BY (QUALIFIED) |
| George Rottinghaus | George Rottinghaus | | Margaret Dunsmore |
| FILE LINK | DATE ADDED | LAST REVIEW DATE | |
| | 10/4/99 | 4/3/07 | |
| | | UNCONTROLLED USE NOT STAMPED HERE | |

PURPOSE AND SCOPE:

Quantitative determination of *Claviceps* ergopeptine alkaloids in all grains, mixed feeds, haylages, pellets, and silages. Ground samples are extracted with chloroform:methanol and filtered. Filtrates are cleaned up using SPE Ergonil and M-224 columns. Samples are analyzed by HPLC with fluorescence detection at 250 nm excitation and 420 nm emission with a detection limit of 50 ppb total ergopeptine alkaloids.

PREPARATION:

Primary ergopeptine alkaloid standard solutions (500 ppm) – Ergopeptine alkaloids were purchased from RBI (Sigma). Primary stock solutions of ergotamine, ergocornine, ergocryptine and ergocristine (500 ppm) are prepared in acetonitrile. Ergosine is not commercially available and small quantities have been isolated by preparative HPLC, concentration unknown.

Intermediate ergopeptine alkaloid standard solution mix (10 ppm) – Pipette 200 µL of each primary ergot alkaloid standard solution and the ergosine isolate into a 15 mL polypropylene Falcon tube and add 9.0 mL of acetonitrile to provide a 10 ppm mixed solution of the ergopeptine alkaloid standards.

Working ergopeptine alkaloid standard solution (100 ppb) – Pipette 0.1 mL of intermediate standard solution into a 15 mL polypropylene Falcon tube and add 9.9 mL methanol to provide a 100 ppb ergopeptine alkaloid standard mix. Standards are stored in freezer and replaced as needed.

Vacuum box - (University of Missouri Instrument Shop)

Rotator shaker - Thermo-Fisher Scientific

HPLC system – Hitachi Model L-7100 pump with Hitachi Model L-7480 or L-7483 fluorescence detector (excitation 250 nm, emission 420 nm), Hitachi Model L-7200 autosampler with a Hitachi D-7000 data acquisition interface and ConcenChrom software on a microcomputer.

HPLC operating parameters:

HPLC column: 150 X 4.6 mm reversed phase C₁₈ Luna 3 µm column (Phenomenex) with a C18 SecurityGuard 4.0 x 3.0 mm guard column (Phenomenex).

Mobile phase: acetonitrile:water (40:60) with 200 mg ammonium carbonate added per liter of mobile phase. Filter and degass mobile phase by passing through a 0.45 µm nylon membrane filter under vacuum. Mobile phase is pumped at 1 mL/min.

Flow rate: 1 mL/min

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 Covance Client Identification: 1002382
 Covance No.: 8223-016

| | | | |
|--|--|--------------------------------------|--|
| DEPARTMENT | | SECTION NAME | |
| ARTICLE | | TOXICOLOGY | |
| DETERMINATION OF ERGOPEPTINE ALKALOIDS IN FEEDSTUFFS | | POP-SECTION TYPE: MEMBERSHIP/STATION | |
| TOXICOSITY | | TOX-MKT-70ML03 | |
| APPROVED BY (SECTION HEAD) | | APPROVED BY (QA OFFICER) | |
| George Rottinghaus | | Margaret Dunsmore | |
| DATE ADDED | | LAST REVISION DATE | |
| 10/4/99 | | 4/3/07 | |
| FILE LINK | | CONTROLLED POLISH STAMPED HERE | |

Injection volume: 20 µl.
Column temp: room temp
Detection wavelength: ex-250 nm; em-420 nm
Run time: 20 min

Ergosil cleanup columns - add an S&S 1/2 inch biological disc (Thermo-Fisher, St. Louis, MO) to a 6 ml Monoject disposable syringe barrel (Midwest Vet. Des Moines, IA) followed by: a) 1 mL Ergosil (Analtech, Inc., Newark, DE); b) 1/2 inch S&S disc; c) 1 mL ground sodium sulfate; and d) 1/2 inch S&S disc.

M-224 cleanup columns - prepare by adding 1 cm of M-224 material (Romer Labs, Union, MO) to a 3 mL Monoject disposable syringe barrel containing a small frit in the bottom.

Control ergot sample - prepared by grinding and extracting 0.5 g of ergot body with chloroform:base and storing the chloroform filtrate in freezer. Control sample is run with each batch of samples that are run and plotted in Excel ergot control sheet.

Additional laboratory forms - Toxicology laboratory bench sheet is used to record data, such as sample weight, solvent volume, volume used, and final volume.

PROCEDURE AND ANALYSIS:

1. Weigh 10 g finely ground sample into a 125 mL polypropylene wide mouth screw cap bottle and add 100 mL chloroform and 5 mL 0.1 M sodium hydroxide. Secure lid tightly and place on a rotator shaker for at least 60 min. Add approximately 2 g sodium sulfate and place on rotator shaker for approximately 5 min.
2. Filter approximately 20 mL extract through Whatman PN-1 filter paper (Thermo-Fisher, St. Louis, MO) into a 20 mL screw cap test tube.
3. Apply 10 mL extract in 5 mL increments to Ergosil cleanup column under vacuum (leave 4 vacuum valves open). Elute pigments from the columns with 1.8 mL acetone:chloroform (8:2) followed by approximately 3 mL anhydrous petroleum ether. Apply vacuum (close 4 open vacuum valves) until the cleanup columns are no longer cool to the touch, indicating the petroleum ether has been totally removed.
4. Elute ergopeptine alkaloids with methanol into 2 mL volumetric flask. If the methanol eluate is still pigmented, pass the methanol eluant through a small M-224 cleanup column into an autosampler vial to remove the last remaining pigmentation prior to HPLC analysis.

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 Covance Client Identification: 1002382
 Covance No.: 8223-016

| | | |
|--|--------------------------|---------------------------------|
| DEPARTMENT | | SECTION NAME |
| TOX PATH | | TOXICOLOGY |
| TEST TITLE | | SAS SECTION TYPE NUMBER/VERSION |
| DETERMINATION OF ERGOPEPTINE ALKALOIDS IN FEEDSTUFFS | | TOX-MET-700.03 |
| PREPARED BY | APPROVED BY SECTION HEAD | APPROVED BY QA/CMC/ELN |
| George Rottinghaus | George Rottinghaus | Margaret Dunsmore |
| FILE NAME | DATE ADOPTED | LAST REVISION DATE |
| | 10/4/99 | 4/3/07 |
| UNCONTROLLED PHILLY HEADPHOT HERE | | |

5. Run standards and samples by HPLC using the TOX- INS-759 "Use of HPLC and HSM Software (instructions)" using the "Ergot Screen" method in the HSM software. Always bracket samples with the 100 ppb ergopeptine standard mix.

Retention times: (see Figure 1)

| <u>Ergopeptine alkaloid</u> | <u>Approximate Retention times</u> |
|-----------------------------|------------------------------------|
| Ergosine | 6.0 min |
| Ergotamine | 7.0 min |
| Ergocornine | 10.5 min |
| Ergocryptine | 14.5 min |
| Ergocristine | 17.5 min |

Calculations:

Results should be calculated and reported as a ppb result by using the following equation:

$$\frac{(\text{HPLC value})(\text{final volume})}{1.0 \text{ g ground feed}} = \text{ppb ergopeptine alkaloid}$$

Control values: are determined and data entered into Excel file "ergot control" with date. Control values should be within 20% of average value or sample set is redone.

Confirmation

Treat the methanolic extract that was positive for ergots and standards with 0.2% acetic acid at 65 C for 30 min and reexamine by HPLC for the presence of the inactive -imine isomers of the ergopeptine alkaloids.

REFERENCE:

Rottinghaus GE, Schultz LM, Ross PF, and Hill NS: An HPLC method for the detection of ergot in ground and pelleted feedstuffs. *J Vet Diagn Invest* 5:242-247, 1993.

Chromatograms:

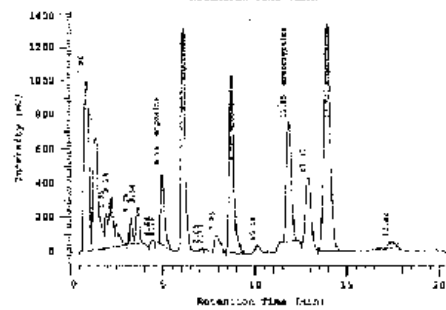
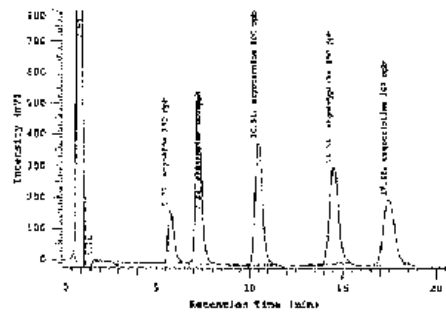
Figure 1. Chrom 1. Ergopeptine alkaloid standard mix (100 ppb); Chrom 2. Ergot contaminated sample.

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Page 3 of 4

DAS Protocol No.: 101088
Covance Client Identification: 1002382
Covance No.: 8223-016

| | | | |
|--|----------------------------|------------------------------------|--|
| DEPARTMENT | | SECTION NAME | |
| TOXICOLOGY | | TOXICOLOGY | |
| POP TITLE | | SUB SECTION TYPE - NUMBER REVISION | |
| DETERMINATION OF ERGOPEPTINE ALKALOIDS IN FEEDSTUFFS | | TOX-MET-700.03 | |
| PREPARED BY | APPROVED BY (SECTION HEAD) | APPROVED BY (QA OFFICER) | |
| George Rottinghaus | George Rottinghaus | Margaret Dunsmore | |
| DATE | DATE ADJUSTED | LAST REVISION DATE | |
| 10/6/99 | 10/6/99 | 4/3/07 | |



PRINTED ON: 8/5/2010 COPY EXPIRES IN 30 DAYS UNLESS STAMPED ABOVE
Page 4 of 4

APPENDIX V

Disposal Certification

(Carcasses)



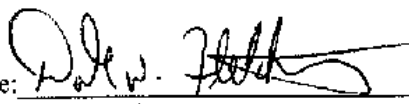
GENESIS Midwest
Laboratories

N6230 County Road G
Neillsville, WI 54456
Phone: (715) 743-4557
FAX: (715) 743-4109
dwfletcher@genesismidwest.com

DISPOSAL CERTIFICATION

Two hundred-forty (240) broilers from GML Study # 208-008-21 (Sponsor # 101088) were transported to Sunny-Side Meadows on October 21, 2010, for slaughter. Protocol-driven tissues were collected and weighed from each bird. All parts collected for weighing as well as the remainder of the carcasses were transported back to Genesis Midwest and were incinerated.

All birds that were not transported to Sunny-Side Meadows for slaughter were humanely euthanized at Genesis Midwest and the carcasses were incinerated.

Signature:  Date: 10/22/10
Dale W. Fletcher
Genesis Midwest, LLC

APPENDIX VI

Data Utilized in Statistical Analysis

Conducted by Dr. Gary Cromwell

ABBREVIATIONS EMPLOYED IN THE FOLLOWING DATA SHEETS

I = Phase 1 (Starter)

II = Phase 2 (Grower)

III = Phase 3 (Finisher)

Init = Initial

Wt = Weight (g)

ADG = Average Daily Gain (g)

ADFI = Average Daily Feed intake (g)

FG = Feed:Gain Ratio

DP = Dressing Percentage

Pct = Percentage

Trt = Treatment/Group

Rep = Replicate

Blk - Block

| 208-008-21 | | | | | BODY WEIGHTS (g) | | | | # of Birds at End of Day: | | | Average Weight, g | | | |
|------------|-----|-----|-----|-----|------------------|--------|---------|---------|---------------------------|----|----|-------------------|-----|-------|-------|
| Blk | Rep | Sex | Pen | Trt | Init | D14 | D28 | D42 | 14 | 28 | 42 | Init | D14 | D28 | D42 |
| Pen Means | | | | | | | | | | | | | | | |
| 1 | 1 | M | 4 | 1 | 453.6 | 4100.0 | 14100.0 | 17700.0 | 10 | 10 | 7 | 45 | 410 | 1,410 | 2,529 |
| 3 | 5 | M | 15 | 1 | 461.8 | 4000.0 | 15000.0 | 24100.0 | 10 | 10 | 9 | 46 | 400 | 1,500 | 2,678 |
| 2 | 3 | M | 29 | 1 | 448.8 | 3400.0 | 12400.0 | 27100.0 | 9 | 9 | 9 | 45 | 378 | 1,378 | 3,011 |
| 5 | 9 | M | 43 | 1 | 440.2 | 3500.0 | 13900.0 | 26200.0 | 10 | 10 | 9 | 44 | 350 | 1,390 | 2,911 |
| 4 | 8 | M | 48 | 1 | 445.6 | 4300.0 | 15300.0 | 27400.0 | 10 | 10 | 9 | 45 | 430 | 1,530 | 3,044 |
| 6 | 12 | M | 56 | 1 | 449.2 | 3500.0 | 13300.0 | 24200.0 | 9 | 9 | 8 | 45 | 389 | 1,478 | 3,025 |
| 2 | 4 | F | 7 | 1 | 407.8 | 3500.0 | 12400.0 | 24900.0 | 10 | 10 | 10 | 41 | 350 | 1,240 | 2,490 |
| 4 | 7 | F | 16 | 1 | 386.0 | 3400.0 | 12300.0 | 24900.0 | 10 | 10 | 10 | 39 | 340 | 1,230 | 2,490 |
| 3 | 6 | F | 22 | 1 | 408.0 | 3700.0 | 13100.0 | 25600.0 | 10 | 10 | 10 | 41 | 370 | 1,310 | 2,560 |
| 1 | 2 | F | 34 | 1 | 392.8 | 3700.0 | 13200.0 | 25400.0 | 10 | 10 | 10 | 39 | 370 | 1,320 | 2,540 |
| 6 | 11 | F | 39 | 1 | 386.2 | 3400.0 | 12600.0 | 27500.0 | 10 | 10 | 10 | 39 | 340 | 1,260 | 2,750 |
| 5 | 10 | F | 51 | 1 | 388.4 | 3200.0 | 12600.0 | 28000.0 | 10 | 10 | 10 | 39 | 320 | 1,260 | 2,800 |
| 1 | 1 | M | 5 | 2 | 453.1 | 4100.0 | 14600.0 | 25600.0 | 10 | 10 | 9 | 45 | 410 | 1,460 | 2,844 |
| 3 | 5 | M | 12 | 2 | 456.8 | 3700.0 | 13900.0 | 26000.0 | 10 | 10 | 9 | 46 | 370 | 1,390 | 2,889 |
| 2 | 3 | M | 27 | 2 | 447.8 | 4000.0 | 14300.0 | 24800.0 | 10 | 10 | 8 | 45 | 400 | 1,430 | 3,100 |
| 5 | 9 | M | 41 | 2 | 449.0 | 3800.0 | 13900.0 | 29300.0 | 10 | 10 | 9 | 45 | 380 | 1,390 | 3,256 |
| 4 | 8 | M | 49 | 2 | 468.2 | 3900.0 | 14500.0 | 25700.0 | 10 | 10 | 9 | 47 | 390 | 1,450 | 2,856 |
| 6 | 12 | M | 57 | 2 | 467.2 | 4000.0 | 15400.0 | 32000.0 | 10 | 10 | 10 | 47 | 400 | 1,540 | 3,200 |
| 2 | 4 | F | 6 | 2 | 390.2 | 3600.0 | 12500.0 | 25100.0 | 10 | 10 | 10 | 39 | 360 | 1,250 | 2,510 |
| 4 | 7 | F | 17 | 2 | 387.2 | 3200.0 | 11200.0 | 21200.0 | 10 | 10 | 9 | 39 | 320 | 1,120 | 2,356 |
| 3 | 6 | F | 25 | 2 | 390.6 | 3900.0 | 13400.0 | 27700.0 | 10 | 10 | 10 | 39 | 390 | 1,340 | 2,770 |
| 1 | 2 | F | 31 | 2 | 390.4 | 3500.0 | 13100.0 | 25600.0 | 10 | 10 | 10 | 39 | 350 | 1,310 | 2,560 |
| 6 | 11 | F | 36 | 2 | 409.6 | 3500.0 | 12800.0 | 25000.0 | 10 | 10 | 10 | 41 | 350 | 1,280 | 2,500 |
| 5 | 10 | F | 52 | 2 | 375.6 | 3100.0 | 10700.0 | 24700.0 | 10 | 9 | 9 | 38 | 310 | 1,189 | 2,744 |
| 1 | 1 | M | 3 | 3 | 457.2 | 4100.0 | 15100.0 | 27200.0 | 10 | 10 | 10 | 46 | 410 | 1,510 | 2,720 |
| 3 | 5 | M | 13 | 3 | 440.2 | 3500.0 | 13400.0 | 25400.0 | 10 | 10 | 9 | 44 | 350 | 1,340 | 2,822 |
| 2 | 3 | M | 30 | 3 | 448.0 | 3400.0 | 12300.0 | 22100.0 | 9 | 9 | 8 | 45 | 378 | 1,367 | 2,763 |
| 5 | 9 | M | 45 | 3 | 464.0 | 3600.0 | 14000.0 | 26400.0 | 10 | 10 | 9 | 46 | 360 | 1,400 | 2,933 |
| 4 | 8 | M | 47 | 3 | 446.2 | 3500.0 | 13300.0 | 29500.0 | 10 | 10 | 10 | 45 | 350 | 1,330 | 2,950 |
| 6 | 12 | M | 58 | 3 | 444.0 | 3700.0 | 14600.0 | 28700.0 | 10 | 10 | 9 | 44 | 370 | 1,460 | 3,189 |
| 2 | 4 | F | 8 | 3 | 415.8 | 3300.0 | 12100.0 | 24400.0 | 10 | 10 | 10 | 42 | 330 | 1,210 | 2,440 |
| 4 | 7 | F | 20 | 3 | 412.2 | 3300.0 | 11800.0 | 24400.0 | 10 | 10 | 10 | 41 | 330 | 1,180 | 2,440 |
| 3 | 6 | F | 24 | 3 | 401.6 | 3300.0 | 9500.0 | 19600.0 | 10 | 8 | 8 | 40 | 330 | 1,188 | 2,450 |
| 1 | 2 | F | 35 | 3 | 385.8 | 3000.0 | 10900.0 | 22000.0 | 10 | 9 | 9 | 39 | 300 | 1,211 | 2,444 |
| 6 | 11 | F | 40 | 3 | 398.6 | 3400.0 | 12100.0 | 27100.0 | 10 | 10 | 10 | 40 | 340 | 1,210 | 2,710 |
| 5 | 10 | F | 55 | 3 | 385.0 | 3300.0 | 12100.0 | 26900.0 | 10 | 10 | 10 | 39 | 330 | 1,210 | 2,690 |

