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ARE GENETICALLY MODIFIED FOODS SAFE FOR HUMANS?

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ABSTRACT

The cultivation of genetically modified (GM) crops and their injection into our organic phenomenon may be a huge genetic experiment involving all living beings. GM foods are mainly aimed at an increased level of crop production through the introduction of resistance against plant diseases caused by insects or viruses, making it safer. Many scientists have showed variety of evidences to prove that GM food possess many advantages, it's a incontrovertible fact that most of the people doubt the security of using GM food. This article is directed on removing the doubt regarding the safety of GM foods.

Keywords: Food, Genetically Modified, Safety, Health, Humans

Introduction

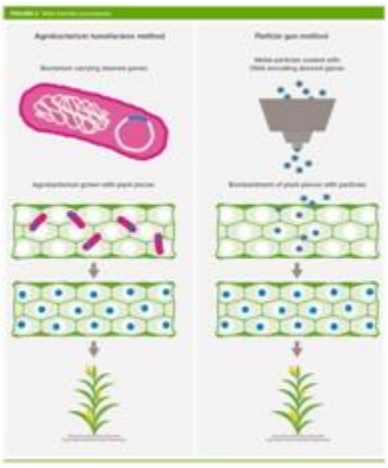

Fig. 1 GM crops-DNA transfer
Resource- https://royalsociety.org/topics- policy/projects/gm-plants/what-is-gm-and-how-is-it-done/

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GM may be a technology that involves inserting DNA into the genome of an organism. To produce a GM plant, new DNA is transferred into plant cells. Usually, the cells are then grown in tissue culture where they develop into plants. The seeds produced by these plants inherit the new DNA. The genetic makeup of an organism is its genome, which altogether in plants and animals is formed of DNA. The genome contains genes, regions of DNA that sometimes carry the instructions for creating proteins. It is these proteins that give the plant its characteristics. For example, the colour of flowers is determined by genes that carry the key for making proteins involved in producing the pigments that colour petals.

Genetic modification of plants involves adding a selected part of DNA into the plant's genome, giving it new or different characteristics. This could include changing the way the plant grows, or making it immune to a specific disease. The new DNA becomes a part of the GM plant's genome which the seeds produced by these plants will contain.

One of the methods to transfer DNA is to coat the surface of small metal particles with the relevant DNA fragment, and bombard the particles into the plant cells. Another method is to use a bacterium or virus. There are many viruses and bacteria that transfer their DNA into a host cell as a normal part of their life cycle. For GM plants, the bacterium most often used is named Agrobacterium tumefaciens . The gene of interest is transferred into the bacterium and therefore the bacterial cells then transfer the new DNA to the genome of the plant cells. The plant cells that have successfully haunted the DNA are then grown to make a replacement plant. This happens because individual plant cells have a powerful capacity to get entire plants.

On rare occasions, the method of DNA transfer can happen without human intervention. For example the sweet potato contains DNA sequences that were transferred thousands of years ago, from Agrobacterium bacteria into the sweet potato genome.

Starting in January 2022, certain types of GMOs will require a disclosure that lets you know if the food you are eating (or ingredients in the food you are eating) is a bioengineered food. Bioengineered food is that the term that Congress uses to describe certain sorts of GMOs once they passed the National Bioengineered Food Disclosure Standard.

The Standard establishes requirements for labelling foods that humans eat that are or may be bioengineered and defines bioengineered foods as those that contain detectable genetic material that has been altered through certain lab techniques and can't be created through regular breeding or found in nature.

The Standard requires that by 2022, food makers, importers, and certain retailers label foods that are bioengineered or have bioengineered ingredients. At that time, foods sold in the United States

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that meet the definition of bioengineered food must have information on their packaging using one of the approved methods, including text on the package that says “bioengineered food,” the bioengineered food symbol etc.

Why are GM Crops Produced?

Agricultural plants are one among the foremost frequently cited samples of genetically modified organisms (GMOs). Advances have also been made in developing crops that mature faster and tolerate aluminium, boron, salt, drought, frost, and other environmental stressors, allowing plants to grow in conditions where they might not otherwise flourish. Other applications include the assembly of nonprotein (bioplastic) or nonindustrial (ornamental plant) products.

GM foods are developed – and marketed – because there's some perceived advantage either to the producer or consumer of those foods. This is meant to translate into a product with a lower cost , greater benefit (in terms of durability or nutritional value) or both. Initially GM seed developers wanted their products to be accepted by producers and have concentrated on innovations that bring direct benefit to farmers (and the food industry generally).

