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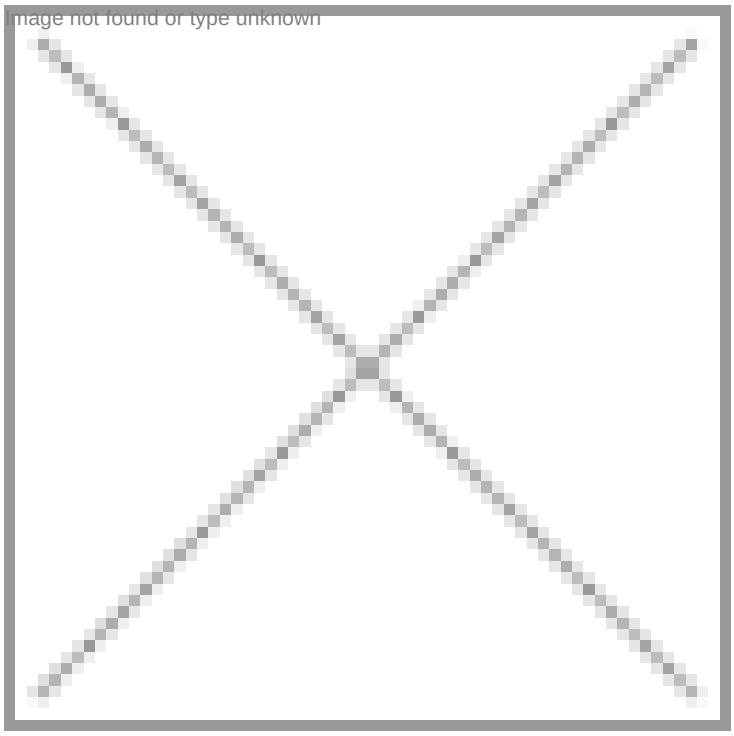

Biotechnology in defense of biodiversity

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There is a pervasive urban myth that modern biotechnology, particularly the genetically modified (GM) crops are antithetical to the conservation of biodiversity.

This urban myth is being bandied out by numerous anti-GM activists around the world. Most of them are ignorant of what constitutes biodiversity, and the differences between natural biodiversity and agricultural biodiversity. Instead of getting romantic, sentimental, and politicize biodiversity, it is time to ask some dispassionate scientific questions in this contentious biotechnology and biodiversity debate: How useful is this biodiversity? What are the best ways of biodiversity conservation? Should all of it always be preserved in natural habitats or is it better preserved using modern biotechnology?

Perhaps, the most important of all questions is should all biodiversity be preserved or is it worth preserving? What is happening today is that the entire biodiversity issue has been politicized on a grand scale. Every NGO, every environmentalist, every social activist invokes it for political purposes to garner public attention and attract funding for their own existence without any scientific outlook. When was the last time you heard a peep from any knowledgeable biologist, a biodiversity expert, an ecologist, or an environmental scientist on the subject of biodiversity conservation? There is a good reason for it because they know better or at least are trying to understand the issue.

The real challenge that faces knowledgeable experts in biodiversity is the identification of its components and their characterization-a daunting challenge on a global scale.

Anti-GM activists say that GM crops are unnatural and cause "genetic pollution" or "genetic contamination"-these terms do not exist in the lexicon of geneticists. These have been coined solely for the purpose of political campaigning, attracting media attention and scaring the ignorant public because words like "pollution" and "contamination" raises specter of damage or spoilage.

There is not a shred of credible scientific evidence to suggest modern day crops including GM crops are a threat to biodiversity either natural or on-farm agricultural biodiversity. Indian campaigners keep repeating that India is a mega-biodiversity country meaning it has a wealth of natural flora and fauna that are invaluable, in what sense nobody knows simply because Indian biodiversity has not been well studied at all. Instead, it would be a worthwhile cause if they NGOs campaign the government for funding biodiversity studies on a scientific basis using the best of modern scientific and technological tools. At least then, we will know how rich India is in its biodiversity and how useful it might be. What happens in agriculture is old varieties are replaced by newly introduced varieties from time to time all throughout the ages. That is called agricultural improvement or development. However, there is an unanimous scientific opinion that it is only human settlements-due to population explosion all over the world-that destroys natural habitats, which in turn has destroyed natural biodiversity.

In fact, agriculture as it started 10,000 years ago is one of the most environmentally destructive of natural habitats where virgin lands were cleared for converting them into agricultural fields. This kind of habitat destruction continues to this day. GM crops are late entrants to the science just like hundreds and thousands of improved varieties and hybrids that have been introduced into agriculture in the modern times. Another important reason why low yielding and unproductive old varieties are not grown is simply economics. Just because old varieties are not being grown does not mean they have vanished from the surface of the earth. Most of them have been conserved and propagated scientifically by gene banks all over the world. To every person who is interested in using such germplasm for research and development or even just to grow it is available at no cost from most of these gene banks. People, who are in the business of plant breeding and plant improvement, use these all the time.

