Appendix 19

Compositional Analysis of Grain from Imidazolinone-Tolerant Soybean BPS-CV127-9 Produced in Brazil and Comparison with that from Isogenic Control and Conventional Soybean Varieties

2006/2007 and 2007 Season

with Supplement

BASF
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Compositional Analysis of Grain from Imidazolinone-Tolerant Soybean BPS-CV127-9 Produced in Brazil in 2006/2007 and Comparison with that from Isoline Control and Conventional Soybean Varieties

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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).

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STATEMENT OF COMPLIANCE

This study was not conducted in compliance with the requirements of 40 CFR Part 160.

The data generated by ITAL on behalf of BASF Plant Science in support of product safety comply with generally accepted scientific procedures. ITAL is an ISO 9001 compliant laboratory. Record keeping is consistent with procedures used throughout the research community. This report accurately presents the raw data developed during the study.

This report was amended as a result of a request from the Ministry of Health Labor and Welfare, Japan, to include standard deviations with all data presented.

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ABBREVIATIONS AND DEFINITIONS

ADF	Acid detergent fiber
AHAS	Acetohydroxyacid synthase
ALS	Acetolactate synthase is a synonym for acetohydroxyacid synthase
AOAC	American Organization of Analytical Chemists
AOCS	American Oil Chemists Society
CFIA	Canadian Food Inspection Agency
CL	Clearfield
DW	Dry weight
FW	Fresh weight
HPLC	High pressure liquid chromatography
HU	Hemagglutinating units
ICP-OES	Inductively coupled plasma-optical emission spectroscopy
ILSI	International Life Sciences Institute
JAOAC	Journal of the AOAC
LSD	Least significant difference
NDF	Neutral detergent fiber
PBS	Phosphate buffered saline
TDF	Total dietary fiber

Compositional Analysis of Grain from Imidazolinone-Tolerant Soybean BPS-CV127-9 Produced in Brazil in 2006/2007 and Comparison with that from Isoline Control and Conventional Soybean Varieties

SUMMARY

Soybean (*Glycine max* L.) plants have been developed by BASF Plant Science, L.L.C (BPS) and EMBRAPA (Empresa Brasileira de Pesquisa Agropecuaria) that are tolerant to the imidazolinone class of agricultural herbicides. The herbicide-tolerant soybean plants BPS-CV127-9 (hereafter referred to as BPS-CV127-9) were produced by introduction of an imidazolinone-tolerant acetohydroxyacid synthase large subunit (*ahasl*) from *Arabidopsis thaliana* into the soybean plant genome. The herbicide tolerance in BPS-CV127-9 will allow growers to treat the soybean crop with imidazolinone herbicides without causing injury to the plant at normal field application rates. Therefore, introduction of BPS-CV127-9 offers soybean growers an additional tool for controlling weeds. An important component of the safety assessment of BPS-CV127-9 is to demonstrate that the nutrient and antinutrient composition of the grain is equivalent to that of the isoline control variety as well as other conventional commercial soybean varieties, thereby confirming that BPS-CV127-9 grain is appropriate for use in soybean food and feed products. Analytes, including proximates, fatty acids, amino acids, minerals, vitamins, antinutrients (including phytate, trypsin inhibitor, stachyose, raffinose, urease and lectin), fiber (total dietary, crude, acid and neutral detergent fibers), isoflavones, and phospolipids, were quantitated in BPS-CV127-9 grain, and compared with that found in the isoline, nontransgenic, conventional soybean control and two other commercial conventional varieties. The grain was produced from plants grown in replicated field trials at six locations in Brazil during the summer of 2006/2007. The field trials were conducted at sites located near Santo Antonio de Posse, Uberaba, Londrina, Brasilia, Santo Antonio de Goias, and Sete Lagoas. Grain compositional analyses showed that BPS-CV127-9 is compositionally equivalent to the isoline control. Where minor differences in amounts of individual nutritional constituents were detected between the grain of BPS-CV127-9 and that of the conventional isoline control, these were most likely due to small genetic differences between BPS-CV127-9 and the control resulting from the inherent genetic heterogeneity of the original transformed soybean variety Conquista. However, where differences in component levels were observed between BPS-CV127-9 and the isoline control, the values for BPS-CV127-9 were either comparable to the commercial conventional soybean varieties grown in the same field trials and/or were within or comparable to the range of values for conventional soybeans published in the International Life Sciences Institute (ILSI) crop composition database.

In summary, these compositional analyses demonstrate that the introduction of the *ahasl* gene from *Arabidopsis thaliana* into the soybean genome, together with treatment by imidazolinone herbicide on BPS-CV127-9 does not impact the

nutritional composition of grain produced by BPS-CV127-9. Results of these analyses demonstrate that grain from BPS-CV127-9 is compositionally equivalent to, and as nutritious as, grain from the isoline control as well as other conventional soybean varieties.

INTRODUCTION

Soybean (*Glycine max* L.) plants have been developed that are tolerant to the imidazolinone class of agricultural herbicides. The herbicide-tolerant soybean plants, referred to as BPS-CV127-9, were produced by introduction of an imidazolinone-tolerant acetohydroxyacid synthase large subunit (*ahasl*) gene from *Arabidopsis thaliana* into the soybean plant genome via biolistics. Acetohydroxyacid synthase (AHAS) is a key enzyme in plants, bacteria, and fungi that is required for the biosynthesis of the branched-chain amino acids valine, leucine, and isoleucine. Herbicides of the imidazolinone class, function by binding near the active site of the catalytic AHAS large subunit, thereby preventing normal functioning of the enzyme (Pang *et al*., 2002). Several *ahas* genes encoding AHAS enzymes that are tolerant to imidazolinone herbicides have been discovered in plants through mutagenesis and selection and have been used to create imidazolinone-tolerant maize (*Zea mays* L.), rice (*Oryza sativa* L.), wheat (*Triticum aestivum* L.), oilseed rape (*Brassica napus* and *B. juncea* L.), and sunflower (*Helianthus annuus* L.). These crops were developed through mutagenesis, selection, and conventional breeding technologies and have been commercialized under the Clearfield® brand name since 1992. There are five single point mutations in *ahas* genes that have been found to result in tolerance to imidazolinones in plants (Tan *et al*., 2005). One of these, a mutation that results in a substitution of a serine residue with an asparagine at position 653 (relative to the AHAS enzyme from *Arabidopsis thaliana*), is known to result in tolerance to imidazolinone herbicides with no cross-tolerance to other AHAS inhibitors (Lee *et al*., 1999). The imidazolinone-tolerant AHAS large subunit *csr1-2* gene (Sathasivan *et al*., 1990) from *Arabidopsis thaliana* that has the S653N mutation was transformed into soybean (*Glycine max* L.) plants with the native *A. thaliana* promoter, to produce soybean plants that are tolerant to imidazolinone herbicides. This has led to the development of BPS-CV127-9 soybean by BASF and EMBRAPA.

Soybean has many uses in animal and human nutrition. The grain is typically processed to two commodity products, oil and meal. The defatted toasted meal is commonly used in livestock feed. The various soybean protein fractions derived from processing nontoasted defatted soybean meal are used in different human foods. Also, the soybean oil is used in different food products including cooking oil and salad dressings. Therefore, the purpose of the current study was to demonstrate that the grain of BPS-CV127-9, treated or not-treated with an imidazolinone herbicide, is substantially equivalent in composition to grain from the isoline and other conventional soybean varieties, and that BPS-CV127-9 grain is appropriate for use in animal feed and human foods. The grain was produced from plants grown in replicated field trials at six locations in Brazil during the summer of 2006/2007. The components analyzed included: proximates, fatty acids, amino acids, minerals, vitamins, antinutrients (including phytic acid, trypsin inhibitor, stachyose, raffinose, urease and lectin), fiber (total dietary, crude, acid and neutral detergent fibers),

isoflavones, and phospholipids. The results of analyses were subjected to statistical analysis and values for BPS-CV127-9 were compared to the isoline control and to the commercial conventional varieties as well as compared to the composition means and ranges reported in the ILSI Crop Composition Database (Version 3).

MATERIALS AND METHODS

Grain source. Imidazolinone treated and nontreated BPS-CV127-9 plants (abbreviated as CV127+Imi and CV127, respectively in the data Tables) together with the isoline control variety, and two other conventional standard soybean varieties [Monsoy 8001 (Std 1) and Coodetec 217 (Std2), respectively] were grown at six locations in Brazil during the 2006/2007 growing season. The field trials were conducted at sites located near Santo Antonio de Posse, Uberaba, Londrina, Brasilia, Santo Antonio de Goias, and Sete Lagoas. The plants were grown under standard agronomic practices in a complete randomized block design with four replicate blocks per location. With the exception of the BPS-CV127-9 plants treated with the imidazolinone herbicide at 70 g/ai/ha, all other entries in the study were treated with Bentazon + Acifluorfen-sodium (commercial name Volt) at the rate of 1.0 liters/ha. The grain was harvested at the conclusion of the growing season and approximately 2 kg of each replicate grain sample was shipped to (Instituto de Technologia de Alimentos) ITAL in Campinas, Brazil, for compositional analysis. For the two conventional standard soybean reference varieties, the same grain harvest and separation procedures were followed, but approximately 500 g of grain was further sub-sampled from each 2 kg replicate grain sample, and the four 500 g replicate samples for each standard reference variety from each field location were pooled to make a single sample from each location for compositional analyses. Therefore, statistical analyses of the compositional data were only conducted for the CV127 and isoline control treatments, and data from the two conventional standard soybean reference varieties were used for comparative purposes to establish a range of natural variability for each analyte for soybeans grown in Brazil. Results were recorded on a fresh weight (FW) and adjusted for moisture content and recorded on a dry weight (DW) basis. Statistical analysis was conducted using the dry weight data.

Analytical methods. *Ash.* The method used was based on AOAC International (2000) method 945.38 C. The sample was placed in an electric furnace at 550°C and ignited to drive off all volatile organic matter. The nonvolatile matter remaining was quantitated gravimetrically and calculated to determine percent ash. The limit of quantitation for this study was 0.1% FW.

Carbohydrates. The method used was based on the USDA Agriculture Handbook No. 8 (1963) method. The total carbohydrate level was calculated by difference using the fresh weight-derived data and the following equation: % carbohydrates = 100% - (% protein + % fat + % moisture + % ash). The limit of quantitation for this study was 0.1% FW.

Fat by Butt Extraction. The method used was based on AOAC International (2000) method 945.38 F. The sample was weighed into a cellulose thimble. Petroleum ether

was dripped through the sample to remove the fat. The extract was then evaporated, dried, and weighed. The limit of quantitation for this study was 0.1% FW.

Moisture. The method used was based on AOCS International (1998) methods Bc 2-49. The sample was dried in a forced draft oven at 130°C to a constant weight. The moisture weight loss was determined and converted to percent moisture. The limit of quantitation for this study was 0.1% FW.

Protein. The method used was based on AOAC International (2000) method 979.09. Nitrogenous compounds in the sample were reduced in the presence of boiling sulfuric acid and a $CuSO_4 + K_2SO_4 + Se$ mixture to form ammonia. The acid digest was made alkaline. The ammonia was distilled and then titrated with a standard acid. The percent nitrogen was calculated and converted to protein using the factor 6.25. The limit of quantitation for this study was 0.100% FW.

Amino Acid Composition. The method used was based on Spackman *et al*. (1958). This method estimates the levels of 18 amino acids in the sample: alanine, arginine, aspartic acid (including asparagine), cystine (including cysteine), glutamic acid (including glutamine), glycine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, proline, serine, threonine, tryptophan, tyrosine, and valine. This was accomplished through direct acid hydrolysis with 6N hydrochloric acid. Once hydrolyzed, the individual amino acids were then quantified using an automated amino acid analyzer detected at 520 nm. The reference standards were 2.5 µmol/mL per amino acid with the exception of cystine, 1.25 µmol/mL, (Pierce, Rockford, IL). Tryptophan analysis was based on the method of Spies (1967), by measuring the absorbance at 590 nm following direct enzymatic hydrolysis with pronase at 40ºC for 24 hours. The reference standard was L-tryptophan >99% (used as 100%, Sigma Chemical Co., St. Louis, MO). The limit of quantitation for this study was 0.1 mg/g FW sample.

Crude Fiber. Crude fiber was measured as the loss on ignition of dried residue remaining after digestion of the sample with 1.25% solutions of sulfuric acid and sodium hydroxide according to the method of Diemar (1963). The limit of quantitation for this study was 0.1 g/100 g FW sample.

Acid Detergent Fiber (ADF). The method was based on AOAC International (1995) method 920.85. The sample was placed in a fritted vessel and washed with an acidic boiling detergent solution that dissolved the protein, carbohydrate, and ash. After an acetone wash to remove the fats and pigments; the lignocellulose fraction was collected on the frit and quantitated gravimetrically. The limit of quantitation for this study was 0.1% FW.

Neutral Detergent Fiber (NDF). The method used for sample preparation was the AOAC International (1995) method 920.85. Samples were placed in a fritted vessel and washed with a neutral boiling detergent solution that dissolved the protein, carbohydrate, enzyme, and ash. After an acetone wash to remove the fats and pigments, the hemicellulose, cellulose, and lignin fractions were collected on the frit and quantitated gravimetrically. The limit of quantitation for this study was 0.1% FW.

Total Dietary Fiber. The method was based on AOAC International (2000) method 985.29. The finely ground sample was gelatinized with Termamyl and then enzymatically digested with protease and amyloglucosidase to remove protein and starch. Four volumes of 95% ethyl alcohol were added to precipitate soluble dietary fiber. The total residues were filtered and washed consecutively with 78% ethyl alcohol, 95% ethyl alcohol, and acetone. After drying, the residue was weighed. One duplicate was then analyzed for protein, and the other was incinerated at 525ºC for ash determination. Total dietary fiber = weight residue – weight (protein + ash) – blank (containing enzymes only). The limit of quantitation for this study was 0.1% FW.

Fatty Acids. The method used was based on AOCS (1998) method Ce 1-62, Ce 1f-96, Ce 1e-91 that estimates the levels of fatty acids in the samples. The lipid was extracted and saponified with 0.5 N sodium hydroxide in methanol. The mixture was methylated with a solution of NH_4Cl and H_2SO_4 in methanol based on Hartman and Lago (1973). The resulting methyl esters were extracted with hexane. The methyl esters of the fatty acids were analyzed by gas chromatography using area normalization for quantitation. The 37 Component FAME mix from Supelco (Sigma) was used as reference standards. The limit of quantitation for this study was 0.01% FW.

Isoflavones. The method used was based on Berhow (2002). The defatted sample was extracted using an aqueous solution of 70% ethanol with 0.1% acetic acid. The extract was centrifuged and filtered. The sample was analyzed on a high-performance liquid chromatography (HPLC) system with a diode array detector. Isoflavones were quantified using an external standard curve of known standards. The limit of quantification for each component was 0.3 mg/100 g FW sample.

Phospholipids. The method used was based on Beare-Rogers *et al.* (1992). Lipids were extracted from the sample by a mixture of chloroform-methanol (2:1). Phospholipids or lecithins were purified by solid phase extraction on a silica column. Separation and quantification of lecithins were accomplished by normal phase liquid chromatography with UV detection. The limit of quantitation for phospholipids was 0.1 mg/g oil.

Lectin. The method used was based on Wititsuwannakul *et al.* (1998). 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 2% erythrocyte (from dog blood) suspension was added to an equal volume of the sample and the mixture incubated at 37ºC for 30 minutes followed by another 30 minute incubation at room temperature. The last well to show visible agglutination was considered the point of equivalence. One hemagglutinating unit (HU) was defined as the reciprocal of dilution at the point of equivalence, the specific activity being given as one hemagglutunating unit per µg or mg of protein (HU) in the undiluted sample. The minimum dose was defined as the minimum concentration necessary to show visible agglutination. These assays are only semiquantitative and should be regarded as liable to an error of 25%.

Minerals. The method used was based on AOAC International (2005) methods 985.35e and 984.27. The sample was placed in an electric furnace at 450°C and

ignited to drive off all volatile organic matter. The minerals remaining were quantitated by inductively coupled plasma-optical emission spectroscopy (ICP-OES). The limit of quantitation for this study was 0.01 mg/kg FW sample for all minerals.

Phytic Acid. The method used was based on Latta and Eskin (1980). The sample was extracted using 2.4% HCl. Purification and concentration was conducted using an anion exchange column (Dowex-1 AGX-4, 100-200 mesh). Sample and standards were submitted to a color reaction with Wade reagent, with the absorbance measured at 500 nm. Inositol hexaphosporic acid was used as a standard. The limit of quantitation for this study was 0.75 mg/g FW sample.

Sugars (Raffinose and Stachyose). The method used was based on Cicek (2001) and Kennedy *et al.* (1985). Sugars were extracted from the sample with ethanol + deionized water (1:1). Proteins and lipids which co-extracted were eliminated by precipitation, followed by filtration. Raffinose and stachyose were separated and quantified by HPLC with a refractive index detector. The limit of quantification for this study was 0.2 g/100 g FW sample.

Trypsin Inhibitor. The method used was based on Rackis *et al*. (1974). Trypsin inhibitor units (TIU) were determined by photometrically measuring the inhibition of the trypsin cleavage of benzoyl-DL-arginine-p-nitroanalide hydrochloride. The sample was ground and/or defatted with petroleum ether, if necessary. A sample of matrix was extracted for 3 hours with 0.1 N sodium hydroxide. Varying aliquots of the sample suspension were exposed to a known amount of trypsin and benzoy1-DL-arginine-p-nitroanalide hydrochloride. The sample was allowed to react for 10 minutes at 37°C. After 10 minutes, the reaction was quenched by the addition of 30% trichloroacetic acid. The solution was filtered or centrifuged and the absorbance at 410 nm was measured. The limit of quantitation for this study was 1.00 TIU/mg FW sample.

Urease Activity. The method was based on AOCS (1998) method Ba 9-58. This assay is based on an increase in pH as ammonia is released from urea by residual urease enzyme in the soy meal. The urease activity was assayed by measuring the hydrolysis of 3% urea at pH 7.0 at 37º C. A difference between the pH of the test sample and the pH of the blank is an indication and index of urease activity. The optimum pH increase has generally been considered to be 0.05–0.30.

Folates. The method is based on microbiological assay with use of microplates and *Lactobacillus casei* subspecies *rhamnosus* – ATCC 7469, and use of Kit VitaFast Folic Acid of r-biopharm. The antioxidants 2-mercaptoethanol and ascorbic acid were used in all preparation stages of the extract. The samples were hydrolyzed in an autoclave with potassium dihydrogen phosphate 0.1 M pH 6.8, followed by consecutive enzymatic hydrolysis. Each enzyme was inactivated by boiling the sample before addition of the next enzyme. The enzymes used were: α-amylase for 3 hours, protease for 3 hours, and folate conjugase for 5 hours. After the necessary dilutions, the extracts were applied in the microplates. After the addition of the samples, the plate was kept in a chamber at 37ºC for 44-48 hours and the quantification of the turbidity in the microplates was measured at 630 nm in a microplate reader. Quantitation was by comparison to a standard curve. The limit of quantitation for this study was 0.1 μg/g FW sample.

Vitamin E (Tocopherols). The samples were saponificated at 90-95ºC with reflux using nitrogen forced through the condenser, with potassium hydroxide and with the antioxidant, ascorbic acid. The extraction of the non-saponifiable material was completed with diethyl ether. The diethyl ether extract was concentrated in a rotary evaporator at 40ºC, dried under nitrogen and the residue was dissolved in n-hexane. The tocopherols were separated by HPLC over a Lichrospher Si60 (125x4mm) column, (Merck, Germany). The mobile phase consisted of n-hexane, ethyl acetate, and n-propyl alcohol in an isocratic system. The detection and quantification was accomplished using a fluorescence detector with excitation at 294 nm and emission at 326 nm. The limit of quantitation for this study was 0.05 mg/g FW sample.

Vitamin Niacin. For the extraction of the niacin, the samples were first hydrolyzed by 1 N sulfuric acid hydrolysis in an autoclave for 30 minutes. The pH was adjusted to 4.5 with 10 N sodium hydroxide, as recommended by the AOAC International (2005), method 961.14. The extracts were passed over an ion-exchange resin prior to HPLC on a Lichrospher 100RP18 (250 x 4mm) column (Merck). The mobile phase consisted of heptanesulfonic acid sodium salt, triethylamine, potassium dihydrogen phosphate, and methanol in a gradient system. Niacin was monitored at 265 nm. The limit of quantification for this study was 0.50 mg/100 g FW sample.

Vitamins B1 (Thiamin) and B2 (Riboflavin). For the extraction of the vitamins, the samples were hydrolyzed with 0.01 N hydrochloric acid in an autoclave for 15 minutes, the pH was adjusted to 4.5 with sodium acetate. Enzymatic hydrolysis using diastase and papain was carried out for 12 hours at room temperature, as recommended by AOAC methods (2005) 970.65 and 942.23. Extracts were subjected to HPLC using a Lichrospher 100RP18 (250x4mm) column (Merck). The mobile phase consisted of potassium chloride, methanol, and water in an isocratic system. A fluorescence detector was used to monitor the natural fluorescence of the riboflavin (excitation 432nm and emission 545nm) and after oxidation of thiamine to thiochrome (362nm for excitation and 464nm for emission). The limit of quantitation for this study Vitamin B1 was 0.03 mg/g fresh weight sample. The limit of quantification for this study for vitamin B2 was 0.02 mg/100 g FW sample.

Statistical analysis. Analysis of variance was carried out on the data using SAS Version 9.1 (SAS Institute Inc., Cary, NC) following two procedures, the General Linear Model and the Mixed Model. With the exception of moisture content, all data were expressed on a dry weight basis for statistical analyses. Differences were assessed across location and by location. The model for across location:

y = variety + location + variety x location + block(location) + e
Random effects: location, variety x location, block(location).
Where y is the response variable (any analyte measured)

The model for separate analyses by location:

y = variety + block + e
where e is the response error

Contrasts were carried out to compare each of the sprayed and unsprayed BPS-CV127-9 treatments with the isoline control. Differences were considered statistically significant at the 0.05 confidence level.

RESULTS AND DISCUSSION

Proximate composition. Grain samples were analyzed for moisture, crude fat, protein, and total dietary fiber, content. The carbohydrate composition and calorie values were calculated. The results on a fresh weight/as is basis are shown in Table 1. The results on a dry weight basis are shown in Table 2 and besides the description of the moisture data, all discussion of the results refers to data presented in Table 2. These data show that there were no statistically significant differences in the carbohydrate or caloric content between the isoline control and BPS-CV127-9 treated either with imidazolinone (CV127+Imi) or the conventional herbicide (CV127) at any location. At one location (Santo Antonio de Goias) the ash level in the CV127+Imi treatment was statistically significantly lower than the the isoline control, but this was not observed for the CV127 treatment. The moisture content of grain from the CV127+Imi line was statistically significantly slightly lower than the the isoline control at five of the six locations, and lower in the CV127 treatment compared to the control at four of the locations. The total dietary fiber in the CV127+Imi treatment was statistically significantly higher at four of the six locations on a dry weight basis and crude fat at five, while protein content was statistically significantly lower at three of the locations (Table 2). For all locations, the proximate values for the CV127+Imi and CV127 were comparable to the values for the two conventional soybeans commonly grown commercially in Brazil (Table 2). Furthermore, the means and ranges of the values for proximates in BPS-CV127-9 and control treatments across all locations in comparison with the mean and ranges published in the ILSI Crop Composition Database are shown in Table 11. All proximate mean values and range of values obtained for CV127+Imi, BPS-CV127-9 treated with the conventional herbicide Volt (CV127), and the isoline control were within the proximate ranges reported for soybeans globally as well as for soybeans produced in Brazil. Also, values for proximates were comparable between the CV127+Imi and the CV127 treatments, showing that the herbicide application did not have a significant effect on grain proximate composition. Overall, these results show that grain produced by BPS-CV127-9, either treated with imidazolinone herbicide or with conventional herbicides, is comparable to and in the same range as conventional soybean varieties with a history of safe food and feed uses as well as safety to the environment, with respect to moisture, protein, total dietary fiber, fat, ash, and carbohydrate levels.

Fiber composition. Grain samples were analyzed for crude fiber (CF), acid detergent fiber (ADF) and neutral detergent fiber (NDF). Results are shown on a dry weight basis in Table 3. There were no statistically significant differences in grain CF levels between either CV127+Imi or CV127 treatments and the isoline control at three of the six field trial sites. However CF was statistically significantly higher at one location and lower in another in both the CV127+Imi and CV127 treatments as compared to the isoline control. When analyzed across all field trial locations, there were no statistically significant differences in grain CF levels between either CV127+Imi or CV127 treatments and the isoline control (Table 11). The grain ADF levels were

statistically significantly higher at two locations and the NDF was statistically significantly higher at five locations for the CV127+Imi treatment compared to the isoline control. A similar result was observed for the CV127 treatment compared to the isoline control, except there was a statistically significant difference in ADF levels between these two treatments at only one field site. In general, values for CF, ADF and NDF were comparable between the CV127+Imi and the CV127 treatments, showing that the herbicide application did not have a significant effect on grain fiber composition. For all locations, the CF, ADF and NDF values for the CV127+Imi and CV127 were comparable to the values for the two conventional soybeans commonly grown commercially in Brazil (Table 3). Furthermore, the means and ranges of the values for CF, ADF and NDF in BPS-CV127-9 (both CV127+Imi and CV127 treatments) and the isoline control treatments across all locations in comparison with the mean and ranges published in the ILSI Crop Composition Database are shown in Table 11. All CF, ADF and NDF mean values and range of values obtained for CV127+Imi and CV127 treatments, and the isoline control were within the ranges reported globally for soybeans as well as for soybeans produced in Brazil. These results show that grain fiber produced by BPS-CV127-9, either treated with imidazolinone herbicide or with conventional herbicides, is comparable to the isoline control and in the same range as grain fiber content of conventional soybean varieties with a history of safe food and feed uses as well as safety to the environment.

Antinutrients. The antinutrients examined included raffinose, stachyose, trypsin inhibitor, urease, lectin, and phytate. The results are summarized in Table 4. At four of the six locations, the raffinose content was slightly but statistically significantly higher in the CV127+Imi as compared to the isoline control, and the CV127 treatment slightly, but statistically significantly higher at three of the field test locations. The raffinose content in both the control and in BPS-CV127-9 grain is higher than the range for this analyte that is reported in the ILSI Database (Table 11), but they are comparable to the raffinose content of both conventional soybean varieties that were produced in the same field trials in Brazil, indicating that the higher raffinose levels may be a characteristic of Brazilian soybean varieties.

There were no statistically significant differences in stachyose content between either CV127+Imi or the CV127 treatments and the isoline control at four of the six field test locations. Stachyose levels were slightly lower in grain of the CV127+Imi treatment at the Santo Antonio de Goias and Santo Antonio de Posse field sites, and levels in grain of the CV127 treatment slightly lower at the Santo Antonio de Posse site only. However, levels of stachyose in grain of both CV127+Imi and the CV127 treatments were comparable to the stachyose content of both conventional soybean varieties that were produced in the same field trials in Brazil, and were comparable and within the range for this analyte as reported in the global ILSI Crop Composition Database (Table 11).

At all locations except for one (Santo Antonio de Goias) the trypsin inhibitor content of CV127+Imi was not statistically significantly different from the isoline control. Furthermore, except for the Santo Antonio de Goias location, levels of trypsin inhibitor in grain of both CV127+Imi and the CV127 treatments were comparable to the trypsin inhibitor content of both conventional soybean varieties that were produced in the same field trials in Brazil. Also, mean levels of trypsin inhibitor in

both BPS-CV127-9 treatments and the isoline control were comparable to one another and less than the range reported in the ILSI Crop Composition Database (Table 11), indicating that the lower trypsin inhibitor levels may be a characteristic of Brazilian soybean varieties.

At all locations except for one, Sete Lagoas, the urease content was not statistically significantly different between grain from CV127+Imi or CV127 treatments than from the isoline control. Also, urease levels in grain of both BPS-CV127-9 treatments were similar to that of the standard conventional soybean varieties used as comparators in the field trial. At all but two locations the lectin levels in CV127+Imi or CV127 treatments were not statistically significantly different from levels in grain of the isoline control. Again the values were similar to those obtained for the conventional soybean varieties that were produced in the same field trials in Brazil and were within the global range for this analyte as reported in the ILSI Crop Composition Database (Table 11). The lectin method has an intrinsic 25% error associated with it.

There were no statistically significant differences found in the phytate levels for grain from either CV127+Imi or CV127 treatments compared to that of isoline control at any of the locations. Also, mean phytate values for CV127+Imi, CV127 and the isoline control across locations were comparable to one another and to levels in the conventional soybean varieties that were produced in the same field trials in Brazil, and values were lower than the range for this antinutrient as reported in the ILSI Crop Composition Database (Table 11) again indicating that the lower phytate levels may be a characteristic of Brazilian soybean varieties.

In general, values for the antinutrients were comparable between the CV127+Imi and the CV127 treatments, showing that the herbicide application did not have a significant effect on grain antinutrient composition. For all locations, the antinutrient values for the CV127+Imi and CV127 treatments were comparable to the values for either one or both of the conventional soybean varieties commonly grown commercially in Brazil (Table 4). The means and ranges of the values for the antinutrients in the BPS-CV127-9 and control treatments across all locations in comparison with the mean and ranges published in the ILSI Crop Composition Database are shown in Table 11 (data not available for urease). Mean values and range of values of some of the antinutrients for the BPS-CV127-9 treatments (CV127+Imi and CV127), and the isoline control were outside of ranges reported globally for soybeans in the ILSI Crop Composition Database. These differences in levels for some of the antinutrients in BPS-CV127-9 and the control with the values presented in the ILSI Database may reflect differences between the soybeans analyzed in this study adapted for production in a tropical climate to the database that is biased to soybean varieties adapted to temperate climate production conditions. Overall, comparing antinutrient levels in BPS-CV127-9 to levels in the isoline control and the standard Brazilian commercial varieties, these results indicate that antinutrient levels in grain produced by BPS-CV127-9, either treated with imidazolinone herbicide or with conventional herbicides, are comparable to and in the same range as antinutrient levels in conventional soybean varieties with a history of safe food and feed uses as well as safety to the environment.

Minerals. Five minerals, calcium, iron, phosphorus, magnesium, and potassium were quantified in soybean grain with the results presented on a dry weight basis in Table 5. At two locations the calcium values were statistically higher in grain from CV127+Imi as compared to the nontransgenic control, at two other locations the values were statistically significantly lower, and at the other two locations no differences were observed. Statistically significant differences in calcium levels were also observed between the CV127 treatment and the isoline control at two field locations. At all field locations except for one (Brasilia) there were no statistically significant differences in iron and phosphorus content of the grain of BPS-CV127-9 (both treatments CV127+Imi and CV127) compared to levels in grain of the isogenic control variety. At all but two field locations, magnesium and potassium values were not statistically significantly different between BPS-CV127-9 (both treatments CV127+Imi and CV127) and the isogenic control. In summary, there were no clear trends for any mineral levels showing significant differences across all locations between BPS-CV127-9 (both treatments CV127+Imi and CV127) and the isoline control. Furthermore, for all locations, the mineral values for the CV127+Imi and CV127 were comparable to the values for the two conventional soybeans commonly grown commercially in Brazil (Table 5). Also, values for minerals were comparable between the CV127+Imi and the CV127 treatments, showing that the herbicide application did not have a significant effect on grain mineral composition. The means and ranges of the values for minerals in BPS-CV127-9 and control treatments across all locations in comparison with the mean and ranges published in the ILSI Crop Composition Database are shown in Table 11. Mean and range of values for iron, phosphorus, magnesium and potassium obtained for CV127+Imi, BPS-CV127-9 treated with the conventional herbicide Volt (CV127), and the isoline control were within the ranges reported globally for soybeans. Although the mean values for grain calcium content for the BPS-CV127-9 and isoline control treatments were within the range reported for soybean grain in the ILSI Crop Composition Database, the high end of the value ranges for BPS-CV127-9 and the isoline control were higher than the range reported in the ILSI Crop Composition Database. These results show that mineral content of grain produced by BPS-CV127-9, either treated with imidazolinone herbicide or with conventional herbicides, is comparable to and in the same range as the mineral content of conventional soybean varieties with a history of safe food and feed uses as well as safety to the environment.

Amino Acids. Grain samples were analyzed for amino acid content and the results on a dry weight basis are reported in Table 6**.** For all field locations except for results from the Uberaba field test site, there were no statistically significant differences in amino acid levels between BPS-CV127-9 (both treatments CV127+Imi and CV127), and the isogenic control. The only exception was for cysteine levels in the BPS-CV127-9 grain produced at St. Ant. de Posse, which was statistically significantly different (higher) than the values for control grain. Also, amino acid levels in grain of the BPS-CV127-9 and control treatments were comparable to the conventional comparator soybean varieties grown in the same field trials. Only at the Uberaba field location were differences in amino acid levels observed between the BPS-CV127-9 treatments and the isogenic control. The majority (14 of 18) of the amino acid values from the grain produced in Uberaba were statistically significantly different when CV127+Imi and CV127 results were compared to those of the isogenic control. The amino acid values from either CV127+Imi or CV127 grain produced at Uberaba that

were significantly different from control grain were significantly lower, with the exception of cysteine which was significantly higher. These differences in grain amino acid levels between the BPS-CV127-9 and control treatments observed at the Uberaba site were not representative of results from the other five field sites, and when amino acid levels were analyzed across all field locations, there were no statistically significant differences in grain amino acid levels between the BPS-CV127-9 and control treatments (Table 11). Furthermore, mean grain amino acid content of BPS-CV127-9 (both treatments CV127+Imi and CV127) and the isoline control were within the range of values for amino acids that are typical of soybeans produced in Brazil or globally in the ILSI Crop Composition Database (Table 11). It is also important to note that there were no statistically significant differences in branched-chain amino acid content of the grain between BPS-CV127-9 and the isoline control when analyszed across field locations (Table 11). The AHAS enzyme catalyzes an important step in the biosynthesis of branched-chain amino acids valine, leucine and isoleucine, and the AHAS enzyme is under feedback regulation by these amino acids in plants. Results show that levels of these amino acids were not impacted by the expression of the AtAHAS enzyme in soybean or by the application of imidazolinone herbicide to the plant, therefore confirming that the mutation conferring herbicide tolerance in the AtAHAS enzyme does not affect feedback regulation of the enzyme by the branched-chain amino acids in the soybean plant. In summary, these results demonstrate that with repect to amino acid content, the grain from BPS-CV127-9 is comparable to and in the same range as conventional soybean varieties with a history of safe food and feed uses as well as safety to the environment.

Vitamins. The tocopherols (α, β γ, δ and total tocopherols) together with Vitamins E, B1, folic acid, niacin, and riboflavin were analyzed in the soybean grain samples. Levels of niacin and riboflavin in the grain samples were below the level of detection for the assays, and are not reported in data Table 7. Vitamin E values in international units/100 g DW and as mg/100 g DW are reported together with the other vitamins (Table 7). Levels of all vitamins were comparable between grain of the BPS-CV127-9 treatments and the isoline control, but some statistically significant differences between the BPS-CV127-9 treatments and the control were observed across all locations for all vitamins. However, there were no trends of higher or lower values for the BPS-CV127-9 treatments for all locations as compared to the control. For no location were all vitamins statistically significantly different. There were statistically significant differences observed between BPS-CV127-9 (both treatments) and the isoline control for the individual tocopherols but only two locations had statistically significant differences for total tocopherols and in both cases, at Londrina and Brasília, the levels were slightly higher in the BPS-CV127-9 (both treatments CV127+Imi and CV127) samples compared to the control. These results demonstrate that the levels of these selected vitamins in grain from BPS-CV127-9 (both CV127+Imi and CV127 treatments) are comparable and within the same ranges as levels in the conventional, nontransgenic isogenic control variety. Furthermore, for all locations, the vitamin levels for the CV127+Imi and CV127 treatments were comparable to one or both of the values for the conventional soybean varieties commonly grown commercially in Brazil (Table 7). In general, values for the vitamins were comparable between the CV127+Imi and the CV127 treatments, showing that the herbicide application did not have a significant effect on grain

vitamin composition. The means and ranges of the values for some vitamins in the BPS-CV127-9 and control treatments across all locations in comparison with the mean and ranges published in the ILSI Crop Composition Database are shown in Table 11. Except for Vitamin B1, mean values and range of values of vitamins E and folic acid for CV127+Imi, BPS-CV127-9 treated with the conventional herbicide Volt (CV127), and the isoline control were comparable to the ranges reported globally for soybeans in the ILSI Crop Composition Database. The difference in levels for Vitamin B1 in BPS-CV127-9 and the control with the values presented in the ILSI Database may reflect differences between the soybeans analyzed in this study adapted for production in a tropical climate to the database that is biased to soybean varieties adapted for production in temperate climates. Overall, comparing vitamin levels in BPS-CV127-9 to levels in the isoline control and the standard Brazilian commercial varieties, these results indicate that vitamin levels in grain produced by BPS-CV127-9, either treated with imidazolinone herbicide or with conventional herbicides, are comparable to and in the same range as vitamin levels in conventional soybean varieties with a history of safe food and feed uses as well as safety to the environment.

Fatty Acids. Grain samples were analyzed for fatty acid content and results for the nine most prevalent fatty acids are shown in Table 8. The nine most prevalent include myristic, palmitic, stearic, oleic, linoleic, linolenic, arachidonic, eicosenoic, and behenic acids. The mean fatty acid values were compared within field locations and across locations. Some statistically significant differences in individual grain fatty acids levels were observed between the BPS-CV127-9 treatments and the isoline control (Tables 8 and 11), but there were no consistent differences between these treatments for levels of any individual fatty acid across field locations or for levels of all fatty acids at any one location. Furthermore, the mean and range of grain fatty acid levels for CV127+Imi, CV127, and the isoline control were either within or comparable to the ranges reported globally and from Brazil for soybeans in the ILSI Crop Composition Database (Table 11). Also, for all locations, the grain fatty acid values for the CV127+Imi and CV127 treatments were comparable to the values for the two conventional soybeans that are commercially cultivated in Brazil (Table 8). In addition, the values for fatty acids were comparable between grain from CV127+Imi and CV127, demonstrating that the different herbicide treatments had no significant impact on fatty acid composition. These results demonstrate that the fatty acid content in grain produced from BPS-CV127-9, either treated with imidazolinone herbicide or with conventional herbicides, is comparable to, and within the same range as, the fatty acid content of conventional soybean varieties with a history of safe food and feed use as well as safety to the environment.

Isoflavones. Grain samples were analyzed for their isoflavone composition and the results for the most prevalent, including daidzin, malonyl daidzin, daidzein, glycitin, malonyl glycitin, glycitein, genistin, malonyl genistin, and genistein, are reported on a dry weight basis in Table 9. Some statistically significant differences in individual grain isoflavone levels were observed between the BPS-CV127-9 treatments and the isoline control (Tables 9 and 11), but except for malonyl daidzin there were no consistent differences between these treatments for levels of any individual isoflavone across field locations or for levels of all isoflavones at any one location. Furthermore, when the mean values of the total isoflavones (total daidzein, total genistein, and total

glycitein) were compared across locations, the range of values and the mean values for grain from CV127+Imi and CV127 were comparable to one another and were either within the range or comparable to values for the same isoflavones in soybean grain reported globally and from Brazil in the ILSI composition database (Table 11). Also, for all locations, the grain isoflavone values for the CV127+Imi and CV127 treatments were generally slightly lower but comparable to the values for the two conventional soybeans that are commercially cultivated in Brazil (Table 9). These results demonstrate that the different herbicide treatments had no effect on isoflavone content of grain produced by BPS-CV127-9 soybeans and that the isoflavone content is comparable to that of grain from conventional soybeans that are commonly cultivated in Brazil that have a history of safe food and feed use as well as safety to the environment.