| 208-008-21 | | | | | BODY WEIGHTS (g) | | | | # of Birds at End of Day: | | | Average Weight, g | | | |
|------------|-----|-----|-----|-----|------------------|--------|---------|---------|---------------------------|--------|----------|-------------------|-------|---------|---------|
| Blk | Rep | Sex | Pen | Trt | Init | D14 | D28 | D42 | 14 | 28 | 42 | Init | D14 | D28 | D42 |
| Pen Means | | | | | | | | | | | | | | | |
| 1 | 1 | M | 2 | 4 | 444.7 | 3700.0 | 13700.0 | 27600.0 | 10 | 10 | 10 | 44 | 370 | 1,370 | 2,760 |
| 3 | 5 | M | 14 | 4 | 443.0 | 4200.0 | 15300.0 | 29500.0 | 10 | 10 | 10 | 44 | 420 | 1,530 | 2,950 |
| 2 | 3 | M | 28 | 4 | 438.8 | 3700.0 | 13300.0 | 28300.0 | 10 | 10 | 10 | 44 | 370 | 1,330 | 2,830 |
| 5 | 9 | M | 44 | 4 | 440.6 | 4100.0 | 15500.0 | 26200.0 | 10 | 10 | 8 | 44 | 410 | 1,550 | 3,275 |
| 4 | 8 | M | 46 | 4 | 458.8 | 3800.0 | 14800.0 | 32200.0 | 10 | 10 | 10 | 46 | 380 | 1,480 | 3,220 |
| 6 | 12 | M | 59 | 4 | 467.8 | 4100.0 | 15400.0 | 32700.0 | 10 | 10 | 10 | 47 | 410 | 1,540 | 3,270 |
| 2 | 4 | F | 10 | 4 | 395.6 | 3300.0 | 11400.0 | 23200.0 | 10 | 10 | 10 | 40 | 330 | 1,140 | 2,320 |
| 4 | 7 | F | 18 | 4 | 400.0 | 3500.0 | 13000.0 | 25800.0 | 10 | 10 | 10 | 40 | 350 | 1,300 | 2,580 |
| 3 | 6 | F | 21 | 4 | 388.5 | 3400.0 | 12400.0 | 25400.0 | 10 | 10 | 10 | 39 | 340 | 1,240 | 2,540 |
| 1 | 2 | F | 32 | 4 | 399.6 | 3600.0 | 13200.0 | 25700.0 | 10 | 10 | 10 | 40 | 360 | 1,320 | 2,570 |
| 6 | 11 | F | 37 | 4 | 399.6 | 3200.0 | 12100.0 | 26200.0 | 10 | 10 | 10 | 40 | 320 | 1,210 | 2,620 |
| 5 | 10 | F | 54 | 4 | 374.6 | 3300.0 | 12600.0 | 25800.0 | 10 | 10 | 10 | 37 | 330 | 1,260 | 2,580 |
| 1 | 1 | M | 1 | 5 | 422.9 | 4000.0 | 13500.0 | 27300.0 | 10 | 9 | 9 | 42 | 400 | 1,500 | 3,033 |
| 3 | 5 | M | 11 | 5 | 462.2 | 4000.0 | 14600.0 | 24100.0 | 10 | 10 | 8 | 46 | 400 | 1,460 | 3,013 |
| 2 | 3 | M | 26 | 5 | 459.1 | 4000.0 | 14400.0 | 21900.0 | 10 | 10 | 7 | 46 | 400 | 1,440 | 3,129 |
| 5 | 9 | M | 42 | 5 | 447.6 | 3600.0 | 13400.0 | 26400.0 | 9 | 9 | 8 | 45 | 400 | 1,489 | 3,300 |
| 4 | 8 | M | 50 | 5 | 445.0 | 4000.0 | 14900.0 | 29100.0 | 10 | 10 | 9 | 45 | 400 | 1,490 | 3,233 |
| 6 | 12 | M | 60 | 5 | 455.0 | 3800.0 | 14400.0 | 27400.0 | 10 | 10 | 9 | 46 | 380 | 1,440 | 3,044 |
| 2 | 4 | F | 9 | 5 | 412.4 | 3300.0 | 12300.0 | 24800.0 | 10 | 10 | 10 | 41 | 330 | 1,230 | 2,480 |
| 4 | 7 | F | 19 | 5 | 407.8 | 3600.0 | 12900.0 | 25400.0 | 10 | 10 | 10 | 41 | 360 | 1,290 | 2,540 |
| 3 | 6 | F | 23 | 5 | 390.4 | 3600.0 | 12900.0 | 25500.0 | 10 | 10 | 10 | 39 | 360 | 1,290 | 2,550 |
| 1 | 2 | F | 33 | 5 | 401.8 | 3400.0 | 12300.0 | 24600.0 | 10 | 10 | 10 | 40 | 340 | 1,230 | 2,460 |
| 6 | 11 | F | 38 | 5 | 385.0 | 3500.0 | 12600.0 | 27900.0 | 10 | 10 | 10 | 39 | 350 | 1,260 | 2,790 |
| 5 | 10 | F | 53 | 5 | 372.8 | 3400.0 | 10900.0 | 26100.0 | 10 | 10 | 10 | 37 | 340 | 1,090 | 2,610 |
| Average | | | | | | | | | | | | | | | |
| | Rep | Sex | Pen | Trt | Init | D14 | D28 | D42 | Starter | Grower | Finisher | Init | D14 | D28 | D42 |
| | | M | | 1 | 449.9 | 3800.0 | 14000.0 | 24450.0 | 9.7 | 9.7 | 8.5 | 45.0 | 392.8 | 1,447.6 | 2,866.3 |
| | | F | | 1 | 394.9 | 3483.3 | 12700.0 | 26050.0 | 10.0 | 10.0 | 10.0 | 39.5 | 348.3 | 1,270.0 | 2,605.0 |
| | | M | | 2 | 457.0 | 3916.7 | 14433.3 | 27233.3 | 10.0 | 10.0 | 9.0 | 45.7 | 391.7 | 1,443.3 | 3,024.1 |
| | | F | | 2 | 390.6 | 3466.7 | 12283.3 | 24883.3 | 10.0 | 9.8 | 9.7 | 39.1 | 346.7 | 1,248.1 | 2,573.3 |
| | | M | | 3 | 449.9 | 3633.3 | 13783.3 | 26550.0 | 9.8 | 9.8 | 9.2 | 45.0 | 369.6 | 1,401.1 | 2,896.2 |
| | | F | | 3 | 399.8 | 3266.7 | 11416.7 | 24066.7 | 10.0 | 9.5 | 9.5 | 40.0 | 326.7 | 1,201.4 | 2,529.1 |
| | | M | | 4 | 449.0 | 3933.3 | 14666.7 | 29416.7 | 10.0 | 10.0 | 9.7 | 44.9 | 393.3 | 1,466.7 | 3,050.8 |
| | | F | | 4 | 393.0 | 3383.3 | 12450.0 | 25350.0 | 10.0 | 10.0 | 10.0 | 39.3 | 338.3 | 1,245.0 | 2,535.0 |
| | | M | | 5 | 448.6 | 3900.0 | 14200.0 | 26033.3 | 9.8 | 9.7 | 8.3 | 44.9 | 396.7 | 1,469.8 | 3,125.4 |
| | | F | | 5 | 395.0 | 3466.7 | 12316.7 | 25716.7 | 10.0 | 10.0 | 10.0 | 39.5 | 346.7 | 1,231.7 | 2,571.7 |
| | | | | | | | | | | | | | | | |
| | | | | 1 | 422.4 | 3641.7 | 13350.0 | 25250.0 | 9.8 | 9.8 | 9.3 | 42.2 | 370.6 | 1,358.8 | 2,735.7 |
| | | | | 2 | 423.8 | 3691.7 | 13358.3 | 26058.3 | 10.0 | 9.9 | 9.3 | 42.4 | 369.2 | 1,345.7 | 2,798.7 |
| | | | | 3 | 424.9 | 3450.0 | 12600.0 | 25308.3 | 9.9 | 9.7 | 9.3 | 42.5 | 348.1 | 1,301.3 | 2,712.6 |
| | | | | 4 | 421.0 | 3658.3 | 13558.3 | 27383.3 | 10.0 | 10.0 | 9.8 | 42.1 | 365.8 | 1,355.8 | 2,792.9 |
| | | | | 5 | 421.8 | 3683.3 | 13258.3 | 25875.0 | 9.9 | 9.8 | 9.2 | 42.2 | 371.7 | 1,350.7 | 2,848.5 |
| | | | | | | | | | | | | | | | |
| | | M | | | 450.9 | 3836.7 | 14216.7 | 26736.7 | 9.9 | 9.8 | 8.9 | 45.1 | 388.8 | 1,445.7 | 2,992.6 |
| | | F | | | 394.7 | 3413.3 | 12233.3 | 25213.3 | 10.0 | 9.9 | 9.8 | 39.5 | 341.3 | 1,239.3 | 2,562.8 |

| 208-008-21 | | | | | BODY WEIGHTS (g) | | | | | | | | | | | | | | |
|------------|-----|-----|-----|-----|------------------|-------|-------|------|-------|---------|-------|-------|------|-------|------|-------|-------|------|-------|
| | | | | | ADG, g | | | | | ADFI, g | | | | | FG | | | | |
| Blk | Rep | Sex | Pen | Trt | 0-14 | 14-28 | 28-42 | 0-28 | Final | 0-14 | 14-28 | 28-42 | 0-28 | Final | 0-14 | 14-28 | 28-42 | 0-28 | Final |
| Pen Means | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | M | 4 | 1 | 26.0 | 71.4 | 79.9 | 48.7 | 59.1 | 32.1 | 102.1 | 149.6 | 67.1 | 94.6 | 1.23 | 1.43 | 1.87 | 1.38 | 1.60 |
| 3 | 5 | M | 15 | 1 | 25.3 | 78.6 | 84.1 | 51.9 | 62.7 | 29.3 | 100.0 | 182.4 | 64.7 | 103.9 | 1.16 | 1.27 | 2.17 | 1.25 | 1.66 |
| 2 | 3 | M | 29 | 1 | 23.8 | 71.4 | 116.7 | 47.6 | 70.6 | 27.7 | 97.6 | 169.8 | 62.7 | 98.4 | 1.16 | 1.37 | 1.46 | 1.32 | 1.39 |
| 5 | 9 | M | 43 | 1 | 21.9 | 74.3 | 108.7 | 48.1 | 68.3 | 31.4 | 101.4 | 164.1 | 66.4 | 99.0 | 1.44 | 1.37 | 1.51 | 1.38 | 1.45 |
| 4 | 8 | M | 48 | 1 | 27.5 | 78.6 | 108.2 | 53.1 | 71.4 | 30.0 | 100.0 | 165.9 | 65.0 | 98.6 | 1.09 | 1.27 | 1.53 | 1.23 | 1.38 |
| 6 | 12 | M | 56 | 1 | 24.6 | 77.8 | 110.5 | 51.2 | 71.0 | 33.3 | 109.5 | 166.9 | 71.4 | 103.2 | 1.36 | 1.41 | 1.51 | 1.40 | 1.45 |
| 2 | 4 | F | 7 | 1 | 22.1 | 63.6 | 89.3 | 42.8 | 58.3 | 30.7 | 90.7 | 157.1 | 60.7 | 92.8 | 1.39 | 1.43 | 1.76 | 1.42 | 1.59 |
| 4 | 7 | F | 16 | 1 | 21.5 | 63.6 | 90.0 | 42.6 | 58.4 | 27.9 | 90.7 | 160.0 | 59.3 | 92.9 | 1.30 | 1.43 | 1.78 | 1.39 | 1.59 |
| 3 | 6 | F | 22 | 1 | 23.5 | 67.1 | 89.3 | 45.3 | 60.0 | 27.1 | 97.9 | 162.9 | 62.5 | 96.0 | 1.15 | 1.46 | 1.82 | 1.38 | 1.60 |
| 1 | 2 | F | 34 | 1 | 23.6 | 67.9 | 87.1 | 45.7 | 59.5 | 27.9 | 97.9 | 162.9 | 62.9 | 96.2 | 1.18 | 1.44 | 1.87 | 1.38 | 1.62 |
| 6 | 11 | F | 39 | 1 | 21.5 | 65.7 | 106.4 | 43.6 | 64.6 | 27.1 | 95.7 | 162.9 | 61.4 | 95.2 | 1.26 | 1.46 | 1.53 | 1.41 | 1.48 |
| 5 | 10 | F | 51 | 1 | 20.1 | 67.1 | 110.0 | 43.6 | 65.7 | 27.9 | 102.9 | 157.9 | 65.4 | 96.2 | 1.39 | 1.53 | 1.44 | 1.50 | 1.46 |
| 1 | 1 | M | 5 | 2 | 26.0 | 75.0 | 98.9 | 50.5 | 66.6 | 33.6 | 105.0 | 174.3 | 69.3 | 104.3 | 1.29 | 1.40 | 1.76 | 1.37 | 1.56 |
| 3 | 5 | M | 12 | 2 | 23.2 | 72.9 | 107.1 | 48.0 | 67.7 | 30.0 | 104.3 | 178.5 | 67.2 | 104.3 | 1.30 | 1.43 | 1.67 | 1.40 | 1.54 |
| 2 | 3 | M | 27 | 2 | 25.4 | 73.6 | 119.3 | 49.5 | 72.7 | 30.0 | 105.0 | 167.5 | 67.5 | 100.8 | 1.18 | 1.43 | 1.40 | 1.36 | 1.39 |
| 5 | 9 | M | 41 | 2 | 23.9 | 72.1 | 133.3 | 48.0 | 76.4 | 29.3 | 105.7 | 184.6 | 67.5 | 106.5 | 1.22 | 1.47 | 1.39 | 1.41 | 1.39 |
| 4 | 8 | M | 49 | 2 | 24.5 | 75.7 | 100.4 | 50.1 | 66.9 | 31.4 | 104.3 | 168.1 | 67.9 | 101.3 | 1.28 | 1.38 | 1.67 | 1.35 | 1.51 |
| 6 | 12 | M | 57 | 2 | 25.2 | 81.4 | 118.6 | 53.3 | 75.1 | 30.0 | 104.3 | 175.7 | 67.2 | 103.3 | 1.19 | 1.28 | 1.48 | 1.26 | 1.38 |
| 2 | 4 | F | 6 | 2 | 22.9 | 63.6 | 90.0 | 43.2 | 58.8 | 30.7 | 98.6 | 160.7 | 64.7 | 96.7 | 1.34 | 1.55 | 1.79 | 1.49 | 1.64 |
| 4 | 7 | F | 17 | 2 | 20.1 | 57.1 | 88.3 | 38.6 | 55.2 | 25.7 | 88.6 | 156.1 | 57.2 | 90.1 | 1.28 | 1.55 | 1.77 | 1.48 | 1.63 |
| 3 | 6 | F | 25 | 2 | 25.1 | 67.9 | 102.1 | 46.5 | 65.0 | 29.3 | 99.3 | 157.1 | 64.3 | 95.2 | 1.17 | 1.46 | 1.54 | 1.38 | 1.46 |
| 1 | 2 | F | 31 | 2 | 22.2 | 68.6 | 89.3 | 45.4 | 60.0 | 27.1 | 96.4 | 162.9 | 61.8 | 95.5 | 1.22 | 1.41 | 1.82 | 1.36 | 1.59 |
| 6 | 11 | F | 36 | 2 | 22.1 | 66.4 | 87.1 | 44.3 | 58.5 | 24.3 | 97.1 | 162.9 | 60.7 | 94.8 | 1.10 | 1.46 | 1.87 | 1.37 | 1.62 |
| 5 | 10 | F | 52 | 2 | 19.5 | 62.8 | 111.1 | 41.1 | 64.4 | 24.3 | 96.0 | 181.0 | 60.2 | 100.4 | 1.25 | 1.53 | 1.63 | 1.46 | 1.56 |
| 1 | 1 | M | 3 | 3 | 26.0 | 78.6 | 86.4 | 52.3 | 63.7 | 30.0 | 105.0 | 175.7 | 67.5 | 103.6 | 1.15 | 1.34 | 2.03 | 1.29 | 1.63 |
| 3 | 5 | M | 13 | 3 | 21.9 | 70.7 | 105.9 | 46.3 | 66.1 | 30.0 | 103.6 | 179.3 | 66.8 | 104.3 | 1.37 | 1.47 | 1.69 | 1.44 | 1.58 |
| 2 | 3 | M | 30 | 3 | 23.8 | 70.6 | 99.7 | 47.2 | 64.7 | 31.2 | 103.2 | 178.5 | 67.2 | 104.3 | 1.31 | 1.46 | 1.79 | 1.42 | 1.61 |
| 5 | 9 | M | 45 | 3 | 22.4 | 74.3 | 109.5 | 48.3 | 68.7 | 28.6 | 105.7 | 172.6 | 67.2 | 102.3 | 1.28 | 1.42 | 1.58 | 1.39 | 1.49 |
| 4 | 8 | M | 47 | 3 | 21.8 | 70.0 | 115.7 | 45.9 | 69.2 | 31.4 | 101.4 | 169.3 | 66.4 | 100.7 | 1.44 | 1.45 | 1.46 | 1.45 | 1.46 |
| 6 | 12 | M | 58 | 3 | 23.3 | 77.9 | 123.5 | 50.6 | 74.9 | 27.9 | 103.6 | 180.5 | 65.8 | 104.0 | 1.20 | 1.33 | 1.46 | 1.30 | 1.39 |
| 2 | 4 | F | 8 | 3 | 20.6 | 62.9 | 87.9 | 41.7 | 57.1 | 27.1 | 93.6 | 162.9 | 60.4 | 94.5 | 1.32 | 1.49 | 1.85 | 1.45 | 1.66 |
| 4 | 7 | F | 20 | 3 | 20.6 | 60.7 | 90.0 | 40.7 | 57.1 | 27.1 | 92.1 | 162.1 | 59.6 | 93.8 | 1.31 | 1.52 | 1.80 | 1.47 | 1.64 |
| 3 | 6 | F | 24 | 3 | 20.7 | 61.3 | 90.2 | 41.0 | 57.4 | 28.6 | 92.2 | 164.3 | 60.4 | 95.0 | 1.38 | 1.51 | 1.82 | 1.47 | 1.66 |
| 1 | 2 | F | 35 | 3 | 18.7 | 65.1 | 88.1 | 41.9 | 57.3 | 23.6 | 97.6 | 164.3 | 60.6 | 95.2 | 1.26 | 1.50 | 1.87 | 1.45 | 1.66 |
| 6 | 11 | F | 40 | 3 | 21.4 | 62.1 | 107.1 | 41.8 | 63.6 | 27.1 | 95.7 | 162.1 | 61.4 | 95.0 | 1.26 | 1.54 | 1.51 | 1.47 | 1.49 |
| 5 | 10 | F | 55 | 3 | 20.8 | 62.9 | 105.7 | 41.8 | 63.1 | 26.4 | 94.3 | 162.9 | 60.4 | 94.5 | 1.27 | 1.50 | 1.54 | 1.44 | 1.50 |

