

No risks reported from GM crops grown for decades: FSSAI scientist

DR S R Rao, Chairman, FSSAI Scientific Panel on GM foods, and former senior advisor, Department of Biotechnology, talks to The Indian Express about the debate on the genetically modified (GM) crops.

by [Esha Roy](#)



DR S R Rao, Chairman, FSSAI Scientific Panel on GM foods.

Are there any dangers associated with GM crops?

The term 'dangers' is out of place here – risk or safety is better suited. The *Bacillus thuringiensis* (or Bt) bacteria has been in use as an indispensable crop protection tool for 100 years in agriculture and forestry. For the past 50 years, Bt has been used by organic farmers as an approved microbial pest control agent (MCPA). Through molecular biology techniques, the gene responsible for insect control from a chosen strain has been isolated and transferred into the target plants like cotton and brinjal. Although horizontal gene transfer across species occurs through years of evolutionary process in nature, laboratory transfer of genes across species like in Bt cotton can happen in few months.

There have been no risks reported from commercially cultivated GM crops which have now been cultivated and consumed for decades, especially in countries such as the US, Australia, Canada, South Africa, Philippines, India etc. These crops – mostly cotton, soybean, corn and canola – are generally genetically modified to develop insect/pests resistance and/or also to

be herbicide tolerant, that is when the herbicide is sprayed on the crop it only kills the weeds but not the crop itself.

Globally, cultivation and consumption figures indicate that 67 countries have adopted biotech crops (till 2018), including 26 EU countries and 17 others who formally import GM crops for food, feed and processing. GM Crops are being grown by 24 countries – 19 developing and 5 industrial countries, covering about 190 million hectares.

The only negative impact, I think, is that in some cases in India and elsewhere the incidence of pink bollworm pest was reported on Bt Cotton. It appeared that the insect had become resistant to the Bt gene. However, in recent years, an Integrated Pest Management System was adopted, which includes the selective use of pesticides, agronomic and cultural practices of sowing, management and harvest.

GM technology is simply one of the many tools in the overall crop management system. I should also reiterate here that all GM crops undergo rigorous food and environmental safety assessment following international protocols and national regulatory guidelines. Food safety assessment is mostly as per the Codex Alimentarius, or the Food and Agriculture Organization-World Health Organization

‘Food Code’ – a collection of standards, guidelines and codes of practice adopted to protect consumer health and promote fair practices in food trade. The criteria such as history of use of the sources of the genes, compositional analysis of widely consumed varieties of GM and non-GM (crops)... Acute toxicology studies of GM pure protein and sub-chronic studies of 90 days are carried out on mice (reflecting its full life span). If untoward effects don’t show up in these tests then the variety of GM is deemed fit for human consumption. History of the use of the source of genes and that of plant is taken into account for food safety. Compositional analysis of increased or decreased levels of nutrients, anti-nutrients, secondary metabolites, and/or natural plant toxins in the GM plant and its non-GM comparator(s) is important in food safety assessment. Any statistically significant difference is reviewed in comparison to values/ranges for conventional varieties available in literature or on recognised databases. These tests establish that apart from being pest/ herbicide resistant, the plant/vegetable/crop remains exactly the same as the original plant. Experiments conducted on weediness, potential crossing over of genes to wild or related species and non-target effects as per international and national protocols also demonstrate

that the GM crops are environmentally safe as well. Since no other characteristic of the crop has changed, there is no change in its effect on the environment. Several reports and dossiers on risk assessment of crops from different countries over the years are available on the web portal of the Biosafety Clearing House (an information exchange mechanism established by the Cartagena Protocol on Biosafety) and the portals of many other regulatory agencies), and they substantiate that so far all approved GM crops are safe for consumption and environment beyond doubt.

Is our regulatory system robust enough to address the concerns over GM crops?

India has put in place rules and regulations as early 1989 under the Environmental Protection Act (1986). Since then the system evolved scientific risk assessment from product to product. India is the only country where all the genetically engineered products of use in medicine, agriculture etc are regulated under one single law. There are international as well as national protocols and guidelines in place, and we follow these strictly. Several regulatory and biosafety tests, which cost up to 2-3 million dollars, are carried out before a crop is actually authorised for commercial use. Several notified public and private labs conduct independent tests apart from the official regulators, independent multi-disciplinary scientific experts in RCGM (Review Committee on Genetic Manipulation) and GEAC. These regulatory bodies are assisted by a biosafety support unit of PhD scientists trained by international experts and agencies in risk assessment. In case of special needs, several expert committees are also roped in.

In recent years, the final signing authority is the environment minister. What has also been started now is that all documents pertaining to a GM crop is placed in the public domain, including all the data on the tests that have been conducted and their results. So the decision-making is more participatory and the civil society is also involved. This is what has been done for GM mustard – which is on hold and still awaiting approval.

Is there a need to make a distinction between food and non-food GM crops?

