

The Ever Changing Dynamics of Genetically Modified Crops

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Abstract:- Genetically modified crops can help with the amount of food grown, and research is being done to investigate risks to human health and the environment. Although many people have opinions about genetic engineering and GM crops we need to ensure that our knowledge is informed by reliable scientific research conducted by many different scientists. The research conducted helps to identify the issues relating to genetically modified crops in the present era, and conjointly focuses on its regulation. This research paper throws light on how these have been efficiently working in developing countries mainly in India.

"All it takes is rumor... the danger itself is irrelevant. Its the perception of danger we are selling"

- Sharon Weil, (save the world)

I. INTRODUCTION TO GENETICALLY MODIFIED CROPS

GM stands for "Genetically Modified". Where plants that have had their genes changed for food production are cultivated. In rare circumstances, genes from other creatures have been introduced into the agricultural plant's genome to improve in some way as the human population increases there is a higher demand for food, and it's often difficult to grow enough food to provide everyone with a balanced diet. Growing genetically modified (GM) crops is a partial answer to this problem because GM crops offer better yields. than conventional crops, they can also offer extra nutritional value. Let's look at a few examples of genetically modified crops, so we can see how this is possible crops that are most commonly modified are cotton, soybean, maize, and canola crop yields are often negatively affected because pests like insects damage the crops, traditionally farmers have sprayed their crops with pesticides to kill the insect pests but this is time-consuming, expensive and often harmful to farmers workers in contact with the poisons also pesticides kill useful insects such as pollinators it can harm other animals that eat the insects that have been poisoned spraying the pesticides also damages soil and water in the environment. Crops have been genetically modified with a gene from a bacterium "bacillus thuringiensis", this gene causes the cells of the crop plant to produce an insecticide in their leaves that kills insects that eat it the genetic modification reduces the need for chemical pesticides. The growth of weeds in fields reduces the yield of crops because the weeds compete with the crops of water, light, and minerals in the soil. Farmers can spray their fields with weed killers but this may also damage the environment or even the crop plants themselves. So, crops can also be genetically modified to be resistant to weed killers. This means that only weeds will be killed by the weed killers this does not reduce the number of chemicals sprayed on the field

but it does mean that higher yields can be gained. Have you ever been told that eating carrots helps you see in the dark? This is because carrots are a good source of vitamin A, which is essential for healthy vision? A common problem in some countries is a deficiency in vitamin A because people have a diet mainly made up of cereals like rice with few fresh fruits and vegetables, to overcome this deficiency rice has been genetically modified to contain beta-carotene which is used in the body to make a vitamin A, this gives the rice a yellow color so it's known as golden rice, its taste is not altered but it contains extra nutritional benefits. Other examples of GM crops include those that grow in difficult conditions such as drought or cold temperatures and crops that are resistant to diseases, all of these genetic modifications mean we can either increase yields from existing farmland or we can farm low-quality land, both of which help us to feed the ever-growing world population but so far we have only looked at the benefits of growing GM crops many people are worried about possible risks associated with genetic engineering like for an instance little is known about the long-term effects of genetic engineering as GM crops haven't yet been around for long, there are concerns that GM crops could breed with other plants which would spread the modified genes into other populations and this could hurt whole ecosystems these risks are the reason why growing crops is banned in many countries, many people think that more research needs to be done to make sure that they are safe. Further will look into the concept of how these are being regulated.

II. HOW GMOS ARE BEING REGULATED

Pink pineapples, non-browning vegetables, and other genetically engineered organisms are making their way into our food supply. Most scientists are safe but critics are fiercely opposed to Genetically modified organisms. We are sure we have an option too. But what about the government agencies that have the authority to approve or reject genetically modified crops destined for consumers? The truth may surprise you. Although certain GMOs are subject to stringent controls, others sneak through the cracks with no government monitoring. Take this non-bruising white button mushroom for an instance. A person when scientists treated it to the popular gene-editing technology CRISPR, made headlines. The scientists utilized CRISPR in the mushroom to manipulate the quantities of an enzyme known as "polyphenol oxidase." This enzyme aids in the production of the dark pigment melanin in reaction to cell injury, which causes unattractive bruising. The US Department of Agriculture got the opportunity to evaluate this mushroom as the first CRISPR food, and officials declared that it would not be regulated. The news coverage of this announcement did not always emphasize some critical details. Gregory Jaffe, the biotechnology project's director (center for science in the