| 208-008-21 | | | | | BODY WEIGHTS (g) | | | | | | | | | | | | | | |
|------------|-----|-----|-----|-----|------------------|-------|-------|------|-------|---------|-------|-------|------|-------|------|-------|-------|------|-------|
| | | | | | ADG, g | | | | | ADFI, g | | | | | FG | | | | |
| Blk | Rep | Sex | Pen | Trt | 0-14 | 14-28 | 28-42 | 0-28 | Final | 0-14 | 14-28 | 28-42 | 0-28 | Final | 0-14 | 14-28 | 28-42 | 0-28 | Final |
| Pen Means | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | M | 2 | 4 | 23.3 | 71.4 | 99.3 | 47.3 | 64.7 | 29.3 | 100.7 | 172.9 | 65.0 | 101.0 | 1.26 | 1.41 | 1.74 | 1.37 | 1.56 |
| 3 | 5 | M | 14 | 4 | 26.8 | 79.3 | 101.4 | 53.1 | 69.2 | 30.7 | 108.6 | 177.9 | 69.7 | 105.7 | 1.14 | 1.37 | 1.75 | 1.31 | 1.53 |
| 2 | 3 | M | 28 | 4 | 23.3 | 68.6 | 107.1 | 45.9 | 66.3 | 27.9 | 102.9 | 162.9 | 65.4 | 97.9 | 1.20 | 1.50 | 1.52 | 1.42 | 1.48 |
| 5 | 9 | M | 44 | 4 | 26.1 | 81.4 | 123.2 | 53.8 | 76.9 | 29.3 | 109.3 | 175.8 | 69.3 | 104.8 | 1.12 | 1.34 | 1.43 | 1.29 | 1.36 |
| 4 | 8 | M | 46 | 4 | 23.9 | 78.6 | 124.3 | 51.2 | 75.6 | 32.9 | 106.4 | 175.0 | 69.7 | 104.8 | 1.38 | 1.35 | 1.41 | 1.36 | 1.39 |
| 6 | 12 | M | 59 | 4 | 25.9 | 80.7 | 123.6 | 53.3 | 76.7 | 30.7 | 103.6 | 184.3 | 67.2 | 106.2 | 1.18 | 1.28 | 1.49 | 1.26 | 1.38 |
| 2 | 4 | F | 10 | 4 | 20.7 | 57.9 | 84.3 | 39.3 | 54.3 | 25.0 | 85.0 | 145.7 | 55.0 | 85.2 | 1.21 | 1.47 | 1.73 | 1.40 | 1.57 |
| 4 | 7 | F | 18 | 4 | 22.1 | 67.9 | 91.4 | 45.0 | 60.5 | 27.9 | 99.3 | 162.1 | 63.6 | 96.4 | 1.26 | 1.46 | 1.77 | 1.41 | 1.59 |
| 3 | 6 | F | 21 | 4 | 21.5 | 64.3 | 92.9 | 42.9 | 59.6 | 25.7 | 93.6 | 162.1 | 59.7 | 93.8 | 1.19 | 1.46 | 1.75 | 1.39 | 1.58 |
| 1 | 2 | F | 32 | 4 | 22.9 | 68.6 | 89.3 | 45.7 | 60.2 | 27.1 | 96.4 | 162.1 | 61.8 | 95.2 | 1.19 | 1.41 | 1.82 | 1.35 | 1.58 |
| 6 | 11 | F | 37 | 4 | 20.0 | 63.6 | 100.7 | 41.8 | 61.4 | 24.3 | 87.9 | 152.1 | 56.1 | 88.1 | 1.21 | 1.38 | 1.51 | 1.34 | 1.43 |
| 5 | 10 | F | 54 | 4 | 20.9 | 66.4 | 94.3 | 43.7 | 60.5 | 26.4 | 99.3 | 155.0 | 62.9 | 93.6 | 1.26 | 1.49 | 1.64 | 1.44 | 1.55 |
| 1 | 1 | M | 1 | 5 | 25.6 | 78.6 | 109.5 | 52.1 | 71.2 | 29.3 | 107.5 | 182.5 | 68.4 | 106.4 | 1.15 | 1.37 | 1.67 | 1.31 | 1.49 |
| 3 | 5 | M | 11 | 5 | 25.3 | 75.7 | 110.9 | 50.5 | 70.6 | 29.3 | 108.6 | 183.5 | 69.0 | 107.1 | 1.16 | 1.43 | 1.65 | 1.37 | 1.52 |
| 2 | 3 | M | 26 | 5 | 25.3 | 74.3 | 120.6 | 49.8 | 73.4 | 30.0 | 106.4 | 156.2 | 68.2 | 97.5 | 1.19 | 1.43 | 1.30 | 1.37 | 1.33 |
| 5 | 9 | M | 42 | 5 | 25.4 | 77.8 | 129.4 | 51.6 | 77.5 | 28.6 | 108.7 | 177.2 | 68.7 | 104.8 | 1.13 | 1.40 | 1.37 | 1.33 | 1.35 |
| 4 | 8 | M | 50 | 5 | 25.4 | 77.9 | 124.5 | 51.6 | 75.9 | 30.7 | 108.6 | 173.9 | 69.7 | 104.4 | 1.21 | 1.39 | 1.40 | 1.35 | 1.38 |
| 6 | 12 | M | 60 | 5 | 23.9 | 75.7 | 114.6 | 49.8 | 71.4 | 32.1 | 109.3 | 164.9 | 70.7 | 102.1 | 1.34 | 1.44 | 1.44 | 1.42 | 1.43 |
| 2 | 4 | F | 9 | 5 | 20.6 | 64.3 | 89.3 | 42.5 | 58.1 | 26.4 | 90.7 | 161.4 | 58.6 | 92.8 | 1.28 | 1.41 | 1.81 | 1.38 | 1.60 |
| 4 | 7 | F | 19 | 5 | 22.8 | 66.4 | 89.3 | 44.6 | 59.5 | 27.9 | 95.7 | 158.6 | 61.8 | 94.1 | 1.22 | 1.44 | 1.78 | 1.39 | 1.58 |
| 3 | 6 | F | 23 | 5 | 22.9 | 66.4 | 90.0 | 44.7 | 59.8 | 28.6 | 99.3 | 162.9 | 64.0 | 96.9 | 1.25 | 1.49 | 1.81 | 1.43 | 1.62 |
| 1 | 2 | F | 33 | 5 | 21.4 | 63.6 | 87.9 | 42.5 | 57.6 | 25.7 | 90.7 | 154.3 | 58.2 | 90.2 | 1.20 | 1.43 | 1.76 | 1.37 | 1.57 |
| 6 | 11 | F | 38 | 5 | 22.3 | 65.0 | 109.3 | 43.6 | 65.5 | 26.4 | 92.9 | 160.7 | 59.7 | 93.3 | 1.19 | 1.43 | 1.47 | 1.37 | 1.42 |
| 5 | 10 | F | 53 | 5 | 21.6 | 53.6 | 108.6 | 37.6 | 61.3 | 26.4 | 92.9 | 145.0 | 59.7 | 88.1 | 1.22 | 1.73 | 1.34 | 1.59 | 1.44 |
| Average | | | | | | | | | | | | | | | | | | | |
| | Rep | Sex | Pen | Trt | 0-14 | 14-28 | 28-42 | 0-28 | Final | 0-14 | 14-28 | 28-42 | 0-28 | Final | 0-14 | 14-28 | 28-42 | 0-28 | Final |
| | | M | | 1 | 24.8 | 75.3 | 101.3 | 50.1 | 67.2 | 30.6 | 101.8 | 166.5 | 66.2 | 99.6 | 1.24 | 1.35 | 1.68 | 1.32 | 1.49 |
| | | F | | 1 | 22.1 | 65.8 | 95.4 | 43.9 | 61.1 | 28.1 | 96.0 | 160.6 | 62.0 | 94.9 | 1.28 | 1.46 | 1.70 | 1.41 | 1.56 |
| | | M | | 2 | 24.7 | 75.1 | 112.9 | 49.9 | 70.9 | 30.7 | 104.8 | 174.8 | 67.7 | 103.4 | 1.24 | 1.40 | 1.56 | 1.36 | 1.46 |
| | | F | | 2 | 22.0 | 64.4 | 94.7 | 43.2 | 60.3 | 26.9 | 96.0 | 163.5 | 61.5 | 95.5 | 1.23 | 1.49 | 1.74 | 1.43 | 1.58 |
| | | M | | 3 | 23.2 | 73.7 | 106.8 | 48.4 | 67.9 | 29.9 | 103.8 | 176.0 | 66.8 | 103.2 | 1.29 | 1.41 | 1.67 | 1.38 | 1.52 |
| | | F | | 3 | 20.5 | 62.5 | 94.8 | 41.5 | 59.3 | 26.7 | 94.3 | 163.1 | 60.5 | 94.7 | 1.30 | 1.51 | 1.73 | 1.46 | 1.60 |
| | | M | | 4 | 24.9 | 76.7 | 113.2 | 50.8 | 71.6 | 30.1 | 105.3 | 174.8 | 67.7 | 103.4 | 1.21 | 1.38 | 1.56 | 1.34 | 1.45 |
| | | F | | 4 | 21.4 | 64.8 | 92.1 | 43.1 | 59.4 | 26.1 | 93.6 | 156.5 | 59.8 | 92.1 | 1.22 | 1.45 | 1.70 | 1.39 | 1.55 |
| | | M | | 5 | 25.1 | 76.7 | 118.3 | 50.9 | 73.3 | 30.0 | 108.2 | 173.0 | 69.1 | 103.7 | 1.20 | 1.41 | 1.47 | 1.36 | 1.42 |
| | | F | | 5 | 21.9 | 63.2 | 95.7 | 42.6 | 60.3 | 26.9 | 93.7 | 157.2 | 60.3 | 92.6 | 1.23 | 1.49 | 1.66 | 1.42 | 1.54 |
| | | | | | | | | | | | | | | | | | | | |
| | | | | 1 | 23.5 | 70.6 | 98.3 | 47.0 | 64.1 | 29.4 | 98.9 | 163.5 | 64.1 | 97.3 | 1.26 | 1.40 | 1.69 | 1.37 | 1.52 |
| | | | | 2 | 23.3 | 69.8 | 103.8 | 46.5 | 65.6 | 28.8 | 100.4 | 169.1 | 64.6 | 99.4 | 1.23 | 1.45 | 1.65 | 1.39 | 1.52 |
| | | | | 3 | 21.8 | 68.1 | 100.8 | 45.0 | 63.6 | 28.3 | 99.0 | 169.5 | 63.6 | 98.9 | 1.30 | 1.46 | 1.70 | 1.42 | 1.56 |
| | | | | 4 | 23.1 | 70.7 | 102.6 | 46.9 | 65.5 | 28.1 | 99.4 | 165.7 | 63.8 | 97.7 | 1.22 | 1.41 | 1.63 | 1.36 | 1.50 |
| | | | | 5 | 23.5 | 69.9 | 107.0 | 46.7 | 66.8 | 28.5 | 100.9 | 165.1 | 64.7 | 98.2 | 1.21 | 1.45 | 1.56 | 1.39 | 1.48 |
| | | | | | | | | | | | | | | | | | | | |
| | | M | | | 24.6 | 75.5 | 110.5 | 50.0 | 70.2 | 30.3 | 104.7 | 173.0 | 67.5 | 102.7 | 1.24 | 1.39 | 1.59 | 1.35 | 1.47 |
| | | F | | | 21.6 | 64.1 | 94.5 | 42.8 | 60.1 | 26.9 | 94.7 | 160.2 | 60.8 | 93.9 | 1.25 | 1.48 | 1.71 | 1.42 | 1.57 |

| 208-008-21 | | | | | | | | | | | |
|------------|-----|-----|-----------------------|------|--------|-------|-------------------------|-------|--------|--------|--------|
| | | | | | | | | | | | |
| | | | Live birds at end of: | | | | Survival (%) to end of: | | | | |
| | Sex | Trt | Start | Grow | Finish | | Start | Grow | Finish | | |
| | M | 1 | 58 | 58 | 51 | | 96.7 | 96.7 | 85.0 | | |
| | F | 1 | 60 | 60 | 60 | | 100.0 | 100.0 | 100.0 | | |
| | M | 2 | 60 | 60 | 54 | | 100.0 | 100.0 | 90.0 | | |
| | F | 2 | 60 | 59 | 58 | | 100.0 | 98.3 | 96.7 | | |
| | M | 3 | 59 | 59 | 55 | | 98.3 | 98.3 | 91.7 | | |
| | F | 3 | 60 | 57 | 57 | | 100.0 | 95.0 | 95.0 | | |
| | M | 4 | 60 | 60 | 58 | | 100.0 | 100.0 | 96.7 | | |
| | F | 4 | 60 | 60 | 60 | | 100.0 | 100.0 | 100.0 | | |
| | M | 5 | 59 | 58 | 50 | | 98.3 | 96.7 | 83.3 | | |
| | F | 5 | 60 | 60 | 60 | | 100.0 | 100.0 | 100.0 | | |
| | | | | | | | | | | | |
| | | 1 | 118 | 118 | 111 | | 98.3 | 98.3 | 92.5 | | |
| | | 2 | 120 | 119 | 112 | | 100.0 | 99.2 | 93.3 | | |
| | | 3 | 119 | 116 | 112 | | 99.2 | 96.7 | 93.3 | | |
| | | 4 | 120 | 120 | 118 | | 100.0 | 100.0 | 98.3 | | |
| | | 5 | 119 | 118 | 110 | | 99.2 | 98.3 | 91.7 | | |
| | | | | | | | | | | | |
| | M | | 296 | 295 | 268 | | 98.7 | 98.3 | 89.3 | | |
| | F | | 300 | 296 | 295 | | 100.0 | 98.7 | 98.3 | | |
| | | | | | | | | | | | |
| | | | Mortalities during: | | | | Mortalities (%) during: | | | | |
| | Sex | Trt | Start | Grow | Finish | Total | | Start | Grow | Finish | Finish |
| | M | 1 | 2 | 0 | 7 | 9 | | 3.3 | 0.0 | 11.7 | 15.0 |
| | F | 1 | 0 | 0 | 0 | 0 | | 0.0 | 0.0 | 0.0 | 0.0 |
| | M | 2 | 0 | 0 | 6 | 6 | | 0.0 | 0.0 | 10.0 | 10.0 |
| | F | 2 | 0 | 1 | 1 | 2 | | 0.0 | 1.7 | 1.7 | 3.3 |
| | M | 3 | 1 | 0 | 4 | 5 | | 1.7 | 0.0 | 6.7 | 8.3 |
| | F | 3 | 0 | 3 | 0 | 3 | | 0.0 | 5.0 | 0.0 | 5.0 |
| | M | 4 | 0 | 0 | 2 | 2 | | 0.0 | 0.0 | 3.3 | 3.3 |
| | F | 4 | 0 | 0 | 0 | 0 | | 0.0 | 0.0 | 0.0 | 0.0 |
| | M | 5 | 1 | 1 | 8 | 10 | | 1.7 | 1.7 | 13.3 | 16.7 |
| | F | 5 | 0 | 0 | 0 | 0 | | 0.0 | 0.0 | 0.0 | 0.0 |
| | | | | | | | | | | | |
| | | 1 | 2 | 0 | 7 | 9 | | 1.7 | 0.0 | 5.8 | 7.5 |
| | | 2 | 0 | 1 | 7 | 8 | | 0.0 | 0.8 | 5.8 | 6.7 |
| | | 3 | 1 | 3 | 4 | 8 | | 0.8 | 2.5 | 3.3 | 6.7 |
| | | 4 | 0 | 0 | 2 | 2 | | 0.0 | 0.0 | 1.7 | 1.7 |
| | | 5 | 1 | 1 | 8 | 10 | | 0.8 | 0.8 | 6.7 | 8.3 |
| | | | | | | | | | | | |
| | M | | 4 | 1 | 27 | 32 | | 1.3 | 0.3 | 9.0 | 10.7 |
| | F | | 0 | 4 | 1 | 5 | | 0.0 | 1.3 | 0.3 | 1.7 |