Phospholipids. Phospholipids are common contaminants during soybean oil processing, often referred to as gums in the solvent extracted oil. If not removed the gum material typically settles out and can cause significant losses in oil refining. Therefore, phospholipid levels were analyzed in grain samples of the different treatments and the results for phosphatidyl ethanolamine, phosphatidic acid, phosphatidyl inositol and phosphatidyl choline are presented in Table 10. These data were also analyzed across field site locations and results presented in Table 11. Although some statistically significant differences in phospholipid levels were observed between the BPS-CV127-9 treatments and the isoline control at different field site locations, in general, the values for the phospholipids obtained from grain of CV127+Imi and CV127 were comparable to the values obtained from grain produced by the isoline control variety at all locations. Also, for all locations, the grain phospholipid values for the CV127+Imi and CV127 treatments were comparable to the values for the two conventional soybeans that are commercially cultivated in Brazil (Table 10). This demonstrates that the application of imidazolinone herbicide compared to the use of conventional herbicides had no impact on the content of phospholipids in grain produced by BPS-CV127-9. Furthermore, these results also demonstrate that the phospholipid levels of grain produced by BPS-CV127-9 are similar and comparable to those in grain produced by conventional soybean varieties that are commonly cultivated in Brazil that have a history of safe food and feed use as well as safety to the environment.

CONCLUSION

Soybean has many uses in animal and human nutrition. The grain is typically processed to two commodity products, oil and meal. The defatted toasted meal is commonly used in livestock feed. The various soybean protein fractions derived from processing nontoasted defatted soybean meal is used in different human foods. Also, the soybean oil is used in different food products including cooking oil and salad dressings. An important component of the safety assessment of BPS-CV127-9 is to demonstrate that the nutrient and antinutrient composition of the grain is equivalent to that of the isoline control variety as well as other conventional commercial soybean varieties, thereby confirming that BPS-CV127-9 grain is appropriate for use in soybean food and feed products. The analytes measured (proximates, fatty acids, amino acids, minerals, vitamins, antinutrients, fiber, isoflavones, and phospolipids)

are important nutrient and antinutrient components of soybean grain. The values of these analytes determined in BPS-CV127-9 grain were compared with that found in the isoline, nontransgenic, conventional soybean control and two other commercial conventional varieties adapted for commercial production in Brazil. Results of these compositional analyses showed that BPS-CV127-9 is compositionally equivalent to the isoline control. Where minor differences in amounts of individual nutritional constituents were detected between the grain of BPS-CV127-9 and that of the conventional isoline control, these were most likely due to small genetic differences between BPS-CV127-9 and the control resulting from the inherent genetic heterogeneity of the original transformed soybean variety Conquista. However, where differences in component levels were observed between BPS-CV127-9 and the isoline control, the values for BPS-CV127-9 were either comparable to the commercial conventional soybean varieties grown in the same field trials and/or were within or comparable to the range of values for conventional soybeans published in the ILSI Crop Composition Database.

In summary, these compositional analyses demonstrate that the introduction of the *ahas* gene from *Arabidopsis thaliana* into the soybean genome, together with treatment by imidazolinone herbicide on BPS-CV127-9 does not impact the nutritional composition of grain produced by BPS-CV127-9. Results of these analyses demonstrate that grain from BPS-CV127-9 is compositionally equivalent to, and as nutritious as, grain from the isoline control as well as other conventional soybean varieties.

RECORDS RETENTION: Raw data, the original copy of this report, and other relevant records are archived at BASF, 26 Davis Drive. Research Triangle Park, NC, USA 27709.

STUDY PERSONNEL: Statistical analysis work reported herein conducted by [redacted] Ph.D., BASF Plant Science, LLC, Research Triangle Park, NC 27705.

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Table 1. Proximate Composition of Grain on a Fresh Weight Basis of Soybean BPS-CV127-9 Treatments (CV127 and CV127+imi), the Isoline Control and Two Conventional Soybean Varieties (Std 1 and Std 2) Grown at Six Locations in Brazil in the 2006/07 Season

Location	Treatment	N	Moisture	Total Dietary Fiber	Protein	Fat	Ash	Carbohydrates	Calories
			Mean ± Standard Deviation (range) g/100 g fresh weight						
Santo Antonio de Goias	Isoline	4	10.2 ± 0.1 (10.1 – 10.3)	22.00 ± 1.12 (21.30 – 23.66)	35.8 ± 1.2 (35.1 – 37.5)	19.6 ± 0.2 (19.3 – 19.8)	4.4 ± 0.2 (4.2 – 4.5)	8.0 ± 1.3 (6.9 – 9.5)	352 ± 5 (344 – 356)
	CV127	4	9.1 ± 0.3* (8.8 – 9.4)	22.73 ± 0.79 (21.90 – 23.70)	35.9 ± 0.3 (35.6 – 36.3)	21.2 ± 0.2 (21.0 – 21.5)	4.4 ± 0.1 (4.2 – 4.5)	6.7 ± 1.0 (5.4 – 7.9)	362 ± 4 (356 – 366)
	CV127 + Imi	4	9.6 ± 0.1* (9.4 – 9.7)	23.99 ± 2.30 (20.23 – 25.41)	36.6 ± 0.3 (36.3 – 36.9)	20.5 ± 0.5 (19.9 – 20.9)	4.2 ± 0.1 (4.2 – 4.3)	5.6 ± 2.3 (3.4 – 8.8)	353 ± 9 (347 – 366)
	Std 1	1	10.5	23.29	35.4	18.1	4.4	8.3	338
	Std 2	1	9.9	22.84	33.5	21.2	4.2	8.4	359
Uberaba	Isoline	4	9.9 ± 0.4 (9.6 – 10.4)	21.45 ± 1.68 (20.05 – 23.74)	37.3 ± 0.9 (35.9 – 38.0)	19.2 ± 0.9 (18.5 – 20.5)	4.3 ± 0.1 (4.2 – 4.3)	8.0 ± 1.7 (6.0 – 9.6)	354 ± 8 (342 – 360)
	CV127	4	8.9 ± 0.2* (8.7 – 9.1)	21.55 ± 1.35 (20.15 – 22.80)	35.9 ± 0.3 (35.4 – 36.1)	20.3 ± 0.4 (19.9 – 20.4)	4.3 ± 0.1 (4.2 – 4.3)	9.2 ± 1.7 (7.3 – 11.0)	363 ± 4 (358 – 367)
	CV127 + Imi	4	9.0 ± 0.2* (8.8 – 9.1)	22.03 ± 1.43 (20.19 – 23.52)	36.3 ± 0.1 (36.2 – 36.4)	20.6 ± 0.3 (20.1 – 20.9)	4.2 ± 0.1 (4.1 – 4.3)	7.9 ± 1.7 (6.0 – 10.1)	362 ± 7 (356 – 370)
	Std 1	1	9.5	22.55	34.9	19.1	4.1	9.9	351
	Std 2	1	9.6	24.19	35.0	21.8	4.1	5.3	357
Sete Lagoas	Isoline	4	10.6 ± 0.2 (10.5 – 10.6)	21.47 ± 1.39 (20.13 – 23.42)	37.0 ± 0.2 (36.6 – 37.1)	19.4 ± 0.1 (19.2 – 19.5)	4.4 ± 0.1 (4.3 – 4.4)	7.3 ± 1.6 (5.0 – 8.9)	351 ± 5 (344 – 356)
	CV127	4	9.7 ± 0.3* (9.3 – 10.0)	21.56 ± 0.97 (20.56 – 22.74)	36.0 ± 0.2 (35.8 – 36.2)	20.3 ± 0.5 (19.8 – 20.9)	4.5 ± 0.1 (4.3 – 4.6)	8.0 ± 1.0 (6.8 – 9.0)	359 ± 5 (354 – 366)
	CV127 + Imi	4	9.8 ± 0.1* (9.7 – 9.9)	22.17 ± 1.46 (20.73 – 23.55)	35.6 ± 0.3 (35.2 – 35.9)	20.9 ± 0.3 (20.7 – 21.3)	4.4 ± 0.1 (4.4 – 4.5)	7.1 ± 1.4 (5.9 – 8.6)	359 ± 5 (353 – 364)
	Std 1	1	9.8	23.31	34.0	19.4	4.4	9.1	347
	Std 2	1	9.8	22.80	33.7	21.7	4.3	7.7	361

Table 1. continued.

Location	Treatment	N	Moisture	Total Dietary Fiber	Protein	Fat	Ash	Carbohydrates	Calories
			Mean ± Standard Deviation (range) g/100 g fresh weight						
Londrina	Isoline	4	9.4 ± 0.2 (9.2 – 9.7)	24.04 ± 1.01 (22.64 – 25.03)	34.7 ± 0.2 (34.4 – 34.9)	21.0 ± 0.2 (20.7 – 21.1)	4.6 ± 0 (4.6)	6.3 ± 1.1 (5.3 – 7.7)	353 ± 3 (350 – 357)
	CV127	4	9.1 ± 0.1 (9.0 – 9.2)	23.06 ± 1.93 (20.27 – 24.48)	34.1 ± 0.4 (33.7 – 34.5)	21.3 ± 0.1 (21.2 – 21.3)	4.6 ± 0.1 (4.6 – 4.7)	7.9 ± 2.0 (6.3 – 10.7)	359 ± 8 (354 – 370)
	CV127 + Imi	4	9.4 ± 0.1 (9.3 – 9.5)	22.53 ± 1.30 (21.37 – 24.38)	34.4 ± 0.4 (33.8 – 34.6)	21.4 ± 0.2 (21.2 – 21.5)	4.6 ± 0.1 (4.5 – 4.7)	7.8 ± 0.8 (6.6 – 8.4)	361 ± 6 (352 – 366)
	Std 1	1	9.9	21.30	32.8	20.5	4.7	10.8	359
	Std 2	1	9.4	24.81	34.1	22.5	4.6	4.6	358
Brasília	Isoline	4	10.1 ± 0.1 (9.9 – 10.2)	22.05 ± 1.60 (19.74 – 23.43)	36.7 ± 0.9 (35.7 – 37.9)	18.6 ± 0.5 (18.0 – 19.1)	4.7 ± 0.1 (4.6 – 4.7)	8.0 ± 2.1 (6.3 – 10.9)	346 ± 5 (342 – 352)
	CV127	4	9.1 ± 0.1* (9.0 – 9.2)	21.76 ± 1.47 (19.67 – 23.01)	36.9 ± 0.9 (35.8 – 38.1)	19.2 ± 0.6 (18.4 – 19.7)	4.6 ± 0.1 (4.5 – 4.6)	8.6 ± 1.4 (6.8 – 10.3)	355 ± 8 (345 – 364)
	CV127 + Imi	4	9.0 ± 0.1* (8.9 – 9.2)	20.75 ± 0.46 (20.31 – 21.37)	37.1 ± 0.7 (36.4 – 38.0)	18.8 ± 0.7 (18.3 – 19.9)	4.6 ± 0 (4.6)	9.7 ± 1.2 (8.6 – 11.2)	357 ± 3 (354 – 361)
	Std 1	1	9.5	22.63	33.7	19.9	4.5	9.8	353
	Std 2	1	9.5	22.30	32.9	21.5	4.6	9.2	362
Santo Antonio de Posse	Isoline	4	10.3 ± 0.2 (10.0 – 10.4)	21.58 ± 1.21 (19.77 – 22.29)	36.1 ± 0.4 (35.7 – 36.6)	19.3 ± 0.3 (19.1 – 19.7)	4.7 ± 0.1 (4.5 – 4.8)	8.2 ± 1.1 (7.3 – 9.7)	351 ± 6 (347 – 360)
	CV127	4	10.1 ± 0.1 (9.9 – 10.2)	22.90 ± 0.37 (22.39 – 23.29)	34.7 ± 0.3 (34.5 – 35.1)	20.9 ± 0.9 (20.4 – 22.2)	4.7 ± 0.2 (4.6 – 4.9)	6.7 ± 1.1 (5.1 – 7.4)	354 ± 5 (350 – 360)
	CV127 + Imi	4	9.6 ± 0.3* (9.3 – 9.9)	23.27 ± 0.73 (22.32 – 23.85)	34.4 ± 0.5 (33.8 – 34.9)	21.3 ± 0.6 (20.7 – 21.9)	4.8 ± 0.1 (4.7 – 4.9)	6.7 ± 0.8 (6.0 – 7.8)	357 ± 6 (351 – 364)
	Std 1	1	10.1	20.04	33.2	19.6	4.5	12.6	360
	Std 2	1	9.7	25.31	33.5	21.6	4.8	5.1	349

*Statistically significantly different from the isoline nontransgenic comparator at $p < 0.05$.

Table 2. Proximate Composition of Grain on a Dry Weight Basis of Soybean BPS-CV127-9 Treatments (CV127 and CV127+Imi), the Isoline Control and Two Conventional Soybean Varieties (Std 1 and Std 2) Grown at Six Locations in Brazil in the 2006/07 Season

Location	Treatment	N	Total Dietary Fiber	Protein	Fat	Ash	Carbohydrates	Calories
			Mean ± Standard Deviation (range) g/100 g dry weight					
Santo Antonio de Goias	Isoline	4	24.65 ± 1.22 (23.75 – 26.34)	39.8 ± 1.3 (39.1 – 41.8)	21.8 ± 0.2 (21.5 – 22.0)	4.9 ± 0.2 (4.7 – 5.0)	9.0 ± 1.4 (7.7 – 10.6)	392 ± 6 (383 – 397)
	CV127	4	25.00 ± 0.92 (24.07 – 26.15)	39.5 ± 0.4 (39.2 – 40.1)	23.3 ± 0.2* (23.2 – 23.6)	4.8 ± 0.2 (4.6 – 5.0)	7.4 ± 1.1 (6.0 – 8.7)	398 ± 4 (393 – 401)
	CV127 + Imi	4	26.08 ± 2.53* (22.40 – 28.11)	40.5 ± 0.3 (40.1 – 40.8)	22.7 ± 0.5* (22.0 – 23.1)	4.7 ± 0.1* (4.6 – 4.8)	6.1 ± 2.5 (3.4 – 8.8)	391 ± 10 (384 – 405)
	Std 1	1	26.02	39.6	20.2	4.9	9.3	377
	Std 2	1	25.34	37.2	23.5	4.7	9.3	398
Uberaba	Isoline	4	23.79 ± 1.87 (22.18 – 26.28)	41.4 ± 0.9 (40.1 – 42.1)	21.3 ± 1.1 (20.5 – 22.9)	4.8 ± 0.1 (4.6 – 4.8)	8.8 ± 1.8 (6.6 – 10.6)	392 ± 9 (379 – 399)
	CV127	4	23.66 ± 1.53 (22.07 – 25.08)	39.4 ± 0.3 (38.9 – 39.6)	22.3 ± 0.5 (21.8 – 22.9)	4.7 ± 0.1 (4.6 – 4.7)	10.0 ± 1.9 (8.0 – 12.0)	398 ± 4 (394 – 402)
	CV127 + Imi	4	24.20 ± 1.59* (22.13 – 25.87)	39.9 ± 0.1* (39.7 – 40.0)	22.6 ± 0.4* (22.0 – 23.0)	4.6 ± 0.1 (4.5 – 4.7)	8.7 ± 1.8 (6.6 – 11.1)	398 ± 7 (392 – 406)
	Std 1	1	24.91	38.6	21.1	4.5	10.9	388
	Std 2	1	26.75	38.7	24.1	4.5	5.9	395
Sete Lagoas	Isoline	4	24.02 ± 1.56 (22.49 – 26.19)	41.4 ± 0.2 (41.1 – 41.5)	21.7 ± 0.2 (21.5 – 21.8)	4.9 ± 0.1 (4.8 – 4.9)	8.1 ± 1.8 (5.6 – 9.9)	393 ± 6 (385 – 398)
	CV127	4	23.87 ± 1.07 (22.84 – 25.18)	39.9 ± 0.3 (39.6 – 40.1)	22.5 ± 0.4* (22.0 – 23.0)	4.9 ± 0.2 (4.7 – 5.1)	8.8 ± 1.1 (7.5 – 10.0)	397 ± 5 (392 – 403)
	CV127 + Imi	4	24.57 ± 1.61* (23.01 – 26.07)	39.5 ± 0.3* (39.1 – 39.8)	23.2 ± 0.3* (22.9 – 23.6)	4.9 ± 0.1 (4.9 – 5.0)	7.9 ± 1.5 (6.6 – 9.5)	398 ± 6 (391 – 403)
	Std 1	1	25.84	37.7	21.5	4.9	10.1	384
	Std 2	1	25.28	37.4	24.1	4.8	8.5	400

Table 2. continued.

Location	Treatment	N	Total Dietary Fiber	Protein	Fat	Ash	Carbohydrates	Calories
			Mean ± Standard Deviation (range) g/100 g dry weight					
Londrina	Isoline	4	26.53 ± 1.06 (25.07 – 27.57)	38.3 ± 0.2 (38.1 – 38.5)	23.1 ± 0.2 (22.8 – 23.3)	5.1 ± 0 (5.1)	7.0 ± 1.2 (5.8 – 8.5)	389 ± 4 (385 – 395)
	CV127	4	25.37 ± 2.11 (22.32 – 26.90)	37.5 ± 0.4 (37.0 – 38.0)	23.4 ± 0.1 (23.3 – 23.5)	5.1 ± 0.1 (5.1 – 5.2)	8.7 ± 2.2 (6.9 – 11.8)	395 ± 8 (389 – 407)
	CV127 + Imi	4	24.85 ± 1.45 (23.58 – 26.94)	37.9 ± 0.4 (37.3 – 38.2)	23.6 ± 0.2* (23.4 – 23.7)	5.1 ± 0.1 (5.0 – 5.2)	8.6 ± 0.9 (7.3 – 9.3)	398 ± 6 (389 – 404)
	Std 1	1	23.63	36.4	22.8	5.2	12.0	398
	Std 2	1	27.38	37.6	24.8	5.1	5.1	395
Brasília	Isoline	4	24.51 ± 1.79 (21.93 – 26.06)	40.8 ± 1.1 (39.6 – 42.2)	20.7 ± 0.6 (20.0 – 21.2)	5.2 ± 0.1 (5.1 – 5.2)	8.9 ± 2.4 (7.0 – 12.1)	385 ± 5 (381 – 391)
	CV127	4	23.92 ± 1.64 (21.61 – 25.34)	40.6 ± 1.1 (39.3 – 42.0)	21.1 ± 0.6 (20.3 – 21.6)	5.0 ± 0.1 (4.9 – 5.1)	9.5 ± 1.6 (7.5 – 11.4)	390 ± 8 (380 – 400)
	CV127 + Imi	4	22.80 ± 0.51 (22.29 – 23.46)	40.8 ± 0.9 (40.0 – 41.9)	20.7 ± 0.8 (20.1 – 21.8)	5.1 ± 0.1 (5.0 – 5.1)	10.7 ± 1.3 (9.4 – 12.3)	393 ± 3 (390 – 396)
	Std 1	1	25.00	37.2	22.0	5.0	10.8	391
	Std 2	1	24.64	36.4	23.8	5.1	10.2	400
Santo Antonio de Posse	Isoline	4	24.04 ± 1.32 (22.06 – 24.78)	40.2 ± 0.4 (39.8 – 40.8)	21.5 ± 0.4 (21.2 – 22.0)	5.2 ± 0.1 (5.0 – 5.3)	9.1 ± 1.2 (8.1 – 10.9)	391 ± 8 (385 – 402)
	CV127	4	25.46 ± 0.42 (24.90 – 25.93)	38.6 ± 0.3 (38.4 – 39.0)	23.2 ± 0.9* (22.7 – 24.6)	5.3 ± 0.2 (5.1 – 5.5)	7.5 ± 1.3 (5.6 – 8.3)	394 ± 5 (390 – 400)
	CV127 + Imi	4	25.72 ± 0.86* (24.60 – 26.46)	38.0 ± 0.6* (37.4 – 38.5)	23.6 ± 0.7* (22.8 – 24.2)	5.3 ± 0.1 (5.2 – 5.4)	7.4 ± 0.9 (6.6 – 8.6)	394 ± 6 (388 – 401)
	Std 1	1	22.29	36.9	21.8	5.0	14.0	400
	Std 2	1	28.03	37.1	23.9	5.3	5.6	386

*Statistically significantly different from the isoline nontransgenic comparator at $p < 0.05$.

Table 3. Fiber Composition of Grain on a Dry Weight Basis of Soybean BPS-CV127-9 Treatments (CV127 and CV127+Imi), the Isoline Control and Two Conventional Soybean Varieties (Std 1 and Std 2) Grown at Six Locations in Brazil in the 2006/07 Season

Location	Treatment	N	Crude Fiber	Acid Detergent Fiber	Neutral Detergent Fiber
			Mean ± Standard Deviation (range) g/100 g dry weight		
Santo Antonio de Goias	Isoline	4	9.6 ± 1.2 (8.1 – 11.0)	10.71 ± 1.37 (9.07 – 12.08)	14.82 ± 0.94 (13.95 – 16.10)
	CV127	4	7.3 ± 0.3* (6.9 – 7.6)	10.90 ± 0.94 (9.75 – 11.79)	13.97 ± 0.97 (12.72 – 15.07)
	CV127 + Imi	4	7.0 ± 0.2* (6.8 – 7.2)	13.11 ± 1.25* (11.73 – 14.76)	16.91 ± 1.91* (14.06 – 18.12)
	Std 1	1	8.4	11.51	14.82
	Std 2	1	9.0	12.14	16.36
Uberaba	Isoline	4	8.3 ± 0.3 (7.9 – 8.6)	12.06 ± 2.44 (9.27 – 14.95)	15.12 ± 1.14 (13.57 – 16.16)
	CV127	4	8.7 ± 1.3 (7.5 – 10.5)	13.77 ± 1.41 (12.08 – 15.20)	17.50 ± 1.27* (15.61 – 18.31)
	CV127 + Imi	4	10.2 ± 1.2* (9.0 – 11.3)	12.34 ± 1.30 (10.96 – 14.06)	16.76 ± 1.60* (15.07 – 18.15)
	Std 1	1	8.5	9.32	11.71
	Std 2	1	9.3	10.64	10.63
Sete Lagoas	Isoline	4	8.7 ± 0.2 (8.5 – 8.9)	10.22 ± 1.05 (8.84 – 11.20)	13.60 ± 1.05 (12.04 – 14.26)
	CV127	4	7.8 ± 0.6 (7.2 – 8.4)	14.40 ± 0.43* (14.15 – 15.04)	18.24 ± 1.09* (16.84 – 19.26)
	CV127 + Imi	4	7.2 ± 0.6 (6.4 – 7.9)	13.69 ± 1.49* (12.07 – 15.62)	18.21 ± 1.30* (17.01 – 19.96)
	Std 1	1	7.6	12.74	16.57
	Std 2	1	8.4	10.96	12.72
Londrina	Isoline	4	7.8 ± 0.6 (7.3 – 8.6)	11.70 ± 0.58 (11.18 – 12.51)	14.27 ± 0.52 (13.76 – 14.81)
	CV127	4	9.8 ± 1.3* (8.0 – 11.1)	12.68 ± 0.97 (11.41 – 13.59)	17.33 ± 1.77* (15.25 – 19.34)
	CV127 + Imi	4	7.9 ± 1.3 (6.8 – 9.7)	14.24 ± 1.25 (12.42 – 15.20)	18.01 ± 1.04* (16.73 – 19.15)
	Std 1	1	7.7	11.69	14.36
	Std 2	1	7.6	11.45	13.11
Brasília	Isoline	4	8.3 ± 1.4 (6.9 – 10.2)	11.66 ± 0.38 (11.10 – 11.94)	16.31 ± 1.10 (15.05 – 17.32)
	CV127	4	8.9 ± 1.0 (7.6 – 9.9)	12.94 ± 0.65 (12.28 – 13.81)	19.60 ± 0.97* (18.27 – 20.55)
	CV127 + Imi	4	8.5 ± 0.7 (7.8 – 9.2)	14.86 ± 2.84 (12.51 – 19.00)	16.89 ± 1.45 (15.59 – 18.61)
	Std 1	1	9.2	11.75	16.71
	Std 2	1	6.7	12.59	17.73
Santo Antonio de Posse	Isoline	4	8.4 ± 0.3 (8.0 – 8.7)	12.03 ± 1.42 (11.05 – 14.11)	15.77 ± 0.83 (14.91 – 16.73)
	CV127	4	7.5 ± 0.4 (7.1 – 8.0)	14.12 ± 1.48 (12.51 – 15.92)	18.11 ± 1.50* (16.48 – 20.05)
	CV127 + Imi	4	7.7 ± 0.5 (7.0 – 8.2)	14.32 ± 1.53 (12.54 – 16.13)	18.32 ± 1.16* (17.49 – 20.01)
	Std 1	1	8.1	14.43	16.92
	Std 2	1	8.0	11.88	16.51

*Statistically significantly different from the isoline nontransgenic comparator at $p < 0.05$.

Table 4. Antinutrient Composition of Grain on a Dry Weight Basis of Soybean BPS-CV127-9 Treatments (CV127 and CV127+Imi), the Isoline Control and Two Conventional Soybean Varieties (Std 1 and Std 2) Grown at Six Locations in Brazil in the 2006/07 Season

Location	Treatment	N	Raffinose	Stachyose	Trypsin Inhib.	Urease	Lectin	Phytate
			Mean ± Standard Deviation (range)					
			g/100 g dry wt	g/100 g dry wt.	TIU/mg dry wt.	ΔpH	HU/mg dry wt.	mg/g dry wt.
Santo Antonio de Goias	Isoline	4	1.1 ± 0.1 (1.0 – 1.2)	4.0 ± 0.2 (3.8 – 4.2)	11.45 ± 1.66 (9.28 – 12.95)	2.05 ± 0.05 (2.01 – 2.12)	2.35 ± 0.68 (1.36 – 2.79)	2.85 ± 0.86 (2.12 – 4.01)
	CV127	4	1.1 ± 0.2 (1.0 – 1.3)	3.8 ± 0.1 (3.6 – 3.9)	15.56 ± 0.73* (14.98 – 16.58)	2.10 ± 0.04 (2.05 – 2.13)	2.27 ± 0.62 (1.54 – 3.01)	2.89 ± 0.70 (1.87 – 3.41)
	CV127 + Imi	4	1.1 ± 0.1 (1.0 – 1.2)	3.6 ± 0.1* (3.5 – 3.8)	13.29 ± 1.20* (12.95 – 14.73)	2.12 ± 0.03 (2.08 – 2.15)	2.60 ± 0.81 (1.57 – 3.49)	3.16 ± 1.44 (2.06 – 5.27)
	Std 1	1	1.2	4.1	6.11	2.05	3.53	1.47
	Std 2	1	1.0	3.7	9.59	2.10	1.52	2.65
Uberaba	Isoline	4	1.1 ± 0.1 (1.0 – 1.1)	4.1 ± 0.1 (3.9 – 4.1)	7.92 ± 3.36 (6.03 – 12.95)	2.05 ± 0.05 (2.01 – 2.12)	2.28 ± 0.74 (1.75 – 3.35)	2.31 ± 0.63 (1.89 – 3.23)
	CV127	4	1.2 ± 0.1 (1.1 – 1.3)	3.8 ± 0.2 (3.6 – 4.0)	10.15 ± 1.41 (8.69 – 12.01)	2.09 ± 0.04 (2.05 – 2.13)	2.01 ± 0.49* (1.46 – 2.57)	2.47 ± 0.86 (1.25 – 3.22)
	CV127 + Imi	4	1.2 ± 0.1 (1.1 – 1.3)	3.9 ± 0.2 (3.7 – 4.1)	9.72 ± 0.91 (8.97 – 10.98)	2.02 ± 0.14 (1.81 – 2.13)	1.37 ± 0.16* (1.27 – 1.56)	2.10 ± 1.05 (0.93 – 3.36)
	Std 1	1	1.1	4.6	5.40	2.07	1.38	2.19
	Std 2	1	1.0	3.7	5.03	2.06	1.58	2.02
Sete Lagoas	Isoline	4	1.4 ± 0.1 (1.3 – 1.5)	3.2 ± 0.1 (3.0 – 3.2)	11.71 ± 0.36 (11.30 – 12.14)	1.64 ± 0.25 (1.27 – 1.80)	2.65 ± 0.41 (2.20 – 3.15)	3.19 ± 1.59 (1.43 – 4.94)
	CV127	4	1.7 ± 0.1* (1.6 – 1.8)	3.1 ± 0.2 (2.9 – 3.4)	12.65 ± 2.60 (10.28 – 16.08)	1.21 ± 0.49* (0.67 – 1.74)	2.45 ± 0.94 (1.68 – 3.70)	3.02 ± 0.71 (2.38 – 3.89)
	CV127 + Imi	4	1.5 ± 0.2* (1.3 – 1.7)	3.2 ± 0.1 (3.1 – 3.2)	11.62 ± 0.80 (10.44 – 12.17)	1.47 ± 0.40* (0.90 – 1.79)	2.83 ± 0.34 (2.42 – 3.25)	2.22 ± 0.49 (1.60 – 2.77)
	Std 1	1	1.6	3.7	10.73	1.43	2.13	2.28
	Std 2	1	1.0	3.1	11.06	1.65	1.68	2.05

Table 4. continued.

Location	Variety	N	Raffinose	Stachyose	Trypsin Inhib.	Urease	Lectin	Phytate
			Mean ± Standard Deviation (range)					
			g/100 g dry wt	g/100 g dry wt.	TIU/mg dry wt.	ΔpH	HU/mg dry wt.	mg/g dry wt.
Londrina	Isoline	4	1.1 ± 0.1 (1.0 – 1.2)	3.8 ± 0.2 (3.6 – 4.0)	14.58 ± 1.82 (12.08 – 16.40)	1.74 ± 0.13 (1.66 – 1.93)	1.74 ± 0.26 (1.52 – 2.10)	3.56 ± 1.43 (2.22 – 5.37)
	CV127	4	1.3 ± 0.1 (1.2 – 1.3)	3.7 ± 0.1 (3.6 – 3.7)	13.14 ± 1.63 (11.23 – 15.21)	1.68 ± 0.15 (1.55 – 1.89)	2.19 ± 0.76 (31.86 – 65.25)	2.64 ± 0.91 (1.45 – 3.51)
	CV127 + Imi	4	1.2 ± 0.1* (1.1 – 1.3)	3.8 ± 0.1 (3.7 – 3.9)	12.92 ± 1.66 (11.32 – 15.13)	1.78 ± 0.25 (1.60 – 2.15)	2.52 ± 0.74 (1.49 – 3.24)	1.72 ± 0.80 (0.71 – 2.50)
	Std 1	1	1.2	4.1	13.43	1.78	1.85	3.65
	Std 2	1	0.8	3.6	17.40	1.83	2.17	2.38
Brasília	Isoline	4	1.0 ± 0.1 (0.9 – 1.0)	3.6 ± 0.2 (3.3 – 3.8)	15.74 ± 0.65 (14.94 – 16.39)	2.09 ± 0.01 (2.09 – 2.10)	2.21 ± 0.85 (1.35 – 3.20)	3.22 ± 1.98 (1.73 – 6.09)
	CV127	4	1.2 ± 0.1* (1.2 – 1.3)	3.6 ± 0.2 (3.3 – 3.8)	11.08 ± 0.82 (10.48 – 12.25)	2.06 ± 0.11 (1.90 – 2.14)	2.97 ± 0.43 (2.59 – 3.47)	2.86 ± 1.33 (1.45 – 4.52)
	CV127 + Imi	4	1.2 ± 0.1* (1.1 – 1.2)	3.6 ± 0.1 (3.5 – 3.7)	11.64 ± 0.75 (10.54 – 12.25)	2.17 ± 0.04 (2.13 – 2.21)	1.81 ± 0.70 (1.44 – 2.85)	2.96 ± 0.66 (2.42 – 3.91)
	Std 1	1	1.0	4.2	14.54	2.15	1.60	3.99
	Std 2	1	0.9	3.8	19.64	2.16	2.48	7.39
Santo Antonio de Posse	Isoline	4	1.2 ± 0.1 (1.1 – 1.3)	3.7 ± 0.1 (3.5 – 3.8)	12.37 ± 0.63 (11.66 – 13.10)	1.99 ± 0.03 (1.96 – 2.02)	2.20 ± 0.73 (1.60 – 3.16)	2.58 ± 0.67 (1.80 – 3.31)
	CV127	4	1.7 ± 0.1* (1.6 – 1.7)	3.4 ± 0.1* (3.3 – 3.5)	11.73 ± 1.73 (10.34 – 14.24)	1.96 ± 0.16 (1.79 – 2.18)	1.49 ± 0.05* (1.43 – 1.54)	2.62 ± 0.90 (1.53 – 3.39)
	CV127 + Imi	4	1.5 ± 0.2* (1.2 – 1.7)	3.4 ± 0.1* (3.3 – 3.4)	12.88 ± 1.17 (11.76 – 14.49)	1.91 ± 0.02 (1.88 – 1.94)	1.87 ± 0.84* (1.36 – 3.12)	3.08 ± 0.97 (1.75 – 3.87)
	Std 1	1	1.3	4.1	10.88	1.96	2.35	2.09
	Std 2	1	1.0	3.3	13.58	1.94	2.13	2.53

*Statistically significantly different from the isoline nontransgenic comparator at $p < 0.05$.

Table 5. Mineral Composition of Grain on a Dry Weight Basis of Soybean BPS-CV127-9 Treatments (CV127 and CV127+Imi), the Isoline Control and Two Conventional Soybean Varieties (Std 1 and Std 2) Grown at Six Locations in Brazil in the 2006/07 Season

Location	Treatment	N	Calcium	Iron	Phosphorus	Magnesium	Potassium
			Mean ± Standard Deviation (range) mg/100 g dry weight				
Santo Antonio de Goias	Isoline	4	258 ± 30 (222 – 296)	8.45 ± 1.48 (6.40 – 9.85)	618 ± 20 (594 – 643)	252 ± 20 (222 – 265)	1878 ± 35 (1837 – 1912)
	CV127	4	269 ± 24 (238 – 290)	8.18 ± 0.44 (7.68 – 8.69)	686 ± 60 (617 – 759)	290 ± 10* (281 – 304)	1938 ± 46 (1908 – 2006)
	CV127 + Imi	4	230 ± 16* (214 – 247)	7.78 ± 0.68 (7.20 – 8.58)	618 ± 42 (588 – 680)	285 ± 13* (274 – 303)	1844 ± 63 (1778 – 1918)
	Std 1	1	216	9.07	580	264	2044
	Std 2	1	278	10.35	559	308	1772
Uberaba	Isoline	4	266 ± 19 (238 – 280)	6.84 ± 1.25 (6.01 – 8.69)	557 ± 19 (541 – 584)	226 ± 25 (204 – 260)	1857± 68 (1782 – 1935)
	CV127	4	294 ± 23 (274 – 327)	5.96 ± 0.35 (5.56 – 6.42)	552 ± 45 (515 – 611)	231 ± 9 (218 – 240)	1803 ± 57 (1720 – 1850)
	CV127 + Imi	4	296 ± 17* (276 – 318)	5.96 ± 0.19 (5.79 – 6.22)	576 ± 32 (546 – 611)	241 ± 12 (227 – 257)	1797 ± 37 (1751 – 1833)
	Std 1	1	256	6.54	541	225	1960
	Std 2	1	279	7.35	527	257	1822
Sete Lagoas	Isoline	4	237 ± 4 (232 – 241)	7.82 ± 0.14 (7.71 – 8.01)	703 ± 64 (666 – 799)	230 ± 7 (219 – 235)	1905 ± 81 (1785 – 1959)
	CV127	4	249 ± 13 (231 – 261)	6.97 ± 0.17 (6.84 – 7.22)	728 ± 14 (712 – 745)	236 ± 5 (229 – 240)	1783 ± 21* (1756 – 1806)
	CV127 + Imi	4	240 ± 8 (231 – 248)	7.09 ± 0.22 (6.94 – 7.40)	723 ± 19 (712 – 752)	247 ± 7 (240 – 256)	1791 ± 104* (1703 – 1907)
	Std 1	1	205	7.23	674	240	2020
	Std 2	1	301	8.24	719	273	1945
Londrina	Isoline	4	236 ± 16 (221 – 257)	9.76 ± 0.47 (9.41 – 10.43)	740 ± 53 (677 – 805)	249 ± 6 (240 – 255)	1977 ± 56 (1902 - 2035)
	CV127	4	284 ± 33* (242 – 322)	10.27 ± 0.78 (9.18 – 10.91)	725 ± 76 (618 – 799)	306 ± 26* (268 – 326)	2109 ± 94* (1969 – 2164)
	CV127 + Imi	4	266 ± 15* (251 – 280)	9.92 ± 0.47 (9.41 – 10.48)	691 ± 32 (644 – 717)	289 ± 16* (267 – 304)	2040 ± 35* (1989 – 2065)
	Std 1	1	221	9.50	729	255	2048
	Std 2	1	244	9.46	742	297	2011
Brasília	Isoline	4	314 ± 11 (305 – 330)	9.02 ± 0.47 (8.64 – 9.71)	786 ± 34 (763 – 834)	262 ± 5 (256 – 266)	1902 ± 29 (1874– 1936)
	CV127	4	276 ± 14* (265 – 295)	7.18 ± 0.59* (6.67 – 8.02)	675 ± 20* (655 – 703)	267 ± 1 (266 - 269)	1815 ± 33 (1775 – 1850)
	CV127 + Imi	4	275 ± 9* (265 – 284)	7.27 ± 0.43* (6.78 – 7.76)	694 ± 21* (679 – 724)	267 ± 4 (264 – 273)	1848 ± 11 (1833 – 1857)
	Std 1	1	246	8.22	733	257	1911
	Std 2	1	313	9.54	875	306	1933
Santo Antonio de Posse	Isoline	4	296 ± 12 (281 – 309)	9.15 ± 0.16 (8.93 – 9.28)	722 ± 54 (672 – 789)	256 ± 5 (248 – 259)	2050 ± 26 (2013 – 2071)
	CV127	4	291 ± 23 (261 – 312)	8.78 ± 0.28 (8.47 – 9.13)	694 ± 59 (619 – 751)	265 ± 12 (251 – 281)	1936 ± 132 (1822 – 2100)
	CV127 + Imi	4	288 ± 14 (271 – 305)	8.46 ± 0.39 (8.03 – 8.97)	701 ± 48 (655 – 760)	266 ± 4 (261 – 269)	1964± 119 (1794 – 2069)
	Std 1	1	209	8.04	620	258	2103
	Std 2	1	286	9.25	745	283	1964

*Statistically significantly different from the isoline nontransgenic comparator at $p < 0.05$.