One of the objectives for developing plants supported GM organisms is to enhance crop protection. The GM crops currently on the market are mainly aimed toward an increased level of crop protection through the introduction of resistance against plant diseases caused by insects or viruses or through increased tolerance towards herbicides.

Resistance against insects is attained by incorporating into the food plant the gene for toxin production from the bacterium Bacillus Thuringiensis (BT). This toxin is currently used as a standard insecticide in agriculture and is safe for human consumption. GM crops that inherently produce this toxin have shown to require lower quantities of insecticides in specific situations, e.g. where pest pressure is high. Virus resistance is achieved through the introduction of a gene from certain viruses which cause disease in plants. Virus resistance makes plants less vulnerable to diseases caused by such viruses, leading to higher crop yields.

Herbicide tolerance is achieved through the introduction of a gene from a bacterium conveying resistance to some herbicides. In situations where weed pressure is high, the utilization of such crops results in a reduction within the quantity of the herbicides used.

A number of animals have also been genetically engineered to extend yield and reduce susceptibility to disease. for instance , salmon are engineered to grow larger and mature faster, and cattle are enhanced to exhibit resistance to mad cow disease (United States Department of Energy, 2007).

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How Is That The Safety Assessment Of GM Foods Conducted?

Food security is one among major concerns for the growing global population. Modern agricultural biotechnologies, like genetic modification, are a possible solution through enabling a rise of production, more efficient use of natural resources, and reduced environmental impacts. However, new crop varieties with altered genetic materials could also be subjected to safety assessments to fulfil the regulatory requirements, before marketing.

FSANZ has established a rigorous and transparent process for assessing the security of GM foods. The security assessment is undertaken in accordance with internationally established scientific principles and guidelines developed through the work of the Organisation for Economic Cooperation and Development (OECD), Food and Agriculture Organization (FAO) of the United Nations , World Health Organization (WHO) and therefore the Codex Alimentarius Commission.

FSANZ conducts a radical safety assessment of all GM foods before they're allowed within the food supply. This assessment ensures that any approved GM foods are as safe and nutritious as comparable conventional foods already within the Australian and New Zealand food supply.

What's involved during a safety assessment?

The safety assessment of a GM food is conducted within the established risk assessment framework employed by FSANZ. In the case of GM food, thefirst purpose is:

(i) to spot new or altered hazards related to the food as a results of the genetic modification;

(ii) to assess whether there's any risk related to any identified hazards under the intended conditions of use; and

(iii)to work out if any new conditions of use are needed to enable safe use of the food.

(iv)The safety assessment is characterised by:

- Case-by-case consideration of GM foods; Case-by-case assessment is important because the key issues requiring consideration during a safety assessment often depend upon the sort of food being evaluated andtherefore the nature of the genetic modification.
- Consideration of both the intended and unintended effects of the genetic modification; In addition to the intended effect (e.g. replacement traits like insect protection), there can also be other effects related to the genetic modification that were unintended (e.g.

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compositional changes to the food) and which can impact on the health and safety of the population. Therefore it's important that both the intended and any unintended effects are evaluated.

- Comparisons with conventional foods having a suitable standard of safety. Such a comparative approach focuses on: (i) the identification of similarities and differences between the GM food and an appropriate comparator; and (ii) a characterisation of any of the identified differences so as to work out if they'll raise potential safety and nutritional issues.

The goal of the security assessment isn't to determine the absolute safety of the GM food but rather to think about whether the GM foodhas all the advantages and risks normally related to the traditional food. Many federal agencies play a crucial role in ensuring the security of GMOs. As described within the Coordinated Framework for the Regulation of Biotechnology, FDA works closely with EPA and USDA to make sure the security of GMO foods and plants.

Collaboration and coordination among these agencies help confirm food developers understand the importance of a secure food supply and therefore the rules they have to follow when creating new plants through gene-splicing .

FDA's voluntary Plant Biotechnology Consultation Program evaluates the security of food from new GMOs before they enter the market. This program allows developers to figure with FDA on a product- by-product basis.

The GM products that are currently on the international market have all passed safety assessments conducted by national authorities. These different assessments generally follow an equivalent basic principles, including an assessment of environmental and human health risk. The food safety assessment istypically supported Codex documents.