| 208-008-21 | | | | FEED CONSUMPTION | | | # of Days | | | | |
|------------|-----|-----|-----|------------------|-------|-------|-----------|-----|-----|----------|------------|
| | | | | (g/bird/day) | | | | | | | |
| Rep | Sex | Pen | Trt | I | II | III | I | II | III | I and II | All phases |
| Pen Means | | | | | | | | | | | |
| 1 | M | 4 | 1 | 32.1 | 102.1 | 149.6 | 140 | 140 | 119 | 67.1 | 94.6 |
| 5 | M | 15 | 1 | 29.3 | 100.0 | 182.4 | 140 | 140 | 136 | 64.7 | 103.9 |
| 3 | M | 29 | 1 | 27.7 | 97.6 | 169.8 | 137 | 126 | 126 | 62.7 | 98.4 |
| 9 | M | 43 | 1 | 31.4 | 101.4 | 164.1 | 140 | 140 | 131 | 66.4 | 99.0 |
| 8 | M | 48 | 1 | 30.0 | 100.0 | 165.9 | 140 | 140 | 135 | 65.0 | 98.6 |
| 12 | M | 56 | 1 | 33.3 | 109.5 | 166.9 | 138 | 126 | 121 | 71.4 | 103.2 |
| 4 | F | 7 | 1 | 30.7 | 90.7 | 157.1 | 140 | 140 | 140 | 60.7 | 92.8 |
| 7 | F | 16 | 1 | 27.9 | 90.7 | 160.0 | 140 | 140 | 140 | 59.3 | 92.9 |
| 6 | F | 22 | 1 | 27.1 | 97.9 | 162.9 | 140 | 140 | 140 | 62.5 | 96.0 |
| 2 | F | 34 | 1 | 27.9 | 97.9 | 162.9 | 140 | 140 | 140 | 62.9 | 96.2 |
| 11 | F | 39 | 1 | 27.1 | 95.7 | 162.9 | 140 | 140 | 140 | 61.4 | 95.2 |
| 10 | F | 51 | 1 | 27.9 | 102.9 | 157.9 | 140 | 140 | 140 | 65.4 | 96.2 |
| 1 | M | 5 | 2 | 33.6 | 105.0 | 174.3 | 140 | 140 | 136 | 69.3 | 104.3 |
| 5 | M | 12 | 2 | 30.0 | 104.3 | 178.5 | 140 | 140 | 135 | 67.2 | 104.3 |
| 3 | M | 27 | 2 | 30.0 | 105.0 | 167.5 | 140 | 140 | 123 | 67.5 | 100.8 |
| 9 | M | 41 | 2 | 29.3 | 105.7 | 184.6 | 140 | 140 | 136 | 67.5 | 106.5 |
| 8 | M | 49 | 2 | 31.4 | 104.3 | 168.1 | 140 | 140 | 135 | 67.9 | 101.3 |
| 12 | M | 57 | 2 | 30.0 | 104.3 | 175.7 | 140 | 140 | 140 | 67.2 | 103.3 |
| 4 | F | 6 | 2 | 30.7 | 98.6 | 160.7 | 140 | 140 | 140 | 64.7 | 96.7 |
| 7 | F | 17 | 2 | 25.7 | 88.6 | 156.1 | 140 | 140 | 139 | 57.2 | 90.1 |
| 6 | F | 25 | 2 | 29.3 | 99.3 | 157.1 | 140 | 140 | 140 | 64.3 | 95.2 |
| 2 | F | 31 | 2 | 27.1 | 96.4 | 162.9 | 140 | 140 | 140 | 61.8 | 95.5 |
| 11 | F | 36 | 2 | 24.3 | 97.1 | 162.9 | 140 | 140 | 140 | 60.7 | 94.8 |
| 10 | F | 52 | 2 | 24.3 | 96.0 | 181.0 | 140 | 126 | 126 | 60.2 | 100.4 |
| 1 | M | 3 | 3 | 30.0 | 105.0 | 175.7 | 140 | 140 | 140 | 67.5 | 103.6 |
| 5 | M | 13 | 3 | 30.0 | 103.6 | 179.3 | 140 | 140 | 135 | 66.8 | 104.3 |
| 3 | M | 30 | 3 | 31.2 | 103.2 | 178.5 | 138 | 126 | 121 | 67.2 | 104.3 |
| 9 | M | 45 | 3 | 28.6 | 105.7 | 172.6 | 140 | 140 | 135 | 67.2 | 102.3 |
| 8 | M | 47 | 3 | 31.4 | 101.4 | 169.3 | 140 | 140 | 140 | 66.4 | 100.7 |
| 12 | M | 58 | 3 | 27.9 | 103.6 | 180.5 | 140 | 140 | 128 | 65.8 | 104.0 |
| 4 | F | 8 | 3 | 27.1 | 93.6 | 162.9 | 140 | 140 | 140 | 60.4 | 94.5 |
| 7 | F | 20 | 3 | 27.1 | 92.1 | 162.1 | 140 | 140 | 140 | 59.6 | 93.8 |
| 6 | F | 24 | 3 | 28.6 | 92.2 | 164.3 | 140 | 129 | 112 | 60.4 | 95.0 |
| 2 | F | 35 | 3 | 23.6 | 97.6 | 164.3 | 140 | 126 | 126 | 60.6 | 95.2 |
| 11 | F | 40 | 3 | 27.1 | 95.7 | 162.1 | 140 | 140 | 140 | 61.4 | 95.0 |
| 10 | F | 55 | 3 | 26.4 | 94.3 | 162.9 | 140 | 140 | 140 | 60.4 | 94.5 |

| 208-008-21 | | | | FEED CONSUMPTION | | | # of Days | | | | |
|------------|-----|-----|-----|------------------|-------|-------|-----------|-----|-----|----------|------------|
| | | | | (g/bird/day) | | | | | | | |
| Rep | Sex | Pen | Trt | I | II | III | I | II | III | I and II | All phases |
| 1 | M | 2 | 4 | 29.3 | 100.7 | 172.9 | 140 | 140 | 140 | 65.0 | 101.0 |
| 5 | M | 14 | 4 | 30.7 | 108.6 | 177.9 | 140 | 140 | 140 | 69.7 | 105.7 |
| 3 | M | 28 | 4 | 27.9 | 102.9 | 162.9 | 140 | 140 | 140 | 65.4 | 97.9 |
| 9 | M | 44 | 4 | 29.3 | 109.3 | 175.8 | 140 | 140 | 132 | 69.3 | 104.8 |
| 8 | M | 46 | 4 | 32.9 | 106.4 | 175.0 | 140 | 140 | 140 | 69.7 | 104.8 |
| 12 | M | 59 | 4 | 30.7 | 103.6 | 184.3 | 140 | 140 | 140 | 67.2 | 106.2 |
| 4 | F | 10 | 4 | 25.0 | 85.0 | 145.7 | 140 | 140 | 140 | 55.0 | 85.2 |
| 7 | F | 18 | 4 | 27.9 | 99.3 | 162.1 | 140 | 140 | 140 | 63.6 | 96.4 |
| 6 | F | 21 | 4 | 25.7 | 93.6 | 162.1 | 140 | 140 | 140 | 59.7 | 93.8 |
| 2 | F | 32 | 4 | 27.1 | 96.4 | 162.1 | 140 | 140 | 140 | 61.8 | 95.2 |
| 11 | F | 37 | 4 | 24.3 | 87.9 | 152.1 | 140 | 140 | 140 | 56.1 | 88.1 |
| 10 | F | 54 | 4 | 26.4 | 99.3 | 155.0 | 140 | 140 | 140 | 62.9 | 93.6 |
| 1 | M | 1 | 5 | 29.3 | 107.5 | 182.5 | 140 | 133 | 126 | 68.4 | 106.4 |
| 5 | M | 11 | 5 | 29.3 | 108.6 | 183.5 | 140 | 140 | 133 | 69.0 | 107.1 |
| 3 | M | 26 | 5 | 30.0 | 106.4 | 156.2 | 140 | 140 | 121 | 68.2 | 97.5 |
| 9 | M | 42 | 5 | 28.6 | 108.7 | 177.2 | 133 | 126 | 114 | 68.7 | 104.8 |
| 8 | M | 50 | 5 | 30.7 | 108.6 | 173.9 | 140 | 140 | 138 | 69.7 | 104.4 |
| 12 | M | 60 | 5 | 32.1 | 109.3 | 164.9 | 140 | 140 | 134 | 70.7 | 102.1 |
| 4 | F | 9 | 5 | 26.4 | 90.7 | 161.4 | 140 | 140 | 140 | 58.6 | 92.8 |
| 7 | F | 19 | 5 | 27.9 | 95.7 | 158.6 | 140 | 140 | 140 | 61.8 | 94.1 |
| 6 | F | 23 | 5 | 28.6 | 99.3 | 162.9 | 140 | 140 | 140 | 64.0 | 96.9 |
| 2 | F | 33 | 5 | 25.7 | 90.7 | 154.3 | 140 | 140 | 140 | 58.2 | 90.2 |
| 11 | F | 38 | 5 | 26.4 | 92.9 | 160.7 | 140 | 140 | 140 | 59.7 | 93.3 |
| 10 | F | 53 | 5 | 26.4 | 92.9 | 145.0 | 140 | 140 | 140 | 59.7 | 88.1 |

| 208-008-21 | | | | | CARCASS WEIGHTS (g) | | | | | | | | |
|------------|-----|-----|-----|------|---------------------|--------|------------|------|-------|--------|-------|--------|-------|
| Rep | Sex | Pen | Trt | Bird | Live Wt | Hot Wt | Chilled Wt | Fat | Liver | Breast | Wings | Thighs | Legs |
| 1 | M | 4 | 1 | A | 2026.9 | 1579.9 | 1648.3 | 15.5 | 37.9 | 535.4 | 187.0 | 231.6 | 217.2 |
| 1 | M | 4 | 1 | B | 2350.7 | 1814.5 | 1887.3 | 20.7 | 65.7 | 570.6 | 206.1 | 282.0 | 245.0 |
| 1 | M | 4 | 1 | C | 2475.1 | 1881.9 | 1956.5 | 31.0 | 41.5 | 624.7 | 210.6 | 259.8 | 262.8 |
| 1 | M | 4 | 1 | D | 2448.2 | 1935.8 | 2022.3 | 38.0 | 44.9 | 633.1 | 210.1 | 296.3 | 271.0 |
| 5 | M | 15 | 1 | A | 2418.3 | 1963.8 | 2031.3 | 34.2 | 49.4 | 584.9 | 208.9 | 281.5 | 296.9 |
| 5 | M | 15 | 1 | B | 2974.1 | 2255.2 | 2330.9 | 71.8 | 55.5 | 756.0 | 241.0 | 312.6 | 290.6 |
| 5 | M | 15 | 1 | C | 2765.7 | 2069.5 | 2131.1 | 37.5 | 73.0 | 708.9 | 248.4 | 264.1 | 275.9 |
| 5 | M | 15 | 1 | D | 2975.9 | 2281.0 | 2357.2 | 35.4 | 43.8 | 764.3 | 239.3 | 310.6 | 317.4 |
| 3 | M | 29 | 1 | A | 2940.1 | 2321.7 | 2400.4 | 62.8 | 73.0 | 708.9 | 232.3 | 341.3 | 318.1 |
| 3 | M | 29 | 1 | B | 2083.6 | 1612.0 | 1683.0 | 18.7 | 56.2 | 495.1 | 193.7 | 238.3 | 245.3 |
| 3 | M | 29 | 1 | C | 2655.1 | 2101.1 | 2179.3 | 5.6 | 56.0 | 609.2 | 239.4 | 279.3 | 308.3 |
| 3 | M | 29 | 1 | D | 2143.8 | 1633.9 | 1699.2 | 36.5 | 49.4 | 450.2 | 206.5 | 234.7 | 240.0 |
| 9 | M | 43 | 1 | A | 2514.7 | 1949.6 | 2026.9 | 29.8 | 46.1 | 666.0 | 203.2 | 294.7 | 244.3 |
| 9 | M | 43 | 1 | B | 2330.2 | 1808.7 | 1880.4 | 40.4 | 45.8 | 627.3 | 195.4 | 252.7 | 234.9 |
| 9 | M | 43 | 1 | C | 2242.4 | 1762.0 | 1834.1 | 45.1 | 31.3 | 552.5 | 187.3 | 250.4 | 222.1 |
| 9 | M | 43 | 1 | D | 2577.0 | 1796.2 | 1875.6 | 21.2 | 68.5 | 523.7 | 210.9 | 252.6 | 252.9 |
| 8 | M | 48 | 1 | A | 2847.9 | 2138.4 | 2220.2 | 33.4 | 60.1 | 700.5 | 250.6 | 295.5 | 292.1 |
| 8 | M | 48 | 1 | B | 2714.9 | 2058.1 | 2110.4 | 36.7 | 54.9 | 626.5 | 248.2 | 302.8 | 286.2 |
| 8 | M | 48 | 1 | C | 2816.7 | 2157.4 | 2214.3 | 30.3 | 70.7 | 612.6 | 241.8 | 293.7 | 306.1 |
| 8 | M | 48 | 1 | D | 2011.5 | 1547.4 | 1601.4 | 44.3 | 49.3 | 454.5 | 185.7 | 212.0 | 225.7 |
| 12 | M | 56 | 1 | A | 2320.6 | 1850.3 | 1919.3 | 12.8 | 43.7 | 587.3 | 219.8 | 283.3 | 290.9 |
| 12 | M | 56 | 1 | B | 2857.1 | 2217.6 | 2280.5 | 44.0 | 61.0 | 600.9 | 238.9 | 285.1 | 323.1 |
| 12 | M | 56 | 1 | C | 2763.9 | 2154.8 | 2234.2 | 30.2 | 47.5 | 762.0 | 238.7 | 296.9 | 293.5 |
| 12 | M | 56 | 1 | D | 2556.8 | 1930.1 | 1998.8 | 19.5 | 56.5 | 577.6 | 222.9 | 292.8 | 280.3 |
| 4 | F | 7 | 1 | A | 2492.1 | 1960.1 | 2034.2 | 58.4 | 47.8 | 610.2 | 196.5 | 284.1 | 282.0 |
| 4 | F | 7 | 1 | B | 2338.1 | 1749.4 | 1814.2 | 35.5 | 42.8 | 568.8 | 197.5 | 267.5 | 254.2 |
| 4 | F | 7 | 1 | C | 2248.1 | 1809.0 | 1851.3 | 8.7 | 35.0 | 565.3 | 202.6 | 240.0 | 277.7 |
| 4 | F | 7 | 1 | D | 2268.1 | 1949.9 | 2000.2 | 33.0 | 58.1 | 587.0 | 229.0 | 288.6 | 293.5 |
| 7 | F | 16 | 1 | A | 2547.2 | 1992.6 | 2085.5 | 53.2 | 53.1 | 667.2 | 209.2 | 284.0 | 262.3 |
| 7 | F | 16 | 1 | B | 2176.7 | 1742.9 | 1820.1 | 51.3 | 39.8 | 516.9 | 181.4 | 244.4 | 223.6 |
| 7 | F | 16 | 1 | C | 2238.3 | 1790.0 | 1877.3 | 55.0 | 37.6 | 598.1 | 185.3 | 245.1 | 217.6 |
| 7 | F | 16 | 1 | D | 2461.9 | 1950.3 | 2033.4 | 42.2 | 57.4 | 609.1 | 195.9 | 265.8 | 265.4 |
| 6 | F | 22 | 1 | A | 2401.9 | 1837.4 | 1900.2 | 84.7 | 59.9 | 582.9 | 206.4 | 254.0 | 242.8 |
| 6 | F | 22 | 1 | B | 2516.3 | 1956.2 | 2010.2 | 30.1 | 52.5 | 646.5 | 213.9 | 265.3 | 259.8 |
| 6 | F | 22 | 1 | C | 2470.3 | 1846.5 | 1924.6 | 47.1 | 44.8 | 599.4 | 213.6 | 298.0 | 248.1 |
| 6 | F | 22 | 1 | D | 2483.4 | 1936.2 | 2003.4 | 46.0 | 49.8 | 667.5 | 199.6 | 283.0 | 249.2 |
| 2 | F | 34 | 1 | A | 2418.0 | 1983.2 | 2040.3 | 42.1 | 59.4 | 631.1 | 191.8 | 267.9 | 253.0 |
| 2 | F | 34 | 1 | B | 2360.2 | 1863.1 | 1945.9 | 45.7 | 48.5 | 636.2 | 206.8 | 258.2 | 254.6 |
| 2 | F | 34 | 1 | C | 2311.8 | 1813.9 | 1893.3 | 53.5 | 49.3 | 590.1 | 203.6 | 281.8 | 233.6 |
| 2 | F | 34 | 1 | D | 2418.6 | 1925.6 | 2018.5 | 46.7 | 48.2 | 712.7 | 200.0 | 289.9 | 240.3 |
| 11 | F | 39 | 1 | A | 2298.8 | 1814.4 | 1889.3 | 37.5 | 47.3 | 505.7 | 195.8 | 250.9 | 254.9 |
| 11 | F | 39 | 1 | B | 1997.9 | 1511.6 | 1582.6 | 56.0 | 47.5 | 520.5 | 173.5 | 224.4 | 193.7 |
| 11 | F | 39 | 1 | C | 2318.2 | 1835.6 | 1915.8 | 69.4 | 42.4 | 613.3 | 181.5 | 284.8 | 235.3 |
| 11 | F | 39 | 1 | D | 2277.3 | 1822.5 | 1883.4 | 42.7 | 40.0 | 611.4 | 199.0 | 265.5 | 227.2 |
| 10 | F | 51 | 1 | A | 2075.9 | 1597.4 | 1659.7 | 39.7 | 58.0 | 483.4 | 176.6 | 210.9 | 225.6 |
| 10 | F | 51 | 1 | B | 2427.9 | 1942.0 | 2010.2 | 54.3 | 49.8 | 552.0 | 207.4 | 245.3 | 261.4 |
| 10 | F | 51 | 1 | C | 2462.4 | 1929.9 | 1992.3 | 40.5 | 16.2 | 652.7 | 207.8 | 271.2 | 245.3 |
| 10 | F | 51 | 1 | D | 2031.4 | 1583.1 | 1629.4 | 20.9 | 42.1 | 494.6 | 189.2 | 217.0 | 213.7 |