Table 6. Amino acid Composition of Grain on a Dry Weight Basis of Soybean BPS-CV127-9 Treatments (CV127 and CV127+Imi), the Isoline Control and Two Conventional Soybean Varieties (Std 1 and Std 2) Grown at Six Locations in Brazil in the 2006/07 Season

Location/ Treatment	Asp	Thr	Ser	Glu	Pro	Gly	Ala	Cys	Val
Santo Antonio de Goias				Mean ± Standard Deviation (range) g/100 g dry weight					
Isoline	4.53 ± 0.33 (4.25 – 5.00)	1.55 ± 0.09 (1.46 – 1.68)	2.07 ± 0.13 (1.93 – 2.25)	7.47 ± 0.48 (7.20 – 8.19)	2.06 ± 0.10 (1.92 – 2.16)	1.59 ± 0.11 (1.49 – 1.74)	1.62 ± 0.08 (1.57 – 1.74)	0.45 ± 0.03 (0.40 – 0.47)	1.59 ± 0.17 (1.36 – 1.76)
CV127	4.50 ± 0.13 (4.33 – 4.64)	1.53 ± 0.04 (1.47 – 1.56)	2.04 ± 0.05 (1.97 – 2.09)	7.51 ± 0.29 (7.10 – 7.79)	1.91 ± 0.06 (1.82 – 1.95)	1.63 ± 0.05 (1.56 – 1.68)	1.58 ± 0.05 (1.52 – 1.63)	0.42 ± 0.02 (0.40 – 0.44)	1.60 ± 0.11 (1.44 – 1.70)
CV127 + Imi	4.85 ± 0.34 (4.36 – 5.12)	1.63 ± 0.11 (1.47 – 1.72)	2.17 ± 0.14 (1.95 – 2.26)	8.01 ± 0.54 (7.22 – 8.42)	2.02 ± 0.13 (1.83– 2.11)	1.72 ± 0.10 (1.57 – 1.79)	1.67 ± 0.09 (1.54 – 1.74)	0.41 ± 0.04 (0.36 – 0.44)	1.68 ± 0.10 (1.53 – 1.74)
Std 1	4.72	1.55	2.16	7.68	1.99	1.71	1.67	0.16	1.63
Std 2	4.13	1.40	1.90	6.58	1.78	1.46	1.50	0.42	1.50
Uberaba									
Isoline	5.02 ± 0.16 (4.79 – 5.16)	1.63 ± 0.03 (1.60 – 1.66)	2.28 ± 0.08 (2.17 – 2.34)	8.17 ± 0.37 (7.63 – 8.46)	2.12 ± 0.06 (2.04 – 2.17)	1.78 ± 0.09 (1.65 – 1.86)	1.75 ± 0.05 (1.68 – 1.78)	0.25 ± 0.16 (0.17 – 0.49)	1.76 ± 0.04 (1.70 – 1.79)
CV127	4.36 ± 0.45* (3.70 – 4.66)	1.46 ± 0.14 (1.25 – 1.56)	1.98 ± 0.19* (1.71 – 2.12)	7.17 ± 0.73* (6.17 – 7.82)	1.81 ± 0.17* (1.65 – 1.96)	1.57 ± 0.14* (1.37 – 1.67)	1.56 ± 0.14* (1.36 – 1.67)	0.43 ± 0.02* (0.40 – 0.44)	1.59 ± 0.13 (1.42 – 1.71)
CV127 + Imi	4.28 ± 0.37* (3.83 – 4.61)	1.46 ± 0.14 (1.30 – 1.61)	1.96 ± 0.19* (1.76 – 2.16)	7.01 ± 0.64* (6.20 – 7.56)	1.87 ± 0.13* (1.67 – 1.94)	1.55 ± 0.14* (1.39 – 1.71)	1.53 ± 0.14* (1.37 – 1.68)	0.52 ± 0.20* (0.29 – 0.75)	1.57 ± 0.16 (1.41 – 1.74)
Std 1	4.44	1.50	2.05	7.24	1.87	1.66	1.62	0.14	1.59
Std 2	4.64	1.52	2.14	7.52	1.97	1.68	1.68	0.15	1.67
Sete Lagoas									
Isoline	4.75 ± 0.61 (4.02 – 5.37)	1.59 ± 0.21 (1.34 – 1.80)	2.12 ± 0.24 (1.83 – 2.39)	7.77 ± 1.02 (6.59 – 8.92)	2.01 ± 0.24 (1.74 – 2.32)	1.66 ± 0.18 (1.45 – 1.87)	1.69 ± 0.20 (1.45 – 1.92)	0.44 ± 0.04 (0.38 – 0.47)	1.73 ± 0.22 (1.46 – 1.98)
CV127	4.44 ± 0.22 (4.20 – 4.65)	1.48 ± 0.07 (1.38 – 1.54)	1.96 ± 0.08 (1.87 – 2.03)	7.33 ± 0.31 (6.95 – 7.60)	1.91 ± 0.08 (1.85 – 2.01)	1.60 ± 0.06 (1.52 – 1.67)	1.59 ± 0.08 (1.48 – 1.66)	0.37 ± 0.05 (0.31 – 0.42)	1.59 ± 0.08 (1.47 – 1.66)
CV127 + Imi	4.86 ± 0.33 (4.43 – 5.17)	1.62 ± 0.07 (1.57 – 1.70)	2.15 ± 0.12 (2.02 – 2.29)	8.04 ± 0.42 (7.53 – 8.45)	2.04 ± 0.09 (1.90 – 2.12)	1.72 ± 0.07 (1.64 – 1.81)	1.71 ± 0.04 (1.67 – 1.76)	0.41 ± 0.03 (0.38 – 0.44)	1.73 ± 0.05 (1.68 – 1.79)
Std 1	4.33	1.51	1.96	7.05	1.84	1.56	1.61	0.42	1.64
Std 2	4.14	1.43	1.90	6.83	1.77	1.50	1.52	0.39	1.63

Table 6. continued.

Location/ Treatment	Asp	Thr	Ser	Glu	Pro	Gly	Ala	Cys	Val
					Mean ± Standard Deviation (range)				
Londrina					g/100 g dry weight				
Isoline	4.42 ± 0.09 (4.32 – 4.50)	1.53 ± 0.05 (1.48 – 1.59)	2.01 ± 0.06 (1.95 – 2.08)	7.35 ± 0.20 (7.13 – 7.59)	1.87 ± 0.04 (1.84 – 1.93)	1.60 ± 0.05 (1.55 – 1.66)	1.57 ± 0.04 (1.52 – 1.62)	0.45 ± 0.02 (0.43 – 0.48)	1.59 ± 0.04 (1.55 – 1.63)
CV127	4.23 ± 0.40 (3.67 – 4.52)	1.49 ± 0.15 (1.26 – 1.58)	1.97 ± 0.20 (1.70 – 2.18)	7.01 ± 0.66 (6.10 – 7.57)	1.82 ± 0.17 (1.56 – 1.93)	1.57 ± 0.16 (1.33 – 1.69)	1.55 ± 0.16 (1.32 – 1.64)	0.44 ± 0.04 (0.38 – 0.47)	1.59 ± 0.17 (1.34 – 1.68)
CV127 + Imi	4.50 ± 0.15 (4.36 – 4.72)	1.55 ± 0.01 (1.54 – 1.56)	2.07 ± 0.07 (2.01 – 2.16)	7.48 ± 0.27 (7.19 – 7.85)	1.92 ± 0.05 (1.86 – 1.99)	1.65 ± 0.05 (1.60 – 1.72)	1.65 ± 0.04 (1.61 – 1.70)	0.44 ± 0.04 (0.40 – 0.48)	1.66 ± 0.05 (1.60 – 1.72)
Std 1	4.27	1.52	1.92	6.98	1.76	1.56	1.57	0.47	1.58
Std 2	4.43	1.51	2.00	7.25	1.86	1.58	1.59	0.46	1.61
Brasília									
Isoline	4.61 ± 0.20 (4.44 – 4.86)	1.55 ± 0.07 (1.48 – 1.63)	2.04 ± 0.08 (1.95 – 2.13)	7.51 ± 0.34 (7.21 – 7.92)	1.89 ± 0.10 (1.78 – 2.00)	1.63 ± 0.08 (1.54 – 1.71)	1.62 ± 0.07 (1.56 – 1.70)	0.45 ± 0.04 (0.40 – 0.48)	1.65 ± 0.05 (1.59 – 1.70)
CV127	4.51 ± 0.10 (4.42 – 4.65)	1.50 ± 0.02 (1.48 – 1.51)	2.02 ± 0.02 (1.99 – 2.04)	7.29 ± 0.16 (7.10 – 7.47)	1.74 ± 0.03 (1.69 – 1.77)	1.63 ± 0.02 (1.61 - 1.66)	1.59 ± 0.03 (1.56 – 1.63)	0.42 ± 0.04 (0.35 – 0.44)	1.56 ± 0.04 (1.52 – 1.61)
CV127 + Imi	4.64 ± 0.10 (4.50 – 4.74)	1.54 ± 0.05 (1.49 – 1.60)	2.09 ± 0.05 (2.02 – 2.14)	7.49 ± 0.16 (7.30 – 7.69)	1.80 ± 0.05 (1.76 – 1.86)	1.68 ± 0.03 (1.64 – 1.71)	1.63 ± 0.04 (1.57 – 1.66)	0.44 ± 0.03 (0.41 – 0.47)	1.64 ± 0.06 (1.56 – 1.71)
Std 1	4.26	1.49	1.88	6.93	1.76	1.55	1.55	0.41	1.58
Std 2	3.94	1.36	1.78	6.16	1.58	1.41	1.39	0.39	1.40
Santo Antonio de Posse									
Isoline	4.54 ± 0.28 (4.32 – 4.94)	1.52 ± 0.07 (1.47 – 1.63)	2.02 ± 0.13 (1.92 – 2.20)	7.39 ± 0.42 (7.02 – 7.99)	1.94 ± 0.23 (1.81 – 2.28)	1.64 ± 0.11 (1.57 – 1.81)	1.62 ± 0.12 (1.54 – 1.79)	0.45 ± 0.05 (0.38 – 0.51)	1.64 ± 0.11 (1.54 – 1.79)
CV127	4.74 ± 0.51 (4.14 – 5.24)	1.54 ± 0.26 (1.27 – 1.70)	2.17 ± 0.27 (1.79 – 2.41)	7.52 ± 1.06 (6.33 – 8.46)	2.01 ± 0.28 (1.70 – 2.31)	1.70 ± 0.24 (1.45 – 1.94)	1.69 ± 0.21 (1.48 – 1.89)	0.64 ± 0.14* (0.54 – 0.85)	1.69 ± 0.27 (1.42 – 1.94)
CV127 + Imi	4.54 ± 0.59 (3.66 – 4.91)	1.53 ± 0.19 (1.25 – 1.67)	2.01± 0.26 (1.63 – 2.19)	7.21 ± 0.96 (5.83 – 8.00)	1.86 ± 0.27 (1.49 – 2.11)	1.60 ± 0.20 (1.32 – 1.74)	1.58 ± 0.22 (1.27 – 1.73)	0.55 ± 0.23* (0.37 – 0.87)	1.58 ± 0.22 (1.26 – 1.76)
Std 1	4.17	1.46	1.88	6.66	1.64	1.50	1.50	0.42	1.46
Std 2	4.32	1.51	1.94	6.93	2.05	1.51	1.56	0.48	1.64

Table 6. continued.

Location/ Treatment	Met	Ile	Leu	Tyr	Phe	Lys	His	Arg	Trp
Santo Antonio de Goias				Mean ± Standard Deviation (range) g/100 g dry weight					
Isoline	0.19 ± 0.02 (0.17– 0.21)	1.57 ± 0.15 (1.42 – 1.77)	2.86 ± 0.20 (2.68 – 3.14)	1.33 ± 0.10 (1.25 – 1.47)	2.02 ± 0.12 (1.92 – 2.20)	2.43 ± 0.16 (2.24 – 2.64)	0.88 ± 0.07 (0.79 – 0.96)	2.91 ± 0.30 (2.64 – 3.34)	0.77 ± 0.12 (0.65 – 0.89)
CV127	<0.21 (nd^ – 0.24)	1.57 ± 0.08 (1.46 – 1.63)	2.87 ± 0.14 (2.66 – 2.97)	1.31 ± 0.05 (1.25 – 1.36)	1.95 ± 0.10 (1.80 – 2.01)	2.45 ± 0.10 (2.30 – 2.52)	0.88 ± 0.02 (0.86 – 0.91)	2.93 ± 0.13 (2.75 – 3.04)	0.78 ± 0.08 (0.69 – 0.86)
CV127 + Imi	<0.13 (nd – 0.15)	1.67 ± 0.13 (1.48 – 1.75)	3.02 ± 0.21 (2.70 – 3.13)	1.36 ± 0.09 (1.23 – 1.42)	2.07 ± 0.15 (1.86 – 2.19)	2.57 ± 0.18 (2.30 – 2.68)	0.88 ± 0.07 (0.78 – 0.94)	3.16 ± 0.16 (2.92 – 3.29)	0.79 ± 0.14 (0.61 – 0.94)
Std 1	0.14	1.64	2.97	1.39	2.04	2.54	0.84	2.97	0.82
Std 2	0.12	1.50	3.65	1.20	1.83	2.22	0.79	2.57	0.70
Uberaba									
Isoline	0.12 ± 0.05 (0.07 – 0.18)	1.76 ± 0.06 (1.67 – 1.80)	3.18 ± 0.10 (3.03 – 3.22)	1.46 ± 0.04 (1.40 – 1.49)	2.18 ± 0.06 (2.09 – 2.23)	2.70 ± 0.10 (2.55 – 2.78)	0.94 ± 0.02 (0.92 – 0.96)	3.28 ± 0.13 (3.10 – 3.35)	0.74 ± 0.12 (0.59 – 0.87)
CV127	0.16 ± 0.07 (0.09 – 0.24)	1.50 ± 0.13* (1.31 – 1.58)	2.71 ± 0.24* (2.37 – 2.88)	1.25 ± 0.12* (1.11 – 1.36)	1.87 ± 0.17* (1.64 – 2.00)	2.33 ± 0.19* (2.08 – 2.49)	0.81 ± 0.05* (0.74 – 0.87)	2.82 ± 0.20* (2.57 – 2.98)	0.69 ± 0.02 (0.67 – 0.71)
CV127 + Imi	<0.19 (nd – 0.30)	1.52 ± 0.13* (1.38 – 1.68)	2.71 ± 0.24* (2.48 – 2.98)	1.23 ± 0.11* (1.11 – 1.33)	1.88 ± 0.16* (1.71 – 2.07)	2.36 ± 0.19* (2.14 – 2.57)	0.83 ± 0.09* (0.75 – 0.95)	2.87 ± 0.24* (2.62 – 3.15)	0.79 ± 0.16 (0.67 – 1.03)
Std 1	0.11	1.58	2.83	1.35	1.96	2.46	0.81	2.82	0.57
Std 2	nd	1.71	3.03	1.38	2.09	2.54	0.86	2.94	0.82
Sete Lagoas									
Isoline	0.18 ± 0.03 (0.15 0.21)	1.67 ± 0.22 (1.43 – 1.94)	2.96 ± 0.38 (2.51 – 3.09)	1.35 ± 0.16 (1.17 – 1.55)	2.06 ± 0.26 (1.77 – 2.37)	2.50 ± 0.32 (2.12 – 2.85)	0.90 ± 0.10 (0.79 – 1.03)	3.19 ± 0.42 (2.75 – 3.69)	0.75 ± 0.08 (0.65 – 0.83)
CV127	<0.11 (nd – 0.14)	1.56 ± 0.06 (1.55 – 1.64)	2.75 ± 0.13 (2.57 – 2.87)	1.23 ± 0.06 (1.15 – 1.28)	1.92 ± 0.10 (1.78 – 2.01)	2.40 ± 0.11 (2.27 – 2.53)	0.84 ± 0.06 (0.79 – 0.91)	3.02 ± 0.21 (2.76 – 3.23)	0.75 ± 0.09 (0.63 – 0.83)
CV127 + Imi	<0.16 (nd – 0.24)	1.69 ± 0.05 (1.63 – 1.74)	3.02 ± 0.13 (2.87 – 3.16)	1.35 ± 0.04 (1.32 – 1.39)	2.09 ± 0.08 (1.98 – 2.16)	2.57 ± 0.08 (2.46 – 2.65)	0.89 ± 0.04 (0.86 – 0.94	3.23 ± 0.10 (3.10 – 3.33)	0.79 ± 0.16 (0.70 – 1.02)
Std 1	0.09	1.60	2.75	1.32	1.92	2.38	0.82	2.86	0.94
Std 2	0.06	1.55	2.73	1.20	1.88	2.31	0.80	2.74	0.77

Table 6. continued.

Location/ Treatment	Met	Ile	Leu	Tyr	Phe	Lys	His	Arg	Trp
					Mean ± Standard Deviation (range)				
Londrina					g/100 g dry weight				
Isoline	0.19 ± 0.06 (0.10 – 0.23)	1.52 ± 0.05 (1.48 – 1.59)	2.72 ± 0.08 (2.64 – 2.82)	1.28 ± 0.03 (1.25 – 1.32)	1.85 ± 0.05 (1.79 – 1.92)	2.39 ± 0.05 (2.33 – 2.44)	0.80 ± 0.01 (0.79 – 0.81)	2.80 ± 0.08 (2.69 – 2.89)	0.72 ± 0.09 (0.63 – 0.83)
CV127	0.25 ± 0.05 (0.18 – 0.30)	1.51 ± 0.15 (1.28 – 1.59)	2.69 ± 0.26 (2.31 – 2.83)	1.27 ± 0.13 (1.08 – 1.35)	1.85 ± 0.18 (1.59 – 1.97)	2.35 ± 0.23 (2.00 – 2.49)	0.79 ± 0.08 (0.69 – 0.86)	2.76 ± 0.27 (2.35 – 2.92)	0.70 ± 0.07 (0.62 – 0.76)
CV127 + Imi	0.26 ± 0.03 (0.22 – 0.29)	1.60 ± 0.03 (1.58 – 1.64)	2.88 ± 0.08 (2.82 – 2.99)	1.35 ± 0.02 (1.33 – 1.38)	1.98 ± 0.04 (1.95 – 2.03)	2.47 ± 0.06 (2.40 – 2.54)	0.85 ± 0.03 (0.83 – 0.89)	2.94 ± 0.05 (2.90 – 3.01)	0.73 ± 0.10 (0.60 – 0.81)
Std 1	0.17	1.48	2.59	1.27	1.78	2.31	0.75	2.63	0.72
Std 2	0.23	1.53	2.76	1.27	1.88	2.36	0.79	2.75	0.72
Brasília									
Isoline	<0.20 (nd – 0.21)	1.56 ± 0.06 (1.51 – 1.65)	2.82 ± 0.11 (2.72 – 2.96)	1.30 ± 0.05 (1.23 – 1.34)	1.92 ± 0.09 (1.82 – 2.03)	2.43 ± 0.10 (2.31 – 2.54)	0.86 ± 0.07 (0.78 – 0.94)	3.00 ± 0.18 (2.78 – 3.22)	0.75 ± 0.08 (0.67 – 0.84)
CV127	<0.11 (nd – 0.18)	1.57 ± 0.03 (1.54 – 1.61)	2.73 ± 0.04 (2.70 – 2.79)	1.25 ± 0.01 (1.24 – 1.26)	1.89 ± 0.04 (1.87 – 1.95)	2.31 ± 0.03 (2.28 – 2.35)	0.77 ± 0.03 (0.75 – 0.82)	2.87 ± 0.07 (2.82 – 2.97)	0.75 ± 0.13 (0.60 – 0.92)
CV127 + Imi	0.16 ± 0.05 (0.10 – 0.23)	1.62 ± 0.05 (1.57 – 1.68)	2.80 ± 0.07 (2.71 – 2.89)	1.28 ± 0.04 (1.24 – 1.32)	1.96 ± 0.05 (1.90 – 2.01)	2.39 ± 0.06 (2.32 – 2.46)	0.84 ± 0.01 (0.83 – 0.84)	2.96 ± 0.04 (2.90 – 2.99)	0.75 ± 0.13 (0.64 – 0.94)
Std 1	nd	1.49	2.60	1.22	1.77	2.30	0.81	2.65	0.66
Std 2	0.10	1.38	2.45	1.12	1.64	2.08	0.72	2.34	0.77
Santo Antonio de Posse									
Isoline	<0.15 (nd – 0.20)	1.59 ± 0.09 (1.51 – 1.71)	2.81 ± 0.14 (2.73 – 3.01)	1.33 ± 0.06 (1.29 – 1.42)	1.93 ± 0.09 (1.87 – 2.06)	2.45 ± 0.18 (2.29 – 2.70)	0.87 ± 0.04 (0.83 – 0.93)	3.03 ± 0.18 (2.84 – 3.28)	0.66 ± 0.07 (0.59 – 0.72)
CV127	<0.10 (nd – 0.15)	1.64 ± 0.25 (1.36 – 1.88)	2.93 ± 0.44 (2.45 – 3.36)	1.32 ± 0.17 (1.15 – 1.50)	2.00 ± 0.30 (1.66 – 2.29)	2.58 ± 0.37 (2.17 – 2.93)	0.91 ± 0.14 (0.77 – 1.04)	3.06 ± 0.45 (2.56 – 3.51)	0.67 ± 0.07 (0.61 – 0.77)
CV127 + Imi	<0.17 (nd – 0.17)	1.56 ± 0.22 (1.24 – 1.70)	2.78 ± 0.37 (2.24 – 3.04)	1.28 ± 0.16 (1.06 – 1.40)	1.89 ± 0.26 (1.52 – 2.08)	2.40 ± 0.33 (1.93 – 2.66)	0.85 ± 0.13 (0.67 – 0.97)	2.90 ± 0.39 (2.36 – 3.20)	0.73 ± 0.12 (0.63 – 0.91)
Std 1	0.12	1.39	2.51	1.22	1.69	2.18	0.74	2.49	0.64
Std 2	0.06	1.61	2.76	1.32	1.97	2.31	0.76	2.75	1.16

*Statistically significantly different from the isoline nontransgenic comparator at $p < 0.05$. ^nd = not detected.

Table 7. Selected Vitamin Composition of Grain on a Dry Weight Basis of Soybean BPS-CV127-9 Treatments (CV127 and CV127+Imi), the Isoline Control and Two Conventional Soybean Varieties (Std 1 and Std 2) Grown at Six Locations in Brazil in the 2006/07 Season

Location/ Treatment	α-tocopherol mg/100 g DW	β-tocopherol mg/100 g DW	γ-tocopherol mg/100 g DW	δ-tocopherol mg/100 g DW	Total Tocopherol mg/100 g DW	Vitamin E (IU/100 g DW)	Vitamin E mg/100 g DW	Vitamin B1 mg/100 g DW	Folic Acid (µg/100 g DW)
Santo Antonio de Goias				Mean ± Standard Deviation (range)					
Isoline	2.87 ± 0.26 (2.62 – 3.19)	0.40 ± 0.21 (0.20 – 0.61)	18.31 ± 1.69 (17.19 – 20.83)	7.04± 0.71 (6.01 – 7.53)	27.94 ± 3.24 (23.73 – 31.54)	6 ± 1 (6 – 7)	5.71 ± 0.33 (5.22 – 5.96)	0.61 ± 0.12 (0.48 – 0.74)	362 ± 44 (320 – 424)
CV127	3.05 ± 0.15 (2.86 – 3.22)	0.72 ± 0.12* (0.58 – 0.86)	16.70 ± 1.07* (15.19 – 17.69)	7.64 ± 0.44 (7.11 – 8.15)	28.11 ± 1.48 (26.10 – 29.61)	6 ± 0 (6)	5.60 ± 0.25 (5.37 – 5.84)	0.51 ± 0.10 (0.40 – 0.63)	290 ± 13* (276 – 304)
CV127 + Imi	2.81 ± 0.28 (2.43 – 3.08)	0.69 ± 0.12* (0.58 – 0.81)	15.88 ± 1.45* (14.55 – 17.64)	7.21 ± 0.43 (6.62 – 7.65)	26.53 ± 1.62 (25.13 – 26.97)	6 ± 1 (5 – 6)	5.21 ± 0.44 (4.68 – 5.53)	0.48 ± 0.15 (0.34 – 0.67)	299 ± 15* (282 – 316)
Std 1	3.29	0.85	14.22	6.31	24.66	6	5.51	0.66	277
Std 2	2.45	0.12	20.88	7.42	30.86	6	5.40	0.66	350
Uberaba									
Isoline	2.82 ± 0.25 (2.54 – 3.13)	0.59 ± 0.20 (0.34 – 0.82)	16.51 ± 1.09 (15.48 – 18.04)	6.35 ± 0.38 (6.08 – 6.90)	26.31 ± 1.61 (25.05 – 28.58)	6 ± 1 (5 – 6)	5.17 ± 0.20 (4.91 – 5.40)	0.70 ± 0.17 (0.44 – 0.79)	431 ± 23 (402 – 456)
CV127	3.18 ± 0.07* (3.11 – 3.25)	0.93 ± 0.09* (0.83 – 1.04)	15.48 ± 0.56 (14.83 – 16.11)	6.98 ± 0.22* (6.81 – 7.30)	26.57 ± 0.65 (25.60 – 26.96)	6 ± 0* (6)	5.61 ± 0.13* (5.41 – 5.70)	0.46 ± 0.05* (0.40 – 0.52)	276 ± 30* (235 – 305)
CV127 + Imi	3.30 ± 0.14* (3.21 – 3.51)	0.98 ± 0.17* (0.88 – 1.22)	16.49 ± 0.49 (16.06 – 17.03)	7.38 ± 0.09* (7.27 – 7.47)	28.16 ± 0.53 (27.66 – 28.90)	7 ± 1* (6 – 7)	5.88 ± 0.18* (5.77 – 6.15)	0.47 ± 0.08* (0.37 – 0.54)	303 ± 28* (277 – 338)
Std 1	2.98	0.71	12.68	5.31	21.68	5	4.95	0.45	381
Std 2	2.53	0.55	17.89	6.06	27.04	6	5.18	0.42	403
Sete Lagoas									
Isoline	2.53 ± 0.05 (2.48 – 2.59)	0.49 ± 0.07 (0.40 – 0.57)	16.20 ± 0.36 (15.90 – 16.71)	6.64 ± 0.21 (6.40 – 6.85)	25.81 ± 0.39 (25.26 – 26.16)	5 ± 0 (5)	4.92 ± 0.08 (4.81 – 4.97)	0.62 ± 0.14 (0.49 – 0.78)	367 ± 14 (352 – 379)
CV127	3.04 ± 0.09* (2.93 – 3.12)	0.90 ± 0.20* (0.69 – 1.17)	15.98 ± 0.78 (14.82 – 16.49)	6.83 ± 0.23 (6.64 – 7.16)	26.57 ± 1.04 (25.06 – 27.29)	6 ± 0* (6)	5.49 ± 0.18 (5.26 – 5.65)	0.50 ± 0.03 (0.47 – 0.54)	284 ± 43* (242 – 327)
CV127 + Imi	2.95 ± 0.21* (2.49 – 3.23)	0.81 ± 0.09* (0.68 – 0.88)	15.95 ± 0.65 (15.33 – 16.68)	6.86 ± 0.47 (6.37 – 7.50)	26.50 ± 1.34 (25.18 – 28.26)	6 ± 0* (6)	5.39 ± 0.31 (5.12 – 5.80)	0.59 ± 0.13 (0.49 – 0.78)	297 ± 27* (282 – 337)
Std 1	3.27	0.47	14.50	6.04	24.28	6	5.44	0.63	317
Std 2	2.48	0.49	17.83	6.47	27.05	6	5.11	0.49	205

Table 7. continued.

Location/ Treatment	α-tocopherol mg/100 g DW	β-tocopherol mg/100 g DW	γ-tocopherol mg/100 g DW	δ-tocopherol mg/100 g DW	Total Tocopherol mg/100 g DW	Vitamin E (IU/100 g DW)	Vitamin E mg/100 g DW	Vitamin B1 mg/100 g DW	Folic Acid (µg/100 g DW)
Londrina				Mean ± Standard Deviation (range)					
Isoline	3.42 ± 0.19 (3.23 – 3.66)	0.93 ± 0.08 (0.83 – 1.01)	16.31 ± 0.24 (16.01 – 16.33)	6.93 ± 0.50 (6.22 – 7.38)	27.51 ± 0.46 (26.87 – 27.95)	7 ± 1 (6 – 7)	5.94 ± 0.15 (5.78 – 6.12)	0.63 ± 0.04 (0.58 – 0.68)	266 ± 37 (234 – 319)
CV127	3.68 ± 0.23 (3.46 – 3.91)	1.01 ± 0.16 (0.81 – 1.20)	17.26 ± 0.56 (16.43 – 17.58)	6.81 ± 0.14 (6.64 – 6.93)	28.54 ± 0.37* (28.11 – 28.99)	7 ± 0 (7)	6.27 ± 0.27* (5.97 – 6.54)	0.55 ± 0.04 (0.51 – 0.58)	260 ± 23 (229 – 279)
CV127 + Imi	3.91 ± 0.23* (3.64 – 4.20)	0.97 ± 0.10 (0.85 – 1.08)	17.79 ± 0.76 (17.18 – 18.84)	7.37 ± 0.42 (7.11 – 7.99)	30.03 ± 1.15* (28.79 – 31.12)	7 ± 1 (7 – 8)	6.66 ± 0.31* (6.28 – 7.01)	0.50 ± 0.04 (0.45 – 0.55)	260 ± 30 (234 – 302)
Std 1	3.89	0.99	13.99	6.26	25.15	7	6.13	0.71	228
Std 2	3.39	0.73	20.02	6.48	31.03	7	6.51	0.53	247
Brasília									
Isoline	2.93 ± 0.40 (2.33 – 3.21)	0.70 ± 0.10 (0.55 – 0.77)	13.73 ± 2.06 (11.62 – 16.03)	4.78 ± 0.28 (4.41 – 5.08)	22.0 ± 2.55 (19.26 – 24.61)	6 ± 1 (5 – 6)	5.00 ± 0.63 (4.11 – 5.48)	0.63 ± 0.17 (0.48 – 0.86)	244 ± 32 (216 – 290)
CV127	3.24 ± 0.20* (3.07 – 3.52)	1.03 ± 0.22* (0.81 – 1.32)	13.39 ± 1.02 (12.50 – 14.86)	5.49 ± 0.93* (4.85 – 6.87)	23.08 ± 2.36* (21.59 – 26.57)	6 ± 1* (6 – 7)	5.38 ± 0.41 (5.05 – 5.97)	0.46 ± 0.05* (0.40 – 0.52)	234 ± 32 (201 – 274)
CV127 + Imi	3.47 ± 0.21* (3.16 – 3.62)	1.05 ± 0.15* (0.89 – 1.19)	13.59 ± 1.05 (12.31 – 14.86)	5.42 ± 0.36* (4.96 – 5.78)	23.57 ± 1.39* (21.95 – 25.35)	6 ± 1* (6 – 7)	5.65 ± 0.35* (5.13 – 5.92)	0.48 ± 0.05* (0.45 – 0.55)	196 ± 9* (183 – 205)
Std 1	3.21	0.91	13.44	5.65	23.20	6	5.34	0.71	314
Std 2	2.74	0.67	16.81	5.51	25.73	6	5.27	0.56	254
Santo Antonio de Posse									
Isoline	3.65 ± 0.55 (3.20 – 4.44)	0.49 ± 0.03 (0.45 – 0.52)	18.04 ± 0.85 (17.00 – 19.00)	5.32 ± 0.35 (5.04 – 5.84)	27.51 ± 1.60 (25.95 – 29.74)	7 ± 1 (6 – 8)	6.29 ± 0.65 (5.70 – 7.21)	0.70 ± 0.10 (0.59 – 0.81)	310 ± 28 (272 – 333)
CV127	4.48 ± 0.26* (4.29 – 4.86)	0.82 ± 0.11* (0.68 – 0.94)	16.14 ± 0.86* (15.29 – 17.08)	5.18 ± 0.32 (4.95 – 5.66)	26.56 ± 0.75 (25.44 – 27.01)	8 ± 1* (7– 8)	6.93 ± 0.27* (6.69 – 7.30)	0.62 ± 0.06 (0.54 – 0.67)	258 ± 17* (235 – 272)
CV127 + Imi	4.48 ± 0.23* (4.20 – 4.69)	0.93 ± 0.14* (0.82 – 1.13)	15.20 ± 1.48* (13.84 – 17.16)	5.12 ± 0.27 (4.90 – 5.49)	25.74 ± 1.91 (24.04 – 27.89)	8 ± 1* (7 – 8)	6.69 ± 0.32 (6.42 – 7.16)	0.60 ± 0.02 (0.57 – 0.62)	266 ± 8* (260 – 277)
Std 1	4.61	1.08	15.31	6.03	27.00	8	7.05	0.62	291
Std 2	3.80	0.80	17.77	5.76	28.14	7	6.48	0.58	227

*Statistically significantly different from the isoline nontransgenic comparator at $p < 0.05$.

Table 8. Fatty Acid Composition of Grain on a Dry Weight Basis of Soybean BPS-CV127-9 Treatments (CV127 and CV127+Imi), the Isoline Control and Two Conventional Soybean Varieties (Std 1 and Std 2) Grown at Six Locations in Brazil in the 2006/07 Season

Line	C14:0 Myristic	C16:0 Palmitic	C18:0 Stearic	C18:1 Oleic	C18:2 Linoleic	C18:3 Linolenic	C20:0 Arachidic	C20:1 Eicosenoic	C22:0 Behenic
Santo Antonio de Goias				Mean ± Standard Deviation (range) g/100 g DW					
Isoline	<0.02 (nd^ – 0.02)	2.36 ± 0.03 (2.31 – 2.40)	0.75 ± 0.09 (0.69 – 0.88)	4.70 ± 0.21 (4.42 – 4.93)	11.39 ± 0.13 (11.23 – 11.55)	1.40 ± 0.07 (1.30 – 1.46)	0.08 ± 0.01 (0.08 – 0.09)	0.03 ± 0.01 (0.02 – 0.03)	0.10 ± 0.01 (0..09 – 0.10)
CV127	0.02 ± 0 (0.02)	2.54 ± 0.07* (2.45 – 2.61)	0.76 ± 0.02 (0.74 – 0.79)	5.43 ± 0.14* (5.27 – 5.61)	11.85 ± 0.18* (11.64 – 12.05)	1.38 ± 0.06 (1.32 – 1.45)	0.08 ± 0.01 (0.07 – 0.09)	0.03 ± 0.01 (0.02 – 0.04)	0.10 ± 0.01 (0.09 – 0.11)
CV127 + Imi	<0.02 (nd – 0.02)	2.44 ± 0.04 (2.40 – 2.48)	0.71 ± 0.01 (0.70 – 0.73)	5.97 ± 0.57* (5.40 – 6.57)	11.02 ± 0.17* (10.86 – 11.26)	1.25 ± 0.07* (1.21 – 1.35)	0.07 ± 0.01 (0.07 – 0.09)	0.04 ± 0* (0.04)	0.11 ± 0.01 (0.10 – 0.11)
Std 1	0.02	2.08	0.66	4.06	10.75	1.56	0.06	0.02	0.08
Std 2	0.02	2.21	0.70	4.94	12.71	1.65	0.07	0.02	0.09
Uberaba									
Isoline	0.02 ± 0 (0.02)	2.21 ± 0.13 (2.08 – 2.39)	0.76 ± 0.02 (0.74 – 0.80)	4.66 ± 0.19 (4.49 – 4.90)	11.07 ± 0.67 (10.68 – 12.06)	1.37 ± 0.08 (1.31 – 1.48)	0.08 ± 0.01 (0.08 – 0.09)	0.03 ± 0.01 (0.02 – 0.03)	0.10 ± 0.01 (0.10 – 0.11)
CV127	0.02 ± 0 (0.02)	2.43 ± 0.07* (2.35 – 2.53)	0.84 ± 0.03* (0.81 – 0.87)	5.23 ± 0.14* (5.06 – 5.35)	11.23 ± 0.22* (11.03 – 11.53)	1.27 ± 0.02* (1.25 – 1.29)	0.09 ± 0* (0.09)	0.02 ± 0.01 (0.02 – 0.03)	0.11 ± 0 (0.11)
CV127 + Imi	<0.02 (nd – 0.02)	2.47± 0.05* (2.41 – 2.53)	0.84 ± 0.01* (0.83 – 0.85)	5.50 ± 0.08* (5.39 – 5.59)	11.26 ± 0.26* (10.95 – 11.57)	1.24 ± 0.03* (1.21 – 1.28)	0.09 ± 0* (0.09)	0.02 ± 0* (0.02)	0.10 ± 0.01 (0.10 – 0.11)
Std 1	0.02	2.18	0.76	3.99	11.35	1.65	0.06	0.03	0.08
Std 2	nd	2.19	0.76	5.07	13.09	1.68	0.07	0.03	0.09
Sete Lagoas									
Isoline	<0.02 (nd – 0.02)	2.23 ± 0.04 (2.20– 2.28)	0.89 ± 0.04 (0.84 – 0.93)	5.02 ± 0.09 (4.93 – 5.11)	11.01 ± 0.18 (10.85 – 11.26)	1.27 ± 0.04 (1.23 – 1.32)	0.09 ± 0.01 (0.08 – 0.10)	0.03 ± 0.01 (0.02 – 0.04)	0.11 ± 0.01 (0.10 – 0.12)
CV127	<0.02 (nd – 0.02)	2.36 ± 0.10* (2.26 – 2.47)	0.93 ± 0.02 (0.89 – 0.94)	5.56 ± 0.08* (5.44 – 5.62)	11.14 ± 0.34 (10.77 – 11.53)	1.23 ± 0.04 (1.19 – 1.27)	0.09 ± 0 (0.09)	0.02 ± 0* (0.02)	0.10 ± 0.01 (0.09 – 0.11)
CV127 + Imi	<0.02 (nd – 0.02)	2.42 ± 0.03* (2.39– 2.45)	0.91 ± 0.02 (0.89 – 0.92)	6.03 ± 0.12* (5.86 – 6.15)	11.29 ± 0.30 (11.05 – 11.73)	1.21 ± 0.07 (1.16 – 1.31)	0.09 ± 0 (0.09)	0.02 ± 0.01 (0.02 – 0.03)	0.11 ± 0 (0.11)
Std 1	nd	2.28	0.84	4.28	11.39	1.54	0.08	0.03	0.08
Std 2	nd	2.34	0.84	5.14	12.94	1.52	0.07	0.03	0.09

Table 8. Continued.

Line	C14:0 Myristic	C16:0 Palmitic	C18:0 Stearic	C18:1 Oleic	C18:2 Linoleic	C18:3 Linolenic	C20:0 Arachidic	C20:1 Eicosenoic	C22:0 Behenic
Londrina				Mean ± Standard Deviation (range) g/100 g DW					
Isoline	<0.02 (nd – 0.02)	2.58 ± 0.05 (2.52 – 2.64)	0.79 ± 0.02 (0.77 – 0.81)	5.17 ± 0.18 (4.95 – 5.32)	11.86 ± 0.12 (11.73 – 11.98)	1.48 ± 0.06 (1.41 – 1.53)	0.09 ± 0 (0.09)	0.03 ± 0.01 (0.02 – 0.04)	0.12 ± 0.01 (0.11 – 0.13)
CV127	0.02 ± 0 (0.02)	2.61 ± 0.03 (2.57 – 2.63)	0.78 ± 0.01 (0.77 – 0.78)	5.41 ± 0.19 (5.18 – 5.63)	11.87 ± 0.14 (11.66 – 11.96)	1.37 ± 0.03* (1.33 – 1.41)	0.09 ± 0 (0.09)	0.03 ± 0.01 (0.02 – 0.04)	0.10 ± 0.01* (0.10 – 0.11)
CV127 + Imi	0.02 ± 0 (0.02)	2.62 ± 0.03 (2.58 – 2.64)	0.80 ± 0.01 (0.78 – 0.82)	5.50 ± 0.19* (5.24 – 5.67)	11.91 ± 0.12 (11.76 – 12.06)	1.36 ± 0.02* (1.35 – 1.39)	0.09 ± 0 (0.09)	0.03 ± 0.01 (0.02 – 0.04)	0.10 ± 0.01* (0.09 – 0.11)
Std 1	nd	2.49	0.79	4.22	12.21	1.85	0.07	0.02	0.09
Std 2	nd	2.42	0.81	5.41	13.22	1.63	0.07	0.03	0.10
Brasília									
Isoline	0.02 ± 0 (0.02)	2.37 ± 0.06 (2.29 – 2.41)	0.86 ± 0.04 (0.81 – 0.89)	4.69 ± 0.24 (4.43 – 4.97)	10.18 ± 0.22 (9.97 – 10.38)	1.32 ± 0.02 (1.31 – 1.35)	0.09 ± 0.01 (0.09 – 0.10)	0.04 ± 0.01 (0.03 – 0.04)	0.11 ± 0.01 (0.10 – 0.12)
CV127	0.02 ± 0 (0.02)	2.41 ± 0.08 (2.29 – 2.47)	0.84 ± 0.01 (0.82 – 0.85)	5.10 ± 0.20 (4.96 – 5.38)	10.25 ± 0.42 (9.63 – 10.52)	1.25 ± 0.06* (1.17 – 1.31)	0.09 ± 0.01 (0.08 – 0.10)	0.03 ± 0.01 (0.02 – 0.04)	0.10 ± 0.01 (0.09 – 0.12)
CV127 + Imi	0.02 ± 0 (0.02)	2.41 ± 0.07 (2.36 – 2.51)	0.80 ± 0.03* (0.77 – 0.82)	4.76 ± 0.35 (4.44 – 5.25)	10.26 ± 0.30 (10.09 – 10.71)	1.26 ± 0.01 (1.25 – 1.28)	0.08 ± 0.01* (0.08 – 0.09)	0.02 ± 0* (0.02)	0.10 ± 0.01 (0.10 – 0.11)
Std 1	0.02	2.45	0.85	4.20	11.51	1.69	0.09	0.04	0.11
Std 2	0.02	2.42	0.86	4.82	12.63	1.69	0.09	0.02	0.09
Santo Antonio de Posse									
Isoline	0.02 ± 0 (0.02)	2.38 ± 0.05 (2.34 – 2.44)	0.85 ± 0.01 (0.84 – 0.86)	4.79 ± 0.07 (4.74 – 4.89)	10.84 ± 0.22 (10.64 – 11.15)	1.32 ± 0.02 (1.30 – 1.34)	0.10 ± 0.01 (0.09 – 0.10)	0.03 ± 0.01 (0.02 – 0.04)	0.12 ± 0 (0.12)
CV127	0.02 ± 0 (0.02)	2.61± 0.08* (2.57 – 2.73)	0.90 ± 0.04* (0.88 – 0.97)	5.35 ± 0.20* (5.23 – 5.65)	11.69 ± 0.49* (11.40 – 12.43)	1.31 ± 0.07 (1.26 – 1.41)	0.09 ± 0.01 (0.09 – 0.11)	0.04 ± 0.01 (0.02 – 0.04)	0.11 ± 0.01 (0.11 – 0.12)
CV127 + Imi	0.02 ± 0 (0.02)	2.63 ± 0.11* (2.48 – 2.73)	0.90 ± 0.03* (0.87 – 0.94)	5.45 ± 0.19* (5.19 – 5.62)	11.89 ± 0.33* (11.59 – 12.28)	1.32 ± 0.02 (1.29 – 1.34)	0.09 ± 0.01 (0.09 – 0.10)	0.04 ± 0* (0.04)	0.12 ± 0.01 (0.11 – 0.13)
Std 1	0.02	2.38	0.78	4.05	11.72	1.65	0.08	0.03	0.09
Std 2	0.02	2.34	0.80	4.83	13.01	1.61	0.07	0.04	0.09

*Statistically significantly different from the Conquista nontransgenic comparator at $p < 0.05$.
^nd = not detected.