The distinction between food and non-food (GM) crops was made by the Technical Expert Committee set up by of the Supreme Court in 2012 following a PIL on GMOs. Some politicians as well as civil society agencies wanted this distinction to be made to emphasise that food is directly ingested, unlike textiles, and therefore decision to authorise the growing of Bt brinjal or food crops needs to be done more cautiously. But the line between

food and non-food is far more blurred than you would imagine. For instance, there is approval to grow Bt cotton, a seemingly non-food crop, but one of the products of Bt cotton is cottonseed oil whose annual production is about 13-14 lakh tonnes — it is the third largest contributor to the Indian edible oil basket. Cottonseed oil is commonly consumed in processed foods — potato chips, cookies, crackers, margarine, mayonnaise, salad dressing, in baking and for deep frying — at many fast food chains. As far as the regulatory system is concerned, there is no distinction made between food and non-food GM crops, all of which are put through rigorous tests. Therefore, such distinction has no rationale and is sometimes not practical.

What has been the experience with Bt Cotton?

In India, Bt cotton with two genes was approved by the regulator in 2002 and is cultivated in the country for the past one-and-a-half decade. In India, 65 lakh farmers across 10 states cultivate more than one crore hectares of cotton annually, the largest in the world. An estimated six crore people depend on cotton for their living. India's share in global cotton production is as high as 25 per cent, a matter of pride for India and the Indian farmer.

With the introduction of Bt cotton, Indian cotton production received a big boost — from 130 lakh bales production in 2002 to 400 plus lakh bales in 2018-19. Increased cotton availability helped Indian cotton exports to flourish and reach \$8 billion last year. The textile industry is a huge beneficiary of the Bt technology-led spurt in cotton production. The success story extends to the entire value chain of the textile and garments industry. Since 2000, the size of the textile industry grew six times to Rs 10 lakh crore, exports tripled to more than Rs 2.5 lakh crore, and spun yarn production also almost doubled during this period.

The success of the Bt cotton technology also ensured resistance to one major pest, the bollworm, which in turn provided opportunities for breeding new hybrids with good genetic background, and led to improved agronomic practices and use of novel pesticide molecules for control of other pests. There has been no adverse effect on soil, nearby organic farms, human or animal health or other pests and diseases. This is well-documented internationally.

Based on research papers and global experience, the farmer has got the maximum profit from Bt cotton, followed by the local seed producer, and then Monsanto or Mahyco which receives royalty for the technology.

Our regulatory system is not independent enough. At least a part of it functions under the Department of Biotechnology, which is a conflict of interest. The Biotechnology Regulatory Authority of India (BRAI) Bill has been pending for almost a decade. How much is the delay in the creation of an independent regulator a problem in streamlining GM approvals?

The Department of Biotechnology is simply one of the stakeholders among several Central and state ministries/departments. The final approval is given by the Ministry of Environment, based on several concurrent laws and rules such as the Seed Act. The Food Safety and Standards Authority of India (FSSAI) is also involved. A number of independent multi-disciplinary experts are involved as part of regulatory committees before things even reach the table of the environment minister. So there are checks and balances. Even within the Department of Biotechnology, the promoter and the regulator sides are entirely separate and are not influenced by each other. Further, the GEAC, the RCGM and sub-committee expert members have to declare any conflict of interest. So I wouldn't agree that there is a conflict of interest in the current system.

In the last five years, applications from companies and individual scientists seeking approval for GM crops have dried up. Public opinion against GM crops and the delays in getting final approvals from the government of the day — even after the GEAC and expert bodies have given approval — makes the investment untenable for investors. Therefore, GM crop research in India is also drying up.

What exactly is holding up the BRAI Bill?

The BRAI Bill was not just for regulating GM crops in agriculture but also strengthening and streamlining the entire system of biotechnology, and to set up an inclusive, participatory, independent regulatory body. But there has been a lot of apprehension about BRAI among activists and the civil society who perceive it as a single window clearance system to get GM projects passed. These apprehensions caused the hold up. For now, the BRAI Bill has been shelved. It was felt that the existing regulatory bodies need to be strengthened and awareness about the technology must be created. When the Haryana case came to light (where a farmer was allegedly growing Bt brinjal), I actually heard a TV reporter say that

“baingan me zeher hai (there is poison in the brinjal).” The Hindi word for toxin is ‘zeher’... The Bt insecticide toxin is genetically inserted into the plant to make it resistant to pests. The Bt toxin is obviously not poison. Such misunderstandings need to be clarified to avoid miscommunication in media too.

How much of the opposition to GM crops is ideological?

The GM technology is even more advanced today than it was 20 years ago. The tools that we have to ensure the quality and safety of GM crops are even more advanced now. For instance, a concern about GM crops is that they require more water and other inputs. However, that is not the case. They require as much water intake as a non-GM plant would. In the early years of its adoption, people said that the GM seeds cost more money. The farmer, however, realised soon in the case of GM crops, there was less expenditure on pesticides and more yield. Also, state governments, such as Andhra Pradesh and Maharashtra put a cap on the seed price. Further, in March 2018, the government reduced the cost notified in 2016.