| 208-008-21 | | | | | CARCASS WEIGHTS (g) | | | | | | | | |
|------------|-----|-----|-----|------|---------------------|--------|------------|------|-------|--------|-------|--------|-------|
| Rep | Sex | Pen | Trt | Bird | Live Wt | Hot Wt | Chilled Wt | Fat | Liver | Breast | Wings | Thighs | Legs |
| 1 | M | 5 | 2 | A | 2075.1 | 1612.8 | 1655.9 | 20.1 | 37.6 | 518.2 | 173.9 | 240.7 | 237.3 |
| 1 | M | 5 | 2 | B | 2574.0 | 2037.5 | 2091.0 | 43.9 | 46.0 | 677.8 | 225.7 | 284.9 | 292.8 |
| 1 | M | 5 | 2 | C | 2540.9 | 2028.3 | 2106.2 | 24.2 | 38.7 | 553.5 | 228.2 | 320.6 | 276.4 |
| 1 | M | 5 | 2 | D | 2870.0 | 2348.5 | 2424.2 | 32.1 | 52.2 | 721.1 | 236.0 | 369.1 | 321.1 |
| 5 | M | 12 | 2 | A | 2483.7 | 1862.6 | 1937.9 | 23.1 | 69.7 | 604.7 | 218.8 | 254.4 | 289.6 |
| 5 | M | 12 | 2 | B | 2538.6 | 1972.8 | 2035.2 | 56.5 | 60.1 | 667.8 | 216.4 | 270.7 | 266.5 |
| 5 | M | 12 | 2 | C | 2449.0 | 1884.2 | 1953.7 | 43.7 | 37.6 | 584.8 | 206.3 | 284.9 | 248.9 |
| 5 | M | 12 | 2 | D | 2587.6 | 2045.6 | 2120.4 | 38.5 | 62.5 | 647.2 | 216.5 | 284.9 | 296.6 |
| 3 | M | 27 | 2 | A | 2829.2 | 2196.4 | 2264.3 | 37.6 | 62.3 | 673.6 | 224.0 | 315.2 | 314.8 |
| 3 | M | 27 | 2 | B | 2560.7 | 1947.8 | 1995.5 | 27.3 | 41.1 | 584.0 | 223.3 | 286.4 | 291.6 |
| 3 | M | 27 | 2 | C | 2301.5 | 1760.5 | 1807.4 | 66.0 | 51.7 | 594.5 | 205.2 | 259.2 | 233.5 |
| 3 | M | 27 | 2 | D | 2589.5 | 2015.9 | 2066.5 | 24.0 | 39.3 | 652.2 | 222.9 | 296.8 | 275.0 |
| 9 | M | 41 | 2 | A | 2452.9 | 1847.0 | 1890.5 | 40.1 | 54.9 | 629.9 | 182.3 | 251.2 | 210.6 |
| 9 | M | 41 | 2 | B | 2694.6 | 2148.1 | 2211.3 | 39.1 | 61.7 | 668.7 | 226.8 | 304.5 | 287.4 |
| 9 | M | 41 | 2 | C | 2499.3 | 1951.5 | 2040.8 | 26.7 | 50.1 | 656.4 | 200.4 | 286.7 | 272.2 |
| 9 | M | 41 | 2 | D | 2510.1 | 1987.8 | 2057.4 | 22.6 | 58.4 | 653.5 | 232.7 | 281.4 | 280.5 |
| 8 | M | 49 | 2 | A | 2720.6 | 2093.7 | 2137.9 | 44.7 | 45.8 | 671.3 | 228.5 | 289.1 | 282.3 |
| 8 | M | 49 | 2 | B | 2425.0 | 1915.4 | 1974.0 | 20.5 | 48.9 | 577.1 | 219.1 | 270.7 | 282.2 |
| 8 | M | 49 | 2 | C | 2502.6 | 1917.3 | 1959.7 | 24.1 | 48.9 | 625.2 | 214.7 | 288.6 | 271.9 |
| 8 | M | 49 | 2 | D | 2769.1 | 2137.3 | 2215.0 | 35.4 | 53.8 | 730.6 | 223.8 | 328.7 | 303.5 |
| 12 | M | 57 | 2 | A | 2835.7 | 2162.8 | 2252.4 | 32.8 | 49.6 | 716.3 | 246.4 | 336.4 | 307.3 |
| 12 | M | 57 | 2 | B | 2663.9 | 2030.8 | 2106.5 | 46.1 | 56.2 | 688.0 | 218.8 | 301.0 | 269.3 |
| 12 | M | 57 | 2 | C | 2698.1 | 2055.0 | 2117.1 | 41.7 | 42.4 | 680.7 | 226.8 | 288.9 | 299.4 |
| 12 | M | 57 | 2 | D | 2643.9 | 2043.9 | 2109.3 | 39.1 | 51.0 | 663.4 | 228.0 | 309.3 | 304.0 |
| 4 | F | 6 | 2 | A | 2131.5 | 1615.4 | 1669.3 | 38.9 | 42.2 | 553.3 | 192.0 | 232.7 | 199.8 |
| 4 | F | 6 | 2 | B | 2534.2 | 1984.7 | 2070.5 | 55.0 | 53.2 | 667.1 | 220.4 | 298.6 | 254.8 |
| 4 | F | 6 | 2 | C | 2389.2 | 1977.0 | 2058.5 | 39.1 | 50.5 | 633.9 | 205.4 | 311.7 | 267.1 |
| 4 | F | 6 | 2 | D | 2634.8 | 2118.1 | 2203.2 | 41.0 | 48.7 | 645.0 | 231.0 | 279.6 | 272.1 |
| 7 | F | 17 | 2 | A | 2264.8 | 1764.9 | 1824.5 | 55.9 | 37.6 | 640.4 | 206.9 | 288.0 | 246.9 |
| 7 | F | 17 | 2 | B | 2037.2 | 1561.1 | 1615.8 | 55.3 | 36.9 | 513.5 | 175.7 | 218.2 | 211.9 |
| 7 | F | 17 | 2 | C | 2211.8 | 1710.5 | 1780.2 | 37.6 | 45.8 | 539.1 | 197.3 | 245.1 | 215.7 |
| 7 | F | 17 | 2 | D | 2506.9 | 1919.2 | 1995.7 | 44.7 | 45.3 | 559.4 | 208.2 | 325.2 | 252.7 |
| 6 | F | 25 | 2 | A | 2026.2 | 1557.2 | 1604.6 | 39.8 | 45.0 | 492.8 | 167.8 | 224.6 | 228.3 |
| 6 | F | 25 | 2 | B | 2637.9 | 2058.0 | 2109.3 | 54.5 | 65.9 | 643.1 | 214.5 | 286.9 | 250.2 |
| 6 | F | 25 | 2 | C | 2443.4 | 1974.5 | 2049.1 | 52.3 | 42.4 | 607.4 | 209.4 | 272.9 | 275.3 |
| 6 | F | 25 | 2 | D | 2391.1 | 1863.7 | 1911.2 | 51.7 | 53.6 | 662.5 | 199.4 | 264.8 | 232.6 |
| 2 | F | 31 | 2 | A | 2620.1 | 2054.6 | 2109.5 | 39.0 | 56.0 | 688.2 | 225.0 | 299.9 | 277.1 |
| 2 | F | 31 | 2 | B | 2434.4 | 1928.9 | 1985.1 | 58.5 | 57.8 | 623.1 | 206.9 | 227.5 | 271.1 |
| 2 | F | 31 | 2 | C | 2414.6 | 1996.3 | 2076.5 | 55.3 | 46.4 | 670.6 | 195.4 | 269.8 | 264.3 |
| 2 | F | 31 | 2 | D | 1833.2 | 1395.4 | 1449.9 | 40.0 | 36.0 | 419.6 | 172.7 | 223.5 | 187.9 |
| 11 | F | 36 | 2 | A | 2333.1 | 1771.6 | 1831.5 | 37.0 | 40.8 | 641.4 | 195.4 | 259.7 | 224.5 |
| 11 | F | 36 | 2 | B | 2268.7 | 1722.0 | 1764.8 | 29.7 | 50.6 | 618.8 | 181.3 | 254.3 | 231.8 |
| 11 | F | 36 | 2 | C | 2400.2 | 1892.9 | 1975.1 | 59.8 | 45.5 | 646.7 | 182.1 | 249.1 | 230.8 |
| 11 | F | 36 | 2 | D | 2508.3 | 1991.2 | 2034.6 | 47.0 | 52.4 | 681.4 | 199.4 | 265.0 | 248.2 |
| 10 | F | 52 | 2 | A | 2141.9 | 1692.2 | 1760.8 | 33.6 | 33.8 | 603.9 | 188.1 | 236.1 | 240.2 |
| 10 | F | 52 | 2 | B | 2224.7 | 1751.1 | 1814.9 | 37.7 | 46.9 | 583.0 | 204.8 | 244.7 | 239.7 |
| 10 | F | 52 | 2 | C | 2422.5 | 1884.1 | 1981.0 | 49.3 | 44.8 | 700.0 | 205.9 | 247.3 | 240.3 |
| 10 | F | 52 | 2 | D | 2151.7 | 1656.6 | 1710.2 | 37.8 | 39.6 | 529.8 | 180.6 | 234.8 | 206.0 |

| 208-008-21 | | | | | CARCASS WEIGHTS (g) | | | | | | | | |
|------------|-----|-----|-----|------|---------------------|--------|------------|------|-------|--------|-------|--------|-------|
| Rep | Sex | Pen | Trt | Bird | Live Wt | Hot Wt | Chilled Wt | Fat | Liver | Breast | Wings | Thighs | Legs |
| 1 | M | 3 | 3 | A | 2763.2 | 2078.0 | 2121.2 | 32.3 | 47.7 | 733.8 | 227.7 | 318.2 | 275.4 |
| 1 | M | 3 | 3 | B | 2054.8 | 1587.8 | 1644.0 | 7.6 | 38.2 | 500.1 | 183.5 | 217.1 | 209.6 |
| 1 | M | 3 | 3 | C | 2505.9 | 1997.7 | 2044.5 | 41.5 | 49.1 | 602.3 | 197.8 | 268.0 | 294.6 |
| 1 | M | 3 | 3 | D | 2661.5 | 2078.8 | 2123.5 | 39.3 | 54.5 | 647.5 | 204.1 | 308.8 | 294.3 |
| 5 | M | 13 | 3 | A | 2560.4 | 1968.2 | 2032.9 | 38.5 | 52.4 | 677.4 | 213.3 | 276.3 | 297.7 |
| 5 | M | 13 | 3 | B | 2280.7 | 1754.4 | 1803.7 | 16.9 | 47.0 | 504.0 | 212.5 | 257.8 | 280.6 |
| 5 | M | 13 | 3 | C | 2701.9 | 2207.2 | 2249.4 | 31.8 | 45.6 | 700.9 | 227.0 | 312.5 | 293.5 |
| 5 | M | 13 | 3 | D | 2037.0 | 1553.7 | 1601.8 | 24.2 | 60.1 | 492.1 | 175.6 | 214.1 | 207.1 |
| 3 | M | 30 | 3 | A | 2602.4 | 2051.4 | 2109.1 | 33.7 | 47.8 | 678.6 | 226.1 | 312.5 | 289.4 |
| 3 | M | 30 | 3 | B | 2467.7 | 1860.7 | 1900.8 | 35.2 | 53.9 | 609.5 | 205.0 | 273.2 | 245.3 |
| 3 | M | 30 | 3 | C | 2775.1 | 2190.8 | 2238.5 | 53.3 | 55.2 | 687.8 | 216.7 | 304.2 | 325.5 |
| 3 | M | 30 | 3 | D | 2863.4 | 2197.0 | 2245.2 | 35.9 | 58.4 | 756.5 | 238.1 | 303.9 | 299.5 |
| 9 | M | 45 | 3 | A | 2126.0 | 1630.6 | 1678.5 | 42.4 | 48.9 | 501.2 | 177.6 | 250.0 | 225.6 |
| 9 | M | 45 | 3 | B | 2306.5 | 1741.7 | 1796.9 | 32.2 | 45.8 | 594.1 | 207.4 | 266.4 | 252.6 |
| 9 | M | 45 | 3 | C | 2546.3 | 2021.7 | 2078.0 | 31.8 | 47.2 | 646.4 | 214.3 | 292.6 | 287.7 |
| 9 | M | 45 | 3 | D | 2624.0 | 2023.4 | 2078.0 | 43.1 | 77.2 | 569.9 | 218.6 | 299.9 | 297.5 |
| 8 | M | 47 | 3 | A | 2862.5 | 2232.8 | 2273.4 | 54.0 | 49.1 | 708.4 | 246.5 | 320.9 | 323.5 |
| 8 | M | 47 | 3 | B | 2816.7 | 2202.2 | 2246.2 | 33.6 | 45.6 | 696.3 | 222.1 | 312.4 | 289.8 |
| 8 | M | 47 | 3 | C | 3001.8 | 2316.2 | 2378.5 | 55.6 | 73.4 | 856.4 | 225.3 | 330.4 | 331.1 |
| 8 | M | 47 | 3 | D | 2542.8 | 2012.2 | 2056.4 | 36.6 | 60.9 | 553.4 | 212.4 | 289.9 | 302.6 |
| 12 | M | 58 | 3 | A | 2669.7 | 2104.1 | 2185.5 | 40.2 | 48.9 | 689.2 | 232.3 | 301.2 | 279.8 |
| 12 | M | 58 | 3 | B | 2481.5 | 1937.2 | 1998.5 | 43.4 | 56.1 | 562.9 | 204.2 | 273.8 | 283.4 |
| 12 | M | 58 | 3 | C | 2762.1 | 2136.5 | 2185.6 | 39.8 | 49.6 | 700.9 | 228.5 | 326.8 | 301.4 |
| 12 | M | 58 | 3 | D | 2764.4 | 2232.6 | 2299.1 | 35.7 | 51.6 | 725.1 | 230.7 | 348.5 | 331.5 |
| 4 | F | 8 | 3 | A | 2119.2 | 1636.1 | 1692.4 | 50.4 | 38.8 | 550.1 | 182.9 | 254.6 | 218.9 |
| 4 | F | 8 | 3 | B | 2222.2 | 1785.6 | 1836.5 | 27.1 | 43.0 | 560.9 | 180.7 | 246.4 | 238.5 |
| 4 | F | 8 | 3 | C | 1988.7 | 1599.9 | 1643.4 | 40.9 | 35.2 | 547.9 | 173.1 | 210.5 | 201.7 |
| 4 | F | 8 | 3 | D | 2116.4 | 1629.5 | 1688.4 | 42.1 | 43.8 | 560.1 | 180.6 | 220.3 | 208.0 |
| 7 | F | 20 | 3 | A | 1861.4 | 1410.8 | 1489.5 | 41.7 | 32.2 | 415.8 | 164.2 | 220.1 | 193.0 |
| 7 | F | 20 | 3 | B | 2265.2 | 1781.7 | 1829.5 | 48.3 | 39.2 | 560.7 | 182.8 | 252.5 | 221.6 |
| 7 | F | 20 | 3 | C | 2191.1 | 1726.3 | 1776.1 | 59.4 | 44.6 | 589.7 | 169.9 | 252.7 | 228.4 |
| 7 | F | 20 | 3 | D | 2274.9 | 1804.9 | 1856.6 | 68.4 | 43.7 | 609.5 | 180.7 | 255.1 | 199.6 |
| 6 | F | 24 | 3 | A | 2219.6 | 1727.6 | 1794.5 | 26.8 | 35.8 | 556.3 | 280.2 | 178.3 | 227.9 |
| 6 | F | 24 | 3 | B | 1953.3 | 1501.9 | 1572.5 | 30.5 | 45.0 | 525.9 | 175.3 | 225.6 | 197.9 |
| 6 | F | 24 | 3 | C | 2089.9 | 1634.6 | 1694.4 | 28.5 | 41.5 | 569.7 | 178.6 | 222.3 | 205.1 |
| 6 | F | 24 | 3 | D | 2127.2 | 1628.3 | 1675.5 | 40.8 | 48.1 | 520.8 | 180.4 | 221.5 | 216.9 |
| 2 | F | 35 | 3 | A | 2326.5 | 1787.9 | 1835.9 | 62.2 | 43.3 | 612.2 | 194.2 | 274.1 | 213.4 |
| 2 | F | 35 | 3 | B | 2254.1 | 1803.7 | 1857.4 | 24.3 | 45.6 | 630.1 | 199.7 | 216.3 | 234.9 |
| 2 | F | 35 | 3 | C | 2102.1 | 1678.6 | 1723.7 | 21.1 | 39.4 | 600.1 | 183.1 | 238.0 | 221.3 |
| 2 | F | 35 | 3 | D | 2286.8 | 1827.7 | 1903.3 | 27.9 | 45.1 | 626.5 | 202.4 | 268.0 | 239.3 |
| 11 | F | 40 | 3 | A | 2234.6 | 1746.9 | 1791.1 | 44.3 | 37.8 | 657.1 | 195.3 | 246.7 | 223.6 |
| 11 | F | 40 | 3 | B | 2331.2 | 1830.5 | 1896.6 | 36.1 | 44.7 | 653.1 | 196.5 | 263.0 | 237.7 |
| 11 | F | 40 | 3 | C | 2577.6 | 2079.0 | 2142.5 | 46.2 | 53.2 | 670.3 | 196.5 | 336.0 | 274.8 |
| 11 | F | 40 | 3 | D | 2333.7 | 1802.2 | 1860.7 | 45.7 | 51.0 | 643.3 | 189.0 | 240.7 | 228.6 |
| 10 | F | 55 | 3 | A | 2329.9 | 1815.1 | 1863.2 | 47.7 | 52.0 | 633.7 | 187.7 | 303.7 | 234.4 |
| 10 | F | 55 | 3 | B | 2177.5 | 1708.5 | 1770.5 | 37.9 | 39.1 | 529.9 | 186.4 | 245.8 | 226.6 |
| 10 | F | 55 | 3 | C | 2306.7 | 1832.0 | 1882.5 | 24.2 | 40.5 | 620.0 | 201.6 | 295.5 | 253.3 |
| 10 | F | 55 | 3 | D | 2289.7 | 1818.4 | 1861.1 | 64.3 | 43.4 | 605.9 | 181.0 | 267.0 | 230.2 |