Table 9. Isoflavone Composition of Grain on a Dry Weight Basis of Soybean BPS-CV127-9 Treatments (CV127 and CV127+Imi), the Isoline Control and Two Conventional Soybean Varieties (Std 1 and Std 2) Grown at Six Locations in Brazil in the 2006/07 Season

Location/ Treatment	Daidzin	Malonyl Daidzin	Daidzein	Glycitin	Malonyl glycitin	Glycitein	Genistin	Malonyl genistin	Genistein
Santo Antonio de Goias	Mean ± Standard Deviation (range) mg/100 g dry weight								
Isoline	13.2 ± 2.8 (9.3 – 15.9)	54.9 ± 3.5 (51.7 – 59.9)	1.1 ± 0.4 (0.8 – 1.6)	4.6 ± 1.0 (3.9 – 6.1)	14.0 ± 1.6 (11.9 – 15.8)	<0.8 (nd^ – 0.9)	16.2 ± 3.0 (11.7 – 18.0)	85.7 ± 4.0 (82.1 – 91.1)	1.1 ± 0.4 (0.7 – 1.7)
CV127	11.7 ± 0.5 (11.0 – 12.3)	40.3 ± 1.9* (38.5 – 42.7)	1.0 ± 0.3 (0.6 – 1.3)	5.0 ± 0.4 (4.5 – 5.3)	14.0 ± 0. 9 (12.8 – 14.7)	<0.8 (nd – 0.8)	15.4 ± 0.8 (14.5 – 16.4)	69.9 ± 2.6* (68.2 – 73.8)	0.6 ± 0.1* (0.5 – 0.7)
CV127 + Imi	11.2 ± 0.3 (10.9 – 11.6)	35.8 ± 1.9* (34.1 – 37.7)	1.1 ± 0. 1 (1.1 – 1.2)	4.9 ± 0.5 (4.3 – 5.4)	12.5 ± 1.4 (11.0 – 14.3)	0.7 ± 0 (0.7)	15.1 ± 0.3 (14.8 – 15.5)	62.9 ± 2.8* (59.5 – 65.5)	0.7 ± 0.1* (0.7 – 0.8)
Std 1	14.2	60.1	1.3	9.4	26.3	0.6	18.1	103.4	0.6
Std 2	11.5	55.5	1.7	12.7	36.2	1.6	15.1	87.1	0.6
Uberaba									
Isoline	12.1 ± 2.4 (9.3 – 15.0)	58.2 ± 7.7 (50.0 – 66.6)	1.1 ± 0.3 (0.7 – 1.5)	5.2 ± 0.4 (4.8 – 5.6)	17.5 ± 2.9 (13.6 – 20.3)	<1 (nd – 1.1)	13.1 ± 2.2 (11.2 – 16.2)	86.0 ± 9.1 (75.4 – 93.6)	0.9 ± 0.4 (0.6 – 1.5)
CV127	10.9 ± 0.7 (9.9 – 11.3)	46.3 ± 2.8* (42.5 – 49.1)	1.1 ± 0.08 (1.0 – 1.2)	5.8 ± 0.1 (5.6 – 5.9)	17.6 ± 1.5 (15.8 – 19.2)	0.8 ± 0. 1 (0.7 – 0.9)	13.1 ± 1.1 (11.6 – 14.1)	80.5 ± 4.1 (75.8 – 85.7)	0.7 ± 0.2 (0.5 – 0.9)
CV127 + Imi	11.4 ± 1.8 (9.0 – 13.2)	48.6 ± 6.8* (42.0 – 58.0)	1.2 ± 0.2 (1.0 – 1.4)	6.3 ± 0.9 (5.2 – 7.3)	18.1 ± 3.0 (14.4 – 21.5)	0.7 ± 0.1 (0.5 – 0.8)	13.9 ± 0.7 (13.2 – 14.5)	82.7 ± 5.5 (78.7 – 90.8)	0.8 ± 0.2 (0.7 – 1.1)
Std 1	12.2	70.5	1.7	10.3	34.5	1.4	15.6	132.7	1.2
Std 2	12.6	65.0	0.8	12.6	34.6	1.5	16.2	115.9	1.5
Sete Lagoas									
Isoline	15.7 ± 1.4 (14.3 – 17.2)	52.4 ± 5.9 (47.3 – 59.3)	2.0 ± 0.4 (1.5 – 2.4)	5.1 ± 1.0 (3.8 – 5.9)	13.6 ± 2.2 (10.4 – 15.1)	<0.7 (nd – 0.7)	17.7 ± 1.6 (16.0 – 19.4)	83.0 ± 7.5 (76.1 – 92.2)	2.2 ± 0.4 (1.7 – 2.7)
CV127	11.7 ± 1.5* (10.2 – 13.3)	37.2 ± 6.9 (29.7 – 45.3)	1.5 ± 0.4 (0.9 – 1.8)	5.9 ± 0.9 (5.3 – 7.2)	15.3 ± 2.0 (13.6 – 18.1)	0.8 ± 0.3* (0.4 – 1.0)	14.6 ± 2.9 (11.9 – 18.7)	61.7 ± 13.7* (49.6 – 81.3)	1.9 ± 0.1 (1.8 – 2.0)
CV127 + Imi	12.5 ± 1.6* (11.3 – 14.7)	38.6 ± 5.6 (34.0 – 46.3)	1.7 ± 0.3 (1.2 – 1.9)	5.7 ± 1.0 (4.5 – 6.7)	14.5 ± 2.8 (10.7 – 17.4)	0.5 ± 0.3* (0.3 – 0.9)	15.7 ± 1.3 (14.3 – 17.3)	64.6 ± 4.0* (61.6 – 70.4)	2.0 ± 0.2 (1.7 – 2.1)
Std 1	15.3	57.0	2.8	12.1	31.9	1.1	21.0	100.3	1.9
Std 2	15.2	53.9	2.7	15.3	39.7	1.8	24.3	97.0	3.2

Table 9. continued.

Location/ Treatment	Daidzin	Malonyl-Daidzin	Daidzein	Glycitin	Malonyl-glycitin	Glycitein	Genistin	Malonyl-genistin	Genistein
Londrina				Mean ± Standard Deviation (range) mg/100 g dry weight					
Isoline	19.6 ± 1.4 (18.5 – 21.7)	74.5 ± 6.0 (70.8 – 83.4)	2.0 ± 0.4 (1.5 – 2.3)	5.5 ± 0.2 (5.2 – 5.7)	15.9 ± 0.9 (15.2 – 17.2)	<0.9 (nd – 1.0)	22.9 ± 1.5 (21.8 – 25.0)	112.6 ± 9.7 (105.5 – 126.9)	1.4 ± 0.1 (1.3 – 1.5)
CV127	13.1 ± 1.2* (12.2 – 14.9)	45.8 ± 3.7* (41.8 – 50.8)	1.5 ± 0.5* (0.9 – 1.7)	4.9 ± 0.6 (4.1 – 5.5)	12.9 ± 1.4* (11.1 – 14.5)	<0.7 (nd – 0.8)	20.5 ± 3.3 (17.8 – 25.3)	94.7 ± 11.5 (86.1 – 110.8)	1.6 ± 0.3 (1.3 – 1.9)
CV127 + Imi	12.6 ± 0.6* (12.1 – 13.4)	41.1 ± 3.1* (37.8 – 45.2)	1.6 ± 0.4* (1.0 – 1.8)	5.7 ± 1.0 (4.2 – 6.2)	14.4 ± 2.7 (10.4 – 16.3)	0.7 ± 0.3 (0.3 – 0.9)	17.7 ± 2.5* (16.0 – 21.4)	79.4 ± 13.1* (67.5 – 97.9)	1.7 ± 0.1 (1.5 – 1.8)
Std 1	18.3	72.7	2.7	10.4	29.5	1.3	26.7	130.7	1.9
Std 2	19.3	70.8	2.9	11.5	28.5	1.5	30.7	128.7	2.9
Brasília									
Isoline	14.2 ± 1.6 (12.5 – 15.9)	57.0 ± 8.8 (46.0 – 67.3)	2.5 ± 0.4 (2.2 – 3.0)	5.9 ± 0.9 (5.2 – 7.0)	18.1 ± 3.1 (15.5 – 22.7)	0.9 ± 0.1 (0.8 – 1.0)	14.2 ± 1.9 (11.7 – 15.8)	78.5 ± 11.8 (61.7. – 89.5)	1.6 ± 0.2 (1.3 – 1.8)
CV127	10.8 ± 0.7* (10.2 – 11.6)	39.1 ± 4.9* (33.7 – 43.6)	2.0 ± 0.3 (1.6 – 2.4)	5.9 ± 1.0 (5.2 – 7.3)	15.2 ± 2.3 (13.8 – 18.6)	0.8 ± 0.1 (0.7 – 0.8)	12.5 ± 2.0 (9.5 – 13.6)	59.5 ± 10.0* (45.7 – 69.5)	1.4 ± 0.4 (0.9 – 1.7)
CV127 + Imi	11.7 ± 0.3* (11.5 – 12.2)	39.1 ± 2.5* (36.4 – 42.2)	2.2 ± 0.3 (1.9 – 2.5)	6.4 ± 0.3 (6.1 – 6.7)	16.7 ± 1.2 (15.3 – 18.3)	0.9 ± 0.1 (0.8 – 0.9)	11.6 ± 1.7 (10.3 – 14.1)	54.2 ± 8.2* (48.5 – 66.4)	1.7 ± 0.3 (1.4 – 1.9)
Std 1	14.4	67.3	1.7	11.7	33.8	1.4	20.1	109.6	1.2
Std 2	15.1	70.7	1.2	12.8	34.8	0.6	20.4	118.7	1.1
Santo Antonio de Posse									
Isoline	12.5 ± 1.4 (10.6 – 13.7)	38.8 ± 5.7 (33.4 – 43.8)	1.6 ± 0.5 (0.9 – 2.0)	5.8 ± 0.6 (5.2 – 6.4)	15.6 ± 0.5 (15.2 – 16.2)	0.7 ± 0.2 (0.4 – 0.9)	12.5 ± 2.7 (9.2 – 15.5)	59.7 ± 11.3 (46.7 – 72.1)	1.3 ± 0.2 (1.2 – 1.6)
CV127	11.2 ± 0.5 (10.8 – 11.8)	31.0 ± 1.4* (29.9 – 33.0)	1.2 ± 0.1 (1.0 – 1.3)	5.9 ± 0.9 (5.1 – 7.1)	13.2 ± 1.4* (12.0 – 14.9)	0.6 ± 0.2 (0.3 – 0.7)	12.7 ± 1.6 (11.1 – 14.8)	54.5 ± 7.2 (46.7 – 63.7)	1.3 ± 0.2 (1.1 – 1.6)
CV127 + Imi	11.1 ± 1.6 (9.6 – 13.4)	31.5 ± 4.9* (27.2 – 38.4)	1.3 ± 0.2 (1.1 – 1.6)	5.1 ± 1.2 (3.9 – 6.5)	11.9 ± 2.4* (8.9 – 14.5)	0.7 ± 0.2 (0.3 – 0.8)	14.4 ± 2.4 (12.3 – 17.5)	60.2 ± 10.6 (49.4 – 73.7)	1.4 ± 0.1 (1.2 – 1.5)
Std 1	15.2	54.9	2.4	14.0	38.8	0.7	23.9	102.7	1.9
Std 2	20.6	68.1	2.9	22.9	50.7	1.8	27.6	106.6	3.1

*Statistically significantly different from the isoline nontransgenic comparator at $p < 0.05$. ^nd = not detected.

Table 10. Phospholipid Composition of Grain of Soybean BPS-CV127-9 Treatments (CV127 and CV127+Imi), the Isoline Control and Two Conventional Soybean Varieties (Std 1 and Std 2) Grown at Six Locations in Brazil in the 2006/07 Season

Location	Treatment	N	Phosphatidyl ethanolamine	Phosphatidic acid	Phosphatidyl inositol	Phosphatidyl choline
			Mean ± Standard Deviation (range) mg/g fat			
Santo Antonio de Goias	Isoline	4	107.1 ± 4.1 (101.0 – 109.4)	3.8 ± 1.3 (2.0 – 5.1)	11.7 ± 0.5 (11.1 – 12.1)	31.6 ± 0.9 (30.4 – 32.7)
	CV127	4	102.3 ± 5.5 (96.1 – 107.6)	2.8 ± 0.3 (2.5 – 3.1)	10.1 ± 0.4 (9.7 – 10.6)	29.5 ± 1.9 (27.7 – 32.1)
	CV127 + Imi	4	103.3 ± 4.7 (96.8 – 107.3)	3.1 ± 0.1 (2.9 – 3.2)	10.1 ± 0.5 (9.7 – 10.7)	30.7 ± 1.2 (29.5 – 32.3)
	Std 1	1	104.5	3.7	12.3	32.6
	Std 2	1	91.3	5.6	11.5	30.4
Uberaba	Isoline	4	114.5 ± 16.1 (92.2 – 127.9)	2.3 ± 0.5 (1.8 – 2.9)	12.2 ± 1.3 (10.5 – 13.5)	33.5 ± 5.4 (25.9 – 38.5)
	CV127	4	98.5 ± 7.9 (93.5 – 110.3)	1.0 ± 0.1 (0.8 – 1.1)	10.0 ± 0.9 (8.9 – 11.0)	30.4 ± 2.5 (28.6 – 34.1)
	CV127 + Imi	4	103.5 ± 3.6* (101.0 – 108.9)	1.4 ± 0.4 (1.0 – 1.9)	9.8 ± 1.0* (8.3 – 10.4)	30.1 ± 1.0 (28.8 – 30.7)
	Std 1	1	108.7	2.1	12.2	38.2
	Std 2	1	103.4	3.4	12.9	27.0
Sete Lagoas	Isoline	4	97.9 ± 2.6 (94.6 – 100.9)	5.7 ± 1.0 (4.6 – 6.9)	12.0 ± 0.5 (11.5 – 12.4)	26.9 ± 1.1 (25.4 – 27.8)
	CV127	4	93.6 ± 3.5 (90.1 – 98.4)	3.7 ± 0.5* (3.2 – 4.3)	9.8 ± 0.8* (9.3 – 10.9)	25.9 ± 0.9 (24.8 – 26.7)
	CV127 + Imi	4	78.5 ± 21.7* (57.9 – 99.2)	2.8 ± 0.4* (2.5 – 3.2)	8.2 ± 2.3* (6.1 – 10.7)	21.3 ± 5.3* (15.9 – 26.7)
	Std 1	1	113.7	4.8	13.1	33.2
	Std 2	1	79.4	7.5	11.4	25.6
Londrina	Isoline	4	96.3 ± 9.0 (89.7 – 109.6)	2.5 ± 0.5 (2.0 – 3.2)	10.4 ± 1.3 (9.2 – 12.2)	25.8 ± 0.8 (24.9 – 26.7)
	CV127	4	94.9 ± 5.3 (90.2 – 100.7)	2.9 ± 0.5 (2.4 – 3.5)	10.0 ± 0.7 (9.2 – 10.9)	28.7 ± 1.8 (26.7 – 30.3)
	CV127 + Imi	4	91.1 ± 0.3 (90.9 – 91.5)	3.2 ± 0.2 (3.1 – 3.4)	10.6 ± 0.7 (9.7 – 11.2)	27.0 ± 0.3 (26.6 – 27.4)
	Std 1	1	100.8	2.3	12.6	31.3
	Std 2	1	94.4	3.5	12.1	29.4
Brasília	Isoline	4	95.5 ± 5.1 (91.7 – 102.9)	4.6 ± 0.7 (4.0 – 5.5)	11.7 ± 1.0 (10.7 – 13.0)	28.8 ± 1.6 (27.6 – 31.1)
	CV127	4	92.4 ± 4.8* (88.5 – 98.6)	3.0 ± 0.7 (2.3 – 3.7)	9.5 ± 1.2* (7.9 – 10.7)	27.2 ± 1.1 (25.8 – 28.6)
	CV127 + Imi	4	93.6 ± 7.3* (84.8 – 102.6)	3.5 ± 1.3 (1.6 – 4.7)	10.4 ± 0.5* (9.9 – 10.9)	27.5 ± 2.5 (25.1 – 30.6)
	Std 1	1	97.4	2.5	11.6	30.6
	Std 2	1	98.1	2.9	11.4	31.8
Santo Antonio de Posse	Isoline	4	100.1 ± 6.9 (95.0 – 110.0)	5.2 ± 0.6 (4.4 – 5.9)	12.9 ± 1.0 (11.8 – 14.2)	29.0 ± 2.1 (27.3 – 31.9)
	CV127	4	74.0 ± 16.3* (51.0 – 87.6)	3.8 ± 0.6* (3.3 – 4.6)	9.3 ± 1.7* (6.8 – 10.6)	20.6 ± 4.2 (14.9 – 23.9)
	CV127 + Imi	4	75.2 ± 18.2* (49.4 – 88.5)	3.6 ± 0.8* (2.7 – 4.4)	8.8 ± 1.8* (6.2 – 10.0)	21.9 ± 5.5 (13.9 – 25.8)
	Std 1	1	101.4	4.6	13.5	32.0
	Std 2	1	84.9	6.0	12.6	26.8

*Statistically significantly different from the isoline nontransgenic comparator at $p < 0.05$.

Table 11. Comparison of Analyte Means and Ranges of Values Across Field Trial Locations for the Isoline, CV 127 and CV127+Imi Treatments with Range of Values for the Conventional Standard Soybean Varieties as well as Ranges of Values from the ILSI Crop Composition Database

Analyte (unit)	Isoline	CV127	CV127+Imi	Conv. Standards	Global	Brazilian
		N = 24		N = 12	N = 80 – 323	N = 69
	Mean (range)					
Proximates						
Moisture	10.1 ± 0.4a*	9.3 ± 0.5b	9.4 ± 0.3b	9.8 ± 0.31	10.1	9.8
%	(9.2 – 10.9)	(8.7 – 10.2)	(8.8 – 9.9)	(9.4 – 10.5)	(4.7 – 34.4)	(7.6 – 11.2)
Ash	5.0 ± 0.2a	5.0 ± 0.2a	4.9 ± 0.3a	4.9 ± 0.3	5.32	5.00
g/100 g DW	(4.6 – 5.3)	(4.6 – 5.5)	(4.5 – 5.4)	(4.5 – 5.3)	(3.89 – 6.99)	(4.58 – 5.47)
Protein	40.3 ± 1.3a	39.2 ± 1.1b	39.4 ± 1.2b	37.6 ± 1.0	39.47	40.15
g/100 g DW	(38.1 – 42.2)	(37.0 – 42.0)	(37.3 – 41.9)	(36.4 – 39.6)	(33.19 – 45.48)	(37.19 – 44.85)
Fat	21.7 ± 0.9b	22.6 ± 1.0a	22.7 ± 1.1a	22.8 ± 1.4	16.68	18.85
g/100 g DW	(20.0 – 23.3)	(20.3 – 24.6)	(20.1 – 24.2)	(20.2 – 24.8)	(8.10 – 23.56)	(14.44 – 23.56)
Total Dietary Fiber (g/100 g DW)	24.59 ± 1.62a (21.93 – 26.90)	24.55 ± 1.4a (21.61 – 26.64)	24.70 ± 1.8a (22.13 – 28.11)	25.43 ± 1.57 (22.29 – 28.03)	NA	NA
Carbohydrate[1]	33.1 ± 0.8a	33.2 ± 0.8a	32.9 ± 0.7a	34.7 ± 1.31	38.2	36.0
g/100 g DW	(31.6 – 34.4)	(31.1 – 34.1)	(31.9 – 34.9)	(27.39 – 42.03)	(29.6 – 50.2)	(29.6 – 41.6)
Calories	390 ± 6b	395 ± 6a	395 ± 7a	393 ± 7	NA^	NA
kcal/100 g DW	(379 – 402)	(389 – 407)	(384-405)	(377 – 400)		
Fiber						
Crude Fiber	8.5 ± 0.9a	8.3 ± 1.2a	8.1 ± 1.3a	8.2 ± 0.8	7.81	8.46
g/100 g DW	(6.9 – 11.0)	(6.9 – 11.1)	(6.4 – 11.3)	(6.7 – 9.3)	(4.12 – 13.87)	(6.42 – 10.93)
ADF	11.39 ± 1.41b	13.14 ± 1.51a	13.76 ± 1.73a	11.76 ± 1.24	11.97	11.34
g/100 g DW	(8.84 – 14.95)	(9.75 – 15.92)	(10.96 – 19.00)	(9.32 – 14.43)	(7.81 – 18.61)	(7.81 – 16.39)
NDF	14.98 ± 1.25b	17.46 ± 2.10a	17.52 ± 1.44a	14.85 ± 2.33	12.33	12.39
g/100 g DW	(12.04 – 17.32)	(12.72 – 20.55)	(14.06 – 20.01)	(10.63 – 16.92)	(8.53 – 21.25)	(8.53 – 21.25)

Table 11 continued.

Analyte (unit)	Isoline	CV127	CV127+Imi	Conv. Stds.	Global	Brazilian
Minerals						
Calcium	268 ± 33b	277 ± 25a	266 ± 27b	254 ± 37	217	NA
mg/100 g DW	(221 – 330)	(231 – 327)	(214 – 318)	(205 – 313)	(117 – 307)	
Iron	8.50 ± 1.23a	7.89 ± 1.48b	7.75 ± 1.31b	8.57 ± 1.14	7.81	NA
mg/100 g DW	(6.01 – 10.43)	(5.56 – 10.91)	(5.79 – 10.48)	(6.54 – 10.35)	(5.54 – 10.95)	
Magnesium	246 ± 18b	266 ± 30a	266 ± 20a	269 ± 26	264	NA
mg/100 g DW	(204 – 266)	(218 – 326)	(227 – 304)	(225 – 308)	(219 – 313)	
Phosphorus	687 ± 88a	677 ± 75a	667 ± 61a	670 ± 106	715	NA
mg/100 g DW	(541 – 834)	(515 – 791)	(546 – 760)	(527 – 875)	(507 – 935)	
Potassium	1928 ± 82a	1897 ± 133ab	1881 ± 113b	1961 ± 95	2061	NA
mg/100 g DW	(1782 – 2071)	(1720 – 2164)	(1703 – 2069)	(1772 – 2103)	(1868 – 2316)	
Amino Acids						
Alanine	1.64 ± 0.11a	1.59 ± 0.12a	1.63 ± 0.12a	1.56 ± 0.08	1.72	1.73
g/100 g DW	(1.45 – 1.92	(1.33 – 1.89)	(1.27 – 1.76)	(1.39 – 1.68)	(1.51 – 2.10)	(1.62 – 1.85)
Arginine	3.03 ± 0.27a	2.91 ± 0.25a	3.01 ± 0.23a	2.71 ± 0.18	2.84	2.93
g/100 g DW	(2.64 – 3.09)	(2.35 – 3.51	(2.36 – 3.33)	(2.34 – 2.97)	(2.29 – 3.40)	(2.59 – 3.28)
Aspartate	4.64 ± 0.35a	4.46 ± 0.34a	4.61 ± 0.37a	4.32 ± 0.22	4.49	4.59
g/100 g DW	(4.02 – 5.37)	3.67 – 5.24)	(3.66 – 5.17)	(3.94 – 4.72)	(3.81 – 5.12)	(4.23 – 5.12)
Cysteine	0.41 ± 0.10a	0.45 ± 0.11a	0.46 ± 0.12a	0.36 ± 0.13	0.59	0.57
g/100 g DW	(0.17 – 0.51)	(0.31 – 0.85)	(0.29 – 0.87)	(0.14 – 0.48)	(0.37 – 0.81)	(0.50 – 0.81)
Glutamate	7.61 ± 0.56a	7.30 ± 0.58a	7.54 ± 0.63a	6.98 ± 0.41	7.09	7.29
g/100 g DW	(6.59 – 8.92)	(6.10 – 8.46)	(5.83 – 8.45)	(6.16 – 7.68)	(5.84 – 8.20)	(6.58 – 8.09)
Glycine	1.65 ± 0.12a	1.62 ± 0.13a	1.65 ± 0.12a	1.56 ± 0.09	1.69	1.70
g/100 g DW	(1.45 – 1.87)	(1.33 – 1.94)	(1.32 – 1.81)	(1.41 – 1.71)	(1.46 – 2.00)	(1.56 – 1.82)
Histidine	0.87 ± 0.07a	0.83 ± 0.08a	0.85 ± 0.07a	0.79 ± 0.04	1.04	1.06
g/100 g DW	(0.78 – 1.03)	(0.69 – 1.04)	(0.67 – 0.97)	(0.72 – 0.86)	(0.88 – 1.18)	(0.98 – 1.18)
Isoleucine	1.61 ± 0.13a	1.56 ± 0.13a	1.61 ± 0.12a	1.54 ± 0.10	1.81	1.85
g/100 g DW	(1.42 – 1.94)	(1.28 – 1.88)	(1.24 – 1.75)	(1.38 – 1.71)	(1.54 – 2.08)	(1.59 – 2.04)
Leucine	2.89 ± 0.23a	2.78 ± 0.23a	2.87 ± 0.22a	2.72 ± 0.17	3.04	3.07
g/100 g DW	(2.51 – 3.40)	(2.31 – 3.36)	(2.24 – 3.16)	(2.45 – 3.65)	(2.59 – 3.62)	(2.81 – 3.38)

Table 11 continued

Analyte (unit)	Isoline	CV127	CV127+Imi	Conv. Stds.	Global	Brazilian
Lysine	2.48 ± 0.19a	2.40 ± 0.20a	2.46 ± 0.18a	2.33 ± 0.14	2.56	2.58
g/100 g DW	(2.12 – 2.85)	(2.00 – 2.93)	(1.93 – 2.68)	(2.08 – 2.54)	(2.29 – 2.84)	(2.42 – 2.82)
Methionine	0.17 ± 0.04a	0.16 ± 0.08a	0.19 ± 0.07a	0.12 ± 0.05	0.55	0.55
g/100 g DW	(nd – 0.23)	(nd – 0.30)	(nd – 0.30)	(0.06 – 0.23)	(0.43 – 0.68)	(0.50 – 0.68)
Phenylalanine	1.99 ± 0.16a	1.91 ± 0.16a	1.98 ± 0.15a	1.87 ± 0.05	1.98	2.06
g/100 g DW	(1.77 – 2.37)	(1.59 – 2.29)	(1.52 – 2.19)	(1.64 – 2.09)	(1.63 – 2.35)	(1.82 – 2.24)
Proline	1.98 ± 0.16a	1.86 ± 0.17b	1.91 ± 0.15ab	1.82 ± 0.14	2.00	2.06
g/100 g DW	(1.74 – 2.32)	(1.56 – 2.31)	(1.49 – 2.12)	(1.58 – 2.03)	(1.69 – 2.28)	(1.86 – 2.28)
Serine	2.09 ± 0.15a	2.02 ± 0.16a	2.07 ± 0.16a	1.96 ± 0.11	2.02	2.17
g/100 g DW	(1.83 – 2.39)	(1.7 – 2.41)	(1.63 – 2.29)	(1.78 – 2.16)	(1.11 – 2.48)	(1.96 – 2.48)
Threoinine	1.56 ± 0.10a	1.50 ± 0.13a	1.55 ± 0.11a	1.48 ± 0.06	1.47	1.40
g/100 g DW	(1.34 – 1.80)	(1.25 – 1.81)	(1.25 – 1.72)	(1.36 – 1.55)	(1.14 – 1.86)	(1.28 – 1.52)
Tryptophan	0.73 ± 0.09a	0.72 ± 0.08a	0.76 ± 0.09a	0.77 ± 0.16	0.43	0.44
g/100 g DW	(0.59 – 0.84)	(0.60 – 0.92)	(0.60 – 1.03)	(0.57 – 1.16)	(0.36 – 0.50)	(0.38 – 0.49)
Tyrosine	1.34 ± 0.10a	1.27 ± 0.10b	1.31 ± 0.09ab	1.27 ± 0.08	1.32	1.38
g/100 g DW	(1.17 – 1.55)	(1.08 – 1.50)	(1.06 – 1.42)	(1.12 – 1.39)	(1.02 – 1.61)	(1.27 – 1.56)
Valine	1.66 ± 0.13a	1.60 ± 0.14a	1.64 ± 0.112a	1.58 ± 0.08	1.91	1.91
g/100 g DW	(1.36 – 1.98)	(1.34 – 1.94)	(1.26 – 1.79)	(1.40 – 1.67)	(1.60 – 2.20)	(1.63 – 2.08)

Table 11 continued

Analyte (unit)	Isoline	CV127	CV127+Imi	Conv. Stds.	Global	Brazilian
Fatty Acids						
Myristic 14:0	<0.09a	<0.09a	<0.09a	0.10	NA	NA
% Total FA	(nd – 0.10)	(nd – 0.10)	(nd – 0.10)	(0.09 – 0.11) N=7		
Palmitic 16:0	9.77 ± 0.39b	10.00 ± 0.37a	9.98 ± 0.40a	10.17 ± 0.65	11.12	11.27
% Total FA	(9.12 – 10.44)	(9.23 – 10.42)	(9.35 – 10.59)	(9.08 – 11.16)	(9.55 – 15.77)	(10.28 – 12.73)
Stearic 18:0	3.39 ± 0.30a	3.38 ± 0.31a	3.30 ± 0.21a	3.46 ± 0.28	4.01	3.95
% Total FA	(2.84 – 3.87)	(2.93 – 3.86)	(2.77 – 3.61)	(2.97 – 3.92)	(2.70 – 5.88)	(2.70 – 5.52)
Oleic 18:1	20.07 ± 0.51c	21.44 ± 0.91b	22.07 ± 1.14a	20.06 ± 1.10	20.7	22.6
% Total FA	(18.47 – 21.02)	(20.34 – 22.74)	(20.10 – 25.76)	(18.54 – 21.38)	(14.3 – 32.2)	(18.7 – 28.9)
Linoleic 18:2	45.87 ± 0.98b	45.42 ± 0.96a	45.00 ± 0.81a	53.54 ± 0.59	53.3	52.6
% Total FA	(44.01 – 47.68)	(43.05 – 46.70)	(42.60 – 46.62)	(52.36 – 54.40	(42.3 – 58.8)	(48.2 – 55.5)
Linolenic 18:3	5.65 ± 0.28a	5.21 ± 0.23b	5.10 ± 0.33c	7.23 ± 0.56	8.34	7.06
% Total FA	(5.05 – 6.10)	(4.80 – 5.67)	(4.59 – 5.72)	(6.31 – 8.15)	(3.00 – 12.52)	(5.92 – 8.18)
Arachidic 20:0	0.37 ± 0.04a	0.35 ± 0.03a	0.34 ± 0.02a	0.31 ± 0.05	0.32	0.37
% Total FA	(0.32 – 0.44)	(0.24 – 0.44)	(0.26 – 0.39)	(0.26 – 0.40)	(0.16 – 0.48)	(0.28 – 0.48)
Eicosenoic 20:1	0.13 ± 0.04a	0.12 ± 0.04a	0.13 ± 0.04a	0.14 ± 0.03	0.20	0.22
% Total FA	(0.09 – 0.19)	(0.08 – 0.20)	(0.08 – 0.18)	(0.09 – 0.20)	(0.14 – 0.35)	(0.17 – 0.28)
Behenic 22:0	0.46 ± 0.04a	0.42 ± 0.4b	0.43 ± 0.04ab	0.40 ± 0.04	0.40	0.45
% Total FA	(0.37 – 0.52)	(0.34 – 0.46)	(0.39 – 0.53)	(0.37 – 0.50)	(0.28 – 0.60)	(0.37 – 0.57)

Table 11 continued

Analyte (unit)	Isoline	CV127	CV127+Imi	Conv. Stds.	Global	Brazilian
Antinutrients						
Phytate mg/g DW	2.95 ± 1.22a (1.43 – 6.09)	2.75 ± 0.84a (1.25 – 4.52)	2.54 ± 1.58a (0.71 – 5.27)	2.89 ± 1.58 (1.47 – 7.39)	11.21 (6.34 – 19.60)	NA
Raffinose g/100 g DW	1.1 ± 0.2c (0.9 – 1.5)	1.4 ± 0.3a (1.0 – 1.8)	1.3 ± 0.2b (1.0 – 1.7)	1.1 ± 0.2 (0.8 – 1.6)	0.355 (0.212 – 0.661)	NA
Stachyose g/100 g	3.7 ± 0.3a (3.0 – 4.2)	3.6 ± 0.3b (2.9 – 4.0)	3.6 ± 0.3b (3.1 – 4.1)	3.8 ± 0.4 (3.1 – 4.6)	2.19 (1.21 – 3.50)	NA
Lectins HU/mg DW	2.24 ± 0.12a (1.35 – 3.35)	2.23 ± 0.23a (1.43 – 3.70)	2.20 ± 0.06a (1.27 – 3.49)	2.03 ± 0.59 (1.38 – 3.53)	1.718 (0.105 – 9.038)	0.815 (0.299 – 1.892)
Urease ΔpH	1.93 ± 0.21a (1.27 – 2.12)	1.85 ± 0.38a (0.67 – 2.18)	1.91 ± 0.30a (0.90 – 2.21)	1.93 ± 0.22 (1.43 – 2.16)	NA	NA
Trypsin Inhibitor TIU/mg DW	12.30 ± 3.00a (6.03 – 16.4)	12.38 ± 2.27a (8.69 – 16.58)	12.01 ± 1.58a (9.14 – 15.13)	11.45 ± 4.59 (5.03 – 19.64)	48.33 (19.59 – 118.68)	NA
Vitamins						
Folic Acid µg/100 g DW	330 ± 71a (216 – 456)	267 ± 31b (201 – 327)	270 ± 42b (183 – 338)	291 ± 63 (205 – 403)	360 (240 – 470)	NA
α-tocopherol mg/100 g DW	3.04 ± 0.48b (2.33 – 4.44)	3.44 ± 0.54a (2.86 – 4.86)	3.49 ± 0.61a (2.63 – 4.69)	3.22 ± 0.65 (2.45 – 4.61)	NA	NA
β-tocopherol mg/100 g DW	0.60 ± 0.21b (0.20 – 1.01)	0.90 ± 0.18a (0.58 – 1.32)	0.90 ± 0.17a (0.58 – 1.22)	0.70 ± 0.26 (0.12 – 1.08)	NA	NA
γ-tocopherol mg/100 g DW	16.51 ± 1.88a (11.62 – 20.83)	15.83 ± 1.45b (12.50 – 17.69)	15.81 ± 1.60b (12.31- 18.84)	16.28 ± 2.65 (12.68 – 20.88)	NA	NA
δ-tocopherol mg/100 g DW	6.18 ± 0.94b (4.41 -7.53)	6.49 ± 0.97a (4.85 – 8.15)	6.56 ± 1.00a (4.9 – 7.99)	6.09 ± 0.56 (5.31 – 7.42)	NA	NA
Total tocopherol mg/100 g DW	26.18 ± 2.68a (19.26 – 31.54)	26.57 ± 2.12a (21.59 – 29.61)	26.75 ± 2.38a (21.95 – 31.12)	26.32 ± 2.82 (21.68 – 31.03)	NA	NA
Vitamin B1 mg/100 g DW	0.65 ± 0.12a (0.44 – 0.86)	0.51 ± 0.07b (0.40 – 0.67)	0.52 ± 0.10b (0.34 – 0.78)	0.58 ± 0.10 (0.42 – 0.71)	0.20 (0.10 – 0.25)	NA

Table 11 continued.

Analyte (unit)	Isoline	CV127	CV127+Imi	Conv. Stds.	Global	Brazilian
Vitamin E IU/100 g DW	6 ± 1a (5 – 8)	7 ± 1a (6 – 8)	7 ± 1a (5 – 8)	6 ± 1 (5 – 8)	NA	NA
Vitamin E mg/100 g DW	5.51 ± 0.63b (4.11 – 7.21)	5.88 ± 0.61a (5.05 – 7.30)	5.91 ± 0.66a (4.68 – 7.16)	5.70 ± 0.67 (4.95 – 7.05)	1.91 (0.19 – 6.17)	3.44 (1.36 – 6.17)
Isoflavones						
Total Daidzein mg/100 g DW	72.2 ± 14.6b (48.4 – 106.6)	52.8 ± 7.2a (41.2 – 67.7)	52.4 ± 7.4a (41.4 – 72.4)	81.3 ± 8.8 (66.2 – 96.2)	86.3 (6.0 – 245.4)	51.0 (6.0 – 112.9)
Total Genistein mg/100 g DW	101.7 ± 21.3b (57.1 – 153.4)	86.1 ± 19.1a (56.9 – 138)	83.4 ± 14.4a (60.2 – 121.0)	134.5 ± 16.8 (102.8 – 166.6)	97.9 (14.4 – 283.7)	65.2 (14.4 – 135.7)
Total Glycitein mg/100 g DW	22.3 ± 3.2a (14.9 – 31.4)	21.7 ± 2.8a (16.6 – 27.5)	21.7 ± 4.0a (14.6 – 30.2)	49.2 ± 9.9 (36.3 – 75.4)	16.1 (1.5 – 31.0)	13.3 (1.5 – 26.4)
Phospholipids						
Phosphatidyl ethanolamine mg/g fat	101.9 ± 10.3a (89.7 – 127.9)	92.6 ± 11.8b (51.0 – 110.3)	90.9 ± 15.5b (57.9 – 108.9)	98.2 ± 9.7 (79.4 – 113.7)	NA	NA
Phosphatidic acid mg/g fat	4.0 ± 1.5a (1.8 – 6.9)	2.8 ± 1.0b (0.8 – 4.6)	2.9 ± 1.0b (1.0 – 4.7)	4.1 ± 1.7 (2.1 – 7.5)	NA	NA
Phosphatidyl inositol mg/g fat	11.8 ± 1.1a (10.1 – 14.2)	9.8 ± 1.0b (6.8 – 11.0)	9.6 ± 1.5b (6.1 – 11.2)	12.3 ± 0.7 (11.4 – 13.5)	NA	NA
Phosphatidyl choline mg/g fat	29.3 ± 3.5a (24.9 – 38.5)	27.0 ± 3.9b (14.9- 34.1)	26.4 ± 4.8b (15.9 – 32.3)	30.7 ± 3.4 (25.6 – 38.2)	NA	NA

*Numbers followed by the same letter are not statistically significantly different at $p < 0.05$.
^NA = not available, [1]Carbohydrates including total dietary fiber.

