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EDITORIAL

GM CROPS: A SOURCE OF ADVERSITY OR PROSPERITY?

Science is not perfect. But it relentlessly strives to reach the truth. According to Carl Sagan, science is only a tool, but it is by far the best tool we have - self-correcting, ongoing and applicable to everything. But sometimes science or the knowledge derived out of science has been bamboozled by powerful lobbyists. We have seen before how nuclear reactors produce energy, clean energy, at a time when more and more energy is needed for development while the resources for obtaining energy by conventional methods are depleting. However, production of nuclear energy has been opposed by creating fear amongst the public: fear of accidents, fear of radiation hazards for those living near the reactor site etc. When argued that there is no such evidence of people located near the site having health problems, some went to the extent that the effect may be seen in the children of 14th generation! A good point which as a scientist one can not prove or disprove. Every technology has its backlash. And talking about accidents, no technology is hundred percent foolproof. Hundred percent safety is a myth. A technology is accepted only on the basis of cost/benefit evaluation. I have written an editorial on similar issues after the Fukushima nuclear accident (Science and Culture, September-October issue, 2011).

In this issue we are going to discuss another controversial issue: Genetically Engineered or in moderate tone, Genetically Modified (GM) foods. GM foods are controversial because some scientists find it ecologically friendly, farmer friendly, a means to address food shortage because of increasing population with limited natural resources, while some other scientists, activists and politicians consider it to be dangerous for human health. Being a physicist, I do not have any authority to comment on this topic. I would, therefore, present the global views as well as Indian views on GM crops. Indian views have been presented through an article written by a leading expert in this field who is no other than M.S. Swaminathan and his colleague. The article very succinctly points out the concerns of using GM crops and what India needs to do in this context. Without a sound risk assessment mechanism in place, it may not serve the desired purpose.

According to a report published by the International Service for the Acquisition of Agri-Biotech Applications (ISAAA), which analyzed available data on officially approved biotech crop adoption globally for more than 20 years, commercialization of biotech crops have delivered substantial agronomic, environmental, economic, health and social benefits to farmers and increasingly to the consumers. More than 18 million farmers of 30 countries, 90% of whom are small and poor farmers, have confirmed receiving multiple benefits such as increased productivity, improved economic, health and social conditions, conserving biodiversity, and mitigating challenges that occurred due to climate change etc.

According to the report, industrial countries planted biotech crops more than the developing countries till 2011; the trend started reversing after that and by 2016 developing countries grew 54% of the global biotech hectares of farming compared to 46% by the industrial countries. Out of the top ten countries, each growing 1 million hectares or more of biotech crops, eight are developing countries (Argentina, Brazil, China, India, Pakistan, Paraguay, South Africa and Uruguay) while only two (USA and Canada) are the industrial countries. Of the 26 countries that planted

biotech crops in 2016, 46% of the countries were in the Americas, 31% in Asia, 15% were in Europe and 8% in Africa. Six countries that have economically gained the most in the first twenty years of commercialization of biotech crops are the USA, Argentina, India, China, Brazil and Canada with India occupying the third position from the top.

India's situation in the context of biotech crops has been topsy-turvy. India introduced insect resistant (IR,Bt) cotton plantation as early as 2002. In the last fifteen years between 2002 and 2016, cottonseed became an important source of oilseeds in India as the production of Bt cotton-based oil increased by three-fold from 0.46 million tons in 2002 to 1.5 million tons in 2016-17. The cotton market is heavily dominated by India and China both on the production and consumption side. However, India received a moratorium when they tried to plant IR brinjal in 2010 but reached the ultimate step of commercial release of biotech mustard in 2016. On May 18, 2017, a week after the government's regulator Genetic Engineering Appraisal Committee (GEAC) approved the commercial release of herbicide-tolerant GM mustard DMH 11 variety, the minister (Anil Dave) on whom rested the final decision suddenly passed away and all hopes of planting biotech mustard was lost. It is not known whether biotech mustard would have finally seen the light of the day even if the minister had not passed away since resistance from various quarters, including scientists, activists and politicians, was mounting up. The claim that biotech mustard has the potential for better yields by 30 to 35 per cent was challenged in the court by activists that there is no such proof to establish that. Deepak Pental, the scientist behind inventing the GM mustard believed that "it will be a setback for Indian agri-biotech research" if the GEAC-approved technology is not allowed to be implemented. On the other hand, P. Pardha-Saradhi, a professor of the University of Delhi, does not see any agronomic benefits in releasing GM mustard but fears that this may jeopardize India's farming, food, human health and its rich biodiversity.

Interestingly, in January 2016 GEAC constituted a Sub-committee of scientific experts to address each aspect of the dossier of biotech mustard before its release. The Sub-committee took eight months to prepare a comprehensive document "Assessment of Food and Environmental Safety (AFES)" and was of the opinion that "biotech mustard is as safe as conventional mustard and does not raise any public health and safety concerns for human beings and animal health". It also does not pose any risk to biodiversity and the agro-system. In order to address the concerns raised by anti-biotech activists, a special meeting was held by GEAC in July 2016 who published a biosafety dossier and allowed for public comments for a month till 5 October 2016. More than 700 comments were received and were analysed by the Sub-committee who decided to take a final position on this issue sometime in 2017. Rest of the history is known.

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Globally about 25% of the total brassica (mustard/canola) grown is genetically engineered. Canada, China and Australia vigorously started biotech mustard hybrids in 2017. Mustard production and yields have remained stagnant in India for the past 20 years. 6 million mustard farmers of India continue to suffer from low yield, meagre farm income and an opportunity to low cost production due to denial of modern technologies. Farmers in Australia, Canada and USA have been benefitting from biotech canola since 1996 and canola is now a major export farm product in Canada.

Ironically, India imports biotech canola (Canadian mustard) from Canada and consumes about 5 million tons

of edible biotech oil as cooking oil every year. The total edible oil consumption in India is 20 million tons, 70% of which is imported and one-third of which is biotech mustard and soybean oils. India spends annually over US$ 12 billion on edible oil imports. In spite of the fact that biotech Indian mustard oil is no different from imported biotech canola (Canadian mustard) and biotech soybean oils, we are ready to consume imported oils but not our indigenous ones!

It is no denying the fact that almost all the food that we eat have been genetically modified and that genetic modification includes not only conventional breeding but also simple selections that man has made over the millennia. Carrots were not orange until the 1700's and tomatoes used to be the size of marbles. Corn used to have very small ears and kernels with hard seed coats with low digestibility.

In addition to its nutritional value, food often has societal, cultural and historical connotations and people have different positions towards food at different parts of the world. People, in general, love to have what is natural and therefore technologically modified food may evoke a negative response among consumers especially in the absence of a sound risk assessment system and cost/benefit evaluations.

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