Farmers will adopt anything that is remunerative, and therefore choose to grow improved varieties and hybrids as and when they became economic sense. Bt cotton's spectacular adoption in India is only because of its economic value. The allegation that non-GM cotton seeds have vanished from the market place and that it is a conspiracy of seed companies' to leave farmers with Bt cotton as the only choice is nonsensical. Non-GM cotton is available in plenty and there are huge stockpiles with cotton seed companies just because there are no takers. It is simply the market forces at play. Every seed producer would not like to keep stock of seeds on which he has spent so much of money if there is a market for it. He would rather sell it and recover his investment.

With respect to on-farm biodiversity, it is argued that GM crops will wipe out all weeds some of which might be useful as fiber or medicinal plants. It is really against natural logic to allow growth of unwanted plants in an agricultural field (particularly in small holdings) when the real purpose of growing a crop of choice is to maximize its productivity. Farmers all over the world struggle to control pests, diseases, and weeds to cut down yield losses. If some of these weeds are really valuable, then farmers must be encouraged to grow them scientifically and make money, if at all there is money to be made.

Scientists have preserved even such weeds, diseases causing organisms and insects for scientific studies to find solution to problems created by them. In fact, modern biotechnological tools are being used to get the best out of these unwanted organisms through functional genomics, yet another tool of modern biotechnology without which not much could have been gained.

"Genetic pollution" and "genetic contamination" are scientifically bogus terms that should be completely rejected by all. These are political slogans used for anti-technology campaigning. What happens in nature is that there is gene flow via pollen drift from plants between sexually compatible species, most often resulting in sterile hybrids, which end their spread then and there. Pollen flow must not always be equated with gene flow. If pollen escapes that does not mean genes have escaped. This is a simple aspect of basic pollination biology that most anti-GM NGOs don't know or don't understand. In the context of gene flow, most NGOs have completely misinterpreted gene flow via vertical and horizontal gene transfer mechanisms. In fact, there is not s shred of scientific evidence to show that in the entire plant kingdom there is what is called horizontal gene transfer known. Sound scientific knowledge is self-defeating for these activists.Pollens and genes have always moved from organism to organism following the natural laws of reproduction, and as modern agriculture developed scientists have developed spatial, biological and temporal means of maintaining genetic purity of pedigrees to a certain practical extent. In spite of it, if genes outcross into a non-target organism, it will only add to increase in biodiversity, and not the other way round. If there is no selection pressure such genes get diluted out in the wild population. Any student of basic population genetics knows this, but activists are not interested in this critical knowledge, instead they are self-proclaimed scare mongers. They are in the business of whipping up fear and making non-issues into political issues.

When the same modern biotechnology presents technological options to prevent gene escape using gene restriction techniques, the activists dubbed them, very cleverly as the "terminator" and "traitor" technologies, and such a wonderful application of gene regulation technology was killed. There is a huge cry against GM crops by the organic lobby buttressed by all and sundry anti-biotech NGOs in India, and elsewhere that there has to be zero tolerance for mixing GM crops with organic crops. This beats all logic.

Before the advent of GM crops, there were two world of crops, one for organic and another for the non-organic crops. Organickers had found their own sanctified way of maintaining isolation and allowed themselves certain degree of mix up with non-organic, and developed a certification system that was working well. It took lots of physical containment and isolation measures to sell organic produce and which is why organic products are abut 30 percent more expensive in the market. It is totally incomprehensible as to why organickers cannot continue to practice their isolation and segregation as before to avoid un-intentioned unavoidable mixing of modern day GM crops, and continue their business. But, no! They want zero tolerance for GM crops and simply force a ban on GM crops. There are no safety issues involved here. It is nothing but a commercial ploy to keep a particular type of goods out of the market and protect economic interest of the organic lobby. Regulatory authorities should not yield to this economic black mailing by the organic lobby.

Modern biotechnology including tissue culture, micro-propagation, marker assisted breeding, conventional breeding, transgenic crops, and genomics, are all quite useful for conserving and propagating biodiversity in many unique ways. Modern biotechnology is not a threat to biodiversity. On the contrary, it can be beneficially deployed to defend, conserve and propagate all forms of biodiversity. National Biodiversity Authorities and Biotechnology Regulatory Authorities should not heed to all these unscientific propaganda against biotechnology and GM crops. Instead, defend their policies based on best possible science and empirical evidence.