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Compositional Analysis of Grain from Imidazolinone-Tolerant Soybean BPS-CV127-9 Produced in Brazil in 2007 and Comparison with that from Isoline Control and Conventional Soybean Varieties

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STATEMENT OF NO DATA CONFIDENTIALITY CLAIMS

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: BASF Plant Science, LLC

Company Agent: James Ligon Date: 5 Feb 2009

Title: Regulatory Affairs Manager

Signature: James M. Ligon

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STATEMENT OF COMPLIANCE

This study was not conducted in compliance with the requirements of 40 CFR Part 160.

The data generated by ITAL on behalf of BASF Plant Science in support of product safety comply with generally accepted scientific procedures. ITAL is an ISO 9001 compliant laboratory. Record keeping is consistent with procedures used throughout the research community. This report accurately presents the raw data developed during the study.

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ABBREVIATIONS AND DEFINITIONS

ADF	Acid detergent fiber
AHAS	Acetohydroxyacid synthase
AOAC	American Organization of Analytical Chemists
AOCS	American Oil Chemists Society
CF	Crude fiber
DW	Dry weight
FW	Fresh weight
HPLC	High pressure liquid chromatography
HU	Hemagglutinating units
ICP-OES	Inductively coupled plasma-optical emission spectroscopy
ILSI	International Life Science Institute
ITAL	Instituto de Technologia de Alimentos
NDF	Neutral detergent fiber
PBS	Phosphate buffered saline

Compositional Analysis of Grain from Imidazolinone-Tolerant Soybean BPS-CV127-9 Produced in Brazil in 2007 and Comparison with that from Isoline Control and Conventional Soybean Varieties

SUMMARY

Soybean (*Glycine max* L.) plants have been developed by BASF Plant Science, L.L.C (BPS) and EMBRAPA (Empresa Brasileira de Pesquisa Agropecuaria) that are tolerant to the imidazolinone class of agricultural herbicides. The herbicide-tolerant soybean plants BPS-CV127-9 (hereafter referred to as BPS-CV127-9) were produced by introduction of an imidazolinone-tolerant acetohydroxyacid synthase large subunit (*ahasl*) from *Arabidopsis thaliana* into the soybean plant genome. The herbicide tolerance in BPS-CV127-9 will allow growers to treat the soybean crop with imidazolinone herbicides without causing injury to the plant at normal field application rates. Therefore, introduction of BPS-CV127-9 offers soybean growers an additional tool for controlling weeds. An important component of the safety assessment of BPS-CV127-9 is to demonstrate that the nutrient and antinutrient composition of the grain is equivalent to that of the isoline control variety as well as other conventional commercial soybean varieties, thereby confirming that BPS-CV127-9 grain is appropriate for use in soybean food and feed products. Analytes, including proximates, fatty acids, amino acids, minerals, vitamins, antinutrients (including phytate, trypsin inhibitor, stachyose, raffinose, urease and lectin), fiber (total dietary, crude, acid and neutral detergent fibers), isoflavones, and phospholipids, were quantitated in BPS-CV127-9 grain, and compared with that found in the isoline, nontransgenic, conventional soybean control and two other commercial conventional varieties. The grain was produced from plants grown in replicated field trials at four locations in Brazil during the Safrinha season in 2007. The field trials were conducted at sites located near Santo Antonio de Goiás, Teresina, Vilhena, and Brasilia. Grain compositional analyses showed that BPS-CV127-9 is compositionally equivalent to the isoline control. Where minor differences in amounts of individual nutritional constituents were detected between the grain of BPS-CV127-9 and that of the conventional isoline control, these were most likely due to small genetic differences between BPS-CV127-9 and the control resulting from the inherent genetic heterogeneity of the original transformed soybean variety Conquista. However, where differences in component levels were observed between BPS-CV127-9 and the isoline control, the values for BPS-CV127-9 were either comparable to the commercial conventional soybean varieties grown in the same field trials and/or were within or comparable to the range of values for conventional soybeans published in the International Life Sciences Institute (ILSI), 2006, Crop Composition Database.

In summary, these compositional analyses demonstrate that the introduction of the *ahas* gene from *Arabidopsis thaliana* into the soybean genome, together with treatment by imidazolinone herbicide on BPS-CV127-9 does not impact the nutritional composition of grain produced by BPS-CV127-9. Results of these

analyses demonstrate that grain from BPS-CV127-9 is compositionally equivalent to, and as nutritious as, grain from the isoline control as well as other conventional soybean varieties.

INTRODUCTION

Soybean (*Glycine max* L.) plants have been developed that are tolerant to the imidazolinone class of agricultural herbicides. The herbicide-tolerant soybean plants, referred to as BPS-CV127-9, were produced by introduction of an imidazolinone-tolerant acetohydroxyacid synthase large subunit (*ahasl*) gene from *Arabidopsis thaliana* into the soybean plant genome via biolistics. Acetohydroxyacid synthase (AHAS) is a key enzyme in plants, bacteria, and fungi that is required for the biosynthesis of the branched-chain amino acids valine, leucine, and isoleucine. Herbicides of the imidazolinone class, function by binding near the active site of the catalytic AHAS large subunit, thereby preventing normal functioning of the enzyme (Pang *et al*., 2002). Several *ahas* genes encoding AHAS enzymes that are tolerant to imidazolinone herbicides have been discovered in plants through mutagenesis and selection and have been used to create imidazolinone-tolerant maize (*Zea mays* L.), rice (*Oryza sativa* L.), wheat (*Triticum aestivum* L.), oilseed rape (*Brassica napus* and *B. juncea* L.), and sunflower (*Helianthus annuus* L.). These crops were developed through mutagenesis, selection, and conventional breeding technologies and have been commercialized under the Clearfield® brand name since 1992. There are five single point mutations in *ahas* genes that have been found to result in tolerance to imidazolinones in plants (Tan *et al*., 2005). One of these, a mutation that results in a substitution of a serine residue with an asparagine at position 653 (relative to the AHAS enzyme from *Arabidopsis thaliana*), is known to result in tolerance to imidazolinone herbicides with no cross-tolerance to other AHAS inhibitors (Lee *et al*., 1999). The imidazolinone-tolerant AHAS large subunit *csr1-2* gene (Sathasivan *et al*., 1990) from *Arabidopsis thaliana* that has the S653N mutation was transformed into soybean (*Glycine max* L.) plants with the native *A. thaliana* promoter, to produce soybean plants that are tolerant to imidazolinone herbicides. This has led to the development of BPS-CV127-9 by BASF and EMBRAPA.

Soybean has many uses in animal and human nutrition. The grain is typically processed to two commodity products, oil and meal. The defatted toasted meal is commonly used in livestock feed. The various soybean protein fractions derived from processing nontoasted defatted soybean meal are used in different human foods. Also, the soybean oil is used in different food products including cooking oil and salad dressings. Therefore, the purpose of the current study was to demonstrate that the grain of BPS-CV127-9, treated or nontreated with an imidazolinone herbicide, is substantially equivalent in composition to grain from the isoline and other conventional soybean varieties, and that BPS-CV127-9 grain is appropriate for use in animal feed and human foods. The grain was produced from plants grown in replicated field trials at four locations in Brazil during the short growing season in 2007. The components analyzed included: proximates, fatty acids, amino acids, minerals, vitamins, antinutrients (including phytate, trypsin inhibitor, stachyose, raffinose, urease and lectin), fiber (total dietary, crude, acid and neutral detergent fibers), isoflavones, and phospholipids. The results of analyses were subjected to

statistical analysis and values for BPS-CV127-9 were compared to the isoline control and to the commercial conventional varieties as well as compared to the composition means and ranges reported in the ILSI Crop Composition Database (Version 3).

MATERIALS AND METHODS

Grain source. Imidazolinone treated and nontreated BPS-CV127-9 plants (abbreviated as CV127+Imi and CV127, respectively in the data Tables) together with a null segregant isoline control variety and two other conventional standard soybean varieties [Monsoy 8001 (Std 1) and Coodetec 217 (Std 2), respectively] were grown at four locations in Brazil during the 2007 short growing season (March - July). The field trials were conducted at sites located near Santo Antonio de Goiás, Teresina, Vilhena, and Brasilia. The plants were grown under standard agronomic practices in a complete randomized block design with four replicate blocks per location. With the exception of the BPS-CV127-9 plants treated with the imidazolinone herbicide at 70 g/ai/ha, all other entries in the study were treated with Bentazon + Acifluorfen-sodium (commercial name Volt) at the rate of 1.0 liters/ha. The grain was harvested at the conclusion of the growing season and approximately 2 kg of each replicate grain sample was shipped to the Instituto de Technologia de Alimentos (ITAL) in Campinas, Brazil, for compositional analysis. For the two conventional standard soybean reference varieties, the same grain harvest and separation procedures were followed, but approximately 500 g of grain was further sub-sampled from each 2 kg replicate grain sample, and the four 500 g replicate samples for each standard reference variety from each field location were pooled to make a single sample from each location for compositional analyses. Therefore, statistical analyses of the compositional data were only conducted for the CV127 and isoline control treatments, and data from the two conventional standard soybean reference varieties were used for comparative purposes to establish a range of natural variability for each analyte for soybeans grown in Brazil. Results were recorded on a fresh weight basis (FW) and adjusted for moisture content and recorded on a dry weight (DW) basis. Except for moisture, statistical analysis was conducted using the dry weight data.

Analytical methods. *Ash.* The method used was based on AOAC International (2000) method 945.38 C. The sample was placed in an electric furnace at 550°C and ignited to drive off all volatile organic matter. The nonvolatile matter remaining was quantitated gravimetrically and calculated to determine percent ash. The limit of quantitation for this study was 0.1% FW.

Carbohydrates. The method used was based on the USDA Agriculture Handbook No. 8 (1963) method. The total carbohydrate level was calculated by difference using the fresh weight-derived data and the following equation: % carbohydrates = 100% - (% protein + % fat + % moisture + % ash). The limit of quantitation for this study was 0.1% FW.

Fat by Butt Extraction. The method used was based on AOAC International (2000) method 945.38 F. The sample was weighed into a cellulose thimble. Petroleum ether was dripped through the sample to remove the fat. The extract was then evaporated, dried, and weighed. The limit of quantitation for this study was 0.1% FW.

Moisture. The method used was based on AOCS International (1998) methods Bc 2-49. The sample was dried in a forced draft oven at 130°C to a constant weight. The moisture weight loss was determined and converted to percent moisture. The limit of quantitation for this study was 0.1% FW.

Protein. The method used was based on AOAC International (2000) method 979.09. Nitrogenous compounds in the sample were reduced in the presence of boiling sulfuric acid and a $CuSO_4 + K_2SO_4 + Se$ mixture to form ammonia. The acid digest was made alkaline. The ammonia was distilled and then titrated with a standard acid. The percent nitrogen was calculated and converted to protein using the factor 6.25. The limit of quantitation for this study was 0.1% FW.

Amino Acid Composition. The method used was based on Spackman *et al*. (1958). This method estimates the levels of 18 amino acids in the sample: alanine, arginine, aspartic acid (including asparagine), cystine (including cysteine), glutamic acid (including glutamine), glycine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, proline, serine, threonine, tryptophan, tyrosine, and valine. This was accomplished through direct acid hydrolysis with 6N hydrochloric acid. Once hydrolyzed, the individual amino acids were then quantified using an automated amino acid analyzer detected at 520 nm. The reference standards were 2.5 µmol/mL per amino acid with the exception of cystine, 1.25 µmol/mL, (Pierce, Rockford, IL). Tryptophan analysis was based on the method of Spies (1967), by measuring the absorbance at 590 nm following direct enzymatic hydrolysis with pronase at 40ºC for 24 hours. The reference standard was L-tryptophan >99% (used as 100%, Sigma Chemical Co., St. Louis, MO). The limit of quantitation for this study was 0.1 mg/g FW sample.

Crude Fiber (CF). Crude fiber was measured as the loss on ignition of dried residue remaining after digestion of the sample with 1.25% solutions of sulfuric acid and sodium hydroxide according to the method of Diemar (1963). The limit of quantitation for this study was 0.1 g/100 g FW sample.

Acid Detergent Fiber (ADF). The method was based on AOAC International (1975) method 7.057. The sample was placed in a fritted vessel and washed with an acidic boiling detergent solution that dissolved the protein, carbohydrate, and ash. After an acetone wash to remove the fats and pigments; the lignocellulose fraction was collected on the frit and quantitated gravimetrically. The limit of quantitation for this study was 0.1% FW.

Neutral Detergent Fiber (NDF). The method used for sample preparation was the AOAC International (1995) method 920.85. Analysis for NDF was performed on the samples using the method of Van Soest *et al*. (1991). Samples were placed in a fritted vessel and washed with a neutral boiling detergent solution that dissolved the protein, carbohydrate, enzyme, and ash. After an acetone wash to remove the fats and pigments, the hemicellulose, cellulose, and lignin fractions were collected on the frit and quantitated gravimetrically. The limit of quantitation for this study was 0.1% FW.

Total Dietary Fiber. The method was based on AOAC International (2000) method 985.29. The finely ground sample was gelatinized with Termamyl and then

enzymatically digested with protease and amyloglucosidase to remove protein and starch. Four volumes of 95% ethyl alcohol were added to precipitate soluble dietary fiber. The total residues were filtered and washed consecutively with 78% ethyl alcohol, 95% ethyl alcohol, and acetone. After drying, the residue was weighed. One duplicate was then analyzed for protein, and the other was incinerated at 525ºC for ash determination. Total dietary fiber = weight residue – weight (protein + ash) – blank (containing enzymes only). The limit of quantitation for this study was 0.1% FW.

Fatty Acids. The method used was based on AOCS (1998) method Ce 1-62, Ce 1f-96, Ce 1e-91 that estimates the levels of fatty acids in the samples. The lipid was extracted and saponified with 0.5 N sodium hydroxide in methanol. The mixture was methylated with a solution of NH_4Cl and H_2SO_4 in methanol based on Hartman and Lago (1973). The resulting methyl esters were extracted with hexane. The methyl esters of the fatty acids were analyzed by gas chromatography using area normalization for quantitation. The 37 Component FAME mix from Supelco (Sigma) was used as reference standards. The limit of quantitation for this study was 0.01% FW.

Isoflavones. The method used was based on Berhow (2002). The defatted sample was extracted using an aqueous solution of 70% ethanol with 0.1% acetic acid. The extract was centrifuged and filtered. The sample was analyzed on a high-performance liquid chromatography (HPLC) system with a diode array detector. Isoflavones were quantified using an external standard curve of known standards. The limit of quantification for each component was 0.3 mg/100 g FW sample.

Phospholipids. The method used was based on Beare-Rogers *et al*. (1992). Lipids were extracted from the sample by a mixture of chloroform-methanol (2:1). Phospholipids or lecithins were purified by solid phase extraction on a silica column. Separation and quantification of lecithins were accomplished by normal phase liquid chromatography with UV detection. The limit of quantitation for phospholipids was 0.1 mg/g oil.

Lectin. The method used was based on Wititsuwannakul *et al.* (1998). 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 2% erythrocyte (from dog blood) suspension was added to an equal volume of the sample and the mixture incubated at 37ºC for 30 minutes followed by another 30 minute incubation at room temperature. The last well to show visible agglutination was considered the point of equivalence. One hemagglutinating unit (HU) was defined as the reciprocal of dilution at the point of equivalence, the specific activity being given as one hemagglutunating unit per µg or mg of protein (HU) in the undiluted sample. The minimum dose was defined as the minimum concentration necessary to show visible agglutination. These assays are only semiquantitative and should be regarded as liable to an error of 25%.

Minerals. The method used was based on AOAC International (2005) methods 985.35e and 984.27. The sample was placed in an electric furnace at 450°C and ignited to drive off all volatile organic matter. The minerals remaining were

quantitated by inductively coupled plasma-optical emission spectroscopy (ICP-OES). The limit of quantitation for this study was 0.01 mg/kg FW sample for all minerals.

Phytate. The method used was based on Latta and Eskin (1980). The sample was extracted using 2.4% HCl. Purification and concentration was conducted using an anion exchange column (Dowex-1 AGX-4, 100-200 mesh). Sample and standards were submitted to a color reaction with Wade reagent, with the absorbance measured at 500 nm. Inositol hexaphosporic acid was used as a standard. The limit of quantitation for this study was 0.75 mg/g FW sample.

Sugars (Raffinose and Stachyose). The method used was based on Cicek (2001) and Kennedy *et al.* (1985). Sugars were extracted from the sample with ethanol + deionized water (1:1). Proteins and lipids which co-extracted were eliminated by precipitation, followed by filtration. Raffinose and stachyose were separated and quantified by HPLC with a refractive index detector. The limit of quantification for this study was 0.2 g/100 g FW sample.

Trypsin Inhibitor. The method used was based on Rackis *et al*. (1974). Trypsin inhibitor units (TIU) were determined by photometrically measuring the inhibition of the trypsin cleavage of benzoyl-DL-arginine-p-nitroanalide hydrochloride. The sample was ground and/or defatted with petroleum ether, if necessary. A sample of matrix was extracted for 3 hours with 0.1 N sodium hydroxide. Varying aliquots of the sample suspension were exposed to a known amount of trypsin and benzoy1-DL-arginine-p-nitroanalide hydrochloride. The sample was allowed to react for 10 minutes at 37°C. After 10 minutes, the reaction was quenched by the addition of 30% trichloroacetic acid. The solution was filtered or centrifuged and the absorbance at 410 nm was measured. The limit of quantitation for this study was 1.00 TIU/mg FW sample.

Urease Activity. The method was based on AOCS (1998) method Ba 9-58. This assay is based on an increase in pH as ammonia is released from urea by residual urease enzyme in the soy meal. The urease activity was assayed by measuring the hydrolysis of 3% urea at pH 7.0 at 37º C. A difference between the pH of the test sample and the pH of the blank is an indication and index of urease activity. The optimum pH increase has generally been considered to be 0.05–0.30.

Folates. The method is based on a microbiological assay with the use of microplates and *Lactobacillus casei* subspecies *rhamnosus* – ATCC 7469, and the use of the VitaFast Folic Acid kit from r-Biopharm. The antioxidants 2-mercaptoethanol and ascorbic acid were used in all preparation stages of the extract. The samples were hydrolyzed in an autoclave with potassium dihydrogen phosphate 0.1 M pH 6.8, followed by consecutive enzymatic hydrolysis. Each enzyme was inactivated by boiling the sample before addition of the next enzyme. The enzymes used were: α-amylase for 3 hours, protease for 3 hours, and folate conjugase for 5 hours. After the necessary dilutions, the extracts were applied in the microplates. After the addition of the samples, the plate was kept in a chamber at 37ºC for 44-48 hours and the quantification of the turbidity in the microplates was measured at 630 nm in a microplate reader. Quantitation was by comparison to a standard curve. The limit of quantitation for this study was 0.1 µg/g FW sample.

Vitamin E (Tocopherols). The samples were saponificated at 90-95ºC with reflux using nitrogen forced through the condenser, with potassium hydroxide and with the antioxidant, ascorbic acid. The extraction of the non-saponifiable material was completed with diethyl ether. The diethyl ether extract was concentrated in a rotary evaporator at 40ºC, dried under nitrogen and the residue was dissolved in n-hexane. The tocopherols were separated by HPLC over a Lichrospher Si60 (125x4mm) column, (Merck, Germany). The mobile phase consisted of n-hexane, ethyl acetate, and n-propyl alcohol in an isocratic system. The detection and quantification was accomplished using a fluorescence detector with excitation at 294 nm and emission at 326 nm. The limit of quantitation for this study was 0.05 mg/g FW sample.

Vitamin Niacin. For the extraction of the niacin, the samples were first hydrolyzed by 1 N sulfuric acid hydrolysis in an autoclave for 30 minutes. The pH was adjusted to 4.5 with 10 N sodium hydroxide, as recommended by the AOAC International (2005), method 961.14. The extracts were passed over an ion-exchange resin prior to HPLC on a Lichrospher 100RP18 (250 x 4mm) column (Merck). The mobile phase consisted of heptanesulfonic acid sodium salt, triethylamine, potassium dihydrogen phosphate, and methanol in a gradient system. Niacin was monitored at 265 nm. The limit of quantification for this study was 0.50 mg/100 g FW sample.

Vitamins B1 (Thiamin) and B2 (Riboflavin). For the extraction of the vitamins, the samples were hydrolyzed with 0.01 N hydrochloric acid in an autoclave for 15 minutes, the pH was adjusted to 4.5 with sodium acetate. Enzymatic hydrolysis using diastase and papain was carried out for 12 hours at room temperature, as recommended by AOAC methods (2005) 970.65 and 942.23. Extracts were subjected to HPLC using a Lichrospher 100RP18 (250x4mm) column (Merck). The mobile phase consisted of potassium chloride, methanol, and water in an isocratic system. A fluorescence detector was used to monitor the natural fluorescence of the riboflavin (excitation 432nm and emission 545nm) and after oxidation of thiamine to thiochrome (362nm for excitation and 464nm for emission). The limit of quantitation for this study Vitamin B1 was 0.03 mg/g FW sample. The limit of quantification for this study for vitamin B2 was 0.02 mg/100 g FW sample.

Statistical analysis. Analysis of variance was carried out on the data using SAS Version 9.1 (SAS Institute Inc., Cary, NC) following two procedures, the General Linear Model and the Mixed Model. With the exception of moisture content, all data were expressed on a dry weight basis for statistical analyses. Differences were assessed across location and by location. The model for across location:

y = variety + location + variety x location + block(location) + e
Random effects: location, variety x location, block(location).
Where y is the response variable (any analyte measured)

The model for separate analyses by location:

y = variety + block + e
where e is the response error

Contrasts were carried out to compare each of the imidazolinone (+ imi) and without imidazolinone BPS-CV127-9 treatments with the isoline control. Differences were considered statistically significant at the 0.05 confidence level.

RESULTS AND DISCUSSION

Proximate composition. Grain samples were analyzed for moisture, total dietary fiber, protein, fat and ash content. The carbohydrate composition and calorie values were calculated. The results on a fresh weight/as is basis are shown in Table 1. The results on a dry weight basis are shown in Table 2 and except for the description of the moisture data, all discussion of the results refers to data on a dry weight basis that is presented in Table 2. The means and ranges of the values for proximates in the CV127 treatments and the isoline control across all field trial locations in comparison with means and ranges of the conventional standard soybean varieties as well as means and ranges published in the ILSI Crop Composition Database are presented in Table 11. Grain moisture levels in the CV127 and CV127+Imi treatments were statistically significantly different from the isoline control for either both or one of the two treatments at each of the four field trial locations. Grain moisture levels were typically higher for the CV127 treatments compared to the isoline control, but were lower at the Brasilia site. When data were analyzed across field trial locations, moisture levels in CV127 grain were not statistically significantly different from levels in the isoline control, whereas grain moisture levels in the CV127+Imi treatment were slightly but statistically significantly higher compared to levels in the isoline control. The herbicide treatment may have had a slight effect on moisture loss during grain maturity. However, grain moisture levels for both CV127 soybean treatments were comparable to and within the range of moisture levels in grain of the conventional standard soybean varieties, and within the range of moisture levels reported in the ILSI Crop Composition Database for soybeans grown both globally as well as for soybeans produced in Brazil (Table 11).

For the other proximate components (total dietary fiber, protein, fat, ash, carbohydrates and calories), there were no statistically significant differences in grain ash levels between either of the CV127 soybean treatments and the isoline control at any of the field trial locations. For the other analytes, there were a few instances of statistically significant differences between either one or both of the CV127 soybean treatments and the isoline control at individual field trial locations, but these differences were not consistent at each location. When data were analyzed across field trial locations, levels of ash, total dietary fiber, carbohydrates and calories in grain of both CV127 soybean treatments were not statistically significantly different from levels in the isoline control, and were comparable to and within the range of these analyte levels in grain of the conventional standard soybean varieties, and within the range of these analyte levels reported in the ILSI Crop Composition Database for soybeans grown both globally as well as for soybeans produced in Brazil (Table 11). Grain protein levels for the CV127+Imi treatment were slightly but statistically significantly higher compared to levels in the isoline control, whereas, no statistically significant differences were observed between the CV127 treatment and the isoline control for this analyte. In contrast, there were no statistically significant differences in grain fat levels between the CV127+Imi treatment and the isoline

control, but levels of fat in grain of the CV127 soybean treatment were slightly, but statistically significantly higher compared to levels in the isoline control. However, mean levels of protein and fat in grain of the CV127 treatments were comparable to and within the range of these analyte levels in grain of the conventional standard soybean varieties grown in the same field trials, and within the range of these analyte levels reported in the ILSI Crop Composition Database for soybeans in both the global category as well as for soybeans produced in Brazil (Table 11). Finally, values for proximates were comparable between the CV127+Imi and the CV127 treatments, showing that the herbicide application did not have a significant effect on grain proximate composition. Overall, these results show that grain produced by BPS-CV127-9, either treated with imidazolinone herbicide or with conventional herbicides, is comparable to and in the same range as conventional soybean varieties with a history of safe food and feed uses as well as safety to the environment, with respect to moisture, total dietary fiber, protein, fat, ash, carbohydrates and calories levels.

Fiber composition. Grain samples were analyzed for crude fiber (CF), acid detergent fiber (ADF) and neutral detergent fiber (NDF). Results are shown on a dry weight basis in Table 3 for each field trial location, and in Table 11 for analysis of data across field trial locations as well as comparison of values for the CV127 and isoline control treatments to values for the conventional standard soybean varieties grown in the same field trials and to values for theses analytes from the ILSI Crop Composition Database. There were no statistically significant differences in grain CF levels between either CV127+Imi or CV127 treatments and the isoline control at three of the four field trial sites. However CF was statistically significantly higher at the Teresina location in both the CV127+Imi and CV127 treatments as compared to the isoline control. When analyzed across all field trial locations, there were no statistically significant differences in grain CF levels between either CV127+Imi or CV127 treatments and the isoline control (Table 11). The grain ADF levels for the CV127+Imi treatment were statistically significantly higher at two locations and lower at one location compared to levels in the isoline control grain, and levels were statistically significantly lower in the CV127 treatment compared to levels in the isoline control at one location. The grain NDF values for both CV127 treatments were not statistically significantly different from the isoline control at any of the field trial locations except grain levels of this analyte for the CV127+Imi treatment were statistically significantly higher at one location compared to levels for the isoline control. When data were analyzed across field trial locations, there were no statistically significant differences in grain levels of ADF between either of the CV127 soybean treatments and the isoline control, and there were no statistically significant differences in NDF levels between the CV127 treatment and the isoline control. Grain NDF levels were statistically significantly higher in the CV127+Imi treatment compared to levels in grain of the isoline control (Table 11). In general, values for CF, ADF and NDF were comparable between the CV127+Imi and the CV127 treatments, showing that the herbicide application did not have a significant effect on grain fiber composition. For all locations, the CF, ADF and NDF values for the CV127+Imi and CV127 treatments were comparable to and within the range of values for the two conventional standard soybeans commonly grown commercially in Brazil (Tables 3 and 11). Furthermore, the means and ranges of the values for CF, ADF and NDF in BPS-CV127-9 (both CV127+Imi and CV127 treatments) across all field trial locations were within the range of these analyte levels reported in the ILSI

Crop Composition Database for soybeans in the global category as well as for soybeans produced in Brazil (Table 11). These results show that grain fiber produced by BPS-CV127-9, either treated with imidazolinone herbicide or with conventional herbicides, is comparable to the isoline control and in the same range as grain fiber content of conventional soybean varieties with a history of safe food and feed uses as well as safety to the environment.

Antinutrients. The antinutrients examined included raffinose, stachyose, trypsin inhibitor, urease, lectin, and phytate. The results are summarized for each field site in Table 4, and in Table 11 for data analysis across field trial locations as well as comparison of values for the CV127 and isoline control treatments to values for the conventional standard soybean varieties grown in the same field trials and to values for these analytes from the ILSI Crop Composition Database. In three of the four field trial locations there were no statistically significant differences in grain raffinose levels between either of the CV127 treatments compared to the isoline control. At one field trial location, the raffinose content was slightly but statistically significantly lower in the CV127 treatments as compared to the isoline control. When data were analyzed across field trial locations, there were no statistically significant differences in grain raffinose levels between the CV127+Imi and isoline control treatments, but levels were statistically significantly lower in grain of the CV127 treatment compared to levels in grain of the isoline control (Table 11). In general, values for raffinose were comparable between the CV127+Imi and the CV127 treatments, showing that the herbicide application did not have a significant effect on grain raffinose composition. For all locations, the grain raffinose levels for the CV127 treatments were comparable to and within the range of values for the two conventional standard soybeans commonly grown commercially in Brazil (Tables 4 and 11). The grain raffinose content in both the isoline control and in both CV127 treatments was higher than the range for this analyte reported in the global category of the ILSI Crop Composition Database (Table 11), but levels were comparable to the raffinose content of both conventional standard soybean varieties produced in the same field trials in Brazil, indicating that the higher grain raffinose levels are most likely a characteristic of Brazilian soybean varieties.

At three of the four field trial locations, the grain stachyose content was statistically significantly lower for the CV127+Imi treatment compared to the isoline control, and at two of the four field trial locations levels of stachyose in the CV127 treatment were statistically significantly lower compared to the isoline control. These differences were also observed in the across field location analysis of the data (Table 11). However, levels of stachyose in grain of both CV127+Imi and the CV127 treatments were comparable and within the range of values for grain of the conventional standard soybean varieties that were produced in the same field trials in Brazil, and were higher than the range for this analyte as reported in the global category of the ILSI Crop Composition Database (Table 11), thus indicating that like raffinose, this is a characteristic of Brazilian soybean varieties. Grain stachyose levels were comparable between the CV127+Imi and the CV127 treatments, showing that the herbicide application did not have a significant effect on grain stachyose composition.

At all locations except for one (Vilhena) the grain trypsin inhibitor content of both CV127 treatments was not statistically significantly different from the isoline control

(Table 4). Furthermore, when data were analyzed across field trial locations, levels of trypsin inhibitor in grain of both CV127+Imi and the CV127 treatments were not statistically significantly different from levels in grain of the isoline control (Table 11). Furthermore, levels of trypsin inhibitor in grain of both CV127 treatments were comparable to and within the range of levels for both conventional standard soybean varieties that were produced in the same field trials in Brazil. Also, mean levels of trypsin inhibitor in both CV127 treatments and the isoline control were comparable to one another and were lower than the range reported in the global category of the ILSI Crop Composition Database (Table 11), indicating that the lower trypsin inhibitor levels may be a characteristic of Brazilian soybean varieties. Grain trypsin inhibitor levels were comparable between the CV127+Imi and the CV127 treatments, showing that the herbicide application did not have a significant effect on grain trypsin inhibitor composition.

At all locations except for one, Teresina, the urease content was not statistically significantly different between grain from CV127+Imi or CV127 treatments and the isoline control. Similarly, there were no statistically significant differences between either of the CV127 treatments and the isoline control in the across field location data analysis (Table 11). Also, urease levels in grain of both CV127 treatments were similar to and within the range of levels for the conventional standard soybean varieties used as comparators in the field trials. Also, grain urease levels were comparable between the CV127+Imi and the CV127 treatments, showing that the herbicide application did not have a significant effect on grain urease composition.

At three of the four field trial locations, the lectin levels in CV127+Imi, and at two locations for the CV127 treatments, were statistically significantly different (lower) from levels in grain of the isoline control (Table 4). Furthermore, when data were analyzed across field trial locations, grain lectin levels of both CV127+Imi and the CV127 treatments were statistically significantly lower from levels in grain of the isoline control (Table 11). However, grain lectin levels in both CV127 treatments were within the range of levels in the conventional soybean varieties that were produced in the same field trials in Brazil. Also, the mean lectin levels in grain of both CV127 treatments were within the range for this analyte for soybeans produced in Brazil, but slightly lower than the range for soybeans in the global category of the ILSI Crop Composition Database (Table 11). The lectin method has an intrinsic 25% error associated with it. Grain lectin levels were comparable between the CV127+Imi and the CV127 treatments, showing that the herbicide application did not have a significant effect on grain lectin composition.

There were no statistically significant differences in grain phytate levels between the CV127 treatments and the isoline control except at the Vilhena location for the CV127+Imi treatment and at the Santo Antonio de Goiás location for the CV127 treatment, where grain of the CV127 treatments had statistically significantly higher levels of phytate compared to that of the isoline control (Table 4). Also, when data were analyzed across field trial locations, there were no statistically significant differences in grain phytate levels between either of the CV127 treatments and the isoline control (Table 11). The mean phytate values for CV127+Imi, CV127 and the isoline control across locations were comparable to one another and to levels in the conventional standard soybean varieties that were produced in the same field trials in

Brazil, and phytate mean values were lower than the range for this antinutrient as reported in the ILSI Crop Composition Database for soybeans globally (Table 11). This indicates that the lower phytate levels may be a characteristic of Brazilian soybean varieties. Finally, grain phytate levels were comparable between the CV127+Imi and the CV127 treatments, showing that the herbicide application did not have a significant effect on grain phytate composition.

Overall, comparing antinutrient levels in both CV127 soybean treatments to levels in the isoline control and the conventional standard soybean varieties included in the field trials, these results show that antinutrient levels in grain produced by CV127 soybeans are comparable to and in the same range as antinutrient levels in grain of the control as well as conventional soybean varieties cultivated in Brazil that have a long history of safe food and feed uses and safety to the environment. The instances where grain antinutrient levels of CV127, the isoline control and the conventional standard soybean varieties differed from the range of levels reported in the global category of the ILSI Crop Composition Database are most likely due to characteristics of soybean varieties adapted for cultivation under tropical growing conditions in Brazil. Also, levels of antinutrients were comparable in the grain of both CV127 treatments, which shows that imidazolinone herbicide application to CV127 soybean does not have a significant effect on grain antinutrient composition.

Minerals. Five minerals, calcium, iron, phosphorous, magnesium, and potassium were quantified in soybean grain with the results presented on a dry weight basis in Table 5. Data analysis across field trial locations as well as comparison of values for the CV127 and isoline control treatments to values for the conventional standard soybean varieties grown in the same field trials and to values for these analytes from the ILSI Crop Composition Database are presented in Table 11. At three locations the calcium values were statistically higher in grain from CV127+Imi as compared to the isoline control, and at two of these locations the values were also statistically significantly higher for the CV127 treatment compared to the isoline control, while no statistically significant differences were observed between treatments for this analyte at the Brasilia field trial location. There were no statistically significant differences between the CV127 and isoline control treatments in grain iron content at two of the field trial locations, but values for iron were significantly lower for CV127+Imi at one location and significatnly higher for CV127 at another location compared to the isoline control. At three of the four field trial sites, there were no statistically significant differences in grain phosphorous content between the CV127 treatments and the isoline control. At the Santo Antonio de Goiás site grain phosphorus values for both CV127 soybean treatments were statistically significantly lower than the value for the isoline control. At all field locations, the grain magnesium values were statistically significantly higher for CV127+Imi compared to the isoline control grain, and at three of the four locations this was also true for grain from CV127 treated with conventional herbicide. At all but one location, the grain potassium values were statistically significantly higher for the BPS-CV127-9 treatments (CV127+Imi and CV127) as compared to values for the isoline control.

When mineral composition data were analyzed across field trial locations, all mineral mean values determined for grain from both CV127 soybean treatments were statistically significantly different from the mean values obtained for grain from the

isoline control soybean, except for grain iron content of the CV127+Imi treatment compared to the isoline control. However, for each of the five minerals measured, the mean and range of grain mineral values for both CV127 soybean treatments were either within or comparable to the range of values of the conventional standard soybean varieties cultivated in the same field trials as well as to the range of values reported globally for soybeans (Table 11). These results demonstrate that the mineral content in grain produced from CV127 soybean is comparable to, and in the same range as, the mineral content of grain of the isoline control as well as other conventional soybean varieties with a history of safe food and feed use as well as safety to the environment. Although a few statistically significant differences in grain mineral content were observed between the two CV127 treatments, in general grain mineral content of the two treatments were equivalent, and shows that imidazolinone herbicide application to CV127 soybean does not have a significant effect on grain mineral composition.

Amino Acids. Grain samples were analyzed for amino acid content and the results, on a dry weight basis are reported in Table 6**.** Data analysis across field trial locations as well as comparison of values for the CV127 and isoline control treatments to values for the conventional standard soybean varieties grown in the same field trials and to values for these analytes from the ILSI Crop Composition Database are presented in Table 11. At all the field trial locations, there were isolated instances of statistically significant differences in grain amino acid content between BPS-CV127-9 (both treatments CV127+Imi and CV127) and the isoline control. However, these differences were not consistent for any one amino acid across all field trial sites. In general, amino acid levels in grain of the CV127 and control treatments were comparable to the conventional comparator soybean varieties grown in the same field trials.

When amino acid levels were analyzed across all field locations, there were only isolated instances of statistically significant differences in grain amino acid levels between the CV127 treatments and isoline control (Table 11). For example, levels of histidine and valine were statistically significantly higher in the grain of the CV127 treatment compared to the isoline control. Similarly, there were statistically significantly higher levels of alanine in grain of the CV127+Imi treatment compared to the isoline control, and levels of tyrosine in grain of both CV127 treatments was statistically significantly lower compared to the isoline control. However, for each of the amino acids measured, the mean and range of grain amino acid values for both CV127 soybean treatments were either within or comparable to the range of values of the conventional standard soybean varieties cultivated in the same field trials as well as to the range of values reported for soybeans in the ILSI Crop Composition Database either in the global or Brazilian category (Table 11). The one exception was for histidine for which mean levels in the CV127 treatments were higher than the range reported in the ILSI Crop Composition Database. It is also important to note that there were no statistically significant differences in branched-chain amino acid content of the grain between BPS-CV127-9 and the isoline control when analyzed across field locations (Table 11). The AHAS enzyme catalyzes an important step in the biosynthesis of branched-chain amino acids valine, leucine and isoleucine, and the AHAS enzyme is under feedback regulation by these amino acids in plants. Results show that levels of these amino acids were not impacted by the expression of the

AtAHAS enzyme in soybean or by the application of imidazolinone herbicide to the plant, therefore confirming that the mutation conferring herbicide tolerance in the AtAHAS enzyme does not affect feedback regulation of the enzyme by the branched-chain amino acids in the soybean plant.

These results demonstrate that the amino acid content in grain produced from BPS-CV127-9 soybean is comparable to, and in the same range as, the amino acid content of grain of the isoline control as well as other conventional soybean varieties with a history of safe food and feed use as well as safety to the environment. In general, grain amino acid content of the two CV127 treatments were equivalent, and shows that imidazolinone herbicide application to BPS-CV127-9 soybean does not have a significant effect on grain mineral composition.

Vitamins. The tocopherols (α, β γ, δ and total tocopherols) together with Vitamins E, B1, folic acid, niacin, and riboflavin were analyzed in the soybean grain samples. Levels of niacin and riboflavin in the grain samples were below the level of detection for the assays, and are not reported. Vitamin E values in international units/100 g DW and as mg/100 g DW are reported together with the other vitamins (Table 7). The mean and range of values for vitamins in grain from both CV127 soybean treatments, the isoline control soybeans and the conventional soybean control treatments across all locations in comparison with the mean and ranges for vitamins in soybean grain published in the ILSI Crop Composition Database are shown in Table 11. Levels of all vitamins were comparable between grain of both CV127 treatments and the isoline control at all field trial locations. No differences between the CV127 and isoline control treatments were observed for Vitamin B1 at any location. Some statistically significant differences between the two CV127 treatments and the isoline control were observed at specific locations for the other vitamins, however, except for the tocopherol levels at Santo Antonio de Goiás where all but one of the tocopherols (α–tocopherol) were higher for the CV127 treatment, there were no trends of higher or lower values for the CV127 soybean treatments for all locations as compared to the isoline control. For no location were all vitamins statistically significantly different between the CV127 and isoline control soybean treatments.