public interest consumer advocacy group) stated that "it gave an impression that USDA said there was no need for it to be regulated, they didn't say there was no need for it to be regulated, what they said was we have no authority to regulate it. Now here is the question why wouldn't the USDA have the authority to answer that, we have to go back to 1986 when the Reagan Administration crafted the Coordinated Framework for Regulation of Biotechnology. It was early days for GMOS and the government decided to evaluate GMOs safely for consumers and the environment with existing laws, rather than creating new ones. This gave USDA, along with EPA and FDA hooks to reel with GMOs under their particular umbrellas of oversight. One of USDA's existing legal hooks is the Plant Protection Act. This allows USDA to regulate anything that might be a plant pest, including GMO plants but also viruses, bacteria, and other microbes. Take, for instance, the non-browning Arctic Apple. To make it, genetic engineers stopped the activity of polyphenol oxidase enzyme-the same enzyme as in the CRISPR mushroom. But they engineered the apple's genes using a generic version of a natural plant pest called Agrobacterium. Because a plant pest was in play, the Arctic Apple has been tied up in a lengthy USDA approval process unlike the CRISPR to mushroom. The agency said that it had no reason to believe that CRISPR edited white mushrooms are plant pests. By the way, scientists don't think crops engineered with Agrobacterium would be plant pests either, this is just how the system works now. The mushroom is not the only GMO to sidestep regulation. For decades, nearly everyone made GMO crops with resistance to the herbicide glyphosate, commonly known as roundup, also USD agrobacterium. So, USDA could regulate them. But then along came the gene gun, which ballistically fires DNA into the plant cells. No plant pest is required. Scotts Miracle-Gro Company first used this to make Roundup-resistant Kentucky bluegrass, thereby evading USDA regulation. This research study identified that it is not a science-based system. One is being regulated because a certain process is used, and another is not being regulated because a different process is used. Like USDA, EPA and FDA have similar existing legal hooks to catch GMO'S trying to make it to the market. EPA can evaluate plants engineered to make their pesticides or "new chemical substances". The FDA has the authority to regulate genetically engineered animals, but that's a whole different bucket of worms. What this means is that crops modified with CRISPR might pass USDA and EPA inspections as long as they don't include plant pest components or pesticides. And CRISPR-modified animals may face FDA investigation. Most experts are skeptical that precise gene editing using CRISPR constitutes a health risk. However, researchers are responding to regulatory gaps in a variety of ways. Some argue that weak rules will increase consumer acceptance of GMOs. Others believe that leaving these loopholes open would cause more harm than benefit. Peggy Lemaux the (crop biotechnology researcher university of California) stated that "We are not saying we will not regulate it because we believe it is safe; we are saying you will not control it because it does not fall under your umbrella." I don't believe that's always a good thing. Others believe that gene editing just allows farmers to do what they've always done faster and more efficiently. For example, regulators and the general public typically trust cross-

breeding. However, cross-breeding takes a generation to complete, and each consecutive cross might introduce genetic baggage, traits that are undesirable or just unneeded, that require repeated crossing to eliminate. Without the baggage, gene editing brings you to the same location in one step.

Bernice Slutsky (the senior vice president of domestic and international policy American seed trade association seed industry trade organization) once stated that the "The plant breeder will still go through all of the testing and quality control measures that they typically do, but at the front end of the process, you have certain efficiencies that you didn't have previously." Earlier this month, the Obama Administration issued a long-awaited update to the Reagan-era Coordinated Framework, which empowers the USDA, EPA, and FDA to regulate GMOs. However, the update substantially stated the existing situation. . It made no changes to the laws and flatly denied gene-edited crops, such as ones generated with CRISPR. Nonetheless, others see the amendment as a welcome start toward getting all agencies on the same page concerning laws and emerging technologies. Since then, the FDA and USDA have asked for public feedback on proposed changes to certain of their policies. Are GMO restrictions too stringent or too lax?

