Crossbreeding GM crops may increase fitness of wild relatives

A new study has investigated the effects of interbreeding a genetically modified squash crop with its wild relative. The findings demonstrate that it could cause wild or weedy relatives to become more resistant to disease.

Genetic Modification (GM) can be used to develop crops that are resistant to specific pests. However, there are concerns that if a GM crop interbreeds with its wild or weedy relative the resistance could be transferred. This could potentially make wild plants more competitive. The study investigates the possible risks of a GM cultivated squash crop (Cucurbita pepo) crossbreeding with a wild squash crop.

The researchers compared the resistance of wild squash and plants that were a hybrid of the cultivated and wild squash varieties to viruses. One half of the hybrids were GM, containing a gene that rendered the plant resistant to zucchini yellow mosaic virus, and the other half were conventional non-GM plants, which had not been specifically bred for virus resistance.

Second and third generations of the crossbred squash plants were exposed to the virus over two years and compared with squash plants which were not exposed to the virus. The research measured the fitness of the plants in terms of variables such as number of seeds, flowers and fruit, pollen production, and plant mass. It also investigated vegetative traits such as leaf area and length between nodes where the leaves grow from the stem.

The results indicated that the presence of the virus dramatically decreased the fitness of both the wild squash plants and the non-GM hybrids. In comparison, the GM hybrid plants continued to be resistant to the virus over the two generations.

With the exception of pollen production, the virus produced negative effects on all fitness components of the wild and non-GM plants, decreasing seed production by 80 to 100 per cent. In the first year, the non-GM plants had a slightly higher resistance to the virus than the wild squash, indicating a possible benefit of conventional non-GM crops. However, the following year the resistance was lower.

In addition, the research found that by the third generation, the shape and structure of the cultivated GM hybrid crop and the wild crop were indistinguishable. They both had a vine-like quality with long spaces between the leaves that would allow them to grow well in the wild. This supports the proposal that the wild-GM hybrid would thrive in the wild.

It is significant that the non-GM hybrid showed some subtle signs of disease resistance. While it did not display fitness as dramatically as the GM hybrid, the study points out that the basic mechanisms for transferring traits to weeds are fundamentally the same for conventional crops as for GM crops. It is therefore possible that a crop conventionally bred for strong virus resistance could pose similar risks to those posed by GM crops. This is an area which deserves further attention.

However, the authors suggest that, to predict more accurately the effect of virus resistance on wild squash populations, data are needed on the long-term patterns of virus incidence and their role in regulating wild plants. The authors also caution that this study only investigates the relationship between one specific plant and one specific virus. Risk assessment must be undertaken on a case-by-case basis; it cannot be assumed that other diseases or crops will behave in the same way.


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Theme(s): Agriculture, Biotechnology, Risk Assessment