| 208-008-21 | | | | | CARCASS WEIGHTS (g) | | | | | | | | |
|------------|-----|-----|-----|------|---------------------|--------|------------|------|-------|--------|-------|--------|-------|
| Rep | Sex | Pen | Trt | Bird | Live Wt | Hot Wt | Chilled Wt | Fat | Liver | Breast | Wings | Thighs | Legs |
| 1 | M | 2 | 4 | A | 2655.2 | 2094.4 | 2156.1 | 25.8 | 47.8 | 649.8 | 232.0 | 335.3 | 310.9 |
| 1 | M | 2 | 4 | B | 2209.1 | 1727.6 | 1791.1 | 47.1 | 49.8 | 577.7 | 200.9 | 272.9 | 246.0 |
| 1 | M | 2 | 4 | C | 2400.7 | 1791.0 | 1848.5 | 32.4 | 61.4 | 566.0 | 209.6 | 252.0 | 274.3 |
| 1 | M | 2 | 4 | D | 2391.2 | 1705.3 | 1754.4 | 18.7 | 43.3 | 546.3 | 207.0 | 254.4 | 239.1 |
| 5 | M | 14 | 4 | A | 2931.4 | 2253.3 | 2309.6 | 40.9 | 54.2 | 683.5 | 240.7 | 373.6 | 320.3 |
| 5 | M | 14 | 4 | B | 3151.2 | 2432.8 | 2488.8 | 51.4 | 70.5 | 738.5 | 265.7 | 341.4 | 347.7 |
| 5 | M | 14 | 4 | C | 2714.2 | 2001.7 | 2068.8 | 44.0 | 66.3 | 682.7 | 249.1 | 283.8 | 277.8 |
| 5 | M | 14 | 4 | D | 2665.0 | 2147.3 | 2214.8 | 33.2 | 48.7 | 687.8 | 224.7 | 328.1 | 318.9 |
| 3 | M | 28 | 4 | A | 2525.3 | 2015.7 | 2111.1 | 10.6 | 50.2 | 679.2 | 210.4 | 313.0 | 287.8 |
| 3 | M | 28 | 4 | B | 2609.9 | 2045.0 | 2114.0 | 17.9 | 52.7 | 604.4 | 230.6 | 307.0 | 318.7 |
| 3 | M | 28 | 4 | C | 2415.2 | 1848.4 | 1906.8 | 28.8 | 44.7 | 593.7 | 216.6 | 322.1 | 290.2 |
| 3 | M | 28 | 4 | D | 1997.9 | 1526.2 | 1574.2 | 28.0 | 53.3 | 482.5 | 194.2 | 234.6 | 225.0 |
| 9 | M | 44 | 4 | A | 3116.1 | 2432.3 | 2505.1 | 48.6 | 77.5 | 697.5 | 262.5 | 330.0 | 335.7 |
| 9 | M | 44 | 4 | B | 2870.7 | 2187.2 | 2256.6 | 55.6 | 62.4 | 700.4 | 218.0 | 345.4 | 302.4 |
| 9 | M | 44 | 4 | C | 2626.7 | 2074.8 | 2151.1 | 34.0 | 66.0 | 680.8 | 211.4 | 287.4 | 287.7 |
| 9 | M | 44 | 4 | D | 2572.1 | 2028.5 | 2094.7 | 35.9 | 41.2 | 685.6 | 222.6 | 312.9 | 278.3 |
| 8 | M | 46 | 4 | A | 2483.9 | 1903.4 | 1962.5 | 37.5 | 51.7 | 543.4 | 218.8 | 273.5 | 289.2 |
| 8 | M | 46 | 4 | B | 2500.8 | 1915.0 | 1978.2 | 31.5 | 52.5 | 612.7 | 218.4 | 280.1 | 289.1 |
| 8 | M | 46 | 4 | C | 2392.2 | 1961.0 | 2024.7 | 23.9 | 47.8 | 624.7 | 204.0 | 279.8 | 289.9 |
| 8 | M | 46 | 4 | D | 2324.2 | 1815.3 | 1880.2 | 27.9 | 56.3 | 598.8 | 204.6 | 267.9 | 267.8 |
| 12 | M | 59 | 4 | A | 2999.5 | 2380.6 | 2440.0 | 57.0 | 52.6 | 770.2 | 242.8 | 303.2 | 265.8 |
| 12 | M | 59 | 4 | B | 2848.5 | 2208.3 | 2268.3 | 37.8 | 57.4 | 726.8 | 230.0 | 329.5 | 315.8 |
| 12 | M | 59 | 4 | C | 2785.9 | 2111.5 | 2153.8 | 33.8 | 70.7 | 682.8 | 241.3 | 302.6 | 295.6 |
| 12 | M | 59 | 4 | D | 2621.2 | 2077.2 | 2164.6 | 33.1 | 54.8 | 726.3 | 214.1 | 290.6 | 287.5 |
| 4 | F | 10 | 4 | A | 2060.7 | 1572.0 | 1646.2 | 38.3 | 41.7 | 562.0 | 192.9 | 278.1 | 272.4 |
| 4 | F | 10 | 4 | B | 2271.4 | 1848.2 | 1928.4 | 32.4 | 44.0 | 676.1 | 192.8 | 256.0 | 223.7 |
| 4 | F | 10 | 4 | C | 2430.2 | 1919.1 | 1963.4 | 55.8 | 43.3 | 674.0 | 195.4 | 271.7 | 234.1 |
| 4 | F | 10 | 4 | D | 2385.4 | 1922.0 | 1974.4 | 53.7 | 48.7 | 611.2 | 201.0 | 273.9 | 261.4 |
| 7 | F | 18 | 4 | A | 2359.8 | 1882.5 | 1965.8 | 41.2 | 48.4 | 634.7 | 205.4 | 276.9 | 254.8 |
| 7 | F | 18 | 4 | B | 2091.3 | 1654.6 | 1728.8 | 50.4 | 53.7 | 535.2 | 175.4 | 243.7 | 228.6 |
| 7 | F | 18 | 4 | C | 2730.4 | 2134.7 | 2206.5 | 50.3 | 59.2 | 712.0 | 211.8 | 297.2 | 255.4 |
| 7 | F | 18 | 4 | D | 2271.6 | 1825.5 | 1891.2 | 28.0 | 48.4 | 598.4 | 205.9 | 270.3 | 234.1 |
| 6 | F | 21 | 4 | A | 2542.9 | 2046.0 | 2106.5 | 39.0 | 36.5 | 648.5 | 216.9 | 310.5 | 244.3 |
| 6 | F | 21 | 4 | B | 2234.1 | 1791.9 | 1853.9 | 38.6 | 44.2 | 583.2 | 199.3 | 271.9 | 235.5 |
| 6 | F | 21 | 4 | C | 2213.3 | 1817.2 | 1899.9 | 29.3 | 38.0 | 610.0 | 184.1 | 260.7 | 254.0 |
| 6 | F | 21 | 4 | D | 2142.0 | 1698.6 | 1755.8 | 42.8 | 44.3 | 613.1 | 181.6 | 270.4 | 210.4 |
| 2 | F | 32 | 4 | A | 2354.0 | 1862.1 | 1923.5 | 24.6 | 33.5 | 609.2 | 200.6 | 271.4 | 272.1 |
| 2 | F | 32 | 4 | B | 2583.0 | 2066.0 | 2124.4 | 62.2 | 57.1 | 655.1 | 211.3 | 286.1 | 272.0 |
| 2 | F | 32 | 4 | C | 2352.0 | 1832.0 | 1893.5 | 45.8 | 44.0 | 593.4 | 207.4 | 281.2 | 238.3 |
| 2 | F | 32 | 4 | D | 2325.7 | 1818.0 | 1887.2 | 23.6 | 51.5 | 621.2 | 199.8 | 273.8 | 246.6 |
| 11 | F | 37 | 4 | A | 2361.2 | 1885.2 | 1941.6 | 48.2 | 46.8 | 686.5 | 196.0 | 287.0 | 240.2 |
| 11 | F | 37 | 4 | B | 1930.1 | 1517.0 | 1605.2 | 34.9 | 39.4 | 532.3 | 171.4 | 214.7 | 208.2 |
| 11 | F | 37 | 4 | C | 2219.1 | 1744.5 | 1800.1 | 50.7 | 47.1 | 557.8 | 189.9 | 276.2 | 229.6 |
| 11 | F | 37 | 4 | D | 2186.7 | 1693.7 | 1765.5 | 40.0 | 38.0 | 545.5 | 196.5 | 277.1 | 238.8 |
| 10 | F | 54 | 4 | A | 2189.5 | 1774.1 | 1840.9 | 36.4 | 45.6 | 526.1 | 196.6 | 276.2 | 235.9 |
| 10 | F | 54 | 4 | B | 2301.1 | 1809.9 | 1851.2 | 44.0 | 40.2 | 568.8 | 198.1 | 262.5 | 244.5 |
| 10 | F | 54 | 4 | C | 2320.1 | 1851.7 | 1914.1 | 38.7 | 58.8 | 654.3 | 200.6 | 259.8 | 234.6 |
| 10 | F | 54 | 4 | D | 2294.9 | 1781.3 | 1849.9 | 50.1 | 46.4 | 590.5 | 190.4 | 272.9 | 238.0 |