When vitamin levels were analyzed across all field locations, there were no statistically significant differences in the mean vitamin content of grain from either of the CV127 soybean treatments compared to those from the isoline control except for β- and δ-tocopherols and vitamin E for the CV127 treatment compared to the isoline control, and α- and γ–tocopherols for the CV127+Imi treatment compared to the isoline control (Table 11). However, for each of the different vitamins measured, the mean and range of grain vitamin values for both CV127 soybean treatments were either within or comparable to the range of values of the conventional soybean varieties cultivated in the same field trials. Global ranges for typical vitamin values in soybean grain were only available for folic acid and vitamins B1 and E. The mean values of folic acid and vitamin E in grain from CV127 soybeans were within the ranges reported globally for soybeans in the ILSI composition database. In the case of vitamin B1, the grain from both CV127 soybean treatments, the isoline control as well as the conventional standard soybean varieties had higher values compared to the typical global range of values for this vitamin, and this may be a characteristic of soybean germplasm adapted for tropical growing conditions in Brazil. Overall, these

results demonstrate that vitamin levels in grain produced by CV127 soybean are comparable to and in the same range as vitamin levels in the grain of control as well as other conventional soybean varieties with a long history of safe food and feed use as well as safety to the environment. Although there were a few statistically significant differences in grain vitamin content observed between the two CV127 treatments, in general vitamin levels in grain of both treatments were comparable which shows that imidazolinone herbicide application to CV127 soybean does not have a significant effect on grain vitamin composition.

Fatty Acids. Grain samples were analyzed for fatty acid content and results for the most prevalent fatty acids are shown in Table 8. The nine most prevalent fatty acids are myristic, palmitic, stearic, oleic, linoleic, linolenic, arachidic, behenic, and tetracosanoic acids. The mean fatty acid values were compared within field locations and across locations. Some statistically significant differences in individual grain fatty acids levels were observed between the BPS-CV127-9 treatments and the isoline control (Tables 8 and 11), but there were no consistent differences between these treatments for levels of any individual fatty acid across field locations or for levels of all fatty acids at any one location. Furthermore, the mean and range of grain fatty acid levels for CV127+Imi, CV127, and the isoline control were either within or comparable to the ranges reported globally and from Brazil for soybeans in the ILSI Crop Composition Database (Table 11). Also, for all locations, the grain fatty acid values for the CV127+Imi and CV127 treatments were comparable to the values for the two conventional standard soybean varieties that are commercially cultivated in Brazil (Table 8). In addition, the values for fatty acids were comparable between grain from CV127+Imi and CV127, demonstrating that the different herbicide treatments had no significant impact on fatty acid composition. These results demonstrate that the fatty acid content in grain produced from BPS-CV127-9, either treated with imidazolinone herbicide or with conventional herbicides, is comparable to, and within the same range as, the fatty acid content of conventional soybean varieties with a history of safe food and feed use as well as safety to the environment.

Isoflavones. Grain samples were analyzed for their isoflavone composition and the results for the most prevalent, including daidzin, malonyl daidzin, daidzein, glycitin, malonyl glycitin, glycitein, genistin, malonyl genistin, and genistein, are reported on a dry weight basis in Table 9. The mean and range of values for the total isoflavones (total daidzein, total genistein, and total glycitein) in grain from both CV127 treatments, the isoline control soybeans and the conventional standard soybean varieties across all field trial locations in comparison with the mean and ranges for isoflavones in soybean grain published in the ILSI Crop Composition Database are shown in Table 11. Some statistically significant differences in individual grain isoflavone levels were observed between the two CV127 treatments and the isoline control (Tables 9), but there were no consistent differences between these treatments for levels of any individual isoflavone across all field locations or for levels of all isoflavones at any one location. The least variability was observed at the Teresina field location where in general the grain isoflavone values for all treatments were low compared to levels in grain of all treatments at the other field trial locations.

When the mean values of the total isoflavones (total daidzein, total genistein, and total glycitein) were compared across field trial locations, there were no statistically

significant differences in grain glycitein levels between the CV127 and isoline control treatments, but levels of this isoflavone were statistically significantly lower in grain of CV127+Imi compared to levels in the grain of the isoline control. Levels of total daidzein and genistein were statistically significantly lower in grain of both CV127 treatments compared to levels in the isoline control. However, for each of the isoflavones, the mean and range of isoflavone values for BPS-CV127-9 soybean grain were either within or comparable to the range of values of the conventional soybean varieties cultivated in the same field trials as well as to the range of values reported globally for soybeans and for soybeans produced in Brazil in the ILSI Crop Composition Database (Table 11). These results demonstrate that the isoflavone content in grain produced from BPS-CV127-9 soybean is comparable to, and in the same range as, the grain isoflavone content of the isoline control as well as conventional soybean varieties with a history of safe food and feed use as well as safety to the environment. There were no statistically significant differences in grain isoflavone content observed between the two CV127 treatments, which shows that imidazolinone herbicide application to CV127 soybean does not have a significant effect on grain isoflavone composition.

Phospholipids. Phospholipids are common contaminants during soybean oil processing, often referred to as gums in the solvent extracted oil. If not removed, the gum material typically settles out and can cause significant losses in oil refining. Therefore, phospholipid levels were analyzed in grain samples and the mean and range of values for phosphatidyl ethanolamine, phosphatidic acid, phosphatidyl inositol and phosphatidyl choline in grain from both CV127 treatments, the isoline control soybeans and the conventional standard soybean varieties for each individual field trial location are shown in Table 10. The mean and range of values for phospholipids in grain from both CV127 treatments and the isoline control soybeans in comparison with mean and ranges for the conventional standard soybean varieties across all field trial locations are shown in Table 11. Data were not available for these analytes in the ILSI Crop Composition Database. There were no statistically significant differences in grain phospholipid levels between the CV127 treatments and the isoline control, except for one instance for phosphatidic acid at the Teresina field location, where levels of this analyte in the CV127+Imi treatment were statistically significantly higher than levels in the isoline control. Also, for all locations, the grain phospholipid values for the CV127+Imi and CV127 treatments were comparable to the values for the two conventional standard soybeans grown in the same field trials and that are commercially cultivated in Brazil (Table 10).

When data were analyzed across field trial locations, there were no statistically significant differences in the mean phospholipid values of grain from both CV127 treatments and the isoline control soybeans, except for levels of phosphatidic acid levels that were slightly but statistically significantly higher in grain of the CV127+Imi treatment compared to levels in grain of the isoline control. However, levels of phospholipids in grain from both CV127 soybean treatments were comparable and within the range of values for those in grain produced by conventional soybean varieties that are commonly cultivated in Brazil and that have a long history of safe food and feed use and safety to the environment. Also, there was only one instance of a statistically significant difference in grain phospholipid content observed between the two CV127 treatments (phosphatidic acid), which shows that

imidazolinone herbicide application to CV127 soybean does not have a significant effect on grain phospholipid composition.

CONCLUSION

Soybean has many uses in animal and human nutrition. The grain is typically processed to two commodity products, oil and meal. The defatted toasted meal is commonly used in livestock feed as a valuable source of protein. The various soybean protein fractions derived from processing nontoasted defatted soybean meal are used in different human foods. Also, the soybean oil is used in different food products including cooking oil and salad dressings. An important component of the safety assessment of BPS-CV127-9 is to demonstrate that the nutrient and antinutrient composition of the grain is equivalent to that of the isoline control variety as well as other conventional commercial soybean varieties, thereby confirming that BPS-CV127-9 grain is appropriate for use in soybean food and feed products. The analytes measured (proximates, fatty acids, amino acids, minerals, vitamins, antinutrients, fiber, isoflavones, and phospholipids) are important nutrient and antinutrient components of soybean grain. The values of these analytes determined in BPS-CV127-9 grain were compared with those found in the isoline, nontransgenic, conventional soybean control and two other commercial conventional varieties adapted for commercial production in Brazil. Results of these compositional analyses showed that BPS-CV127-9 is compositionally equivalent to the isoline control. Where minor differences in amounts of individual nutritional constituents were detected between the grain of BPS-CV127-9 and that of the conventional isoline control, these were most likely due to small genetic differences between BPS-CV127-9 and the control resulting from the inherent genetic heterogeneity of the original transformed soybean variety Conquista. However, where differences in component levels were observed between BPS-CV127-9 and the isoline control, the values for BPS-CV127-9 were either comparable to the commercial conventional soybean varieties grown in the same field trials and/or were within or comparable to the range of values for conventional soybeans published in the ILSI Crop Composition Database.

In summary, these compositional analyses demonstrate that the introduction of the *ahas* gene from *Arabidopsis thaliana* that encodes an imidazolinone-tolerant AHAS enzyme in the soybean genome, together with treatment by imidazolinone herbicide on BPS-CV127-9 does not impact the nutritional composition of grain produced by BPS-CV127-9. Results of these analyses demonstrate that grain from BPS-CV127-9 is compositionally equivalent to, and as nutritious as, grain from the isoline control as well as other conventional soybean varieties.

RECORDS RETENTION: Raw data, the original copy of this report, and other relevant records are archived at BASF, 26 Davis Drive. Research Triangle Park, NC, USA 27709.

STUDY PERSONNEL: Statistical analysis work reported herein conducted by Hongmei Jia, Ph.D., BASF Plant Science, LLC, Research Triangle Park, NC 27705.

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Table 1. Proximate Composition of Grain on a Fresh Weight Basis of Soybean BPS-CV127-9 Treatments (CV127 and CV127+Imi), the Isoline Control and Two Conventional Soybean Varieties (Std 1 and Std 2) Grown at Four Locations in Brazil in the 2007 Season

Location	Treatment	N	Moisture	Total Dietary Fiber	Protein	Fat	Ash	Carbohydrates	Calories
			Mean ± Standard Deviation (range) g/100 g fresh weight						
Santo Antonio de Goiás	Isoline	4	7.7 ± 0.3 (7.6 – 8.1)	19.68 ± 1.96 (17.51 – 21.73)	37.8 ± 0.5 (37.2 – 38.2)	16.7 ± 0.3 (16.4 – 17.2)	4.8 ± 0.2 (4.7 – 5.0)	13.3 ± 1.8 (11.9 – 15.6)	355 ± 7 (346 – 363)
	CV127	4	8.1 ± 0.1* (8.0 – 8.2)	22.20 ± 0.66 (21.36 – 22.96)	37.8 ± 0.5 (37.0 – 38.1)	17.6 ± 0.4 (17.3 – 18.1)	4.9 ± 0.1 (4.8 – 4.9)	9.5 ± 0.6 (8.9 – 10.2)	325 ± 45 (258 – 351)
	CV127 +Imi	4	8.1 ± 0.2* (7.9 – 8.2)	23.23 ± 1.54 (22.14 – 25.49)	37.6 ± 0.4 (37.1 – 38.0)	17.9 ± 0.2 (17.7 – 18.2)	4.8 ± 0.1 (4.7 – 4.8)	8.4 ± 1.5 (6.3 – 9.6)	345 ± 7 (335 – 350)
	Std 1	1	7.9	20.16	38.1	15.6	4.8	13.4	346
	Std 2	1	7.7	21.35	37.6	17.8	4.8	10.8	354
Teresina	Isoline	3	7.4 ± 0.2 (7.2 – 7.5)	22.55 ± 1.62 (20.78 – 23.95)	36.5 ± 1.1 (35.5 – 37.7)	21.7 ± 0.5 (21.2 – 22.0)	5.2 ± 0.1 (5.1 – 5.3)	6.7 ± 1.0 (5.8 – 7.8)	368 ± 5 (363 – 373)
	CV127	3	7.6 ± 0.2 (7.4 – 7.8)	22.98 ± 1.84 (20.92 – 24.45)	35.8 ± 1.3 (34.3 – 36.8)	22.3 ± 0.6 (21.7 – 22.9)	5.1 ± 0.2 (4.9 – 5.3)	6.2 ± 1.6 (4.9 – 8.0)	369 ± 8 (363 – 378)
	CV127 +Imi	3	7.8 ± 0.2* (7.6 – 7.9)	24.08 ± 3.45 (20.09 – 26.19)	37.5 ± 0.9 (36.6 – 38.3)	20.9 ± 1.2 (19.9 – 22.3)	5.1 ± 0.2 (4.9 – 5.2)	4.7 ± 3.3 (2.6 – 8.5)	357 ± 21 (344 – 382)
	Std 1	1	7.5	22.02	36.9	20.7	5.1	7.8	365
	Std 2	1	7.0	25.36	34.7	23.3	5.1	4.5	367

Table 1. continued.

Location	Treatment	N	Moisture	Total Dietary Fiber	Protein	Fat	Ash	Carbohydrates	Calories
			Mean ± Standard Deviation (range) g/100 g fresh weight						
Vilhena	Isoline	4	7.4 ± 0.2 (7.1 – 7.5)	24.29 ± 1.47 (22.44 – 25.94)	36.6 ± 0.4 (36.2 – 36.9)	19.5 ± 0.2 (19.2 – 19.8)	4.7 ± 0.1 (4.7 – 4.8)	7.6 ± 1.4 (6.0 – 9.3)	352 ± 4 (347 – 357)
	CV127	4	7.8 ± 0.1* (7.7 – 7.9)	22.70 ± 0.79 (22.14 – 23.82)	36.1 ± 0.6 (35.5 – 36.8)	19.6 ± 0.4 (19.2 – 20.0)	4.8 ± 0.1 (4.7 – 4.8)	9.1 ± 0.9 (7.7 – 9.7)	357 ± 4 (351 – 361)
	CV127 +Imi	4	7.8 ± 0* (7.8)	20.98 ± 1.47 (19.70 – 23.10)	37.0 ± 0.7 (36.2 – 37.6)	19.2 ± 0.4 (18.7 – 19.5)	4.7 ± 0.1 (4.6 – 4.7)	10.4 ± 1.3 (8.7 – 11.6)	363 ± 4 (356 – 365)
	Std 1	1	7.8	22.33	38.7	16.8	4.8	9.6	345
	Std 2	1	7.4	24.60	35.6	20.8	4.6	7.0	358
Brasília	Isoline	4	8.1 ± 0.1 (7.9 – 8.2)	24.12 ± 1.02 (23.3 – 25.61)	33.9 ± 0.4 (33.4 – 34.4)	17.5 ± 0.2 (17.3 – 17.7)	4.7 ± 0.2 (4.4 – 4.9)	11.8 ± 1.0 (10.6 – 12.9)	340 ± 6 (332 – 344)
	CV127	4	7.9 ± 0.1* (7.8 – 8.0)	23.34 ± 0.75 (22.72 – 24.43)	34.9 ± 0.5 (34.5 – 35.7)	17.5 ± 0.2 (17.3 – 17.7)	4.6 ± 0.2 (4.4 – 4.8)	11.8 ± 0.8 (10.7 – 12.6)	344 ± 4 (339 – 347)
	CV127 +Imi	4	7.9 ± 0* (7.9)	22.90 ± 1.77 (21.09 – 25.30)	34.5 ± 0.6 (33.8 – 35.3)	17.9 ± 0.4 (17.4 – 18.2)	4.6 ± 0.2 (4.3 – 4.7)	12.3 ± 1.6 (10.0 – 13.7)	349 ± 7 (339 – 357)
	Std 1	1	8.2	23.90	33.8	18.1	4.5	11.5	344
	Std 2	1	8.0	24.70	34.3	18.7	4.7	9.6	344

*****Statistically significantly different from the isoline nontransgenic comparator at $p \leq 0.05$.

Table 2. Proximate Composition of Grain on a Dry Weight Basis of Soybean BPS-CV127-9 Treatments (CV127 and CV127+Imi), the Isoline Control and Two Conventional Soybean Varieties (Std 1 and Std 2) Grown at Four Locations in Brazil in the 2007 Season

Location	Treatment	N	Total Dietary Fiber	Protein	Fat	Ash	Carbohydrates	Calories
			Mean ± Standard Deviation (range) g/100 g dry weight					
Santo Antonio de Goiás	Isoline	4	21.33 ± 2.11 (18.94 – 23.52)	41.0 ± 0.6 (40.3 – 41.6)	18.1 ± 0.4 (17.7 – 18.6)	5.2 ± 0.2 (5.1 – 5.4)	14.5 ± 1.9 (12.9 – 16.9)	385 ± 9 (374 – 393)
	CV127	4	24.14 ± 0.70* (23.26 – 24.95)	41.1 ± 0.6 (40.2 – 41.5)	19.1 ± 0.4* (18.8 – 19.7)	5.3 ± 0.1 (5.2 – 5.3)	10.3 ± 0.8* (9.3 – 11.1)	354 ± 48 (281 – 382)
	CV127 +Imi	4	25.27 ± 1.69* (24.12 – 27.76)	40.9 ± 0.4 (40.4 – 41.3)	19.5 ± 0.2* (19.3 – 19.8)	5.2 ± 0.1 (5.1 – 5.2)	9.2 ± 1.6* (6.9 – 10.5)	375 ± 7 (365 – 381)
	Std 1	1	21.88	41.4	16.9	5.2	14.6	377
	Std 2	1	23.13	40.7	19.3	5.2	11.7	384
Teresina	Isoline	3	24.34 ± 1.75 (22.44 – 25.89)	39.4 ± 1.2 (38.4 – 40.7)	23.5 ± 0.5 (22.9 – 23.8)	5.6 ± 0.1 (5.5 – 5.7)	7.2 ± 1.1 (6.3 – 8.4)	398 ± 6 (392 – 403)
	CV127	3	24.86 ± 1.99 (22.62 – 26.40)	38.7 ± 1.5 (37.0 – 39.9)	24.1 ± 0.6 (23.5 – 24.7)	5.5 ± 0.2 (5.3 – 5.7)	6.7 ± 1.7 (5.3 – 8.6)	399 ± 8 (394 – 409)
	CV127 +Imi	3	26.12 ± 3.79 (21.74 – 28.43)	40.6 ± 1.0 (39.6 – 41.6)	22.7 ± 1.3 (21.6 – 24.1)	5.5 ± 0.2 (5.3 – 5.6)	5.0 ± 3.6 (2.8 – 9.2)	388 ± 22 (376 – 374)
	Std 1	1	23.80	39.9	22.4	5.5	8.4	394
	Std 2	1	27.26	37.3	25.1	5.5	4.8	395

Table 2. continued.

Location	Treatment	N	Total Dietary Fiber	Protein	Fat	Ash	Carbohydrates	Calories
			Mean ± Standard Deviation (range) g/100 g dry weight					
Vilhena	Isoline	4	26.21 ± 1.56 (24.26 – 28.01)	39.5 ± 0.4 (39.1 – 39.9)	21.1 ± 0.2 (20.8 – 21.4)	5.1 ± 0.1 (5.1 – 5.2)	8.2 ± 1.5 (6.5 – 10.1)	380 ± 5 (378 – 386)
	CV127	4	24.61 ± 0.84 (24.01 – 25.80)	39.2 ± 0.7 (38.5 – 39.9)	21.3 ± 0.4 (20.8 – 21.7)	5.2 ± 0.1 (5.1 – 5.2)	9.9 ± 1.0 (8.3 – 10.5)	387 ± 5 (380 – 391)
	CV127 +Imi	4	22.76 ± 1.59* (21.37 – 25.05)	40.1 ± 0.8 (39.3 – 40.8)	20.8 ± 0.4 (20.3 – 21.1)	5.1 ± 0.1 (5.0 – 5.1)	11.3 ± 1.4* (9.4 – 12.6)	393 ± 5* (386 – 396)
	Std 1	1	24.22	42.0	18.2	5.2	10.4	374
	Std 2	1	26.57	38.4	22.5	5.0	7.6	387
Brasília	Isoline	4	26.23 ± 1.14 (25.29 – 27.89)	36.9 ± 0.5 (36.4 – 37.4)	19.0 ± 0.2 (18.8 – 19.2)	5.1 ± 0.2 (4.8 – 5.3)	12.8 ± 1.0 (11.5 – 14.0)	370 ± 6 (362 – 374)
	CV127	4	25.34 ± 0.83 (24.66 – 26.55)	37.9 ± 0.6* (37.4 – 38.8)	19.0 ± 0.2 (18.8 – 19.2)	5.0 ± 0.2 (4.8 – 5.2)	12.7 ± 0.8 (11.6 – 13.4)	374 ± 4 (368 – 376)
	CV127 +Imi	4	24.86 ± 1.92 (22.90 – 27.46)	37.4 ± 0.7 (36.7 – 38.3)	19.5 ± 0.4* (18.9 – 19.8)	5.0 ± 0.2 (4.7 – 5.1)	13.4 ± 1.7 (10.9 – 14.9)	379 ± 8 (368 – 388)
	Std 1	1	26.03	36.8	19.7	4.9	12.5	375
	Std 2	1	26.84	37.3	20.3	5.1	10.4	374

*****Statistically significantly different from the isoline nontransgenic comparator at $p \leq 0.05$.

Table 3. Fiber Composition of Grain on a Dry Weight Basis of Soybean BPS-CV127-9 Treatments (CV127 and CV127+Imi), the Isoline Control and Two Conventional Soybean Varieties (Std 1 and Std 2) Grown at Four Locations in Brazil in the 2007 Season

Location	Treatment	N	Crude Fiber	Acid Detergent Fiber	Neutral Detergent Fiber
			Mean ± Standard Deviation (range) g/100 g dry weight		
Santo Antonio de Goiás	Isoline	4	8.1 ± 1.7 (6.9 – 10.6)	9.63 ± 0.95 (8.53 – 10.73)	14.84 ± 0.85 (13.58 – 15.44)
	CV127	4	7.6 ± 0.5 (7.1 – 8.3)	10.21 ± 0.56 (9.61 – 10.93)	14.66 ± 0.55 (14.02 – 15.35)
	CV127 +Imi	4	9.1 ± 3.7 (6.8 – 14.7)	11.01 ± 0.73* (9.96 – 11.65)	16.17 ± 0.83* (15.17 – 16.98)
	Std 1	1	12.1	11.73	15.23
	Std 2	1	7.2	11.61	16.18
Teresina	Isoline	3	7.6 ± 0.8 (6.7 – 8.1)	10.29 ± 0.59 (9.61 – 10.70)	15.10 ± 0.97 (14.03 – 15.93)
	CV127	3	8.9 ± 0.7* (8.5 – 9.7)	10.58 ± 0.66 (9.88 – 11.19)	15.68 ± 1.07 (15.04 – 16.91)
	CV127 +Imi	3	9.0 ± 0.1* (8.9 – 9.1)	13.00 ± 0.52* (12.41 – 13.40)	16.75 ± 1.64 (14.96 – 18.17)
	Std 1	1	7.8	9.94	15.59
	Std 2	1	7.4	12.08	12.26
Vilhena	Isoline	4	7.6 ± 1.0 (6.7 – 8.5)	10.94 ± 1.21 (9.26 – 12.05)	12.32 ± 1.80 (11.32 – 15.02)
	CV127	4	7.8 ± 0.4 (7.3 – 8.3)	8.92 ± 0.90* (8.09 – 9.78)	12.67 ± 0.63 (11.86 – 13.32)
	CV127 +Imi	4	7.4 ± 0.9 (6.2 – 8.1)	8.57 ± 1.06* (7.35 – 9.81)	13.16 ± 0.49 (12.53 – 13.66)
	Std 1	1	8.4	8.89	12.72
	Std 2	1	7.6	12.59	12.70
Brasília	Isoline	4	8.1 ± 0.8 (7.2 – 8.9)	10.14 ± 1.23 (8.73 – 11.70)	14.30 ± 1.19 (12.67 – 15.50)
	CV127	4	7.8 ± 0.7 (7.2 – 8.5)	9.16 ± 0.63 (8.37 – 9.86)	14.32 ± 0.55 (13.73 – 15.05)
	CV127 +Imi	4	7.3 ± 0.4 (6.7 – 7.6)	10.03 ± 0.48 (9.44 – 10.57)	14.85 ± 1.36 (13.43 – 16.68)
	Std 1	1	7.7	10.84	15.00
	Std 2	1	7.3	11.22	13.23

*****Statistically significantly different from the isoline nontransgenic comparator at $p \leq 0.05$.

Table 4. Antinutrient Composition of Grain on a Dry Weight Basis of Soybean BPS-CV127-9 Treatments (CV127 and CV127+Imi), the Isoline Control and Two Conventional Soybean Varieties (Std 1 and Std 2) Grown at Four Locations in Brazil in the 2007 Season

Location	Treatment	N	Raffinose g/100 g dry wt.	Stachyose g/100 g dry wt.	Trypsin Inhib. TIU/mg dry wt.	Urease ΔpH	Lectin HU/mg dry wt.	Phytate mg/g dry wt.
			Mean ± Standard Deviation (range)					
Santo Antonio de Goiás	Isoline	4	1.4 ± 0.1 (1.2 – 1.5)	4.2 ± 0.1 (4.1 – 4.2)	13.38 ± 1.15 (11.88 – 14.68)	1.81 ± 0.09 (1.71 – 1.92)	1.31 ± 0.03 (1.28 – 1.34)	2.70 ± 0.85 (1.89 – 3.72)
	CV127	4	1.2 ± 0.1* (1.1 – 1.2)	3.9 ± 0.1* (3.7 – 4.0)	13.84 ± 0.52 (13.05 – 14.13)	1.78 ± 0.10 (1.69 – 1.91)	0.94 ± 0.46 (0.33 – 1.29)	4.29 ± 1.05* (3.06 – 5.62)
	CV127 +Imi	4	1.2 ± 0.1* (1.1 – 1.3)	3.9 ± 0.1* (3.8 – 4.0)	13.27 ± 0.67 (12.46 – 14.05)	1.84 ± 0.09 (1.75 – 1.95)	0.57 ± 0.49* (0.22 – 1.29)	3.81 ± 0.74 (2.75 – 4.32)
	Std 1	1	1.4	4.8	13.62	1.92	0.67	5.04
	Std 2	1	1.2	4.0	16.76	1.74	1.66	2.52
Teresina	Isoline	3	1.4 ± 0.1 (1.3 – 1.4)	3.4 ± 0.3 (3.0 – 3.6)	10.02 ± 1.33 (8.48 – 10.82)	2.04 ± 0.02 (2.03 – 2.06)	1.46 ± 0.22 (1.33 – 1.72)	4.57 ± 1.83 (2.50 – 6.00)
	CV127	3	1.3 ± 0 (1.3)	3.2 ± 0.2 (3.0 – 3.4)	9.64 ± 1.47 (8.16 – 11.09)	1.95 ± 0.02* (1.94 – 1.97)	1.71 ± 0 (1.71)	3.13 ± 0.39 (2.90 – 3.58)
	CV127 +Imi	3	1.5 ± 0.3 (1.2 – 1.7)	2.6 ± 0.3* (2.4 – 3.0)	10.31 ± 2.53 (7.82 – 12.87)	1.96 ± 0.02* (1.94 – 1.97)	2.29 ± 0.99 (1.71 – 3.43)	3.09 ± 0.41 (2.63 – 3.38)
	Std 1	1	1.5	3.8	9.84	1.98	1.34	2.48
	Std 2	1	1.4	3.1	12.56	2.02	2.67	4.73

Table 4. continued.

Location	Treatment	N	Raffinose g/100 g dry wt.	Stachyose g/100 g dry wt.	Trypsin Inhib. TIU/mg dry wt.	Urease ΔpH	Lectin HU/mg dry wt.	Phytate mg/g dry wt.
			Mean ± Standard Deviation (range)					
Vilhena	Isoline	4	1.3 ± 0.2 (1.2 – 1.5)	4.0 ± 0.3 (3.7 – 4.3)	14.25 ± 2.52 (12.44 – 17.97)	0.40 ± 0.15 (0.28 – 0.61)	1.50 ± 0.43 (0.85 – 1.71)	3.23 ± 0.55 (2.81 – 4.01)
	CV127	4	1.2 ± 0.1 (1.1 – 1.3)	3.8 ± 0.3 (3.4 – 4.0)	17.30 ± 0.99* (16.28 – 18.20)	0.67 ± 0.25 (0.41– 0.91)	0.17 ± 0* (0.17)	3.92 ± 1.17 (2.66 – 5.49)
	CV127 +Imi	4	1.2 ± 0.1 (1.1 – 1.3)	3.9 ± 0.1 (3.7 – 4.0)	17.49 ± 0.36* (17.22 – 18.03)	0.65 ± 0.17 (0.49 – 0.87)	0.13 ± 0.03* (0.11 – 0.17)	4.57 ± 0.31* (4.12 – 4.77)
	Std 1	1	1.2	4.4	14.61	1.16	1.71	4.79
	Std 2	1	1.4	3.7	16.66	0.27	1.71	2.37
Brasília	Isoline	4	1.1 ± 0.1 (1.0 – 1.1)	4.4 ± 0.2 (4.2 – 4.6)	14.21 ± 0.39 (13.90 – 14.73)	2.00 ± 0.02 (1.98 – 2.03)	2.47 ± 1.13 (1.29 – 3.43)	3.25 ± 0.90 (2.19 – 4.19)
	CV127	4	1.0 ± 0.1 (0.9 – 1.1)	4.0 ± 0.1* (3.9 – 4.2)	13.08 ± 0.48 (12.45 – 13.57)	1.98 ± 0.02 (1.96 – 2.00)	0.75 ± 0.54* (0.26 – 1.37)	4.31 ± 1.80 (2.57 – 6.22)
	CV127 +Imi	4	1.0 ± 0.1 (0.9 – 1.1)	3.9 ± 0.1* (3.8 – 4.1)	13.26 ± 1.35 (11.35 – 14.44)	1.98 ± 0.05 (1.93 – 2.03)	1.03 ± 0.84* (0.34 – 2.06)	3.59 ± 0.33 (3.17 – 3.98)
	Std 1	1	1.1	4.8	14.91	1.98	1.72	5.44
	Std 2	1	1.3	4.3	13.18	2.02	1.72	5.14

*****Statistically significantly different from the isoline nontransgenic comparator at $p \leq 0.05$.

Table 5. Mineral Composition of Grain on a Dry Weight Basis of Soybean BPS-CV127-9 Treatments (CV127 and CV127+Imi), the Isoline Control and Two Conventional Soybean Varieties (Std 1 and Std 2) Grown at Four Locations in Brazil in the 2007 Season

Location	Treatment	N	Calcium	Iron	Phosphorus	Magnesium	Potassium
			Mean ± Standard Deviation (range) mg/100 g dry weight				
Santo Antonio de Goiás	Isoline	4	235 ± 14 (223 – 252)	8.67 ± 0.44 (8.24 – 9.24)	831 ± 14 (817 – 845)	240 ± 5 (235 – 245)	1643 ± 37 (1593 – 1676)
	CV127	4	267 ± 13* (255 – 279)	9.63 ± 1.08 (8.64 – 10.93)	739 ± 21* (719 – 769)	268 ± 9* (258 – 279)	1794 ± 18* (1775 – 1810)
	CV127+Imi	4	256 ± 9* (244 – 264)	9.03 ± 0.25 (8.70 – 9.26)	706 ± 41* (654 – 743)	275 ± 10* (268 – 289)	1760 ± 118* (1599 – 1875)
	Std 1	1	192	8.68	793	230	1631
	Std 2	1	213	9.98	808	255	1595
Teresina	Isoline	3	354 ± 8 (345 – 359)	8.44 ± 0.41 (7.98 – 8.77)	758 ± 20 (735 – 771)	258 ± 7 (252 – 266)	1983 ± 76 (1910 – 2061)
	CV127	3	377 ± 48 (332 – 427)	8.44 ± 0.32 (8.23 – 8.81)	711 ± 63 (672 – 784)	277 ± 14 (261 – 288)	2018 ± 56 (1970 – 2079)
	CV127+Imi	3	448 ± 61* (377 – 484)	8.45 ± 0.49 (7.90 – 8.81)	797 ± 70 (733 – 871)	296 ± 14* (280 – 308)	1933 ± 95 (1832 – 2021)
	Std 1	1	329	7.93	734	264	2033
	Std 2	1	323	8.27	703	279	1911

Table 5. continued.

Location	Treatment	N	Calcium	Iron	Phosphorus	Magnesium	Potassium
			Mean ± Standard Deviation (range) mg/100 g dry weight				
Vilhena	Isoline	4	234 ± 5 (230 – 242)	9.90 ± 0.84 (8.96 – 10.90)	704 ± 52 (655 – 752)	243 ± 12 (231 – 258)	1693 ± 32 (1666 – 1739)
	CV127	4	273 ± 13* (257 – 287)	12.10 ± 0.99* (10.70 – 13.00)	708 ± 35 (679 – 759)	287 ± 18* (270 – 309)	1821 ± 101* (1713 – 1945)
	CV127+Imi	4	275 ± 17* (260 – 297)	10.33 ± 0.99 (9.00 – 11.40)	753 ± 14 (741 – 770)	304 ± 6* (296 – 309)	1894 ± 22* (1875 – 1926)
	Std 1	1	231	14.13	790	246	1815
	Std 2	1	224	12.23	614	293	1630
Brasília	Isoline	4	188 ± 11 (172 – 194)	9.47 ± 0.26 (9.23 – 9.80)	778 ± 47 (708 – 809)	218 ± 7 (211 – 227)	1715 ± 80 (1645– 1831)
	CV127	4	205 ± 17 (190 – 228)	9.01 ± 0.49 (8.60 – 9.70)	707 ± 38 (654 – 736)	276 ± 3* (271 - 279)	1911 ± 16* (1894 – 1930)
	CV127+Imi	4	206 ± 11 (198 – 223)	8.63 ± 0.60* (7.80 – 9.20)	690 ± 90 (580 – 799)	277 ± 9* (270 – 289)	1887 ± 96* (1796 – 2001)
	Std 1	1	167	9.43	754	223	1708
	Std 2	1	195	10.60	755	253	1738

*****Statistically significantly different from the isoline nontransgenic comparator at $p \leq 0.05$.

Table 6. Amino Acid Composition of Grain on a Dry Weight Basis of Soybean BPS-CV127-9 Treatments (CV127 and CV127+Imi), the Isoline Control and Two Conventional Soybean Varieties (Std 1 and Std 2) Grown at Four Locations in Brazil in the 2007 Season

Location/Treatment	N	Asp	Thr	Ser	Glu	Pro	Gly	Ala	Cys	Val
		Mean ± Standard Deviation (range) g/100 g dry weight								
Santo Antonio de Goiás										
Isoline	4	4.50 ± 0.17 (4.26 – 4.66)	1.46 ± 0.05 (1.41 – 1.50)	1.95 ± 0.09 (1.83 – 2.05)	7.30 ± 0.16 (7.06 – 7.41)	1.85 ± 0.09 (1.76 – 1.95)	1.62 ± 0.06 (1.55 – 1.68)	1.69 ± 0.02 (1.67 – 1.71)	0.54 ± 0.02 (0.51 – 0.56)	1.77 ± 0.05 (1.72 – 1.83)
CV127	4	4.48 ± 0.20 (4.23 – 4.68)	1.47 ± 0.11 (1.35 – 1.62)	1.92 ± 0.06 (1.85 – 1.99)	7.18 ± 0.28 (6.84 – 7.52)	1.86 ± 0.09 (1.80 – 1.99)	1.59 ± 0.08 (1.50 – 1.69)	1.67 ± 0.16 (1.52 – 1.90)	0.46 ± 0.05 (0.41 – 0.52)	1.72 ± 0.09 (1.63 – 1.84)
CV127+Imi	4	4.50 ± 0.11 (4.41 – 4.65)	1.50 ± 0.12 (1.39 – 1.67)	1.93 ± 0.05 (1.86 – 1.97)	7.23 ± 0.19 (7.00 – 7.46)	1.67 ± 0.38 (1.11– 1.88)	1.65 ± 0.13 (1.53 – 1.83)	1.69 ± 0.13 (1.54 – 1.86)	0.45 ± 0.09 (0.34 – 0.53)	1.73 ± 0.11 (1.56 – 1.79)
Std 1	1	4.77	1.51	2.05	7.54	1.87	1.72	1.74	0.53	1.83
Std 2	1	4.93	1.55	2.21	8.02	2.05	1.72	1.79	0.61	1.87
Teresina										
Isoline	3	4.43 ± 0.20 (4.20 – 4.57)	1.40 ± 0.05 (1.36 – 1.45)	1.90 ± 0.05 (1.85 – 1.95)	7.00 ± 0.28 (6.68 – 7.22)	1.80 ± 0.09 (1.70 – 1.86)	1.53 ± 0.03 (1.50 – 1.55)	1.51 ± 0.06 (1.45 – 1.56)	0.26 ± 0.02 (0.24 – 0.28)	1.41 ± 0.03 (1.37 – 1.43)
CV127	3	4.05 ± 0.14* (3.89 – 4.15)	1.17 ± 0.03* (1.15 – 1.21)	1.75 ± 0.05* (1.70 – 1.80)	6.35 ± 0.16* (6.20 – 6.51)	1.73 ± 0.08 (1.64 – 1.79)	1.42 ± 0.02* (1.41 – 1.44)	1.45 ± 0.06 (1.39 – 1.51)	0.28 ± 0.05 (0.25 – 0.34)	1.51 ± 0.02* (1.50 – 1.53)
CV127+Imi	3	4.38 ± 0.17 (4.19 – 4.52)	1.20 ± 0.03* (1.17 – 1.23)	1.74 ± 0.09* (1.65 – 1.82)	6.46 ± 0.27* (6.17 – 6.69)	1.75 ± 0.14 (1.62 – 1.89)	1.44 ± 0.04* (1.40 – 1.47)	1.66 ± 0.18 (1.46 – 1.82)	0.34 ± 0.09 (0.26 – 0.44)	1.54 ± 0.02* (1.51 – 1.55)
Std 1	1	5.06	1.34	1.91	8.55	2.05	1.60	1.58	0.25	1.38
Std 2	1	4.03	1.31	1.78	6.47	1.69	1.41	1.41	0.27	1.31

Table 6. continued.