III. GMO'S IN INDIA

Earlier, we used to grow non- BT [cotton]. Now, we grow BT. This one requires less pesticide and less manure. It gives a better yield. Many Indian cotton farmers grow the genetically modified variety of cotton seeds known as BT cotton. U.S based biotech giant Monsanto introduced the insect resistant seed technology more than a dozen years ago in collaboration with the Indian seed company meheeco , today the two companies want to sell India's farmers genetically modified seeds for food crops to this facility in China is running trials for several kinds of crops including rice weed and okra, sucking pests are a big problem in okra like other vegetables so BT okra is actually something that is also feasible and people worked on that as well but after a decade of the company's efforts to win Indian government approval for GMO food crops the seeds remain stuck in regulatory limbo growth in global sales of genetically modified seeds has been slowing since 2013 partly due to an international backlash against GMOs opponents claim the crops can damage the environment and potentially harm human health proponents reject the assertions the U.S Food and Drug Administration the World Health Organisation and the European Commission have concluded that are safe to eat, but the pushback has swept the world more than half of the European Union countries have moved to bar cultivation of all genetically engineered crops and the future in Russia and China remains uncertain, the first danger of GMOs is the concentration over the seed supply. Second is the environmental impact the BT is failing to control pests its created super PES herbicide-tolerant crops that have created superweeds Monsanto says it recommends rotating pesticides and using other methods like tillage to help slow resistance among bugs and weeds. India's highest court is currently hearing a petition challenging the testing and introduction of GMO food crops, despite the opposition Monsanto, meheeco

and other companies are still betting on India they say research proves biotech crops are safe there is no such thing as a hundred percent risk-free but you can assess scientifically and come to a conclusion whether this product is safe to the general public or not. Meanwhile, some Indian farmers see that pest-resistant plants are showing their limits as farmers struggle with increasing pest attacks on the BT cotton crops.

Despite having just one GM crop (BT cotton) India is the fourth largest producer behind the U.S.A, Brazil, and Argentina. In India, the GEAC, which is part of the Ministry of Environment and Forests, is the principal agency in charge of giving licenses for experimental and large-scale open field experiments, as well as sanctioning the commercial release of biotech crops. Bt cotton is already being produced in several places with more than 10 million hectares under cultivation. It has produced mixed results since 2002. The idea of Bt Brinjal was dropped in the year 2010 following large-scale protests. Commercial cropping was ordered to start in August 2016, if the trials of the Gm Mustard variety named "Dhara" mustard hybrid-11 or DMH-11 are successful, mustard will become the first food item for which GM seeds will be allowed.

IV. PROS AND CONS OF GM CROPS

When it comes to yield it is believed that Gm crops will increase the yield at the same kind use of some kind of seeds and harvesting technology failed to achieve some kind of yield growth in the U.S, Canada as compared to that of the European Union. Next when we study pest resistance then more resistance to pests and diseases reduces crop losses and reduces reliance on pesticides; yet, there is a risk that pests will develop tolerance to the poisons generated by GM crops. Weed resistance here the advantage is that it is easier control over troublesome weeds by killing the unwanted plants and leaving the food crop unaffected, the disadvantage attached to it is, it will indiscriminately use of weed killers may infiltrate the soil and water system, polluting rivers, waterways as well as groundwater. Talking about food security it shortens the crop cycle of several foods such as pulse or sugarcane by making them grow faster, which may be the only solution to rapidly changing climate conditions that make natural crops extra vulnerable. So, at last, the designer food could lead to the production of food designed specifically for a healthy diet, the disadvantage in this is people with an allergy to a specific ingredient may be unexpectedly affected by a GM food that contains that substance.

V. CONCLUSION AND SUGGESTIONS

Despite the current uncertainties surrounding GM crops, one thing is certain. This technique is simply too valuable to ignore, with the potential to develop commercially vital crop variants. However, there are some legitimate concerns. Decisions must be based on genuine, science-based knowledge if these difficulties are to be handled. Finally, given the importance people place on the food they eat, GM crop policy must be based on an open and honest debate including a diverse cross-section of society. This research

study would suggest that as globalization is increasing we need to improvise the grass root level by enhancing them with knowledge and technology, due to this it will efficiently work on the loopholes of this particular matter. Moreover, keeping the people's mindset in mind the laws should be stringent and effectively implement the GM crops technology for the betterment of the living and the welfare of the society making all the developing nations into the developed ones.

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