| 208-008-21 | | | | | CARCASS WEIGHTS (g) | | | | | | | | |
|------------|-----|-----|-----|------|---------------------|--------|------------|------|-------|--------|-------|--------|-------|
| Rep | Sex | Pen | Trt | Bird | Live Wt | Hot Wt | Chilled Wt | Fat | Liver | Breast | Wings | Thighs | Legs |
| 1 | M | 1 | 5 | A | 2683.6 | 2141.2 | 2210.2 | 41.6 | 54.2 | 619.3 | 219.9 | 295.8 | 295.9 |
| 1 | M | 1 | 5 | B | 2636.6 | 2073.7 | 2135.0 | 25.3 | 49.3 | 603.9 | 227.4 | 307.8 | 303.2 |
| 1 | M | 1 | 5 | C | 2765.6 | 2130.4 | 2186.0 | 51.4 | 44.2 | 688.8 | 229.4 | 314.3 | 291.3 |
| 1 | M | 1 | 5 | D | 2702.3 | 2038.0 | 2120.1 | 50.0 | 65.0 | 678.5 | 207.1 | 320.2 | 292.2 |
| 5 | M | 11 | 5 | A | 2403.5 | 1803.1 | 1864.8 | 40.5 | 45.9 | 641.4 | 211.8 | 266.7 | 239.9 |
| 5 | M | 11 | 5 | B | 2505.3 | 1847.0 | 1903.5 | 38.5 | 47.0 | 685.2 | 190.0 | 285.7 | 222.8 |
| 5 | M | 11 | 5 | C | 2740.2 | 2070.3 | 2133.4 | 54.5 | 48.4 | 714.3 | 209.4 | 297.7 | 259.7 |
| 5 | M | 11 | 5 | D | 2465.7 | 1757.6 | 1810.5 | 47.9 | 46.2 | 538.6 | 199.3 | 252.9 | 235.5 |
| 3 | M | 26 | 5 | A | 2318.4 | 1803.5 | 1865.6 | 22.5 | 38.0 | 619.7 | 194.2 | 260.2 | 238.0 |
| 3 | M | 26 | 5 | B | 2740.2 | 2202.3 | 2280.5 | 18.3 | 58.9 | 787.9 | 231.6 | 295.4 | 282.1 |
| 3 | M | 26 | 5 | C | 2732.2 | 2059.2 | 2106.4 | 52.0 | 66.4 | 683.3 | 223.7 | 287.1 | 305.1 |
| 3 | M | 26 | 5 | D | 2410.1 | 1901.4 | 1968.7 | 32.0 | 62.2 | 658.8 | 208.7 | 257.9 | 246.9 |
| 9 | M | 42 | 5 | A | 3330.6 | 2588.4 | 2663.8 | 64.3 | 51.2 | 768.0 | 266.8 | 342.9 | 340.7 |
| 9 | M | 42 | 5 | B | 2708.4 | 2197.3 | 2280.4 | 37.2 | 54.0 | 696.3 | 226.7 | 322.8 | 305.6 |
| 9 | M | 42 | 5 | C | 2742.5 | 2145.1 | 2208.2 | 48.9 | 58.2 | 643.8 | 234.6 | 291.8 | 300.0 |
| 9 | M | 42 | 5 | D | 3091.5 | 2393.3 | 2465.2 | 47.6 | 71.4 | 773.8 | 264.0 | 359.8 | 346.1 |
| 8 | M | 50 | 5 | A | 2785.9 | 2136.6 | 2192.5 | 45.7 | 48.0 | 719.9 | 225.4 | 322.5 | 321.7 |
| 8 | M | 50 | 5 | B | 2771.4 | 2176.6 | 2244.4 | 38.5 | 51.7 | 653.5 | 257.9 | 316.8 | 318.1 |
| 8 | M | 50 | 5 | C | 2736.9 | 2156.3 | 2223.4 | 54.4 | 54.8 | 668.3 | 233.3 | 320.3 | 268.0 |
| 8 | M | 50 | 5 | D | 2798.2 | 2211.9 | 2268.7 | 46.2 | 57.4 | 767.2 | 237.3 | 318.0 | 295.1 |
| 12 | M | 60 | 5 | A | 2831.7 | 2258.6 | 2317.2 | 41.2 | 56.3 | 747.0 | 230.6 | 359.2 | 305.5 |
| 12 | M | 60 | 5 | B | 2887.6 | 2241.9 | 2324.8 | 48.4 | 53.9 | 665.9 | 258.1 | 329.9 | 322.7 |
| 12 | M | 60 | 5 | C | 2576.8 | 1989.5 | 2041.8 | 36.9 | 34.2 | 605.6 | 221.5 | 298.0 | 276.9 |
| 12 | M | 60 | 5 | D | 2380.7 | 1857.2 | 1908.0 | 22.7 | 41.3 | 667.1 | 196.0 | 295.3 | 259.7 |
| 4 | F | 9 | 5 | A | 2447.8 | 1884.6 | 1951.7 | 42.5 | 63.9 | 679.3 | 205.5 | 268.2 | 244.9 |
| 4 | F | 9 | 5 | B | 2131.6 | 1638.5 | 1699.8 | 43.3 | 45.7 | 559.7 | 193.5 | 241.3 | 214.3 |
| 4 | F | 9 | 5 | C | 2527.3 | 2054.2 | 2119.1 | 48.8 | 56.3 | 725.2 | 201.6 | 280.9 | 265.2 |
| 4 | F | 9 | 5 | D | 2508.9 | 2042.3 | 2105.6 | 43.2 | 48.8 | 793.8 | 197.8 | 284.0 | 258.0 |
| 7 | F | 19 | 5 | A | 2886.5 | 2291.2 | 2364.9 | 67.1 | 69.1 | 765.3 | 246.5 | 307.9 | 325.0 |
| 7 | F | 19 | 5 | B | 2889.8 | 2263.8 | 2314.3 | 28.8 | 48.9 | 743.8 | 253.6 | 368.5 | 312.4 |
| 7 | F | 19 | 5 | C | 2538.9 | 2135.3 | 2205.7 | 36.0 | 64.9 | 675.4 | 238.8 | 315.0 | 312.7 |
| 7 | F | 19 | 5 | D | 2843.6 | 2431.1 | 2490.9 | 58.2 | 49.2 | 750.7 | 269.7 | 353.9 | 341.9 |
| 6 | F | 23 | 5 | A | 2364.9 | 1924.4 | 2005.5 | 23.7 | 42.5 | 628.2 | 206.9 | 263.4 | 260.3 |
| 6 | F | 23 | 5 | B | 2423.4 | 1891.4 | 1964.3 | 51.5 | 56.2 | 632.5 | 197.0 | 247.8 | 255.8 |
| 6 | F | 23 | 5 | C | 2349.1 | 1866.4 | 1944.1 | 44.7 | 50.5 | 609.1 | 212.4 | 275.5 | 273.3 |
| 6 | F | 23 | 5 | D | 2563.3 | 2010.5 | 2100.9 | 52.2 | 48.5 | 752.5 | 210.7 | 299.1 | 247.2 |
| 2 | F | 33 | 5 | A | 2440.1 | 2000.3 | 2068.6 | 39.5 | 52.2 | 713.5 | 191.7 | 259.4 | 267.8 |
| 2 | F | 33 | 5 | B | 2118.8 | 1627.3 | 1682.8 | 34.3 | 60.8 | 531.0 | 193.2 | 238.2 | 224.8 |
| 2 | F | 33 | 5 | C | 2216.6 | 1807.3 | 1861.0 | 28.0 | 43.0 | 643.9 | 183.4 | 257.6 | 223.8 |
| 2 | F | 33 | 5 | D | 2205.6 | 1759.3 | 1806.4 | 29.2 | 49.1 | 604.2 | 191.1 | 247.7 | 232.6 |
| 11 | F | 38 | 5 | A | 2277.7 | 1783.0 | 1827.7 | 54.0 | 32.1 | 670.3 | 177.9 | 224.4 | 236.6 |
| 11 | F | 38 | 5 | B | 2370.2 | 1838.4 | 1908.5 | 47.2 | 46.7 | 589.1 | 204.4 | 279.2 | 250.3 |
| 11 | F | 38 | 5 | C | 2322.5 | 1851.7 | 1908.1 | 35.4 | 48.4 | 649.8 | 185.5 | 275.5 | 263.5 |
| 11 | F | 38 | 5 | D | 2524.4 | 2067.2 | 2128.9 | 47.3 | 48.2 | 694.6 | 217.5 | 284.6 | 269.2 |
| 10 | F | 53 | 5 | A | 1977.4 | 1587.9 | 1638.9 | 26.2 | 44.2 | 558.7 | 181.9 | 221.7 | 220.4 |
| 10 | F | 53 | 5 | B | 2099.9 | 1707.9 | 1758.9 | 18.4 | 33.9 | 520.7 | 197.8 | 241.7 | 225.3 |
| 10 | F | 53 | 5 | C | 2086.0 | 1613.8 | 1667.5 | 31.2 | 37.1 | 546.8 | 178.8 | 243.8 | 235.2 |
| 10 | F | 53 | 5 | D | 2143.8 | 1724.4 | 1802.2 | 34.7 | 24.3 | 599.9 | 188.5 | 236.4 | 229.8 |

| 208-008-21 | | | | | CARCASS WEIGHTS (g) | | | | | |
|------------|-----|-----|-----|-----|---------------------|--------|------------|--------|---------|------|
| Pen Means | | | | | | | | | | |
| Blk | Rep | Sex | Pen | Trt | Live Wt | Hot Wt | Chilled Wt | DP-Hot | DP-Cold | Gain |
| 1 | 1 | M | 4 | 1 | 2325.2 | 1803.0 | 1878.6 | 77.6 | 80.8 | 4.19 |
| 3 | 5 | M | 15 | 1 | 2783.5 | 2142.4 | 2212.6 | 77.1 | 79.7 | 3.28 |
| 2 | 3 | M | 29 | 1 | 2455.7 | 1917.2 | 1990.5 | 77.9 | 80.9 | 3.88 |
| 5 | 9 | M | 43 | 1 | 2416.1 | 1829.1 | 1904.3 | 75.9 | 79.0 | 4.11 |
| 4 | 8 | M | 48 | 1 | 2597.8 | 1975.3 | 2036.6 | 76.1 | 78.5 | 3.12 |
| 6 | 12 | M | 56 | 1 | 2624.6 | 2038.2 | 2108.2 | 77.7 | 80.4 | 3.45 |
| 2 | 4 | F | 7 | 1 | 2336.6 | 1867.1 | 1925.0 | 80.0 | 82.4 | 3.10 |
| 4 | 7 | F | 16 | 1 | 2356.0 | 1869.0 | 1954.1 | 79.4 | 83.0 | 4.56 |
| 3 | 6 | F | 22 | 1 | 2468.0 | 1894.1 | 1959.6 | 76.7 | 79.4 | 3.47 |
| 1 | 2 | F | 34 | 1 | 2377.2 | 1896.5 | 1974.5 | 79.8 | 83.0 | 4.13 |
| 6 | 11 | F | 39 | 1 | 2223.1 | 1746.0 | 1817.8 | 78.4 | 81.7 | 4.13 |
| 5 | 10 | F | 51 | 1 | 2249.4 | 1763.1 | 1822.9 | 78.3 | 81.0 | 3.39 |
| 1 | 1 | M | 5 | 2 | 2515.0 | 2006.8 | 2069.3 | 79.6 | 82.1 | 3.09 |
| 3 | 5 | M | 12 | 2 | 2514.7 | 1941.3 | 2011.8 | 77.2 | 80.0 | 3.64 |
| 2 | 3 | M | 27 | 2 | 2570.2 | 1980.2 | 2033.4 | 77.0 | 79.1 | 2.68 |
| 5 | 9 | M | 41 | 2 | 2539.2 | 1983.6 | 2050.0 | 78.1 | 80.7 | 3.34 |
| 4 | 8 | M | 49 | 2 | 2604.3 | 2015.9 | 2071.7 | 77.4 | 79.6 | 2.75 |
| 6 | 12 | M | 57 | 2 | 2710.4 | 2073.1 | 2146.3 | 76.5 | 79.2 | 3.52 |
| 2 | 4 | F | 6 | 2 | 2422.4 | 1923.8 | 2000.4 | 79.3 | 82.4 | 3.95 |
| 4 | 7 | F | 17 | 2 | 2255.2 | 1738.9 | 1804.1 | 77.1 | 80.0 | 3.74 |
| 3 | 6 | F | 25 | 2 | 2374.7 | 1863.4 | 1918.6 | 78.4 | 80.7 | 2.97 |
| 1 | 2 | F | 31 | 2 | 2325.6 | 1843.8 | 1905.3 | 79.1 | 81.8 | 3.38 |
| 6 | 11 | F | 36 | 2 | 2377.6 | 1844.4 | 1901.5 | 77.5 | 79.9 | 3.10 |
| 5 | 10 | F | 52 | 2 | 2235.2 | 1746.0 | 1816.7 | 78.1 | 81.3 | 4.02 |
| 1 | 1 | M | 3 | 3 | 2496.4 | 1935.6 | 1983.3 | 77.6 | 79.5 | 2.53 |
| 3 | 5 | M | 13 | 3 | 2395.0 | 1870.9 | 1922.0 | 77.9 | 80.1 | 2.78 |
| 2 | 3 | M | 30 | 3 | 2677.2 | 2075.0 | 2123.4 | 77.5 | 79.3 | 2.33 |
| 5 | 9 | M | 45 | 3 | 2400.7 | 1854.4 | 1907.9 | 77.2 | 79.4 | 2.90 |
| 4 | 8 | M | 47 | 3 | 2806.0 | 2190.9 | 2238.6 | 78.1 | 79.8 | 2.18 |
| 6 | 12 | M | 58 | 3 | 2669.4 | 2102.6 | 2167.2 | 78.7 | 81.2 | 3.08 |
| 2 | 4 | F | 8 | 3 | 2111.6 | 1662.8 | 1715.2 | 78.7 | 81.2 | 3.16 |
| 4 | 7 | F | 20 | 3 | 2148.2 | 1680.9 | 1737.9 | 78.1 | 80.9 | 3.50 |
| 3 | 6 | F | 24 | 3 | 2097.5 | 1623.1 | 1684.2 | 77.4 | 80.3 | 3.78 |
| 1 | 2 | F | 35 | 3 | 2242.4 | 1774.5 | 1830.1 | 79.2 | 81.6 | 3.12 |
| 6 | 11 | F | 40 | 3 | 2369.3 | 1864.7 | 1922.7 | 78.6 | 81.1 | 3.11 |
| 5 | 10 | F | 55 | 3 | 2276.0 | 1793.5 | 1844.3 | 78.8 | 81.0 | 2.85 |
| 1 | 1 | M | 2 | 4 | 2414.1 | 1829.6 | 1887.5 | 75.8 | 78.2 | 3.18 |
| 3 | 5 | M | 14 | 4 | 2865.5 | 2208.8 | 2270.5 | 77.1 | 79.3 | 2.82 |
| 2 | 3 | M | 28 | 4 | 2387.1 | 1858.8 | 1926.5 | 77.8 | 80.6 | 3.60 |
| 5 | 9 | M | 44 | 4 | 2796.4 | 2180.7 | 2251.9 | 78.0 | 80.6 | 3.28 |
| 4 | 8 | M | 46 | 4 | 2425.3 | 1898.7 | 1961.4 | 78.3 | 80.9 | 3.31 |
| 6 | 12 | M | 59 | 4 | 2813.8 | 2194.4 | 2256.7 | 78.0 | 80.2 | 2.86 |

| 208-008-21 | | | | | CARCASS WEIGHTS (g) | | | | | |
|------------|-----|-----|-----|-----|---------------------|--------|------------|--------|---------|------|
| Pen Means | | | | | | | | | | |
| Blk | Rep | Sex | Pen | Trt | Live Wt | Hot Wt | Chilled Wt | DP-Hot | DP-Cold | Gain |
| 2 | 4 | F | 10 | 4 | 2286.9 | 1815.3 | 1878.1 | 79.3 | 82.1 | 3.52 |
| 4 | 7 | F | 18 | 4 | 2363.3 | 1874.3 | 1948.1 | 79.4 | 82.5 | 3.97 |
| 3 | 6 | F | 21 | 4 | 2283.1 | 1838.4 | 1904.0 | 80.5 | 83.4 | 3.58 |
| 1 | 2 | F | 32 | 4 | 2403.7 | 1894.5 | 1957.2 | 78.8 | 81.4 | 3.32 |
| 6 | 11 | F | 37 | 4 | 2174.3 | 1710.1 | 1778.1 | 78.6 | 81.8 | 4.06 |
| 5 | 10 | F | 54 | 4 | 2276.4 | 1804.3 | 1864.0 | 79.3 | 81.9 | 3.32 |
| 1 | 1 | M | 1 | 5 | 2697.0 | 2095.8 | 2162.8 | 77.7 | 80.2 | 3.20 |
| 3 | 5 | M | 11 | 5 | 2528.7 | 1869.5 | 1928.1 | 73.9 | 76.2 | 3.13 |
| 2 | 3 | M | 26 | 5 | 2550.2 | 1991.6 | 2055.3 | 78.1 | 80.6 | 3.21 |
| 5 | 9 | M | 42 | 5 | 2968.3 | 2331.0 | 2404.4 | 78.6 | 81.1 | 3.16 |
| 4 | 8 | M | 50 | 5 | 2773.1 | 2170.4 | 2232.3 | 78.3 | 80.5 | 2.85 |
| 6 | 12 | M | 60 | 5 | 2669.2 | 2086.8 | 2148.0 | 78.2 | 80.4 | 2.91 |
| 2 | 4 | F | 9 | 5 | 2403.9 | 1904.9 | 1969.1 | 79.1 | 81.8 | 3.39 |
| 4 | 7 | F | 19 | 5 | 2789.7 | 2280.4 | 2344.0 | 81.8 | 84.1 | 2.80 |
| 3 | 6 | F | 23 | 5 | 2425.2 | 1923.2 | 2003.7 | 79.3 | 82.6 | 4.18 |
| 1 | 2 | F | 33 | 5 | 2245.3 | 1798.6 | 1854.7 | 80.0 | 82.5 | 3.12 |
| 6 | 11 | F | 38 | 5 | 2373.7 | 1885.1 | 1943.3 | 79.4 | 81.8 | 3.09 |
| 5 | 10 | F | 53 | 5 | 2076.8 | 1658.5 | 1716.9 | 79.9 | 82.7 | 3.51 |
| | | | | | | | | | | |
| | Rep | Sex | Pen | Trt | Live Wt | Hot Wt | Chilled Wt | DP-Hot | DP-Cold | Gain |
| | | M | | 1 | 2533.8 | 1950.9 | 2021.8 | 77.0 | 79.8 | 3.64 |
| | | F | | 1 | 2335.0 | 1839.3 | 1909.0 | 78.8 | 81.8 | 3.79 |
| | | M | | 2 | 2575.7 | 2000.1 | 2063.8 | 77.7 | 80.1 | 3.18 |
| | | F | | 2 | 2331.8 | 1826.7 | 1891.1 | 78.3 | 81.1 | 3.52 |
| | | M | | 3 | 2574.1 | 2004.9 | 2057.1 | 77.9 | 79.9 | 2.60 |
| | | F | | 3 | 2207.5 | 1733.2 | 1789.1 | 78.5 | 81.0 | 3.22 |
| | | M | | 4 | 2617.0 | 2028.5 | 2092.4 | 77.5 | 80.0 | 3.15 |
| | | F | | 4 | 2297.9 | 1822.8 | 1888.2 | 79.3 | 82.2 | 3.59 |
| | | M | | 5 | 2697.7 | 2090.9 | 2155.1 | 77.5 | 79.9 | 3.07 |
| | | F | | 5 | 2385.8 | 1908.4 | 1971.9 | 80.0 | 82.7 | 3.33 |
| | | | | | | | | | | |
| | | | | 1 | 2434.4 | 1895.1 | 1965.4 | 77.8 | 80.7 | 3.71 |
| | | | | 2 | 2453.7 | 1913.4 | 1977.4 | 78.0 | 80.6 | 3.34 |
| | | | | 3 | 2390.8 | 1869.1 | 1923.1 | 78.2 | 80.4 | 2.89 |
| | | | | 4 | 2457.5 | 1925.7 | 1990.3 | 78.4 | 81.0 | 3.36 |
| | | | | 5 | 2541.8 | 1999.6 | 2063.5 | 78.7 | 81.2 | 3.20 |
| | | | | | | | | | | |
| | | M | | | 2599.7 | 2015.0 | 2078.0 | 77.5 | 79.9 | 3.13 |
| | | F | | | 2311.6 | 1826.1 | 1889.9 | 79.0 | 81.8 | 3.49 |