Location/Treatment	N	Asp	Thr	Ser	Glu	Pro	Gly	Ala	Cys	Val
		Mean ± Standard Deviation (range) g/100 g dry weight								
Vilhena										
Isoline	4	4.20 ± 0.23 (3.91 – 4.41)	1.40 ± 0.10 (1.29 – 1.50)	1.85 ± 0.09 (1.73 – 1.93)	6.82 ± 0.35 (6.40 – 7.18)	1.77 ± 0.07 (1.70 – 1.85)	1.52 ± 0.09 (1.44 – 1.64)	1.48 ± 0.04 (1.43 – 1.51)	0.39 ± 0.07 (0.34 – 0.48)	1.58 ± 0.05 (1.50 – 1.61)
CV127	4	4.12 ± 0.16 (3.91 – 4.28)	1.37 ± 0.06 (1.31 – 1.44)	1.78 ± 0.06 (1.71 – 1.86)	6.73 ± 0.33 (6.34 – 7.11)	1.79 ± 0.06 (1.72 – 1.85)	1.42 ± 0.08 (1.34 – 1.52)	1.69 ± 0.09* (1.58 – 1.79)	0.41 ± 0.06 (0.35 – 0.49)	1.66 ± 0.06 (1.61 – 1.74)
CV127+Imi	4	4.27 ± 0.25 (4.01 – 4.59)	1.39 ± 0.05 (1.31 – 1.43)	1.83 ± 0.10 (1.71 – 1.95)	6.83 ± 0.29 (6.55 – 7.22)	1.84 ± 0.04 (1.79 – 1.88)	1.45 ± 0.16 (1.34 – 1.68)	1.66 ± 0.05* (1.58 – 1.70)	0.38 ± 0.10 (0.25 – 0.49)	1.62 ± 0.06 (1.53 – 1.66)
Std 1	1	4.66	1.47	2.00	7.51	2.03	1.61	1.57	0.36	1.65
Std 2	1	4.32	1.42	1.90	6.86	1.81	1.55	1.54	0.43	1.63
Brasília										
Isoline	4	3.63 ± 0.11 (3.50 – 3.73)	1.25 ± 0.03 (1.21 – 1.28)	1.61 ± 0.05 (1.54 – 1.66)	5.90 ± 0.16 (5.72 – 6.07)	1.56 ± 0.04 (1.50 – 1.60)	1.33 ± 0.05 (1.28 – 1.39)	1.37 ± 0.07 (1.29 – 1.45)	0.41 ± 0.07 (0.34 – 0.47)	1.45 ± 0.09 (1.35 – 1.54)
CV127	4	3.93 ± 0.41 (3.32 – 4.18)	1.33 ± 0.12 (1.14 – 1.40)	1.76 ± 0.13* (1.56 – 1.84)	6.29 ± 0.54 (5.49 – 6.63)	1.68 ± 0.10* (1.56 – 1.80)	1.45 ± 0.14 (1.24 - 1.55)	1.50 ± 0.12 (1.33 – 1.59)	0.47 ± 0.05 (0.43 – 0.54)	1.64 ± 0.12* (1.49 – 1.76)
CV127+Imi	4	4.03 ± 0.15 (3.85 – 4.17)	1.36 ± 0.06 (1.29 – 1.43)	1.79 ± 0.04* (1.74 – 1.82)	6.53 ± 0.08* (6.45 – 6.63)	1.69 ± 0.03* (1.65 – 1.72)	1.47 ± 0.06 (1.40 – 1.53)	1.49 ± 0.10 (1.38 – 1.61)	0.40 ± 0.08 (0.33 – 0.51)	1.56 ± 0.13 (1.41 – 1.73)
Std 1	1	4.11	1.38	1.84	6.57	1.75	1.53	1.58	0.54	1.72
Std 2	1	3.70	1.23	1.67	5.90	1.60	1.35	1.41	0.54	1.53

Table 6. continued

Location/Treatment	N	Met	Ile	Leu	Tyr	Phe	Lys	His	Arg	Trp
		Mean ± Standard Deviation (range) g/100 g dry weight								
Santo Antonio de Goiás										
Isoline	4	0.50 ± 0.03 (0.47– 0.54)	1.54 ± 0.05 (1.50 – 1.62)	2.79 ± 0.06 (2.72 – 2.86)	1.30 ± 0.04 (1.24 – 1.33)	1.89 ± 0.05 (1.82 – 1.94)	2.38 ± 0.06 (2.31 – 2.46)	1.29 ± 0.02 (1.27 – 1.32)	3.20 ± 0.11 (3.11 – 3.34)	0.66 ± 0.07 (0.57 – 0.74)
CV127	4	0.32 ± 0.12* (0.15 – 0.41)	1.60 ± 0.16 (1.46 – 1.83)	2.66 ± 0.15 (2.45 – 2.79)	1.22 ± 0.09 (1.12 – 1.33)	1.93 ± 0.16 (1.78 – 2.16)	2.43 ± 0.22 (2.27 – 2.76)	1.23 ± 0.18 (0.99 – 1.38)	3.10 ± 0.10 (2.98 – 3.22)	0.63 ± 0.09 (0.50 – 0.70)
CV127+Imi	4	0.46 ± 0.06 (0.40 – 0.50)	1.65 ± 0.22 (1.45 – 1.97)	2.75 ± 0.10 (2.66 – 2.85)	1.23 ± 0.11 (1.10 – 1.38)	1.84 ± 0.06 (1.78 – 1.90)	2.43 ± 0.13 (2.34 – 2.62)	1.21 ± 0.27 (0.91 – 1.52)	3.11 ± 0.03 (3.07 – 3.15)	0.62 ± 0.12 (0.51 – 0.76)
Std 1	1	0.47	1.57	2.92	1.39	1.96	2.45	1.29	3.45	0.61
Std 2	1	0.59	1.65	3.15	1.45	2.12	2.58	1.34	3.34	0.65
Teresina										
Isoline	3	0.15 ± 0.06 (0.08 – 0.20)	1.55 ± 0.04 (1.51 – 1.58)	2.53 ± 0.07 (2.46 – 2.60)	1.25 ± 0.03 (1.22 – 1.28)	1.82 ± 0.06 (1.77 – 1.88)	2.26 ± 0.08 (2.18 – 2.33)	0.82 ± 0.02 (0.80 – 0.83)	2.93 ± 0.11 (2.80 – 3.00)	0.61 ± 0.01 (0.60 – 0.62)
CV127	3	0.09 ± 0.03 (0.07 – 0.11)	1.46 ± 0.03 (1.43 – 1.48)	2.49 ± 0.04 (2.46 – 2.54)	1.09 ± 0.03* (1.05 – 1.11)	1.76 ± 0.02 (1.74 – 1.78)	2.16 ± 0.04 (2.12 – 2.20)	1.27 ± 0.08* (1.18 – 1.34)	2.62 ± 0.11* (2.51 – 2.73)	0.60 ± 0.04 (0.56 – 0.63)
CV127+Imi	3	0.20 ± 0.14 (0.09 – 0.36)	1.45 ± 0.07 (1.37 – 1.51)	2.50 ± 0.06 (2.44 – 2.55)	1.11 ± 0.03* (1.09 – 1.14)	1.77 ± 0.07 (1.69 – 1.81)	2.13 ± 0.13 (1.99 – 2.25)	1.18 ± 0.10* (1.10 – 1.29)	2.81 ± 0.09 (2.71 – 2.88)	0.61 ± 0.08 (0.55 – 0.70)
Std 1	1	ND	1.35	2.85	1.24	1.90	2.29	0.83	2.85	0.63
Std 2	1	0.12	1.47	2.39	1.16	1.71	2.09	0.73	2.65	0.64

Table 6. continued.

Location/ Treatment	N	Met	Ile	Leu	Tyr	Phe	Lys	His	Arg	Trp
		Mean ± Standard Deviation (range) g/100 g dry weight								
Vilhena										
Isoline	4	0.23 ± 0.18 (0.05 0.46)	1.49 ± 0.07 (1.43 – 1.58)	2.59 ± 0.09 (2.49 – 2.67)	1.17 ± 0.04 (1.13 – 1.22)	1.78 ± 0.06 (1.70 – 1.85)	2.32 ± 0.14 (2.16 – 2.47)	1.17 ± 0.08 (1.07 – 1.26)	2.80 ± 0.11 (2.66 – 2.90)	0.63 ± 0.05 (0.60 – 0.70)
CV127	4	0.41 ± 0.05 (0.37 – 0.47)	1.20 ± 0.11* (1.11 – 1.35)	2.69 ± 0.14 (2.54 – 2.86)	1.08 ± 0.04* (1.05 – 1.14)	1.78 ± 0.09 (1.68 – 1.90)	2.21 ± 0.06 (2.13 – 2.28)	1.85 ± 0.32* (1.40 – 2.09)	2.61 ± 0.08* (2.50 – 2.69)	0.69 ± 0.08 (0.60 – 0.76)
CV127+Imi	4	0.31 ± 0.16 (0.10 – 0.47)	1.21 ± 0.19* (1.08 – 1.48)	2.59 ± 0.03 (2.56 – 2.62)	1.09 ± 0.05* (1.02 – 1.14)	1.77 ± 0.06 (1.70 – 1.85)	2.27 ± 0.11 (2.17 – 2.41)	1.80 ± 0.43* (1.17 – 2.13)	2.68 ± 0.14 (2.53 – 2.86)	0.72 ± 0.11 (0.58 – 0.84)
Std 1	1	0.05	1.57	2.77	1.18	1.93	2.51	1.14	3.24	0.73
Std 2	1	0.14	1.53	2.72	1.19	1.90	2.36	1.23	2.84	0.72
Brasília										
Isoline	4	0.25 ± 0.16 (0.10 – 0.39)	1.29 ± 0.06 (1.22 – 1.35)	2.31 ± 0.09 (2.19 – 2.41)	1.03 ± 0.06 (0.98 – 1.11)	1.58 ± 0.05 (1.52 – 1.63)	2.03 ± 0.04 (1.97 – 2.06)	1.08 ± 0.03 (1.04 – 1.12)	2.45 ± 0.06 (2.37 – 2.50)	0.65 ± 0.08 (0.53 – 0.71)
CV127	4	0.42 ± 0.03 (0.37 – 0.45)	1.40 ± 0.20 (1.10 – 1.55)	2.55 ± 0.17* (2.30 – 2.69)	1.10 ± 0.06 (1.01 – 1.16)	1.71 ± 0.11* (1.55 – 1.78)	2.34 ± 0.18* (2.23 – 2.61)	1.43 ± 0.49 (0.93 – 2.11)	2.71 ± 0.18* (2.44 – 2.85)	0.66 ± 0.10 (0.54 – 0.79)
CV127+Imi	4	0.21 ± 0.18 (0.10 – 0.47)	1.41 ± 0.08 (1.34 – 1.52)	2.58 ± 0.10* (2.47 – 2.69)	1.12 ± 0.06 (1.06 – 1.21)	1.74 ± 0.07* (1.65 – 1.80)	2.21 ± 0.06* (2.12 – 2.27)	1.22 ± 0.19 (0.96 – 1.39)	2.74 ± 0.14* (2.54 – 2.84)	0.73 ± 0.09 (0.59 – 0.79)
Std 1	1	0.48	1.53	2.63	1.25	1.79	2.28	1.17	2.72	0.56
Std 2	1	0.45	1.37	2.43	1.14	1.64	2.03	1.05	2.49	0.69

*****Statistically significantly different from the isoline nontransgenic comparator at $p \leq 0.05$.

Table 7. Selected Vitamin Composition of Grain on a Dry Weight Basis of Soybean BPS-CV127-9 Treatments (CV127 and CV127+Imi), the Isoline Control and Two Conventional Soybean Varieties (Std 1 and Std 2) Grown at Four Locations in Brazil in the 2007 Season

Location/ Treatment/N	α-tocopherol mg/100g DW	β-tocopherol mg/100g DW	γ-tocopherol mg/100g DW	δ-tocopherol mg/100g DW	Total tocopherol mg/100g DW	Vitamin E (IU/100 g)	Vitamin E mg/100g DW	Vitamin B1 mg/100g DW	Folic Acid (µg/100 g)
	Mean ± Standard Deviation (range)								
Santo Antonio de Goiás									
Isoline 4	2.50 ± 0.36 (2.20 – 3.00)	0.81 ± 0.16 (0.63 – 1.03)	14.32 ± 0.47 (13.79 – 14.88)	7.84 ± 0.28 (7.58 – 8.12)	25.49 ± 0.44 (25.05 – 25.90)	5 ± 1 (5 – 6)	4.75 ± 0.37 (4.42 – 5.26)	0.64 ± 0.13 (0.52 – 0.80)	444 ± 19 (428 – 462)
CV127 4	2.81 ± 0.27 (2.51 – 3.17)	1.12 ± 0.17* (0.99 – 1.35)	15.04 ± 0.39* (14.77 – 15.61)	8.97 ± 0.26* (8.71 – 9.32)	27.93 ± 0.26* (27.71 – 28.27)	6 ± 1 (5 – 6)	5.25 ± 0.30* (4.90 – 5.64)	0.66 ± 0.05 (0.61 – 0.72)	443 ± 12 (432 – 460)
CV127 +Imi 4	2.53 ± 0.18 (2.37 – 2.73)	0.79 ± 0.16 (0.68 – 1.02)	14.17 ± 0.32 (13.80 – 14.46)	7.95 ± 0.34 (7.75 – 8.46)	25.44 ± 0.86 (24.63 – 26.66)	5 ± 1 (5 – 6)	4.75 ± 0.23 (4.52 – 5.05)	0.58 ± 0.02 (0.55 – 0.60)	452 ± 15 (430 – 464)
Std 1 1	2.67	1.24	11.65	7.51	23.07	5	4.67	0.71	401
Std 2 1	2.53	0.66	15.44	7.18	25.81	5	4.88	0.59	438
Teresina									
Isoline 3	6.61 ± 1.42 (5.38 – 8.17)	0.69 ± 0.13 (0.54 – 0.77)	19.24 ± 2.17 (17.38 – 21.63)	5.05 ± 0.65 (4.52 – 5.77)	31.58 ± 2.56 (29.48 – 34.43)	10 ± 2 (9 – 12)	9.46 ± 1.34 (8.12 – 10.79)	0.43 ± 0.06 (0.37 – 0.48)	291 ± 36 (249 – 315)
CV127 3	6.85 ± 0.12 (6.71 – 6.94)	0.79 ± 0.05 (0.73 – 0.82)	19.67 ± 1.93 (17.46 – 21.05)	5.79 ± 1.00 (4.67 – 6.58)	33.10 ± 2.95 (29.77 – 35.38)	10 ± 1 (10 – 11)	9.80 ± 0.28 (9.53 – 10.09)	0.40 ± 0.07 (0.35 – 0.48)	348 ± 47 (302 – 396)
CV127 +Imi 3	7.84 ± 1.38 (6.47 – 9.23)	0.94 ± 0.11* (0.81 – 1.00)	15.66 ± 3.13 (12.28 – 18.46)	4.57 ± 1.18 (3.31 – 5.66)	29.00 ± 2.87 (25.82 – 31.40)	11 ± 1 (10 – 12)	10.27 ± 0.98 (9.26 – 11.21)	0.37 ± 0.15 (0.28 – 0.55)	367 ± 26* (352 – 397)
Std 1 1	7.51	1.34	14.62	5.61	29.09	11	9.92	0.41	261
Std 2 1	5.23	0.53	22.27	5.16	33.19	9	8.46	0.35	267

Table 7. continued.

Location/ Treatment/N		α-tocopherol mg/100g DW	β-tocopherol mg/100g DW	γ-tocopherol mg/100g DW	δ-tocopherol mg/100g DW	Total tocopherol mg/100g DW	Vitamin E (IU/100 g)	Vitamin E mg/100g DW	Vitamin B1 mg/100g DW	Folic Acid (µg/100 g)
		Mean ± Standard Deviation (range)								
Vilhena										
Isoline	4	2.77 ± 0.36 (2.37 – 3.16)	0.98 ± 0.10 (0.90 – 1.12)	17.30 ± 1.26 (16.32 – 19.14)	8.67 ± 0.93 (7.73 – 9.72)	29.72 ± 2.40 (27.40 – 32.93)	6 ± 1 (5 – 7)	5.47 ± 0.51 (4.93 – 6.11)	0.43 ± 0.06 (0.34 – 0.47)	320 ± 17 (302 – 339)
CV127	4	3.21 ± 0.14* (3.09 – 3.40)	0.96 ± 0.14 (0.76 – 1.09)	15.88 ± 0.89 (14.99 – 17.11)	8.75 ± 0.76 (7.63 – 9.31)	28.80 ± 1.72 (26.72 – 30.91)	6 ± 1 (6 – 7)	5.72 ± 0.28 (5.48 – 6.11)	0.49 ± 0.08 (0.40 – 0.60)	311 ± 7 (303 – 320)
CV127 +Imi	4	3.17 ± 0.25 (2.79 – 3.32)	0.94 ± 0.26 (0.68 – 1.26)	15.45 ± 1.10* (14.34 – 16.59)	8.70 ± 1.06 (7.51 – 9.77)	28.25 ± 2.24 (25.90 – 30.27)	6 ± 0 (6)	5.61 ± 0.33 (5.16 – 5.89)	0.56 ± 0.06 (0.50 – 0.62)	337 ± 12 (320 – 349)
Std 1	1	3.43	1.04	12.63	7.04	24.14	6	5.50	0.34	329
Std 2	1	2.69	0.66	20.93	8.94	33.23	6	5.81	0.31	285
Brasília										
Isoline	4	1.80 ± 0.08 (1.74 – 1.92)	0.85 ± 0.21 (0.69 – 1.15)	15.51 ± 1.09 (14.18 – 16.85)	8.38 ± 0.26 (8.13 – 8.73)	26.54 ± 1.06 (25.02 – 27.46)	5 ± 1 (4 – 5)	4.23 ± 0.20 (3.94 – 4.40)	0.55 ± 0.07 (0.47 – 0.64)	389 ± 46 (323 – 427)
CV127	4	2.09 ± 0.14* (1.96 – 2.26)	1.23 ± 0.27 (0.95 – 1.49)	14.55 ± 0.86 (13.91 – 15.81)	10.49 ± 1.02* (9.62 – 11.72)	28.34 ± 1.73 (26.96 – 30.82)	5 ± 0 (5)	4.50 ± 0.20 (4.35 – 4.80)	0.63 ± 0.05 (0.57 – 0.70)	346 ± 14 (326 – 355)
CV127 +Imi	4	2.20 ± 0.16* (1.96 – 2.33)	1.18 ± 0.24 (0.85 – 1.37)	14.74 ± 0.60 (14.21 – 15.59)	10.49 ± 0.63* (9.86 – 11.35)	27.36 ± 2.98 (23.38 – 30.55)	5 ± 0 (5)	4.62 ± 0.20* (4.35 – 4.84)	0.65 ± 0.07 (0.59 – 0.75)	338 ± 13* (324 – 354)
Std 1	1	2.07	0.65	11.98	6.86	21.56	4	3.95	0.53	309
Std 2	1	2.16	0.89	15.94	7.63	26.61	5	4.64	0.60	294

*****Statistically significantly different from the isoline nontransgenic comparator at $p \leq 0.05$.

Table 8. Fatty Acid Composition of Grain on a Dry Weight Basis of Soybean BPS-CV127-9 Treatments (CV127 and CV127+Imi), the Isoline Control and Two Conventional Soybean Varieties (Std 1 and Std 2) Grown at Four Locations in Brazil in the 2007 Season

Location/ Treatment	N	C14:0 Myristic	C16:0 Palmitic	C18:0 Stearic	C18:1 Oleic	C18:2 Linoleic	C18:3 Linolenic	C20:0 Arachidic	C22:0 Behenic	C24:0 Tetracosanoic
		Mean ± Standard Deviation (range) g/100 g DW								
Santo Antonio de Goiás										
Isoline	4	0.02 ± 0 (0.02) N=2	1.83 ± 0.05 (1.79 – 1.89)	0.85 ± 0.05 (0.80 – 0.91)	4.43 ± 0.07 (4.33 – 4.49)	8.71 ± 0.24 (8.48 – 9.04)	1.23 ± 0.06 (1.18 – 1.30)	0.08 ± 0.01 (0.06 – 0.09)	0.09 ± 0.01 (0.09 – 0.10)	0.03 ± 0 (0.03)
CV127	4	0.02 ± 0 (0.02)	1.91 ± 0.04* (1.85 – 1.95)	0.89 ± 0.03 (0.86 – 0.94)	4.85 ± 0.07* (4.77 – 4.91)	9.05 ± 0.36 (8.79 – 9.57)	1.30 ± 0.06 (1.23 – 1.38)	0.08 ± 0.01 (0.08 – 0.09)	0.10 ± 0.01 (0.09 – 0.11)	0.03 ± 0 (0.03)
CV127 +Imi	4	0.02 ± 0 (0.02) N=3	1.96 ± 0.02* (1.93 – 1.98)	0.91 ± 0.04 (0.87 – 0.95)	5.09 ± 0.10* (4.98 – 5.20)	9.09 ± 0.20 (8.83 – 9.31)	1.30 ± 0.03 (1.27 – 1.34)	0.09 ± 0.01 (0.08 – 0.10)	0.10 ± 0.01 (0.09 – 0.10)	0.03 ± 0 (0.03)
Std 1	1	0.01	1.80	0.83	3.87	8.10	1.37	0.07	0.08	0.01
Std 2	1	NA^	1.77	0.89	4.82	9.44	1.27	0.08	0.10	0.03
Teresina										
Isoline	3	0.02 ± 0 (0.02) N=2	2.37 ± 0.14 (2.21 – 2.48)	0.80 ± 0.05 (0.74 – 0.85)	6.45 ± 0.99 (5.87 – 7.59)	11.27 ± 1.32 (9.74 – 12.05)	1.09 ± 0.12 (0.96 – 1.19)	0.09 ± 0.02 (0.08 – 0.11)	0.15 ± 0.02 (0.14 – 0.17)	0.07 ± 0.02 (0.05 – 0.09)
CV127	3	0.02 ± 0 (0.02)	2.58 ± 0.11 (2.48 – 2.70)	0.87 ± 0.01 (0.85 – 0.88)	6.86 ± 0.78 (6.07 – 7.62)	11.34 ± 1.16 (10.16 – 12.47)	1.02 ± 0.11 (0.92 – 1.13)	0.10 ± 0.01 (0.10 – 0.11)	0.14 ± 0.01 (0.13 – 0.15)	0.08 ± 0.01 (0.06 – 0.09)
CV127 +Imi	3	NA	2.33 ± 0.23 (1.56 – 2.31)	0.89 ± 0.05* (0.84 – 0.93)	8.42 ± 1.12* (7.21 – 9.42)	8.75 ± 2.12 (6.91 – 11.07)	0.84 ± 0.14* (0.74 – 1.00)	0.11 ± 0.01 (0.10 – 0.12)	0.16 ± 0.02 (0.14 – 0.17)	0.10 ± 0.03 (0.06 – 0.12)
Std 1	1	NA	2.14	0.70	5.48	11.49	1.26	0.06	0.11	0.04
Std 2	1	0.02	2.09	0.76	7.04	12.44	1.19	0.06	0.12	0.08

Table 8. continued.

Location/ Treatment	N	C14:0 Myristic	C16:0 Palmitic	C18:0 Stearic	C18:1 Oleic	C18:2 Linoleic	C18:3 Linolenic	C20:0 Arachidic	C22:0 Behenic	C24:0 Tetracosanoic
					Mean ± Standard Deviation (range) g/100 g					
Vilhena										
Isoline	4	NA	2.24 ± 0.05 (2.18 – 2.28)	0.87 ± 0.01 (0.86 – 0.88)	5.09 ± 0.08 (4.99 – 5.18)	10.28 ± 0.22 (10.00 – 10.54)	1.38 ± 0.03 (1.33 – 1.39)	0.08± 0.01 (0.08 – 0.09)	0.11 ± 0.01 (0.10 – 0.12)	0.04 ± 0 (0.04)
CV127	4	0.02 ± 0 (0.02) N=2	2.18 ± 0.04 (2.14 – 2.22)	0.91 ± 0.01* (0.90 – 0.91)	5.57 ± 0.04* (5.53 – 5.61)	10.06 ± 0.32 (9.74 – 10.35)	1.31 ± 0.04* (1.27 – 1.34)	0.09 ± 0 (0.09)	0.11 ± 0.01 (0.10 – 0.12)	0.04 ± 0 (0.04)
CV127 +Imi	4	0.02 N=1	2.12 ± 0.06* (2.03 – 2.16)	0.90 ± 0.01* (0.90 – 0.91)	5.59 ± 0.06* (5.50 – 5.63)	9.72 ± 0.24* (9.41 – 9.97)	1.30 ± 0.03* (1.26 – 1.32)	0.09 ± 0.01 (0.08 – 0.10)	0.10 ± 0.01 (0.10 – 0.12)	0.04 ± 0 (0.04)
Std 1	1	0.02	1.88	0.91	4.52	8.51	1.33	0.09	0.09	0.03
Std 2	1	NA	2.21	0.81	4.70	11.88	1.64	0.06	0.09	0.04
Brasília										
Isoline	4	0.02 N=1	1.97 ± 0.03 (1.94 – 2.00)	0.72 ± 0.02 (0.69 – 0.73)	4.20 ± 0.06 (4.13 – 4.25)	9.55 ± 0.14 (9.41 – 9.70)	1.52 ± 0.03 (1.48 – 1.54)	0.07 ± 0.01 (0.07 – 0.08)	0.08 ± 0.01 (0.08 – 0.09)	0.02 ± 0.01 (0.02 – 0.03)
CV127	4	0.02 ± 0 (0.02)	1.93 ± 0.02 (1.91 – 1.96)	0.73 ± 0.01 (0.72 – 0.74)	4.41 ± 0.09* (4.29 – 4.48)	9.35 ± 0.06 (9.28 – 9.39)	1.54 ± 0.03 (1.51 – 1.58)	0.08 ± 0 (0.08)	0.08 ± 0 (0.08)	0.03 ± 0.01 (0.02 – 0.03)
CV127 +Imi	4	0.02 ± 0 (0.02) N=3	2.00 ± 0.07 (1.90 – 2.05)	0.75 ± 0.01* (0.74 – 0.76)	4.52 ± 0.05* (4.48 – 4.58)	9.56 ± 0.27 (9.19 – 9.82)	1.56 ± 0.05 (1.51 – 1.61)	0.07 ± 0.01 (0.05 – 0.08)	0.08 ± 0 (0.08)	0.02 ± 0.01 (0.02 – 0.03)
Std 1	1	0.02	2.10	0.78	3.97	10.10	1.68	0.05	0.08	0.02
Std 2	1	NA	1.97	0.74	4.24	10.61	1.67	0.05	0.08	0.03

^NA=Not Available
*****Statistically significantly different from the isoline nontransgenic comparator at $p \leq 0.05$.

Table 9. Isoflavone Composition of Grain on a Dry Weight Basis of Soybean BPS-CV127-9 Treatments (CV127 and CV127+Imi), the Isoline Control and Two Conventional Soybean Varieties (Std 1 and Std 2) Grown at Four Locations in Brazil in the 2007 Season

Location/ Treatment	N	Daidzin	Malonyl-Daidzin	Daidzein	Glycitin	Malonyl-glycitin	Glycitein	Genistin	Malonyl-genistin	Genistein
		Mean ± Standard Deviation (range) mg/100 g dry weight								
Santo Antonio de Goiás										
Isoline	4	14.2 ± 1.4 (12.2 – 15.3)	91.4 ± 2.9 (87.2 – 94.0)	0.8 ± 0.1 (0.7 – 0.9)	3.7 ± 0.5 (3.1 – 4.2)	13.3 ± 0.3 (13.0 – 13.8)	0.6 ± 0.2 (0.3 – 0.8)	17.2 ± 3.7 (12.0 – 20.8)	116.6 ± 9.0 (107.8 – 126.8)	ND
CV127	4	9.2 ± 0.5* (8.6 – 9.8)	56.5 ± 3.8* (51.7 – 59.8)	<0.5* (ND^ – 0.5)	3.3 ± 0.5 (2.7 – 3.9)	11.2 ± 1.8 (8.8 – 13.1)	<0.8 (ND – 0.8)	10.0 ± 1.9* (8.4 – 12.1)	84.2 ± 1.8* (82.3 – 86.6)	ND
CV127+Imi	4	9.3 ± 0.5* (8.7 – 9.9)	58.6 ± 3.0* (56.1 – 62.3)	0.6 ± 0* (0.5 – 0.6)	3.6 ± 0.5 (3.0 – 4.2)	11.8 ± 2.3 (9.6 – 14.2)	ND	11.8 ± 0.6* (11.2 – 12.4)	83.6 ± 3.6* (78.5 – 86.6)	ND
Std 1	1	13.9	94.1	0.7	7.5	26.9	0.7	17.7	119.6	ND
Std 2	1	10.4	71.5	0.8	6.6	23.4	1.8	16.0	108.1	ND
Teresina										
Isoline	3	6.2 ± 1.4 (4.9 – 7.7)	16.8 ± 3.7 (13.9 – 20.9)	0.7 ± 0.2 (0.4 – 0.8)	2.8 ± 1.2 (1.6 – 3.9)	7.7 ± 3.0 (4.7 – 10.7)	1.5 ± 0.3 (1.1 – 1.7)	5.6 ± 1.6 (3.8 – 6.8)	30.0 ± 8.0 (21.7 – 37.7)	0.5 ± 0.2 (0.3 – 0.7)
CV127	3	6.9 ± 0.8 (6.3 – 7.8)	20.0 ± 4.2 (15.3 – 23.4)	0.7 ± 0.1 (0.6 – 0.8)	4.0 ± 0.8 (3.1 – 4.5)	10.2 ± 2.4 (7.5 – 12.0)	< 0.8 (ND – 0.8)	6.7 ± 2.5 (4.1 – 9.1)	31.2 ± 9.3 (22.1 – 40.6)	0.5 ± 0.2 (0.4 – 0.8)
CV127+Imi	3	5.7 ± 1.5 (4.0 – 6.7)	16.7 ± 6.4 (9.7 – 22.3)	<1.0 (ND – 1.2)	3.3 ± 1.2 (1.9 – 4.2)	7.8 ± 3.0 (4.4 – 10.2)	<0.4* (ND – 0.4)	4.0 ± 2.0 (2.2 – 6.2)	17.0 ± 9.0 (8.9 – 26.6)	< 0.4 (ND – 0.4)
Std 1	1	9.4	28.0	1.8	9.6	20.6	1.4	15.9	65.1	1.9
Std 2	1	8.0	22.1	1.0	10.8	23.4	1.4	10.2	43.8	1.4

Table 9. continued.

Location/ Treatment	N	Daidzin	Malonyl-Daidzin	Daidzein	Glycitin	Malonyl-glycitin	Glycitein	Genistin	Malonyl-genistin	Genistein
		Mean ± Standard Deviation (range) mg/100 g dry weight								
Vilhena										
Isoline	4	14.5 ± 1.7 (12.1 – 15.8)	61.1 ± 7.3 (51.9 – 67.0)	1.3 ± 0.2 (1.0 – 1.5)	3.9 ± 0.6 (3.1 – 4.6)	11.0 ± 1.4 (9.6 – 12.7)	<0.9 (ND – 0.9)	17.3 ± 0.7 (16.7 – 18.3)	101.6 ± 10.6 (87.9 – 111.2)	0.7 ± 0.2 (0.5 – 0.9)
CV127	4	9.7 ± 1.0* (8.7 – 10.7)	40.1 ± 4.5* (35.3 – 45.8)	0.8 ± 0.1* (0.7 – 0.9)	4.0 ± 0.4 (3.7 – 4.4)	11.8 ± 1.6 (10.6 – 14.1)	< 0.7 (ND – 0.7)	14.6 ± 2.2* (12.3 – 17.4)	71.6 ± 9.1* (62.1 – 82.8)	0.6 ± 0.1 (0.5 – 0.8)
CV127+Imi	4	9.8 ± 0.6* (9.0 – 10.5)	40.7 ± 3.2* (38.1 – 45.4)	0.9 ± 0* (0.9 – 1.0)	4.1 ± 0.7 (3.6 – 5.1)	10.7 ± 0.5 (10.2 – 11.2)	<0.4* (ND – 0.5)	14.0 ± 1.1* (12.6 – 15.3)	70.7 ± 5.1* (65.1 – 75.4)	0.6 ± 0.1 (0.5 – 0.6)
Std 1	1	15.7	73.9	1.2	7.5	22.2	0.8	14.9	102.2	0.5
Std 2	1	15.5	63.4	2.0	11.0	26.2	1.5	20.4	118.0	1.1
Brasília										
Isoline	4	29.6 ± 0.5 (29.1 – 30.2)	196.1 ± 6.3 (191.1 – 205.0)	1.0 ± 0.2 (0.8 – 1.2)	5.5 ± 0.5 (5.2 – 6.2)	18.4 ± 1.6 (16.9 – 20.0)	1.0 ± 0.2 (0.6 – 1.1)	34.4 ± 7.2 (28.1 – 40.6)	224.4 ± 3.4 (220.9 – 227.3)	<0.4 (ND – 0.4)
CV127	4	19.6 ± 1.2* (18.6 – 21.2)	131.7 ± 5.4* (125.2 – 137.5)	0.6 ± 0.1* (0.5 – 0.7)	4.4 ± 0.6* (3.8 – 5.2)	14.9 ± 2.0* (12.8 – 17.2)	<0.8 (ND – 0.8)	27.8 ± 4.6 (22.9 – 32.0)	194.8 ± 3.3* (191.7 – 198.2)	< 0.3 (ND – 0.3)
CV127+Imi	4	20.6 ± 0.6* (19.7 – 21.1)	134.5 ± 1.1* (133.8 – 136.2)	0.7 ± 0.1* (0.5 – 0.8)	4.6 ± 0.5* (4.2 – 5.3)	14.2 ± 1.4* (12.4 – 15.9)	<0.6 (ND – 0.6)	30.8 ± 5.2 (23.2 – 34.3)	200.4 ± 8.9* (192.9 – 210.8)	<0.4 (ND – 0.4)
Std 1	1	26.9	157.5	1.4	8.0	28.0	1.2	29.0	216.7	0.3
Std 2	1	25.1	156.5	1.0	10.5	30.2	1.4	35.7	217.5	0.4

*****Statistically significantly different from the isoline nontransgenic comparator at $p \leq 0.05$. ^ND = not detected.

Table 10. Phospholipid Composition of Grain of Soybean BPS-CV127-9 Treatments (CV127 and CV127+Imi), the Isoline Control and Two Conventional Soybean Varieties (Std 1 and Std 2) Grown at Four Locations in Brazil in the 2007 Season

Location	Treatment	N	Phosphatidyl ethanolamine	Phosphatidic acid	Phosphatidyl inositol	Phosphatidyl choline
			Mean ± Standard Deviation (range) mg/g fat			
Santo Antonio de Goiás	Isoline	4	136.5 ± 20.7 (113.8 – 156.8)	0.9 ± 0.2 (0.7 – 1.1)	12.1 ± 2.3 (10.1 – 14.8)	39.5 ± 5.0 (34.7 – 45.0)
	CV127	4	135.6 ± 14.6 (120.6 – 155.5)	1.0 ± 0.2 (0.7 – 1.1)	11.3 ± 1.3 (10.2 – 13.2)	37.4 ± 1.8 (35.4 – 39.4)
	CV127 +Imi	4	126.1 ± 9.9 (115.9 – 139.5)	0.9 ± 0.2 (0.6 – 1.1)	10.6 ± 0.4 (10.1 – 11.0)	38.1 ± 1.8 (35.8 – 40.2)
	Std 1	1	132.2	0.9	11.7	39.1
	Std 2	1	133.7	1.4	12.4	42.0
Teresina	Isoline	3	68.6 ± 3.7 (65.7 – 72.7)	5.6 ± 1.0 (4.9 – 6.7)	8.8 ± 0.1 (8.7 – 8.9)	21.6 ± 1.5 (20.6 – 23.4)
	CV127	3	63.6 ± 1.8 (61.7 – 65.2)	5.0 ± 0.9 (4.3 – 6.1)	8.7 ± 0.8 (8.1 – 9.6)	21.2 ± 1.8 (19.8 – 23.2)
	CV127 +Imi	3	61.8 ± 14.0 (52.1 – 77.8)	8.1 ± 1.6* (7.0 – 9.9)	8.7 ± 0.9 (8.0 – 9.8)	19.2 ± 2.8 (17.5 – 22.4)
	Std 1	1	70.1	5.3	10.6	24.3
	Std 2	1	51.1	7.2	8.1	17.0
Vilhena	Isoline	4	98.0 ± 6.4 (88.9 – 103.8)	2.2 ± 0.2 (1.8 – 2.3)	9.6 ± 0.7 (8.6 – 10.1)	30.9 ± 1.9 (28.6 – 33.1)
	CV127	4	102.7 ± 4.9 (96.0 – 107.8)	2.4 ± 0.6 (2.0 – 3.2)	9.8 ± 1.0 (9.2 – 11.3)	31.5 ± 1.5 (30.2 – 33.5)
	CV127 +Imi	4	107.0 ± 10.5 (98.1 – 120.7)	2.1 ± 0.2 (1.9 – 2.4)	9.6 ± 0.9 (8.4 – 10.2)	32.0 ± 0.5 (31.3 – 32.4)
	Std 1	1	116.2	2.8	12.1	39.0
	Std 2	1	86.6	4.7	10.6	30.4
Brasília	Isoline	4	124.2 ± 13.1 (114.7 – 142.7)	0.8 ± 0.1 (0.7 – 0.9)	10.6 ± 0.8 (9.7 – 11.7)	36.8 ± 3.1 (32.9 – 40.4)
	CV127	4	123.4 ± 10.7 (112.4 – 135.8)	0.8 ± 0.1 (0.6 – 0.9)	10.0 ± 0.3 (9.7 – 10.4)	36.1 ± 2.1 (33.7 – 38.2)
	CV127 +Imi	4	117.9 ± 6.2 (110.2 – 124.8)	0.8 ± 0.2 (0.5 – 0.9)	9.8 ± 0.5 (9.2 – 10.3)	37.5 ± 1.7 (35.0 – 39.0)
	Std 1	1	107.2	0.9	10.8	37.2
	Std 2	1	106.7	0.8	10.5	38.5

*****Statistically significantly different from the isoline nontransgenic comparator at $p \leq 0.05$.

Table 11. Grain Composition Means and Ranges Across Field Trial Locations for the Isoline, CV 127 and CV127+Imi Treatments and Comparison with Means and Range of Values of the Conventional Standard Soybean Varieties as well as Range of Values from the ILSI Crop Composition Database.

