Joint Submission to Food Standards Australia New Zealand

Application A1199 | SPS Int. V11 and Z6 GM potato lines

gene ethics
working for a GM-free future
ABN: 67 104 140 918

[redacted]

Australian Food Sovereignty Alliance

Pure Harvest Organic Foods

GE Free NZ in Food and Environment
Auckland GE Free Coalition.
GE Free Northland

Slow Food in Australia

FOODwatch

South Australian Genetic Food Information Network (SAGFIN)

Sustainable Agriculture & Communities Alliance (SACA)

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To: FSANZ <submissions@foodstandards.gov.au>

Re: comments on A1199 | SPS V11 and Z6 GM potato lines

Thank you for the opportunity to comment on A1199, an SPS International application seeking approval for the Innate potato lines V11 and Z6.

Introduction

The evidence SPS tendered with its application is mainly referenced only as "unpublished report". So scant data is publicly available to substantiate FSANZ and SPS claims that the V11 and Z6 GM potato lines are safe, efficacious and can deliver on their agronomic and public health promises. These are claimed to result from the genetic manipulation (GM) of Snowden potatoes to:

- reduce acrylamide potential and reduce browning, in potato line V11
- resist disease, reduce acrylamide potential and reduce browning, in potato line Z6

There are no means for the interested public, independent scientists or public health professionals to independently verify or confirm FSANZ's claim that, "Based on the data provided and other information, food derived from V11 and Z6 is considered to be as safe for human consumption as food derived from conventional potato cultivars." Nor has FSANZ fully, fairly and adequately considered other evidence which supports our view that this application should be rejected.

In its Call For Submissions, FSANZ says, "the primary aim of its application is to protect international trade." But it does not explain how or why approval of this application would do more than protect the interests of the globalised processed and fast food industries in maximising profits. Though the GM potatoes would not be grown in Australasia, processed food products derived from potato lines V11 and Z6 would be facilitated to enter the Australian and New Zealand food supply as imported food products (such as French fries, potato crisps, potato flour or potato starch).

Then, in clear contradiction of its previous claim, FSANZ also asserts in the same document that, "There are no relevant international standards and amending the Code to permit food derived from Innate potato lines V11 and Z6 is unlikely to have a significant effect on international trade."

Our food regulator, that ought to serve the public interest and our right to know, also blithely declares, "FSANZ has determined that no additional mandatory labelling is needed," since potato lines V11 and Z6 do not have significantly altered compositional or nutritional characteristics. This conclusion ignores the evidence of change that the applicant presented.

Recommendations

We recommend that FSANZ rejects SPS International Inc's application which seeks approval for events V11 and Z6 to be included in Australian and NZ food supplies, unless the applicant:

- submits compelling peer-reviewed experimental data to show that the dsRNAs induced in the potato lines do not survive digestion and circulation, when whole, intact plant material is fed to laboratory animals;

- employs the "omics" global profiling techniques now used routinely in research laboratories, to search for and analyse potential alterations in genetic, RNA, protein or metabolite expression in the V11 and Z6 potato lines, as unpredictable off-target effects of the RNAi transgenes on the host genome make such analyses essential;

- produces a full analysis of all potential Open Reading Frames (ORFs) within the introduced genetic material, to enable the identification of potential toxins or allergens, and provides

experimental data showing a lack of allergic reactions among laboratory animals that eat the whole plant material.

FSANZ should also:

- take a broad-scale approach to acrylamide reduction in the whole human diet;
- abandon the concept of substantial equivalence. It is unscientific and invalidates FSANZ analyses and decisions, as they are based on sophistry and fictions, not facts.

1. RNA interference in crops raises new and unresolved biosafety concerns

The V11 and Z6 potato lines use the epigenetic mechanism of RNA interference (RNAi), a natural biological mechanism that regulates the expression of genes. Expression of the endogenous potato genes In the V11 and Z6 potato lines is down-regulated.

Though widely studied, RNAi is not fully understood. However, some recent research raises novel biosafety concerns that this application inadequately addresses, and challenges some safety assumptions about GM RNAi crops.

RNAi produces double-stranded RNA (dsRNA) that targets and then blocks the translation of messenger RNA molecules into proteins. It thus acts as a mechanism of gene regulation at the RNA level and may also work on DNA, via epigenetic mechanisms such as DNA methylation, to silence gene expression. This mechanism operates in bacteria, plants, and vertebrates, including humans.

Developers of RNAi GM crops base their safety claims on: (i) a lack of exposure route for RNAi molecules; and (ii) high specificity of the RNAi machinery to target only the gene/s of interest. But more recent research contradicts these claims.

a) Potential risks of dsRNA exposure

Proponents of RNAi crops claim that dsRNAs are very unstable and are therefore unlikely to survive digestion in the mammalian gut, limiting potential human and animal exposure to dsRNAs. However, unlike messenger RNAs which are unstable in the environment and degrade rapidly, dsRNA molecules are highly resistant to degradation under various conditions including freeze-thawing, low acid conditions, boiling, ribonuclease digestion, and extended storage[1-3].

