

## Mustard maker Awaits his Day

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Proagro is on tenterhooks. For months now the Genetic Engineering Approval Committee (GEAC) of the Ministry of Environment and Forests has held up the decision to grant commercial approval to the transgenic mustard hybrid varieties that the company has developed. Even in its last meeting, held in December 2002, the committee decided to take more time to study the environmental and health safety factors of the transgenic mustard.

But Proagro, a subsidiary of Bayer Crop Science Group, is confident that GEAC will grant its approval, though it is likely to lay down strict conditions. "If everything goes well, we can go commercial by 2004," says Proagro, director (research), Dr Paresh Verma. The company has spent eight years and Rs 5 crore to develop three hybrids of mustard plant using the transgenic method.

Proagro's transgenic mustard ran into trouble when some members of the GEAC expressed their apprehension that the herbicide-resistant Barge used to produce the Genetically Modified (GM) mustard hybrids would lead to aggravated weed problems. Allaying such fears, Dr Verma, who has been leading the research on GM mustard at the company's headquarters and main research station in suburban Gurgaon, said, "Farmers will have absolutely no problem as the GM mustard will not lead to any weed problems. They can manually pull out the weeds as they normally do with their mustard crop."

For Proagro, GM Mustard is its first foray into transgenics. It is more of a plant breeding company developing hi-yield hybrids for rice, corn, soybean, sunflower, sorghum, cotton and millet. It has three more R&D stations at Aurangabad, Hyderabad and Bangalore, other than the one attached to its corporate headquarters in Gurgaon. It has about 35 agricultural scientists

working on hybrid crops with an annual R&D investment of Rs 7 crore.

Using the transgenic approach, Proagro developed a hybridisation technique to produce three hybrid varieties of mustard—MT 95002, MT95003 and MT95005. “Natural hybrids of mustards are not commercially viable and we developed hybrids using transgenics to produce hi-yield varieties,” Dr Verma explained. Proagro has used two genes, Barnase and Barstar, to formulate the GM Mustard. Barnase has been used in the female and Barstar in the male to ensure that self-pollination does not occur. An additional gene, Bargene, has been used in the male as a marker. This gene is resistant to the herbicide, glufosinate ammonium. “In all transgenic varieties, we need to have a screening tool to follow the genes. The Bargene in these hybrids has been used only as a marker and its herbicide-resistance will not increase weeds,” explained Dr Verma.

Proagro first presented its GM mustard hybrid to the Royal Commission on Genetic Modification (RCGM) in 2000 after it completed bio-safety studies on food, environment, health and agronomic aspects. Once RCGM had given Proagro's GM mustard a positive review, the company approached GEAC in 2001 for approval. GEAC asked the company to go in for additional trials on environmental and agronomic fronts. It also asked for large-scale field trials. “We held trials in farmlands under strict government supervision, in 50 locations across five states,” Dr Verma said.

This data was presented to the GEAC, which asked for further studies on the environmental and agronomic safety factors. “Our studies have shown that GM mustard is as safe as non GM mustard; it has no allergenic potential, there is no change in the nutritional value and there is no dermal or oral toxicity,” Dr Verma said, confidently.

However, GAEC's biggest trepidation is that the pollination impact of GM mustard may be devastating, if it is not properly studied, as are more than 3,000 varieties of Indian mustard. After the last GEAC meeting, an official statement issued said, “GM mustard is being seen as a more complex issue than Bt cotton, given the biology of the mustard plant and the larger number of species in the mustard family.

The pollination impacts of GM mustard on the related and unrelated plant species have to be looked into rigorously. The GAEC felt that the genes could escape into the soil bacteria and genetically pollute other species of mustard. The committee also raised the issue of pollen flow from GM mustard to non-GM mustard plants, longer duration of the GM hybrids, and food safety studies using the leaves of GM mustard hybrids.

“Our studies have shown that these fears are baseless. The pollen overflow studies have shown that cross-pollination up to 10 mts was a mere 0.12 percent and beyond 10mts, it was 0.01 percent up to a maximum of 35 mts,” Dr Verma emphasised. He said these studies were done under the supervision of local district and state agricultural committees in two locations.

The delay in the commercial release of GM mustard should not be taken amiss, advises Dr Sanjay Saxena, plant tissue expert, Tata Energy Research Institute (TERI). He feels that GEAC must make sure that all parameters have been met and sufficient data has been generated to prove that the crop is safe on all factors before it is released. “Only after the GEAC is fully satisfied with all the data collected can any crop whether it GM mustard or any other be launched on a commercial scale,” he emphasizes.

The transgenic mustard has also shown a 20 per cent increase in seed yield and oil content compared with the best check variety of mustard and the most popular Indian variety, Varuna. The growing period of GM hybrids was only four days more compared to Varuna, he said. Clarifying the gene pollution factor, Dr Verma said, “Proagro's technology is tightly controlled and the genes cannot be found in any plant tissue except in the flowers, that too during a specific phase. The Bargene (the herbicide-resistant marker gene) can be found only in the green tissue (the leaves) and not in the seeds, thereby ensuring no gene pollution.” This technology is based on the same technology used for GM canola being used in the US and Canada since 1997, he added.

Proagro has its fingers crossed. Monsanto had to face a lot of bad publicity and stiff resistance when Bt Cotton was approved by GAEC for commercialization. Proagro is hoping that it will not have to face the similar flak if GM mustard is approved.

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