Aiming for Compatibility with Organic Farming: Will cisgenic plants take the scare out of GMOs?

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While our national and EU policy makers readily acknowledge that transgenic and conventional crops can in principle coexist, the de facto moratorium on GMOs being advocated by Italy and other member states, not to mention the proliferation of "GMO-free-country" proclamations, belies the official line. The picture becomes even more complicated when we realize that organic crops continue to face a number of unresolved structural issues well upstream from supply-chain organization and market demand that still require more viable operational approaches in terms of production guidelines and genetic material expressly adapted to organic growing regimes. Indeed, growers in a number of districts are beset either by a high critical mass of pathogens or crops that are highly susceptible to biotic or environmental stress, conditions that jeopardize both crop yields and quality.

This situation gives research a chance to make a difference by developing alternative methodologies via the tools of genetic engineering. Current tools include the use of hetero-specific transgenes, aliens, and procedures employing viral promoters like CaMV 35S to activate novel constructs, transgene bacteria for selection media like "npt2" per the antibiotic kanamycin, or either the reporter GUS gene or the gene of the "gfp" fluorescent protein as a color-contrast medium to check in vitro proliferated shoots.

In fact, today there are a number of successful techniques to eliminate or silence genes and promoters that do not belong to the genus or species to be transformed. Cisgenic, or intragenic, is thus the name given to plants that are bred via procedures enabling the removal of all heterologous genes used in the process. Practically speaking, the new plant thus retains only its own genes or those belonging to, or congenial to, the species. These plants must, of course, be performance-tested and pre- and post-gene transformation traits compared as a safeguard against allergenic problems and other risks. However, since such plants are conceptually no different from those bred via normal sexual reproduction, they should not arouse ethical issues or doubts about the outcome of heterologous transformation. What we need now, therefore, is a testing protocol that everyone can underwrite so as to rule out the appeals for infinite testing in the name of the precautionary principle that hangs over these issues like the sword of Damocles.

The University of Bologna's Department of Arboreal Crops (DCA) was the first such institution to transform a fruit species using the HcrVf2 gene, which had been isolated and cloned from the apple genus Malus (floribunda 821), into cv. Gala, making it resistant to scab. In other words, Gala was prompted to resist the disease without going through the process of crossing and selection to breed a new plant but, simply, using just a single gene from its own genome. This means that the original cultivar was not subject to the genetic recombination of all its traits and the subsequent selection process followed to breed all the other scab-resistant varieties. The fact that this new Gala does not meet market-quality demands is also a main drawback to traditional breeding. The DCA's GM Gala, which now has several clonally propagated lines, is still kept sequestered in the greenhouse because the Agriculture Ministry (MIPAAF) has yet to authorize field tests.

There is the chance, though, that in the near future, when doubts about the safety of GM plants have dissipated, these powerful genetic tools will become available to organic crops and help to consolidate their success.

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