Endogenous dsRNAs have been detected in various extracellular fluids, including serum, breast milk, plasma and saliva. A study of over 2,000 people detected over 1,000 dsRNAs in plasma[4]. Plant dsRNAs also chemically differ from mammalian ones as they are stable in serum and their RNAi activities in mammalian cells are unaffected.

Published research found food-derived dsRNAs survive in mammals, including humans, and affect the regulation of mammalian genes. These findings show the potential for dsRNAs derived from GM crops to be functionally active in non-target organisms. GM developers challenge Zhang and colleagues[5] initial study but it has been replicated. Zhang *et al.* have since published work that shows a dsRNA from honeysuckle, a traditional Chinese medicine, was taken up in mice and targeted influenza viruses, including H1N1, to reduce the impacts of infection.[6] Brassica vegetable miRNAs were also detected in serum, faeces, stomach, intestines, liver and kidneys of mice.[7] Broccoli miRNA, measured in mice, was shown to mediate gene expression to reduce breast cancer, consistent with broccoli's reported anti-tumorigenic properties.[8] Cross-kingdom activity of RNAi has also been shown between plants, viruses and bacteria.

These peer-reviewed and published papers show the potential for exposure to dsRNAs when humans consume the V11 and Z6 potato lines.

We reject the proponents cavalier claim in its Redacted Application – which FSANZ parrots in its Supporting Document 1 - that,

> *"Where a biotech food has been shown to be compositionally equivalent to conventional varieties, the evidence to date indicates that feeding studies will add little to the safety assessment and generally are not warranted (see e.g. Bartholomaeus et al., 2013; Herman and Ekmay, 2014; OECD, 2003)."*

SPS and FSANZ have not established to our satisfaction that the V11 and Z6 potato lines are compositionally equivalent to non-GM varieties nor that animal feeding trial data would not make a useful contribution to ensuring product safety.

FSANZ should require the applicant to submit compelling peer-reviewed experimental data to show that the dsRNAs induced in the potato lines do not survive digestion and circulation, when whole, intact plant material is fed to laboratory animals.

b) Potential off-target effects

Many dsRNAs also display off-target activity, raising safety issues which hampered their transition into medical therapeutics. Their effects are not as precise as first predicted[9-10]. There appears to be no reliable one-to-one relationship between dsRNAs and their targets, with some dsRNAs targeting many genes, while one gene can be targeted by many dsRNAs. Synthetic dsRNAs are estimated to have 10% off-target effects, despite being designed to target specific genes.[11]

Off-target effects of dsRNAs cannot be ruled out and raise unresolved safety questions as they may cause: (i) down-regulation of other potato genes, altering the food's composition; or (ii) unintended down-regulation of genes in exposed non-target organisms. The application does not provide compelling bioinformatics or experimental data to demonstrate the absence of off-target activity or impacts. The latest evidence of the potential of dsRNAs to have functional activity and off-target effects refutes claims of a long history of safe consumption, requiring more rigorous assessment.

FSANZ should require the applicant to submit more bioinformatics, omics, and rigorous experimental data from animal feeding studies with the whole V11 and Z6 potato lines, to show a lack of off-target activity of the inserted RNAi-encoding genes.

2. Additional safety assessment concerns

Establishing the safety of V11 and Z6 potato lines in the human food supply is essential, as potatoes are a major component in many people's diets. Those on lower incomes who consume more fries, chips, junk and take away foods may be most at risk. Despite this, the application fails to provide data from acute and chronic feeding experiments in laboratory animals to help confirm their safety for humans. The scientific literature does not appear to report any independent peer-reviewed feeding studies to enable objective analysis of safety.

General and basic compositional and allergenicity analyses are the only information in the application on these aspects of safety.

a) Nutritional data

FSANZ too readily accepts the applicant's untested and unsubstantiated data and claims of substantial equivalence, leaving safety not comprehensively tested. The compositional analyses fail to disclose precisely what analytes were assessed, or the techniques used.

Studies using more sensitive 'omics' global profiling techniques to analyse alterations at the genomic, RNA, protein and metabolite level, can accurately analyse thousands of molecules concurrently. Such techniques have revealed unintended and unforeseen differences when GM

crops were compared with their conventional counterparts. These disparities were undetected when basic tests were performed for standard risk assessment, including a 28-fold rise in potentially toxic polyamines in a GM maize variety.[12]

The concept of substantial equivalence is not scientific so FSANZ analyses and conclusions are based on sophistry and fictions.

FSANZ should require the applicant to employ the "omics" global profiling techniques now used routinely in research laboratories, to search for and analyse potential alterations in genetic, RNA, protein or metabolite expression in the V11 and Z6 potato lines. The potential for unpredictable off-target effects of the RNAi transgenes on the host genome make such analyses essential.

b) Allergenicity

The 2001 FAO/WHO consultation on the assessment of possible allergenicity due to GM foods suggested moving from eight to six identical amino acid segment searches. Codex notes:

> *"The smaller the peptide sequence used in the stepwise comparison, the greater the likelihood of identifying false positives, inversely the larger the peptide sequence used, the great the likelihood of false negatives, thereby reducing the utility of comparison."*[13]

Bioinformatics should not be the only or main data source for assessing and ensuring safety, as non-allergenic isoforms of allergens exist which differ by only a few amino acids compared to their allergenic counterparts.[14-15] This demonstrates that allergenicity can be sometimes better predicted by examination of non-contiguous stretches of amino acids.

