

Seed characteristics related to weedy risk of hybrids between GM soybean and wild soybean

Minjung Yook¹, Hae-Rim Park¹ and Do-Soom Kim^{1*}

¹Dept. of Plant Science, College of Agriculture and Life Sciences, Seoul National University, Seoul 08826, Korea

[Introduction]

Genetically modified soybean is one of the major biotech crops and accounts for 50% of global area of GM crops. Soybean is believed to have originated from the East Asian region, so wild soybean species which can cross with GM soybeans inhabit wild areas. Despite no GM soybean cultivation in East Asian regions, the concern of unintentional gene flow from GM soybean to wild soybean and the consequential weedy risk has been growing because of increasing GM soybean import. Therefore, we conducted this study to characterize the seed traits related to weedy risk, including germination of hybrids resulting from gene flow from the GM soybean to the wild soybean.

[Materials and Methods]

Glycine max L. cv. Kwangan-kong, GM soybean (Kwangan-kong with *bar* gene), wild soybean (*Glycine soja*), and F1 & F2 hybrids between GM and wild soybeans were used. To characterize seed phenotypes, seed length, width, and one hundred seed weight were measured. All measurements were repeated three times and each replicate included 10 seeds. Germination test were carried out for 20 days, and TTC test (Lakon, 1949) were performed to evaluate seed dormancy. Four replicates of 200 seeds were performed. for data analyses, ANOVA, DMRT test (phenotype data), and non-linear regression analysis with the Gompertz model (germination data) were conducted by Genstat 5 (Genstat committee, UK).

[Results and Discussions]

For seed phenotypes, pollen-donor GM soybean seeds were much bigger and heavier (about 15.0 g of 100 seed weight) than F2 hybrid (5.7 g), while pollen-recipient wild soybean and F1 hybrid seeds were the smallest and lightest (about 2.5 g). F2 hybrid seeds were brown, an intermediate between the yellow GM soybean seed and black wild soybean seed. These findings indicate that F1 hybrid seeds show similar characteristics to the wild soybean (maternal parent), while F2 hybrid seeds show an intermediate color and size between its two parents. For seed viability, F2 hybrid seed showed the intermediate traits between its parents in germination and dormancy rates, which were 35% and 65%, respectively. GM soybean showed no dormancy, while wild soybean showed greater than 90% dormancy. These results indicate that F2 hybrid show intermediate characteristics in seed germination with high dormancy trait, suggesting a potential weediness of hybrids resulted from gene flow from GM soybean to wild soybean.

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*Corresponding author: Tel. +82-2-880-4542, E-mail. dosoonkim@snu.ac.kr