January 5, 2015

Biotechnology Regulatory Services
U.S. Department of Agriculture
4700 River Road, Unit 147
Riverdale, MD 20737–1236

SUBJECT: DOCKET ID APHIS-2014-0076 Public comment

I am writing to comment on APHIS’ assessment of the Petition for Determination of Non-regulated Status by J.R. Simplot Co. for a Potato Genetically Engineered for Late Blight Resistance, Low Acrylamide Potential, Reduced Black Spot Bruising, and Lowered Reducing Sugars. I am a Distinguished Professor of Plant Sciences and Director of the Seed Biotechnology Center at the University of California, Davis. I am knowledgeable about crop genetics and biotechnology and particularly seed and reproductive biology. I served as the Chair of the Department of Vegetable Crops at UC Davis for five years and have served as the UC liaison with the California Potato Research Advisory Board for the past 20 years, so I am familiar with issues in the potato industry. I was also a member for 32 years of the Board of Directors of the California Crop Improvement Association, the seed certifying agency in California, which conducts a program specifically in the inspection and certification of seed potato crops, so I understand how potato cultivars are propagated for commercial planting.

The information presented in the petition on the biology of the potato, its reproduction and the methods of commercial replication and planting is all correct to the best of my knowledge. Potatoes are propagated almost exclusively by clonal means through the use of seed tubers or tuber pieces. These are grown under certification programs to maintain varietal purity and to meet phytosanitary regulations, and seed tuber production is a distinct and highly controlled operation compared to commercial potato production. Outcrossing is rare or nonexistent, and in any case, would not be relevant to this clonal propagation system. Similarly, any pollen flow from these varieties to commercial potatoes would be without consequence, as it would not affect the tubers produced on such plants. Potatoes are not weedy, and the modifications made in the varieties described in the petition would have no effect on weediness at any rate. Thus, there is no reason to expect that these varieties will become plant pests. In common with a prior product developed by the same company incorporating similar traits and recently approved by USDA-APHIS (i.e., APHIS-2013-0067), from a reproductive biology (i.e., outcrossing, seed production, etc.) and ecological perspective, there is no reason to believe that these varieties would be pests or result in adverse environmental consequences.

The genetic modifications to the potatoes in the petition result in lower levels of reducing sugars and asparagine, which will reduce the incidence of black spot bruise during storage and the formation of acrylamide during cooking. Both of these traits would address important issues for potato producers and consumers. Reductions in potato quality due to bruising cause financial losses to growers and put
additional pressure on land and resources to compensate via higher yields or production areas for these post-harvest losses. The presence of acrylamide in fried products, including potato, is well documented, and the proposed modifications offer a simple method to reduce the levels of this toxic chemical in our food. The modifications reduce the level of acrylamide below the threshold for Proposition 65 in California, enabling the industry to provide safer food for consumers and avoid labeling. The W8 line that is described in this petition reduces acrylamide formation by as much as 90% compared to conventional varieties. This clearly illustrates the benefits for consumer health from the modifications made in this line with no evidence or reasonable rationale that such changes would inadvertently introduce any adverse health effects.

The majority of genetic changes utilized to develop these potatoes are based on the insertion of DNA sequences that produce RNA molecules that block the expression of target proteins (enzymes). This RNA interference or RNAi method does not result in the possibility of production of novel proteins in the plants. Thus, any presumed issues with allergenicity are unfounded. RNAi approaches target and silence specific genes, and data presented supported that this was the case in these potatoes. Other cases where RNAi-related methods have been used, as in virus-resistant papayas and plums that have already been deregulated, have demonstrated the efficacy of the method and its long-term stability with no associated problems. Silencing one specific PPO gene (among several in the potato genome) in the present case prevented discoloration due to bruising without impacting other possible roles of PPO in insect or disease resistance. Silencing genes associated with asparagine production and starch degradation had the expected effect of lowering asparagine levels with minimal effects on other metabolites.

This line also incorporates a resistance gene for late blight derived from a wild potato genotype. These types of disease resistance genes have been extensively studied in diverse crops and have been utilized routinely through conventional breeding. However, using conventional breeding to introduce this gene into cultivated potatoes, while theoretically possible, would take up to decades and would likely still bring along additional parts of the wild genome that could have unwanted effects (termed “linkage drag”). The tetraploid genome of cultivated tomatoes further increases the difficulty of using this conventional approach. In contrast, simply inserting the gene with its own promoter into the cultivated line, as has been done here, transfers the resistance trait alone without any of the other wild DNA or traits. This method can and should be used much more widely to create new varieties that can match ongoing genetic changes in the pathogens to overcome plant resistance mechanisms. Late blight is notorious for this ability, and if breeders must go back to crosses with wild material and then work for years to eliminate unwanted traits and recreate the desirable commercial traits, the pathogens will always have the upper hand. Transfer of individual resistance traits like this should be routine, and frankly, exempt from regulatory scrutiny, as the end result is a variety with a resistance gene that could have been transferred by conventional means but much more slowly and inefficiently. Genetic resistance to late blight would greatly decrease use of fungicides to control this disease. In California, it is routine practice to treat potato plants prophylactically with fungicides to prevent late blight, as once the disease symptoms are detected, it is too late for such applications to be effective, and the disease has likely spread throughout the susceptible population. Strong genetic resistance to late blight could render these applications unnecessary.

Numerous and repeated studies have concluded that genetic modifications via recombinant DNA methods result in no greater risks than those resulting from other genetic modification approaches, including wide crosses, mutation, hybridization, polyploidy and others that are completely unregulated, and which have resulted in only two documented cases of any safety consequences in the entire history of plant breeding, both of which involved intentional breeding for increased insect resistance and known endogenous toxins (in potato and celery). There is no case in which breeding has created novel toxins. This record of safety is despite the tens of thousands of crop varieties that have been produced using a wide array of genetic
modification methods in crop plants for over 100+ years. I refer to a recent comprehensive review that examined these points in detail and reached the following conclusion: “We have illustrated here that the insertional effects associated with genetic engineering are similar to the genetic changes that occur in conventionally bred plants. Based on this similarity, insertional effects should present a similar level of risk as genetic changes associated with conventional breeding.” Thus, genetic modification by non-transgenic means has an almost perfect record of safety, rDNA methods create similar changes that pose no greater risks than those methods, the composition of the products are as expected from the modifications made, and other compounds in the potatoes are within normal ranges, so there is little reason to conclude that there is any inherent safety issue with this variety.

I fully support the petition for this potato variety to be granted non-regulated status. The changes incorporated represent further improvements on a similar previous variety recently approved by APHIS and will have even greater benefits for both producers and consumers. Due to the reproductive biology of potato and the agricultural practices by which it is propagated and grown, there is virtually no chance of gene flow via pollen to other crops or wild relatives, there would be no ecological or economic consequence even if such transfer were to take place and there is the potential to reduce the use of chemicals both in the field in storage. It would be very difficult to achieve similar genetic changes by conventional breeding approaches due to the genetic polyploidy and heterozygous nature of the potato plant, yet were the same changes to be achieved this way, there would be no question about its safety and no requirement for pre-market review at all. I therefore strongly support the petition for non-regulated status for this variety and urge APHIS grant the petition for non-regulation this variety and enable its advantages to be realized for growers and consumers.

Sincerely,

Kent J. Bradford
Distinguished Professor and Director
Seed Biotechnology Center
Department of Plant Sciences
University of California
Davis, CA 95616

---