FSANZ should require the applicant to produce a full analysis of all potential ORFs within the introduced genetic material, to enable the identification of potential toxins or allergens and provide experimental data showing a lack of allergenicity among laboratory animals that eat the whole plant material.

3. Lowering potential levels of acrylamide in the whole food supply

Reduced acrylamide potential appears to be the main claim of the V11 and Z6 potato lines. But acrylamide can also be present or may form during high temperature and extended cooking, such as frying, roasting or baking of several foods. These include potatoes, grain products such breakfast cereals, and coffee, as all contain asparagine (an amino acid) and some sugars (like fructose).

While further research on the cancer-causing potential of acrylamide exposure in food continues, a systematic review of the available evidence concluded:

> *"A majority of the studies reported no statistically significant association between dietary acrylamide intake and various cancers, and few studies reported increased risk for renal, endometrial, and ovarian cancers; however, the exposure assessment has been inadequate leading to potential misclassification or underestimation of exposure. Future studies with improved dietary acrylamide exposure assessment are encouraged."*[16]

Though certain potato varieties are favoured for commercial frying, other varieties that are also suited to frying already have lower acrylamide potential. Since varieties with naturally lower acrylamide potential could be used instead to lower human acrylamide exposure, the motivation for genetically manipulating the Snowden potato appears to be the creation of a patentable product that fits the industrial production demands of the global junk and fast food chains.

Various initiatives to lower acrylamide levels in foods such as French fries and potato crisps have already been made. Some of the management strategies that the US FDA recommends to reduce exposure to acrylamide in foods include:

- "Limit foods that might be high in acrylamide, such as potato products (especially French fries and potato chips), coffee, and foods made from grains (such as breakfast cereals, cookies, and toast).
- Limit certain cooking methods, such as frying and roasting, and limit the time certain foods are cooked. Boiling and steaming do not produce acrylamide.
- Soak raw potato slices in water for 15 to 30 minutes before frying or roasting to reduce acrylamide formation during cooking.
- If frying potatoes or toasting bread, cook them to a lighter colour (as opposed to dark brown), which produces less acrylamide.
- Avoid storing potatoes in the refrigerator, which can result in increased acrylamide levels during cooking."[17]

The Food Drink Europe Federation has produced an 'Acrylamide Toolbox'[18] to support industrial acrylamide reduction and promote management methods. These include potato varieties with naturally lower sugar content levels suitable for frying, storing potatoes above 6°C, discarding immature tubers, washing and blanching cut potatoes before frying to reduce their sugar content, cutting thicker French fries, and cooking at temperatures below 175°C. Seasonal and environmental conditions can also affect acrylamide levels.[19]

FSANZ also says:

> *"It is important to maintain industry and consumer education measures to ensure acrylamide levels in Australian foods remain as low as reasonably achievable."*[20]

But merely approving Innate potatoes on trade grounds, though they are not intended to be imported for use here, shirks FSANZ's responsibilities to protect the health and safety of Australians and New Zealanders.

If FSANZ were really committed to minimising the whole community's exposure to potentially carcinogenic acrylamide across the food supply, it would vigorously implement the effective management strategies available to limit everyone's exposure to foods that might be high in acrylamide - potato products (especially French fries and potato chips), coffee, and foods made from grains (such as breakfast cereals, cookies, and toast).

FSANZ 24th Australian Total Diet Study Results concluded that the acrylamide exposure of Australian consumers is consistent with those considered to be of possible concern to human health by the 72nd meeting of the Joint Food and Agriculture Organisation/World Health Organization Expert Committee on Food Additives (JECFA, 2011)."[21]

The JECFA Committee noted that,

> *"while adverse neurological effects are unlikely at the estimated average exposure, morphological changes in nerves cannot be excluded for individuals with a high dietary exposure to acrylamide*."[22]

This assessment should spur FSANZ into action to protect public health and safety on the broad front required, instead of pretending that the approval of yet another questionable, defective, gene manipulated food product will make any discernible contribution to public welfare.

FSANZ should reject the V11 and Z6 Innate potato varieties, implement an acrylamide potential reduction scheme, and begin to play a serious role in ensuring a genuinely safe and nutritious food supply for all.

FSANZ should take a broad-scale approach to acrylamide reduction in the human diet and reject SPS's V11 and Z6 GM potato application as a hurdle to fulfilling this bigger task.

Conclusions

- Considering that the products of potato lines Z6 and V11 will enter the human food and animal feed chains, FSANZ's assessment of risks to human health are deficient.

- The proponent submits scant and secret data to support its claims so substantial doubts remain about the safety of foods and ingredients derived from these potato lines.

- Data on the efficacy of these potatoes in reducing acrylamide production and black spot are also lacking.

- We therefore recommend that the potato products not be approved for import or sale in Australia and New Zealand. Further data is required to substantiate the applicant's safety claims.

References

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