| 208-008-21 | | | | | CARCASS WEIGHTS (g) | | | | | | | | | | | | |
|------------|-----|-----|-----|-----|---------------------|-------|--------|-------|--------|-------|------|------|-------|--------|-------|--------|------|
| Pen Means | | | | | | | | | | | | Fat | Liver | Breast | Wings | Thighs | Legs |
| Blk | Rep | Sex | Pen | Trt | Fat | Liver | Breast | Wings | Thighs | Legs | Pct | Pct | Pct | Pct | Pct | Pct | Pct |
| 1 | 1 | M | 4 | 1 | 26.3 | 47.5 | 591.0 | 203.5 | 267.4 | 249.0 | 1.38 | 2.53 | 31.49 | 10.85 | 14.23 | 13.25 | |
| 3 | 5 | M | 15 | 1 | 44.7 | 55.4 | 703.5 | 234.4 | 292.2 | 295.2 | 2.01 | 2.52 | 31.73 | 10.61 | 13.21 | 13.37 | |
| 2 | 3 | M | 29 | 1 | 30.9 | 58.7 | 565.9 | 218.0 | 273.4 | 277.9 | 1.53 | 2.96 | 28.35 | 11.08 | 13.75 | 14.02 | |
| 5 | 9 | M | 43 | 1 | 34.1 | 47.9 | 592.4 | 199.2 | 262.6 | 238.6 | 1.80 | 2.52 | 31.07 | 10.47 | 13.77 | 12.53 | |
| 4 | 8 | M | 48 | 1 | 36.2 | 58.8 | 598.5 | 231.6 | 276.0 | 277.5 | 1.84 | 2.89 | 29.32 | 11.39 | 13.54 | 13.66 | |
| 6 | 12 | M | 56 | 1 | 26.6 | 52.2 | 632.0 | 230.1 | 289.5 | 297.0 | 1.23 | 2.48 | 29.99 | 10.94 | 13.80 | 14.12 | |
| 2 | 4 | F | 7 | 1 | 33.9 | 45.9 | 582.8 | 206.4 | 270.1 | 276.9 | 1.74 | 2.38 | 30.31 | 10.73 | 14.03 | 14.39 | |
| 4 | 7 | F | 16 | 1 | 50.4 | 47.0 | 597.8 | 193.0 | 259.8 | 242.2 | 2.59 | 2.39 | 30.55 | 9.88 | 13.29 | 12.38 | |
| 3 | 6 | F | 22 | 1 | 52.0 | 51.8 | 624.1 | 208.4 | 275.1 | 250.0 | 2.67 | 2.64 | 31.82 | 10.64 | 14.04 | 12.76 | |
| 1 | 2 | F | 34 | 1 | 47.0 | 51.4 | 642.5 | 200.6 | 274.5 | 245.4 | 2.39 | 2.60 | 32.53 | 10.17 | 13.91 | 12.43 | |
| 6 | 11 | F | 39 | 1 | 51.4 | 44.3 | 562.7 | 187.5 | 256.4 | 227.8 | 2.85 | 2.46 | 31.03 | 10.34 | 14.11 | 12.52 | |
| 5 | 10 | F | 51 | 1 | 38.9 | 41.5 | 545.7 | 195.3 | 236.1 | 236.5 | 2.10 | 2.34 | 29.93 | 10.75 | 12.96 | 13.01 | |
| 1 | 1 | M | 5 | 2 | 30.1 | 43.6 | 617.7 | 216.0 | 303.8 | 281.9 | 1.45 | 2.12 | 29.93 | 10.47 | 14.65 | 13.68 | |
| 3 | 5 | M | 12 | 2 | 40.5 | 57.5 | 626.1 | 214.5 | 273.7 | 275.4 | 2.01 | 2.86 | 31.12 | 10.67 | 13.61 | 13.69 | |
| 2 | 3 | M | 27 | 2 | 38.7 | 48.6 | 626.1 | 218.9 | 289.4 | 278.7 | 1.96 | 2.39 | 30.87 | 10.81 | 14.24 | 13.69 | |
| 5 | 9 | M | 41 | 2 | 32.1 | 56.3 | 652.1 | 210.6 | 281.0 | 262.7 | 1.57 | 2.75 | 31.87 | 10.26 | 13.70 | 12.78 | |
| 4 | 8 | M | 49 | 2 | 31.2 | 49.4 | 651.1 | 221.5 | 294.3 | 285.0 | 1.49 | 2.39 | 31.38 | 10.71 | 14.20 | 13.77 | |
| 6 | 12 | M | 57 | 2 | 39.9 | 49.8 | 687.1 | 230.0 | 308.9 | 295.0 | 1.87 | 2.32 | 32.02 | 10.71 | 14.38 | 13.75 | |
| 2 | 4 | F | 6 | 2 | 43.5 | 48.7 | 624.8 | 212.2 | 280.7 | 248.5 | 2.19 | 2.44 | 31.36 | 10.65 | 14.05 | 12.40 | |
| 4 | 7 | F | 17 | 2 | 48.4 | 41.4 | 563.1 | 197.0 | 269.1 | 231.8 | 2.71 | 2.30 | 31.30 | 10.93 | 14.84 | 12.86 | |
| 3 | 6 | F | 25 | 2 | 49.6 | 51.7 | 601.5 | 197.8 | 262.3 | 246.6 | 2.58 | 2.70 | 31.38 | 10.32 | 13.69 | 12.92 | |
| 1 | 2 | F | 31 | 2 | 48.2 | 49.1 | 600.4 | 200.0 | 255.2 | 250.1 | 2.55 | 2.57 | 31.31 | 10.60 | 13.52 | 13.12 | |
| 6 | 11 | F | 36 | 2 | 43.4 | 47.3 | 647.1 | 189.6 | 257.0 | 233.8 | 2.26 | 2.49 | 34.08 | 9.99 | 13.56 | 12.32 | |
| 5 | 10 | F | 52 | 2 | 39.6 | 41.3 | 604.2 | 194.9 | 240.7 | 231.6 | 2.17 | 2.27 | 33.18 | 10.73 | 13.28 | 12.76 | |
| 1 | 1 | M | 3 | 3 | 30.2 | 47.4 | 620.9 | 203.3 | 278.0 | 268.5 | 1.47 | 2.39 | 31.24 | 10.30 | 13.96 | 13.50 | |
| 3 | 5 | M | 13 | 3 | 27.9 | 51.3 | 593.6 | 207.1 | 265.2 | 269.7 | 1.44 | 2.74 | 30.79 | 10.83 | 13.79 | 14.04 | |
| 2 | 3 | M | 30 | 3 | 39.5 | 53.8 | 683.1 | 221.5 | 298.5 | 289.9 | 1.86 | 2.54 | 32.17 | 10.45 | 14.08 | 13.63 | |
| 5 | 9 | M | 45 | 3 | 37.4 | 54.8 | 577.9 | 204.5 | 277.2 | 265.9 | 1.98 | 2.86 | 30.36 | 10.74 | 14.56 | 13.91 | |
| 4 | 8 | M | 47 | 3 | 45.0 | 57.3 | 703.6 | 226.6 | 313.4 | 311.8 | 2.00 | 2.56 | 31.27 | 10.13 | 14.00 | 13.94 | |
| 6 | 12 | M | 58 | 3 | 39.8 | 51.6 | 669.5 | 223.9 | 312.6 | 299.0 | 1.85 | 2.39 | 30.83 | 10.33 | 14.40 | 13.80 | |
| 2 | 4 | F | 8 | 3 | 40.1 | 40.2 | 554.8 | 179.3 | 233.0 | 216.8 | 2.36 | 2.34 | 32.39 | 10.47 | 13.58 | 12.63 | |
| 4 | 7 | F | 20 | 3 | 54.5 | 39.9 | 543.9 | 174.4 | 245.1 | 210.7 | 3.12 | 2.29 | 31.15 | 10.08 | 14.14 | 12.17 | |
| 3 | 6 | F | 24 | 3 | 31.7 | 42.6 | 543.2 | 203.6 | 211.9 | 212.0 | 1.89 | 2.54 | 32.29 | 12.02 | 12.66 | 12.58 | |
| 1 | 2 | F | 35 | 3 | 33.9 | 43.4 | 617.2 | 194.9 | 249.1 | 227.2 | 1.85 | 2.37 | 33.75 | 10.65 | 13.62 | 12.42 | |
| 6 | 11 | F | 40 | 3 | 43.1 | 46.7 | 656.0 | 194.3 | 271.6 | 241.2 | 2.25 | 2.42 | 34.25 | 10.15 | 14.06 | 12.53 | |
| 5 | 10 | F | 55 | 3 | 43.5 | 43.8 | 597.4 | 189.2 | 278.0 | 236.1 | 2.36 | 2.37 | 32.36 | 10.26 | 15.06 | 12.80 | |
| 1 | 1 | M | 2 | 4 | 31.0 | 50.6 | 585.0 | 212.4 | 278.7 | 267.6 | 1.66 | 2.70 | 31.04 | 11.28 | 14.73 | 14.16 | |
| 3 | 5 | M | 14 | 4 | 42.4 | 59.9 | 698.1 | 245.1 | 331.7 | 316.2 | 1.87 | 2.65 | 30.83 | 10.82 | 14.61 | 13.92 | |
| 2 | 3 | M | 28 | 4 | 21.3 | 50.2 | 590.0 | 213.0 | 294.2 | 280.4 | 1.16 | 2.65 | 30.64 | 11.14 | 15.29 | 14.56 | |
| 5 | 9 | M | 44 | 4 | 43.5 | 61.8 | 691.1 | 228.6 | 318.9 | 301.0 | 1.92 | 2.72 | 30.82 | 10.15 | 14.19 | 13.37 | |
| 4 | 8 | M | 46 | 4 | 30.2 | 52.1 | 594.9 | 211.5 | 275.3 | 284.0 | 1.54 | 2.66 | 30.34 | 10.79 | 14.04 | 14.48 | |
| 6 | 12 | M | 59 | 4 | 40.4 | 58.9 | 726.5 | 232.1 | 306.5 | 291.2 | 1.78 | 2.63 | 32.22 | 10.30 | 13.61 | 12.96 | |

| 208-008-21 | | | | | CARCASS WEIGHTS (g) | | | | | | | | | | | |
|------------|-----|-----|-----|-----|---------------------|-------|--------|-------|--------|-------|------|-------|--------|-------|--------|-------|
| Pen Means | | | | | | | | | | | Fat | Liver | Breast | Wings | Thighs | Legs |
| Blk | Rep | Sex | Pen | Trt | Fat | Liver | Breast | Wings | Thighs | Legs | Pct | Pct | Pct | Pct | Pct | Pct |
| 2 | 4 | F | 10 | 4 | 45.1 | 44.4 | 630.8 | 195.5 | 269.9 | 247.9 | 2.39 | 2.37 | 33.62 | 10.46 | 14.47 | 13.33 |
| 4 | 7 | F | 18 | 4 | 42.5 | 52.4 | 620.1 | 199.6 | 272.0 | 243.2 | 2.19 | 2.70 | 31.79 | 10.27 | 13.99 | 12.53 |
| 3 | 6 | F | 21 | 4 | 37.4 | 40.8 | 613.7 | 195.5 | 278.4 | 236.1 | 1.98 | 2.16 | 32.32 | 10.27 | 14.63 | 12.41 |
| 1 | 2 | F | 32 | 4 | 39.1 | 46.5 | 619.7 | 204.8 | 278.1 | 257.3 | 1.97 | 2.37 | 31.69 | 10.48 | 14.23 | 13.15 |
| 6 | 11 | F | 37 | 4 | 43.5 | 42.8 | 580.5 | 188.5 | 263.8 | 229.2 | 2.43 | 2.41 | 32.60 | 10.61 | 14.80 | 12.91 |
| 5 | 10 | F | 54 | 4 | 42.3 | 47.8 | 584.9 | 196.4 | 267.9 | 238.3 | 2.27 | 2.56 | 31.35 | 10.54 | 14.38 | 12.79 |
| 1 | 1 | M | 1 | 5 | 42.1 | 53.2 | 647.6 | 221.0 | 309.5 | 295.7 | 1.94 | 2.46 | 29.95 | 10.22 | 14.32 | 13.67 |
| 3 | 5 | M | 11 | 5 | 45.4 | 46.9 | 644.9 | 202.6 | 275.8 | 239.5 | 2.35 | 2.44 | 33.41 | 10.54 | 14.31 | 12.44 |
| 2 | 3 | M | 26 | 5 | 31.2 | 56.4 | 687.4 | 214.6 | 275.2 | 268.0 | 1.53 | 2.73 | 33.42 | 10.45 | 13.41 | 13.04 |
| 5 | 9 | M | 42 | 5 | 49.5 | 58.7 | 720.5 | 248.0 | 329.3 | 323.1 | 2.05 | 2.46 | 29.98 | 10.32 | 13.71 | 13.45 |
| 4 | 8 | M | 50 | 5 | 46.2 | 53.0 | 702.2 | 238.5 | 319.4 | 300.7 | 2.07 | 2.37 | 31.46 | 10.68 | 14.31 | 13.48 |
| 6 | 12 | M | 60 | 5 | 37.3 | 46.4 | 671.4 | 226.6 | 320.6 | 291.2 | 1.71 | 2.15 | 31.38 | 10.54 | 14.94 | 13.56 |
| 2 | 4 | F | 9 | 5 | 44.5 | 53.7 | 689.5 | 199.6 | 268.6 | 245.6 | 2.27 | 2.73 | 34.91 | 10.21 | 13.67 | 12.48 |
| 4 | 7 | F | 19 | 5 | 47.5 | 58.0 | 733.8 | 252.2 | 336.3 | 323.0 | 2.01 | 2.49 | 31.31 | 10.76 | 14.36 | 13.79 |
| 3 | 6 | F | 23 | 5 | 43.0 | 49.4 | 655.6 | 206.8 | 271.5 | 259.2 | 2.15 | 2.47 | 32.67 | 10.33 | 13.54 | 12.96 |
| 1 | 2 | F | 33 | 5 | 32.8 | 51.3 | 623.2 | 189.9 | 250.7 | 237.3 | 1.77 | 2.79 | 33.52 | 10.30 | 13.56 | 12.80 |
| 6 | 11 | F | 38 | 5 | 46.0 | 43.9 | 651.0 | 196.3 | 265.9 | 254.9 | 2.38 | 2.25 | 33.56 | 10.10 | 13.68 | 13.13 |
| 5 | 10 | F | 53 | 5 | 27.6 | 34.9 | 556.5 | 186.8 | 235.9 | 227.7 | 1.61 | 2.05 | 32.44 | 10.88 | 13.75 | 13.28 |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | Fat | Liver | Breast | Wings | Thighs | Legs |
| | Rep | Sex | Pen | Trt | Fat | Liver | Breast | Wings | Thighs | Legs | Pct | Pct | Pct | Pct | Pct | Pct |
| | | M | | 1 | 33.1 | 53.4 | 613.9 | 219.4 | 276.9 | 272.5 | 1.64 | 2.64 | 30.36 | 10.85 | 13.69 | 13.48 |
| | | F | | 1 | 45.6 | 47.0 | 592.6 | 198.5 | 262.0 | 246.5 | 2.39 | 2.46 | 31.04 | 10.40 | 13.72 | 12.91 |
| | | M | | 2 | 35.4 | 50.9 | 643.4 | 218.6 | 291.8 | 279.8 | 1.72 | 2.46 | 31.17 | 10.59 | 14.14 | 13.56 |
| | | F | | 2 | 45.4 | 46.6 | 606.8 | 198.6 | 260.8 | 240.4 | 2.40 | 2.46 | 32.09 | 10.50 | 13.79 | 12.71 |
| | | M | | 3 | 36.6 | 52.7 | 641.4 | 214.5 | 290.8 | 284.1 | 1.78 | 2.56 | 31.18 | 10.43 | 14.14 | 13.81 |
| | | F | | 3 | 41.1 | 42.8 | 585.4 | 189.3 | 248.1 | 224.0 | 2.30 | 2.39 | 32.72 | 10.58 | 13.87 | 12.52 |
| | | M | | 4 | 34.8 | 55.6 | 647.6 | 223.8 | 300.9 | 290.1 | 1.66 | 2.66 | 30.95 | 10.69 | 14.38 | 13.86 |
| | | F | | 4 | 41.6 | 45.8 | 608.3 | 196.7 | 271.7 | 242.0 | 2.20 | 2.42 | 32.21 | 10.42 | 14.39 | 12.82 |
| | | M | | 5 | 41.9 | 52.4 | 679.0 | 225.2 | 305.0 | 286.4 | 1.95 | 2.43 | 31.51 | 10.45 | 14.15 | 13.29 |
| | | F | | 5 | 40.2 | 48.5 | 651.6 | 205.2 | 271.5 | 257.9 | 2.04 | 2.46 | 33.04 | 10.41 | 13.77 | 13.08 |
| | | | | | | | | | | | | | | | | |
| | | | | 1 | 39.4 | 50.2 | 603.2 | 209.0 | 269.4 | 259.5 | 2.00 | 2.55 | 30.69 | 10.63 | 13.71 | 13.20 |
| | | | | 2 | 40.4 | 48.7 | 625.1 | 208.6 | 276.3 | 260.1 | 2.04 | 2.46 | 31.61 | 10.55 | 13.97 | 13.15 |
| | | | | 3 | 38.9 | 47.7 | 613.4 | 201.9 | 269.5 | 254.1 | 2.02 | 2.48 | 31.90 | 10.50 | 14.01 | 13.21 |
| | | | | 4 | 38.2 | 50.7 | 627.9 | 210.2 | 286.3 | 266.0 | 1.92 | 2.55 | 31.55 | 10.56 | 14.38 | 13.37 |
| | | | | 5 | 41.1 | 50.5 | 665.3 | 215.2 | 288.2 | 272.1 | 1.99 | 2.45 | 32.24 | 10.43 | 13.97 | 13.19 |
| | | | | | | | | | | | | | | | | |
| | | M | | | 36.4 | 53.0 | 645.1 | 220.3 | 293.1 | 282.6 | 1.75 | 2.55 | 31.04 | 10.60 | 14.10 | 13.60 |
| | | F | | | 42.8 | 46.1 | 608.9 | 197.7 | 262.8 | 242.1 | 2.26 | 2.44 | 32.22 | 10.46 | 13.91 | 12.81 |