Analyte (unit)	Isoline	CV127	CV127+Imi	Conv Stds	Global	Brazilian
		N = 15		N = 8	N = 80 – 323	N = 69
	Mean (range)					
Proximates						
Moisture %	7.6 ± 0.3b[2] (7.1 – 8.2)	7.8 ± 0.2b (7.4 – 8.2)	7.9 ± 0.2a (7.6 – 8.2)	7.7 ± 0.4 (7.0– 8.2)	10.1 (4.7 – 34.4)	9.8 (7.6 – 11.2)
Ash g/100 g DW	5.2 ± 0.2a (4.8 – 5.7)	5.2 ± 0.2a (4.8 – 5.7)	5.1 ± 0.2a (4.7 – 5.6)	5.2 ± 0.2 (4.9 – 5.5)	5.3 (3.89 – 6.99)	5.0 (4.58 – 5.47)
Protein g/100 g DW	39.2 ± 1.7b (36.4 – 41.6)	39.2 ± 1.5ab (37.0 – 41.5)	39.7 ± 1.6a (36.7 – 41.6)	39.2 ± 2.0 (36.8 – 42.0)	39.5 (33.2 – 45.5)	40.2 (37.2 – 44.9)
Fat g/100 g DW	20.2 ± 2.1b (17.7 – 23.8)	20.7 ± 2.1a (18.8 – 24.7)	20.5 ± 1.4ab (18.9 – 24.1)	20.6 ± 2.6 (16.9 – 25.1)	16.68 (8.1 – 23.6)	18.85 (14.4 – 23.6)
Total Dietary Fiber (g/100 g DW)	24.54 ± 2.60a (18.94 – 28.01)	24.73 ±1.1a (22.62 – 26.55)	24.66 ± 2.37a (21.37 – 28.43)	25.0 ± 2.0 (21.9 – -27.3)	NA^	NA
Carbohydrate[1] g/100 g DW	35.4 ± 2.7a (25.2 – 44.9)	34.8 ± 2.4a (27.9 – 39.9)	34.7 ± 2.5a (24.2 – 43.3)	35.0 ± 2.3 (26.7 – 39.8)	38.2 (29.6 – 50.2)	36.0 (29.6 – 41.6)
Calories kcal/100 g DW	382 ± 11a (362 – 403)	377 ± 29a (281 – 409)	383 ± 12a (365 – 413)	382 ± 9 (374 – 395)	NA	NA
Fiber						
Crude Fiber g/100 g DW	7.9 ± 1.1a (6.7 – 10.6)	8.0 ± 0.7a (7.1 – 9.7)	8.2 ± 2.0a (6.2 – 14.7)	8.2 ± 1.6 (7.2 – 12.1)	7.8 (4.1 – 13.9)	8.5 (6.4 – 10.9)
ADF g/100 g DW	10.25 ± 1.06ab (8.53 – 12.05)	9.66 ± 0.94b (8.09 – 11.19)	10.49 ± 1.73a (7.35 – 13.40)	11.11 ± 1.20 (8.89 – 12.59)	11.97 (7.81 – 18.61)	11.34 (7.81 – 16.39)
NDF g/100 g DW	14.08 ± 1.61a (11.32 – 15.93)	14.24 ± 1.26a (11.86 – 16.91)	15.13 ± 1.72b (12.53 – 18.17)	14.11 ± 1.54 (12.26 – 16.18)	12.33 (8.53 – 21.25)	12.39 (8.53 – 21.25)

Table 11 continued

Analyte (unit)	Isoline	CV127	CV127+Imi	Conv Stds	Global	Brazilian
		N = 15		N = 8	N = 80 – 323	N = 69
			Mean (range)			
Minerals						
Calcium mg/100 g DW	246 ± 60a (172 – 359)	274 ± 64b (190 – 427)	286 ± 92b (198 – 484)	234 ± 60 (167 – 329)	217 (117 – 307)	NA
Iron mg/100 g DW	9.16 ± 0.77a (7.98 – 10.90)	9.88 ± 1.62b (8.23 – 13.00)	9.15 ± 0.96a (7.80 – 11.40)	10.16 ± 2.12 (7.93 – 14.13)	7.81 (5.54 – 10.95)	NA
Magnesium mg/100 g DW	238 ± 16a (211 – 266)	277 ± 13b (258 – 309)	287 ± 16c (268 – 309)	255 ± 23 (223 – 293)	264 (219 – 313)	NA
Phosphorus mg/100 g DW	768 ± 59a (655 – 845)	717 ± 38b (654 – 784)	732 ± 67b (580 – 871)	744 ± 63 (614 – 808)	715 (507 – 935)	NA
Potassium mg/100 g DW	1744 ± 137a (1593 – 2061)	1877 ± 101b (1713 – 2079)	1864 ± 104b (1599 – 2021)	1758 ± 153 (1595 – 2033)	2061 (1868 – 2316)	NA
Amino Acids						
Alanine g/100 g DW	1.51 ± 0.13b (1.29 – 1.71)	1.58 ± 0.15b (1.33 – 1.90)	1.62 ± 0.14a (1.38 – 1.86)	1.58 ± 0.14 (1.41 – 1.79)	1.72 (1.51 – 2.10)	1.73 (1.62 – 1.85)
Arginine g/100 g DW	2.84 ± 0.30a (2.37 – 3.34)	2.77 ± 0.24a (2.44 – 3.22)	2.84 ± 0.20a (2.53 – 3.15)	2.95 ± 0.35 (2.49 – 3.45)	2.84 (2.29 – 3.40)	2.93 (2.59 – 3.28)
Aspartate g/100 g DW	4.17 ± 0.39a (3.50 – 4.66)	4.15 ± 0.32a (3.32 – 4.68)	4.29 ± 0.24a (3.85 – 4.65)	4.45 ± 0.48 (3.70 – 5.06)	4.49 (3.81 – 5.12)	4.59 (4.23 – 5.12)
Cysteine g/100 g DW	0.41 ± 0.11a (0.24 – 0.56)	0.41 ± 0.09a (0.25 – 0.54)	0.39 ± 0.09a (0.25 – 0.53)	0.44 ± 0.14 (0.25 – 0.61)	0.59 (0.37 – 0.81)	0.57 (0.50 – 0.81)
Glutamate g/100 g DW	6.74 ± 0.60a (5.72 – 7.41)	6.66 ± 0.49a (5.49 – 7.52)	6.78 ± 0.37a (6.17 – 7.46)	7.18 ± 0.88 (5.90 – 8.55)	7.09 (5.84 – 8.20)	7.29 (6.58 – 8.09)
Glycine g/100 g DW	1.50 ± 0.12a (1.28 – 1.68)	1.47 ± 0.11a (1.24 – 1.69)	1.50 ± 0.13a (1.34 – 1.83)	1.56 ± 0.13 (1.35 – 1.72)	1.69 (1.46 – 2.00)	1.70 (1.56 – 1.82)
Histidine g/100 g DW	1.11 ± 0.18a (0.80 – 1.32)	1.45 ± 0.38b (0.93 –2.11)	1.37 ± 0.37a (0.91 – 2.13)	1.10 ± 0.22 (0.73 – 1.34)	1.04 (0.88 – 1.18)	1.06 (0.98 – 1.18)

Table 11 continued

Analyte (unit)	Isoline	CV127 N = 15	CV127+Imi	Conv Stds N = 8	Global N = 80 – 323	Brazilian N = 69
	Mean (range)					
Amino Acids						
Isoleucine	1.46 ± 0.12a	1.41 ± 0.20a	1.43 ± 0.22a	1.50 ± 0.10	1.81	1.85
g/100 g DW	(1.22 – 1.62)	(1.10 – 1.83)	(1.08 – 1.97)	(1.35 – 1.65)	(1.54 – 2.08)	(1.59 – 2.04)
Leucine	2.56 ± 0.20a	2.60 ± 0.15a	2.61 ± 0.12a	2.73 ± 0.25	3.04	3.07
g/100 g DW	(2.19 – 2.86)	(2.30 – 2.86)	(2.44 – 2.85)	(2.39 – 3.15)	(2.59 – 3.62)	(2.81 – 3.38)
Lysine	2.24 ± 0.16a	2.29 ± 0.18a	2.27 ± 0.15a	2.32 ± 0.19	2.56	2.58
g/100 g DW	(1.97 – 2.47)	(2.12 – 2.76)	(1.99 – 2.62)	(2.03 – 2.58)	(2.29 – 2.84)	(2.42 – 2.82)
Methionine	0.29 ± 0.18a	0.33 ± 0.13a	0.29 ± 0.17a	0.33 ± 0.22	0.55	0.55
g/100 g DW	(0.05 – 0.54)	(0.07 – 0.47)	(0.09 – 0.50)	(0.05 – 0.59)	(0.43 – 0.68)	(0.50 – 0.68)
Phenylalanine	1.76 ± 0.13a	1.80 ± 0.13a	1.78 ± 0.07a	1.87 ± 0.15	1.98	2.06
g/100 g DW	(1.52 – 1.94)	(1.55 – 2.16)	(1.65 – 1.90)	(1.64 – 2.12)	(1.63 – 2.35)	(1.82 – 2.24)
Proline	1.74 ± 0.14a	1.77 ± 0.10a	1.73 ± 0.19a	1.86 ± 0.17	2.00	2.06
g/100 g DW	(1.50 – 1.95)	(1.56 – 1.99)	(1.11 – 1.89)	(1.60 – 2.05)	(1.69 – 2.28)	(1.86 – 2.28)
Serine	1.82 ± 0.15a	1.81 ± 0.11a	1.83 ± 0.10a	1.92 ± 0.17	2.02	2.17
g/100 g DW	(1.54 – 2.05)	(1.56 – 1.99)	(1.65 – 1.97)	(1.67 – 2.21)	(1.11 – 2.48)	(1.96 – 2.48)
Threonine	1.37 ± 0.10a	1.35 ± 0.13a	1.37 ± 0.13a	1.40 ± 0.11	1.47	1.40
g/100 g DW	(1.21 – 1.50)	(1.14 – 1.62)	(1.17 – 1.67)	(1.23 – 1.55)	(1.14 – 1.86)	(1.28 – 1.52)
Tryptophan	0.64 ± 0.06a	0.65 ± 0.08a	0.67 ± 0.11a	0.65 ± 0.06	0.43	0.44
g/100 g DW	(0.53 – 0.74)	(0.50 – 0.79)	(0.51 – 0.84)	(0.56 – 0.73)	(0.36 – 0.50)	(0.38 – 0.49)
Tyrosine	1.18 ± 0.11a	1.13 ± 0.08b	1.14 ± 0.09b	1.25 ± 0.11	1.32	1.38
g/100 g DW	(0.98 – 1.33)	(1.01 – 1.33)	(1.02 – 1.38)	(1.14 – 1.45)	(1.02 – 1.61)	(1.27 – 1.56)
Valine	1.56 ± 0.15b	1.64 ± 0.10a	1.62 ± 0.12ab	1.62 ± 0.20	1.91	1.91
g/100 g DW	(1.35 – 1.83)	(1.49 – 1.84)	(1.41 – 1.79)	(1.31 – 1.87)	(1.60 – 2.20)	(1.63 – 2.08)

Table 11 continued

Analyte (unit)	Isoline	CV127 N = 15	CV127+Imi	Conv Stds N = 8	Global N = 80 – 323	Brazilian N = 69
	Mean (range)					
Fatty Acids						
Myristic 14:0	0.11 ± 0.01a	0.11 ± 0.01a	0.11 ± 0.01a	0.09 ± 0.02	NA	NA
%Total FA	(0.09 – 0.12) N=5	(0.09 – 0.12) N=13	(0.10 – 0.11) N=7	(0.06 – 0.12) N=4		
Palmitic 16:0	10.32 ± 0.29a	10.24 ± 0.27a	10.18 ± 0.22a	9.77 ± 0.80	11.12	11.27
% Total FA	(9.67 – 10.82)	(9.85 – 10.93)	(9.75 – 10.64)	(8.31 – 10.67)	(9.55 – 15.77)	(10.28 – 12.73)
Stearic 18:0	4.04 ± 0.51b	4.13 ± 0.43ab	4.21 ± 0.39a	3.99 ± 0.77	4.01	3.95
% Total FA	(3.14 – 5.05)	(3.45 – 4.98)	(3.50 – 4.80)	(3.04 – 5.01)	(2.70 – 5.88)	(2.70 – 5.52)
Oleic 18:1	24.38 ± 2.66b	25.64 ± 2.45b	27.79 ± 5.79a	23.39 ± 2.70	20.7	22.6
% Total FA	(21.72 – 33.15)	(22.81 – 32.45)	(22.65 – 43.63)	(20.13 – 28.06)	(14.3 – 32.2)	(18.7 – 28.9)
Linoleic 18:2	48.86 ± 2.06a	47.72 ± 1.71a	45.65 ± 4.80b	50.10 ± 2.14	53.3	52.6
% Total FA	(42.54 – 50.83)	(43.25 – 50.50)	(31.97 – 49.57)	(46.78 – 52.80)	(42.3 – 58.8)	(48.2 – 55.5)
Linolenic 18:3	6.62 ± 1.19a	6.47 ± 1.39ab	6.32 ± 1.54b	7.06 ± 1.32	8.34	7.06
% Total FA	(4.20 – 8.11)	(3.92 – 8.25)	(3.42 – 8.12)	(4.76 – 8.52)	(3.00 – 12.52)	(5.92 – 8.18)
Arachidic 20:0	0.39 ± 0.05a	0.42 ± 0.02a	0.42 ± 0.08a	0.33 ± 0.08	0.32	0.37
% Total FA	(0.32 – 0.49)	(0.39 – 0.46)	(0.27 – 0.55)	(0.26 – 0.48)	(0.16 – 0.48)	(0.28 – 0.48)
Eicosenoic 20:1 % Total FA	Not detected	Not detected	Not detected	Not detected	0.20 (0.14 – 0.35)	0.22 (0.17 – 0.28)
Behenic 22:0	0.51 ± 0.10a	0.49 ± 0.07a	0.50 ± 0.12a	0.44 ± 0.05	0.40	0.45
% Total FA	(0.40 – 0.75)	(0.40 – 0.63)	(0.38 – 0.80)	(0.37 – 0.51)	(0.28 – 0.60)	(0.37 – 0.57)

Table 11. continued

Analyte (unit)	Isoline	CV127 N = 15	CV127+Imi	Conv Stds N = 8	Global N = 80 – 323	Brazilian N = 69
	Mean (range)					
Antinutrients						
Phytate	3.36 ± 1.15a	3.96 ± 1.21a	3.81 ± 0.69a	4.06 ± 1.35	11.21	NA
mg/g DW	(1.89 – 6.00)	(2.57 – 6.22)	(2.63 – 4.77)	(2.37 – 5.44)	(6.34 – 19.60)	
Raffinose	1.30 ± 0.2a	1.2 ± 0.1b	1.2 ± 0.2ab	1.3 ± 0.1	0.355	NA
g/100 g DW	(1.00 – 1.50)	(0.9 – 1.3)	(0.9 – 1.7)	(1.1 – 1.4)	(0.212 – 0.661)	
Stachyose	4.0 ± 0.4a	3.7 ± 0.3b	3.6 ± 0.5b	4.1 ± 0.6	2.19	NA
g/100g	(3.0 – 4.6)	(3.0 – 4.2)	(2.4 – 4.1)	(3.1 – 4.8)	(1.21 – 3.50)	
Lectins	1.70 ± 0.74a	0.84 ± 0.63b	0.92 ± 0.98b	1.65 ± 0.55	1.72	0.82
HU/mg DW	(0.85 – 3.43)	(0.17 – 1.71)	(0.11 – 3.43)	(0.67 – 2.67)	(0.11 – 9.04)	(0.30 – 1.89)
Urease	1.53 ± 0.72a	1.57 ± 0.58a	1.58 ± 0.59a	1.64 ± 0.62	NA	NA
ΔpH	(0.28 – 2.06)	(0.41 – 2.00)	(0.49 – 2.03)	(0.27 – 2.02)		
Trypsin Inhibitor	13.16 ± 2.17a	13.72 ± 2.82a	13.80 ± 2.84a	14.02 ± 2.27	48.33	NA
TIU/mg DW	(8.48 – 17.97)	(8.16 – 18.20)	(7.82 – 18.03)	(9.84 – 16.76)	(19.59 – 118.68)	
Vitamins						
Folic Acid	365 ± 67a	363 ± 56a	374 ± 52a	323 ± 64	360	NA
μg/100 g DW	(249 – 462)	(302 – 460)	(320 – 464)	(261 – 438)	(240 – 470)	
α−tocopherol	3.21 ± 1.89b	3.53 ± 1.78ab	3.67 ± 2.26a	3.54 ± 1.90	NA	NA
mg/100 g DW	(1.74 – 8.17)	(1.96 – 6.94)	(1.96 – 9.23)	(2.07 – 7.51)		
β−tocopherol	0.84 ± 0.18b	1.04 ± 0.23a	0.96 ± 0.24ab	0.88 ± 0.30	NA	NA
mg/100 g DW	(0.54 – 1.15)	(0.73 – 1.49)	(0.68 – 1.37)	(0.53 – 1.34)		
γ−tocopherol	16.41 ± 2.18a	16.06 ± 2.16a	14.96 ± 1.46b	15.68 ± 3.99	NA	NA
mg/100 g DW	(13.79 – 21.63)	(13.91 – 21.05)	(12.28 – 18.46)	(11.65 – 22.27)		
δ−tocopherol	7.65 ± 1.48b	8.68 ± 1.80a	8.15 ± 2.23ab	6.99 ± 1.18	NA	NA
mg/100 g DW	(4.52 – 9.72)	(4.67 – 11.72)	(3.31 – 11.35)	(5.16 – 8.94)		
Total tocopherol	28.12 ± 2.90ab	29.31 ± 2.55a	27.41 ± 2.48b	27.09 ± 4.41	NA	NA
mg/100 g DW	(25.02 – 34.43)	(26.72 – 35.38)	(23.38 – 31.40)	(21.56 – 33.23)		
Vitamin B1	0.52 ± 0.12a	0.55 ± 0.12a	0.55 ± 0.12a	0.48 ± 0.15	0.20	NA
mg/100 g DW	(0.34 – 0.80)	(0.35 – 0.72)	(0.28 – 0.75)	(0.31 – 0.71)	(0.10 – 0.25)	
Vitamin E	5.75 ± 2.07b	6.08 ± 1.99a	6.05 ± 2.26ab	5.98 ± 2.10	1.91	3.44
mg/100 g DW	(3.94 – 10.79)	(4.35 – 10.09)	(4.35 – 11.21)	(4.64 – 9.92)	(0.19 – 6.17)	(1.36 – 6.17)

Table 11. continued

Analyte (unit)	Isoline	CV127 N = 15	CV127+Imi	Conv Stds N = 8	Global N = 80 – 323	Brazilian N = 69
	Mean (range)					
Isoflavones						
Total Daidzein	114.6 ± 76.6a	77.9 ± 49.0b	79.0 ± 51.6b	100.2 ± 57.9	86.3	51.0
mg/100 g DW	(19.7 – 237.8)	(22.6 – 162.2)	(14.7 – 161.0)	(30.8 – 186.4)	(6.0 – 245.4)	(6.0 – 112.9)
Total Genistein	144.5 ± 81.1a	115.9 ± 70.9b	114.6 ± 78.6b	144.6 ± 70.9	97.9	65.2
mg/100 g DW	(26.1 – 270.1)	(26.8 – 232.4)	(11.8 – 246.8)	(54.3 – 255.1)	(14.4 – 283.7)	(14.4 – 135.7)
Total Glycitein	19.0 ± 5.9a	17.5 ± 3.4ab	16.5 ± 3.9b	35.3 ± 4.0	16.1	13.3
mg/100 g DW	(7.3 – 30.2)	(11.5 – 25.7)	(7.4 – 23.9)	(27.9 – 43.0)	(1.5 – 31.0)	(1.5 – 26.4)
Phospholipids						
Phosphatidyl ethanolamine	109.4 ± 28.4a	109.2 ± 28.1a	106.0 ± 25.6a	100.5 ± 29.3	NA	NA
mg/g fat	(65.7 – 156.8)	(61.7 – 155.5)	(52.1 – 139.5)	(51.1 – 133.7)		
Phosphatidic acid	2.1 ± 1.9a	2.1 ± 1.7a	2.6 ± 2.9b	3.0 ± 2.5	NA	NA
mg/g fat	(0.7 – 6.7)	(0.6 – 6.1)	(0.5 – 9.9)	(0.8 – 7.2)		
Phosphatidyl inositol	10.4 ± 1.7a	10.0 ± 1.2a	9.7 ± 0.9a	10.9 ± 1.3	NA	NA
mg/g fat	(8.6 – 14.8)	(8.1 – 13.2)	(8.0 – 11.0)	(8.1 – 12.4)		
Phosphatidyl choline	32.9 ± 7.3a	32.2 ± 6.4a	32.5 ± 7.5a	33.4 ± 8.8	NA	NA
mg/g fat	(20.6 – 45.0)	(19.8 – 39.4)	(17.5 – 40.2)	(17.0 – 42.0)		

[1]Carbohydrates including total dietary fiber.
[2]Numbers followed by the same letter are not statistically significantly different at $p < 0.05$
^NA = not available

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SUPPLEMENT

FINAL REPORT # BPS-015-07A

Compositional Analysis of Grain from Imidazolinone-Tolerant Soybean BPS-CV127-9 Produced in Brazil in 2006/2007 and Comparison with that from Isoline Control and Conventional Soybean Varieties

and FINAL REPORT # BPS-012-08

Compositional Analysis of Grain from Imidazolinone-Tolerant Soybean BPS-CV127-9 Produced in Brazil in 2007 and Comparison with that from Isoline Control and Conventional Soybean Varieties

SUPPLEMENT REPORT DATE: MARCH 11, 2010

PERFORMING LABORATORY

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This document contains supplemental data generated when the grain fractions originally analyzed in the BPS-CV127-9 soybean compositional analysis reports were re-analyzed for methionine and cysteine (cystine) levels using a different analytical procedure.

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STATEMENT OF NO DATA CONFIDENTIALITY CLAIMS

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: BASF Plant Science, L.P.

Company Agent: Andrew Reed Date: March 11, 2010

Title: Director, Global Regulatory

Signature: Andrew T. Reed

These data are the property of BASF Plant Science, L.P. and, as such, are considered to be confidential for all purposes other than compliance with FIFRA §10. Submission of these data in compliance with FIFRA does not constitute a waiver of any right to confidentiality that may exist under any other statute in any other country.

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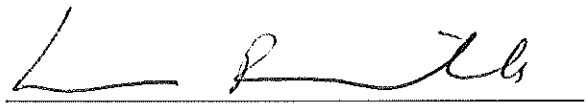
STATEMENT OF COMPLIANCE

This document contains supplemental data to report numbers BPS-015-07A and BPS-012-08, entitled "Compositional Analysis of Grain from Imidazolinone-Tolerant Soybean BPS-CV127-9 Produced in Brazil in 2006/2007 and Comparison with that from Isoline Control and Conventional Soybean Varieties" and "Compositional Analysis of Grain from Imidazolinone-Tolerant Soybean BPS-CV127-9 Produced in Brazil in 2007 and Comparison with that from Isoline Control and Conventional Soybean Varieties," respectively.

This study was not conducted in compliance with the requirements of 40 CFR Part 160.

The data generated by BASF Plant Science in support of product safety comply with generally accepted scientific procedures. Record keeping is consistent with procedures used throughout the research community. This report accurately presents the raw data developed during the study.

REPORTED BY:



11 Mar 2010

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Date

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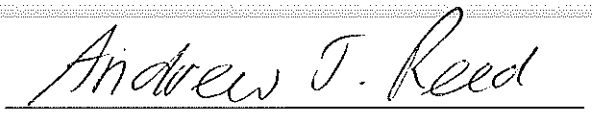

March 11, 2010

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ABBREVIATIONS AND DEFINITIONS

ahas	acetohydroxyacid synthase gene
AHAS	acetohydroxyacid synthase
AOAC	American Organization of Analytical Chemists
AtAHAS	*Arabidopsis thaliana* acetohydroxyacid synthase
ILSI	International Life Science Institute
ITAL	Instituto de Technologia de Alimentos

SUPPLEMENT

DATA TO SUPPORT REPORT # BPS-015-07A

Compositional Analysis of Grain from Imidazolinone-Tolerant Soybean BPS-CV127-9 Produced in Brazil in 2006/2007 and Comparison with that from Isoline Control and Conventional Soybean Varieties

AND REPORT # BPS-012-08

Compositional Analysis of Grain from Imidazolinone-Tolerant Soybean BPS-CV127-9 Produced in Brazil in 2007 and Comparison with that from Isoline Control and Conventional Soybean Varieties

SUMMARY

Soybean (*Glycine max* L.) plants have been developed by BASF Plant Science, L.P. (BPS) and EMBRAPA (Empresa Brasileira de Pesquisa Agropecuaria) that are tolerant to the imidazolinone class of agricultural herbicides. The herbicide-tolerant soybean plants BPS-CV127-9 (also referred to as CV127) were produced by introduction of an imidazolinone-tolerant acetohydroxyacid synthase large subunit (*ahasl*) from *Arabidopsis thaliana* into the soybean plant genome. The herbicide tolerance in BPS-CV127-9 will allow growers to treat the soybean crop with imidazolinone herbicides without causing injury to the plant at normal field application rates. Therefore, introduction of BPS-CV127-9 offers soybean growers an additional tool for controlling weeds. An important component of the safety assessment of BPS-CV127-9 soybean is to demonstrate that the nutrient and antinutrient composition of the grain is equivalent to that of the isoline control variety as well as other conventional commercial soybean varieties, thereby confirming that BPS-CV127-9 grain is appropriate for use in soybean food and feed products. Grain samples were harvested from BPS-CV127-9, the control, and two conventional soybean varieties from multi-location replicated field trials conducted in Brazil in two separate growing seasons (2006/2007 and 2007) and grain samples analyzed for a comprehensive range of important nutrients and antinutrients of soybean. Statistical analysis of composition data from grain of BPS-CV127-9 soybean treated with either an imidazolinone herbicide or a conventional herbicide and from the control and two other conventional soybean varieties, demonstrated that the composition of grain from BPS-CV127-9 soybeans is comparable to that of the control and conventional soybean varieties.

In the two original grain composition studies described above, it was observed that while levels of the amino acids methionine and cysteine in grain were comparable between all treatments, levels of these amino acids were less than levels reported in the International Life Sciences Institute Crop Composition Database (ILSI, 2008) for soybean. Therefore,

in this current report the same grain samples analyzed from the 2006/2007 and the 2007 field trials were re-analyzed specifically for methionine and cysteine (cystine), using a slightly modified method of analysis from the method used originally. The results obtained showed that levels of these amino acids in grain of BPS-CV127-9 were comparable to levels in grain of the isoline control as well as to the two conventional soybean varieties included in the study. Furthermore, levels of these amino acids in grain of all treatments were either comparable or within the range of values for these amino acids in soybean grain reported globally as well as for soybeans grown in Brazil (ILSI, 2008). Where minor differences in amounts of methionine or cysteine were detected between the grain of BPS-CV127-9 and that of the conventional isoline control, these were most likely due to small genetic differences between BPS-CV127-9 and the control resulting from the inherent genetic heterogeneity of the original transformed soybean variety Conquista.

In summary, these compositional analyses further confirm that the introduction of the *ahas* gene from *Arabidopsis thaliana* into the soybean genome, together with treatment by imidazolinone herbicide on BPS-CV127-9 does not impact the nutritional composition of grain produced by BPS-CV127-9. Results of these analyses demonstrate that levels of methionine and cysteine in grain from BPS-CV127-9 are equivalent to levels in grain from the isoline control as well as other conventional soybean varieties and to levels reported in the ILSI Crop Composition Database.

INTRODUCTION

Soybean (*Glycine max* L.) plants have been developed that are tolerant to the imidazolinone class of agricultural herbicides. The herbicide-tolerant soybean plants, referred to as BPS-CV127-9, were produced by introduction of an imidazolinone-tolerant acetohydroxyacid synthase large subunit (*ahasl*) gene from *Arabidopsis thaliana* into the soybean plant genome. In previous studies (Privalle, 2007 and 2008), composition analyses of BPS-CV127-9 soybean grain were conducted to demonstrate that the nutrient and antinutrient composition of the BPS-CV127-9 soybean grain is equivalent to that of the isoline control variety as well as other conventional commercial soybean varieties, thereby confirming that BPS-CV127-9 grain is appropriate for use in soybean food and feed products. The grain samples were harvested from BPS-CV127-9 soybean, a control, and two conventional soybean varieties from multi-location replicated field trials conducted in Brazil during the 2006/2007 and 2007 growing seasons. Grain samples were analyzed for a comprehensive range of important nutrients and antinutrients of soybean. Results of these studies demonstrated that the composition of grain from BPS-CV127-9 soybeans is comparable to that of the control and other conventional soybean varieties.

However, it was noted that levels of the amino acids methionine and cysteine in grain of all treatments in these studies were less than levels reported in the ILSI Crop Composition Database (ILSI, 2008) for soybean. Therefore, in this current report the same grain samples analyzed from the 2006/2007 and the 2007 field trials were re-

analyzed specifically for methionine and cysteine (cystine), using a slightly modified method of analysis from the method used originally. The original method used to measure amino acids in soybean grain was based on Spackman *et al*. (1958), which involved acid hydrolysis of proteins to component amino acids followed by quantification. In the current study, the method of analysis (AOAC, 2000, method 994.12 mod) protects the sulfur group of methionine and cysteine from potential acid hydrolysis. Results of these analyses demonstrate that levels of methionine and cysteine in grain from BPS-CV127-9 are equivalent to levels in grain from the isoline control as well as other conventional soybean varieties and to levels reported in the ILSI Crop Composition Database.

MATERIALS AND METHODS

Grain source. A 20 g aliquot of powdered frozen grain for each sample for which data was reported in BASF Plant Sciences Report #s BPS-015-07A and BPS-012-08 which had been stored frozen at -80ºC was shipped to Eurofins Scientific, Inc., Ames, Iowa, for analysis.

Methionine and cysteine analysis. Cystine and cysteine are first converted to cysteic acid and methionine to methionine sulfone by performic oxidation. The sample is then hydrolyzed to release the cysteic acid and methionine sulfone from the protein. Quantification is performed via ion exchange chromatography with o-phthalaldehyde post-column reaction according to AOAC (2000) method 994.12 mod. The limit of quantification for this method is 0.01% on an "as is" basis.

Statistical analysis. Analysis of variance was carried out on the data using SAS Version 9.1 (SAS Institute Inc., Cary, NC) following two procedures, the General Linear Model and the Mixed Model. With the exception of moisture content, all data were expressed on a dry weight basis for statistical analyses. Differences were assessed across location and by location. The model for across location:

y = variety + location + variety x location + block(location) + e
Random effects: location, variety x location, block(location).
Where y is the response variable (any analyte measured)

The model for separate analyses by location:

y = variety + block + e
where e is the response error

Contrasts were carried out to compare each of the imidazolinone (+ imi) and without imidazolinone BPS-CV127-9 treatments with the isoline control. Differences were considered statistically significant at the 0.05 confidence level.

RESULTS AND DISCUSSION

Soybean grain samples derived from field studies conducted in two different growing seasons in Brazil have been analyzed for important nutrients and antinutrients (Privalle, 2007 and 2008). In this supplementary study aliquots of all of the original soybean grain samples were re-analyzed to determine methionine and cysteine levels.

The results for grain samples from the 2006/2007 growing season are reported in Table 1S; and for grain from the 2007 growing season in Table 3S. Data analysis across field trial locations, as well as comparison of values for grain from CV127 and the isoline control soybeans with those for the conventional standard soybean varieties, and with values from the ILSI Crop Composition Database are presented in Table 2S for the 2006/2007 growing season, Table 4S for the 2007 growing season, and Table 5S for the combined seasons. For some locations, cysteine and methionine levels in CV127 soybean were statistically significantly different from the isoline nontransgenic comparator at $p < 0.05$ in both years. However, these differences were not consistent across all field trial sites and years. In general, the methionine and cysteine levels in the grain samples were found to have a narrow range. Therefore, in the instances where statistically significant differences were found, the ranges often included overlapping values and so the differences were not considered to be biologically relevant.

When methionine and cysteine levels in grain of BPS-CV127-9 and control treatments were analyzed across all field locations (for both the 2006/2007 and 2007 seasons, Table 5S), there were no statistically significant differences in levels of methionine between grain of either of the BPS-CV127-9 soybean treatments and the isoline control, and no statistically significant differences in levels of cysteine between grain of BPS-CV127-9 soybean treated with imidazolinone herbicide (CV127 + imi) and the isoline control. The only statistically significant difference observed in this statistical analysis across both field trial seasons was for grain cysteine levels between BPS-CV127-9 soybean treated with a conventional herbicide (CV127) and the isoline control. However, the mean and range of methionine and cysteine for both CV127 soybean treatments were either within or comparable to the range of values of the conventional standard soybean varieties cultivated in the same field trials as well as to the range of values reported for soybeans in the ILSI Crop Composition Database either in the global or Brazilian category (Tables 2S, 4S or 5S).

CONCLUSION

Results of the current study show that the method used in the original analysis of amino acids methionine and cysteine (Spackman *et al*., 1958) in grain samples harvested from the 2006/2007 and 2007 field trial seasons in Brazil most likely resulted in limited hydrolysis of the sulfur moiety of these amino acids and an underestimation of the levels of these amino acids in the grain of all treatments included in the these field trial studies. The method used in the current study (AOAC, 2000, method 994.12 mod) protected the

sulfur moiety from hydrolysis, and results show that the levels of methionine and cysteine in grain from all treatments included in this study are comparable to levels of these amino acids reported in the ILSI Crop Composition Database (ILSI, 2008).

Although results of the current study show that levels of methionine and cysteine in grain of all treatments were underestimated in the original grain composition analyses studies (Privalle, 2007 and 2008), conclusions from the original studies are unchanged and methionine and cysteine content in grain produced from BPS-CV127-9 soybean is comparable to, and in the same ranges, as the levels found in grain of the isoline control as well as other conventional soybean varieties with a history of safe food and feed use as well as safety to the environment. Furthermore, grain methionine and cysteine levels of the two CV127 treatments (plus or minus imidazolinone herbicide treatment) were equivalent, and show that imidazolinone herbicide application to BPS-CV127-9 soybean does not have a significant effect on grain methionine and cysteine composition.

RECORDS RETENTION: Raw data, the original copy of this report, and other relevant records are archived at BASF, 26 Davis Drive, Research Triangle Park, NC, USA 27709.

STUDY PERSONNEL: Data was compiled by Nancy Gillikin, B.S., statistical analysis work reported herein conducted by Hongmei Jia, Ph.D., BASF Plant Science, L.P., Research Triangle Park, NC 27705.

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Table 1S. Methionine and Cysteine Levels in Grain on a Dry Weight Basis of Soybean BPS-CV127-9 Treatments (CV127 and CV127 + Imi), the Isoline Control and Two Conventional Soybean Varieties (Std 1 and Std 2) Grown at Six Locations in Brazil in the 2006/2007 Season

Location	Treatment	N	Cysteine	Methionine
			Mean ± Standard Deviation (range) g/100 g dry weight	
Santo Antonio de Goiás	Isoline	4	0.53 ± 0.01 (0.51 – 0.53)	0.60 ± 0.01 (0.60 – 0.61)
	CV127	4	0.53 ± 0.01 (0.52 – 0.54)	0.60 ± 0.01 (0.59 – 0.61)
	CV127 + Imi	4	0.53 ± 0.01 (0.52 – 0.54)	0.61 ± 0.01 (0.60 – 0.62)
	Std 1	1	0.54	0.61
	Std 2	1	0.52	0.55
Uberaba	Isoline	4	0.54 ± 0.01 (0.53 – 0.56)	0.65 ± 0.02 (0.63 – 0.67)
	CV127	4	0.50 ± 0.01* (0.48 – 0.51)	0.60 ± 0.02* (0.59 – 0.63)
	CV127 + Imi	4	0.51 ± 0.01* (0.50 – 0.52)	0.62 ± 0.02* (0.59 – 0.64)
	Std 1	1	0.51	0.60
	Std 2	1	0.49	0.55
Sete Lagoas	Isoline	4	0.52 ± 0.01 (0.51 – 0.53)	0.64 ± 0.01 (0.63 – 0.65)
	CV127	4	0.51 ± 0.02 (0.50 – 0.54)	0.63 ± 0.03 (0.61 – 0.68)
	CV127 + Imi	4	0.51 ± 0.01 (0.50 – 0.52)	0.63 ± 0.01 (0.62 – 0.63)
	Std 1	1	0.53	0.65
	Std 2	1	0.50	0.59
Londrina	Isoline	4	0.54 ± 0 (0.54)	0.64 ± 0.01 (0.63 – 0.64)
	CV127	4	0.52 ± 0.01* (0.51 – 0.53)	0.62 ± 0.01* (0.60 – 0.63)
	CV127 + Imi	4	0.52 ± 0.01* (0.52 – 0.54)	0.62 ± 0.01* (0.62 – 0.63)
	Std 1	1	0.53	0.63
	Std 2	1	0.52	0.60

Table 1S Continued.

Location	Treatment	N	Cysteine	Methionine
			Mean ± Standard Deviation (range) g/100 g dry weight	
Brasília	Isoline	4	0.57 ± 0.01 (0.55 – 0.58)	0.64 ± 0.02 (0.62 – 0.66)
	CV127	4	0.55 ± 0.01* (0.54 – 0.56)	0.64 ± 0.02 (0.62 – 0.66)
	CV127 + Imi	4	0.55 ± 0.01* (0.54 – 0.56)	0.63 ± 0.01 (0.63 – 0.64)
	Std 1	1	0.53	0.63
	Std 2	1	0.56	0.60
Santo Antonio de Posse	Isoline	4	0.56 ± 0.01 (0.55 – 0.58)	0.62 ± 0.01 (0.61 – 0.63)
	CV127	4	0.53 ± 0.01* (0.52 – 0.53)	0.61 ± 0.02 (0.59 – 0.63)
	CV127 + Imi	4	0.53 ± 0.01* (0.52 – 0.54)	0.60 ± 0.01 (0.59 – 0.61)
	Std 1	1	0.53	0.60
	Std 2	1	0.53	0.56

*Statistically significantly different from the isoline nontransgenic comparator at $p < 0.05$.

Table 2S. Methionine and Cysteine Means and Ranges Across Field Trial Locations for the Isoline, CV127 and CV127 + Imi Treatments from 2006/2007 and Comparison with Means and Range of Values of the Conventional Standard Soybean Varieties as well as Range of Values from the ILSI Crop Composition Database

Analyte	Isoline	CV127	CV127 + Imi	Conv. Stds.	Global	Brazilian
		N=24		N=12	N=234	N=69
	Mean ± Standard Deviation (range) g/100 g dry weight					
Cysteine	0.54 ± 0.02a[1] (0.51 – 0.58)	0.52 ± 0.02b (0.48 – 0.56)	0.53 ± 0.02b (0.50 – 0.56)	0.52 ± 0.02 (0.49 – 0.56)	0.59 (0.37 – 0.81)	0.57 (0.50 – 0.81)
Methionine	0.63 ± 0.02a (0.60 – 0.67)	0.62 ± 0.02b (0.59 – 0.68)	0.62 ± 0.02b (0.59 – 0.64)	0.60 ± 0.03 (0.55 – 0.65)	0.55 (0.43 – 0.68)	0.55 (0.50 – 0.68)

[1]Numbers followed by the same letter are not statistically significantly different at $p < 0.05$.

Table 3S. Methionine and Cysteine Levels in Grain on a Dry Weight Basis of Soybean BPS-CV127-9 Treatments (CV127 and CV127 + Imi), the Isoline Control and Two Conventional Soybean Varieties (Std 1 and Std 2) Grown at Four Locations in Brazil in the 2007 Season

Location	Treatment	N	Cysteine	Methionine
			Mean ± Standard Deviation (range) g/100 g dry weight	
Santo Antonio de Goiás	Isoline	4	0.54 ± 0.01 (0.53 – 0.55)	0.63 ± 0.02 (0.62 – 0.66)
	CV127	4	0.55 ± 0.01* (0.55 – 0.56)	0.66 ± 0.01* (0.65 – 0.66)
	CV127 + Imi	4	0.55 ± 0.01* (0.54 – 0.56)	0.66 ± 0.01* (0.65 – 0.66)
	Std 1	1	0.53	0.62
	Std 2	1	0.54	0.60
Teresina	Isoline	3	0.44 ± 0.01 (0.43 – 0.44)	0.54 ± 0.01 (0.53 – 0.55)
	CV127	3	0.46 ± 0.04 (0.43 – 0.51)	0.56 ± 0.05 (0.51 – 0.61)
	CV127 + Imi	3	0.47 ± 0.02 (0.46 – 0.50)	0.58 ± 0.01 (0.58 – 0.60)
	Std 1	1	0.45	0.56
	Std 2	1	0.44	0.53
Vilhena	Isoline	4	0.54 ± 0.01 (0.53 – 0.54)	0.62 ± 0.02 (0.60 – 0.64)
	CV127	4	0.55 ± 0.01 (0.53 – 0.56)	0.64 ± 0.01 (0.63 – 0.66)
	CV127 + Imi	4	0.55 ± 0.01 (0.54 – 0.56)	0.64 ± 0.02 (0.62 – 0.66)
	Std 1	1	0.59	0.69
	Std 2	1	0.56	0.62
Brasília	Isoline	4	0.51 ± 0.01 (0.50 – 0.51)	0.58 ± 0.01 (0.58 – 0.59)
	CV127	4	0.51 ± 0.01 (0.50 – 0.51)	0.59 ± 0.01 (0.58 – 0.60)
	CV127 + Imi	4	0.51 ± 0.01 (0.50 – 0.51)	0.58 ± 0.01 (0.58 – 0.59)
	Std 1	1	0.51	0.59
	Std 2	1	0.54	0.57

*Statistically significantly different from the isoline nontransgenic comparator at $p < 0.05$.

Table 4S. Methionine and Cysteine Means and Ranges Across Field Trial Locations for the Isoline, CV127 and CV127 + Imi Treatments from 2007 and Comparison with Means and Range of Values of the Conventional Standard Soybean Varieties as well as Range of Values from the ILSI Crop Composition Database

Analyte	Isoline	CV127	CV127 + Imi	Conv. Stds.	Global	Brazilian
		N=15		N=8	N=234	N=69
	Mean ± Standard Deviation (range) g/100 g dry weight					
Cysteine	0.51 ± 0.04b[1] (0.43 – 0.55)	0.52 ± 0.04a (0.43 – 0.56)	0.52 ± 0.04a (0.46 – 0.56)	0.52 ± 0.05 (0.44 – 0.59)	0.59 (0.37 – 0.81)	0.57 (0.50 – 0.81)
Methionine	0.60 ± 0.04b (0.53 – 0.66)	0.61 ± 0.05a (0.51 – 0.66)	0.62 ± 0.04a (0.58 – 0.66)	0.60 ± 0.05 (0.53 – 0.69)	0.55 (0.43 – 0.68)	0.55 (0.50 – 0.68)

[1]Numbers followed by the same letter are not statistically significantly different at $p < 0.05$.

Table 5S. Methionine and Cysteine Means and Ranges Across Field Trial Locations for the Isoline, CV127 and CV127 + Imi Treatments from 2006/2007 and 2007, and Comparison with Means and Range of Values of the Conventional Standard Soybean Varieties as well as Range of Values from the ILSI Crop Composition Database

Analyte	Isoline	CV127	CV127 + Imi	Conv. Stds.	Global	Brazilian
		N=39		N=20	N=234	N=69
	Mean ± Standard Deviation (range) g/100 g dry weight					
Cysteine	0.53 ± 0.03a[1] (0.43 – 0.58)	0.52 ± 0.03b (0.43 – 0.56)	0.52 ± 0.03ab (0.46 – 0.56)	0.52 ± 0.03 (0.44 – 0.59)	0.59 (0.37 – 0.81)	0.57 (0.50 – 0.81)
Methionine	0.62 ± 0.03a (0.53 – 0.67)	0.62 ± 0.03a (0.51 – 0.68)	0.62 ± 0.03a (0.58 – 0.66)	0.60 ± 0.04 (0.53 – 0.69)	0.55 (0.43 – 0.68)	0.55 (0.50 – 0.68)

[1]Numbers followed by the same letter are not statistically significantly different at $p < 0.05$.