Plant Biotechnology Consultation Program

The Plant Biotechnology Consultation Program may be a voluntary program with four key steps:

- GMO plant developer meets with FDA a few potential new product to be used in human and animal food.
- GMO developer submits food safety assessment data and knowledge to FDA.
- FDA evaluates the info and knowledge and resolves any issues with the developer.

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- Consultation is complete once FDA has no more questions on the security of the human and animal food made up of the new GMO plant variety. Completed consultations are all made public.

The Program allows FDA to figure with cropdevelopers to assist create a secure food supply. It also allows FDA to gather information about new foods. See a fulllist of GMOs that have skilled the Plant Biotechnology Consultation Program.

Regulation of GM foods

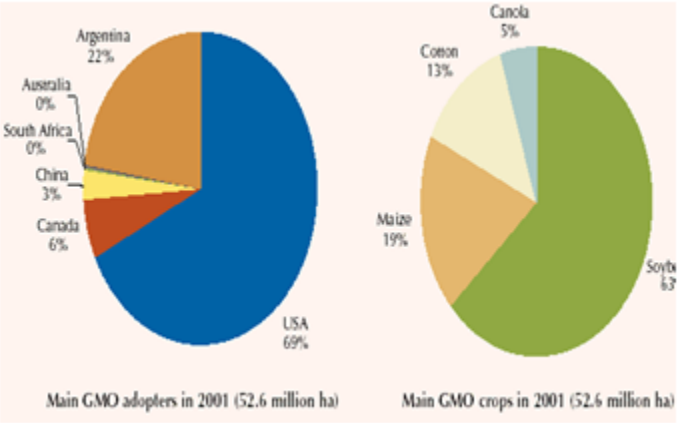

Fig. 2 Main GMO adopters and crops in 2001
Resource- http://www.fao.org/3/y4252e/y4252e13a.htm

In the US , genetically modified crops are regulated by three different agencies. The Department of Agriculture regulates field testing of GM crops for research. The Environmental Protection Agency regulates plants with pest-resistant properties. And therefore the Food and Drug Administration regulates any GM crops that are eaten by humans or animals.

FDA oversight tends to urge the foremost attention. There's no specific law that regulates genetically modified foods. Instead, back in 1997 the agency created a voluntary "consultation" process for companies that want to sell new GM crops. The businesses conduct a security assessment that identifies the novel genetic traits and determines whether any of the new material might be toxic. FDA scientists can invite additional tests and data as required . To date, some 96 crops have skilled this process.

Critics tend to specialise in the very fact that this safety assessment is voluntary — there are not any laws requiring specific tests. Biotech companies often retort that it's not that "voluntary" in

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practice. They find one completing an outsized number of tests and provides the FDA whatever data the agency asks for. It's worth noting that the ECU Union has had a way stricter regulatory policy in situ since 2003. There, all GM foods must be strictly evaluated on a case-by-case basis before they're marketed. And even after approval, individual EU(European Union) countries can request to ban certain GM foods from their borders under a "safeguard" clause. As a result, Europe tends to possess far fewer genetically modified crops and foods.

WHO(World Health Organisation) and GMCrops

WHO has been taking a lively role in reference to GM foods, primarily for2 reasons:

- on the grounds that public health maybenefit from the potential of biotechnology, for instance , from arise within the nutrient content of foods, decreased allergenicity and more efficientand/or sustainable food production; and

- based on the necessity to look at the potential negative effects on human health ofthe consumption of food produced through genetic modification so as to guard public health. Modern technologies should be thoroughly evaluated if they're to constitute a real improvement within the way food is produced.

WHO, along side FAO, has convened severalexpert consultations on the evaluation of GM foods and provided technical advice for the Codex Alimentarius Commission which was fed into the Codex Guidelines on safety assessment of GM foods. WHO will keep paying due attention to the security of GM foods from the view of public health protection, in close collaboration with FAOand other international bodies.

Conclusion

Taking everything into consideration, GMcrops can migrate and spread worldwide. however, clear signals should be sent to biotech companies to proceed with caution and avoid causing unintended harm tohuman health and therefore the environment. It's widely believed that it's the proper of consumers to demand mandatory labelling of GM food products, independent testing for safety and environmental impacts, and liability for any damage related to GM crops. We are aware that a lot of regulatory laws exist already for risk assessments which are performed on three levels. And at an equivalent time, in recent years Cartagena protocol has created laws and guidelines and has obliged countries and corporations to obey them for production, handling and consumption of GM materials. Through thistext , it's safe to believe that GM foods aresafe and may be consumed with no doubts.

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