



## Agri Innovation Post - Edition 48 - December 2022



This month too there has been a lot of discussion on GM crops. The European Food Safety Authority (EFSA) GMO Panel released its Scientific Opinion on the safety of genetically modified (GM) herbicide tolerant and insect resistant maize, for import, processing, and food and feed uses within the European Union (EU). The GMO Panel concluded that GM maize was as safe as the conventional counterpart and the non-GM maize reference varieties tested. In the case of the accidental release of viable maize grains was not considered a safety concern and hence no post-market monitoring of food/feed was considered necessary. These encouraging reports will lend support to the efforts of Indian seed industry to bring new insect resistant and herbicide tolerant hybrids of cotton in the market, once they get regulatory approval. Extensive data has been generated over the years for the cotton events with these traits. The discussions around the need for GM mustard continued with arguments for and against the technology. We have been using cotton seed oil from Bt cotton seed since 2002 with no adverse effects. India also imported GM soymeal last year to meet the paucity of poultry feed in the country. The edible oil that we have been importing over the years included oil derived from GM crops. Around 5–7 million tonnes (30%) of imported oil is derived from GM crops. India imported 14.03 million tonnes of edible oil worth \$19.6 billion in 2022, including 4.17mt of GM soyabean oil. Even the domestically procured cotton seed oil (1.3 mt) is derived from Bt cotton, therefore, a quarter of the 22.5–23.5 mt edible oil that Indians are now consuming comprises GM.

No validated adverse effect has been reported due to the consumption of GM oilseed derived oil or other GM crops. Hence, we should avail ourselves of the opportunity to use GM mustard for developing high yielding and disease resistant hybrids of mustard, that can help us in reducing our

oil import expenditure. The hybrid production system will allow for developing the next generation nutritionally enhanced oilseeds that can contribute to nutritional security. High yielding and nutritionally enhanced oilseed will also improve our agricultural sustainability in both the short and long term.



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### **News from India and Around the World**

#### **NTU Singapore Scientists Genetically Engineer Plants to Increase Oil Content**

<https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=19872>

Scientists from Nanyang Technological University (NTU) Singapore have successfully genetically modified an important plant protein responsible for the accumulation of oil in plant seeds and edible nuts. The research team showed that their patent-pending method can increase the oil content in seeds by 15 to 18 percent.

#### **Genetically Modified Houseplant Pothos to Reduce Indoor Air Pollution**

<https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=19876>

Neoplants, a Paris-based startup, has genetically engineered both a pothos (*Epipremnum aureum*) plant and its associated root microbiome. The houseplant called Neo P1 is capable of purifying the air as effectively as 30 houseplants, according to Neoplants.

#### **Assessment of genetically modified Maize MON 87429 for food and feed uses, under Regulation**

**(EC) No 1829/2003 (application EFSA-GMO-NL-2019-161)**

<https://doi.org/10.2903/j.efsa.2022.7589>

The European Food Safety Authority (EFSA) GMO Panel released its Scientific Opinion on the safety of genetically modified (GM) herbicide tolerant maize MON 87429, for import, processing, and food and feed uses within the European Union (EU), and does not include cultivation in the EU. The GMO Panel concludes that maize MON 87429 is as safe as the conventional counterpart and non-GM maize reference varieties tested, and no post-market monitoring of food/feed is considered necessary. In the case of the accidental release of viable maize MON 87429 grains into the environment, this would not raise environmental safety concerns.

**28-Million-Year-Old Gene Protects Plants Against Caterpillars**

<https://elifesciences.org/for-the-press/1dad5751/a-gene-from-28-million-years-ago-protects-today-s-plants-against-caterpillars>

A study reports that the defense mechanisms plants use to recognize and respond to the caterpillar, a common plant pest, has arisen from a single gene that evolved over millions of years. The study also found that some plants, such as soybeans, have lost this protective gene over time and suggests that genetically engineering plants to reintroduce the gene could protect against crop failure. The researchers found that a single, 28-million-year-old receptor gene perfectly corresponds with plant immune response to the caterpillar peptides. They also found that among the descendants of the oldest plant ancestors that first evolved the receptor gene, a few species that could not respond to the caterpillar peptides had lost the gene.

**What Do People Think About Plant Gene Techs and their Impact on Food Security?**

<https://www.isaaa.org/blog/entry/default.asp?BlogDate=11/23/2022>

Ensuring a food-secure world continues to become more challenging, and countries are finding strategies to feed their populations. Experts often suggest the use of biotechnology to increase the supply of food. However, what do consumers think about products of genetic modification (GM) and genome editing (GE)? A review article titled *Public perception of plant gene technologies worldwide in the light of food security*, published in *GM Crops and Food*, provides some answers. This article summarizes their findings per region and their recommendations.

**Large Chinese Seed Companies Likely to Produce Gene-Edited Crops for Farmers – Study**

<https://www.tandfonline.com/doi/full/10.1080/21645698.2022.2140567?cookieSet=1>

Gene-edited agricultural products could have a significant market share of the Chinese seed market

in the future, based on a survey conducted in 2019 among 111 Chinese seed companies. Seed companies play a role in the translation of technical advances into industrial advantages and in handing these benefits to the farmers. The study aimed to determine whether gene-edited crops will be available to farmers using the data from a survey conducted prior to the new policies that the Chinese government implemented in order to make it easier to industrialize gene-edited crops.

**EFSA Concludes GM Maize MON 95379 Safe**

<https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=19908>

The European Food Safety Authority (EFSA) GMO Panel released its Scientific Opinion on the safety of genetically modified (GM) insect protected maize MON 95379, for import, processing, and food and feed uses within the European Union (EU) and does not include cultivation. Following the submission of application EFSA-GMO-NL-2020-170 under Regulation (EU) No 503/2013 from Bayer Agriculture BV, the EFSA GMO Panel was asked to deliver a Scientific Opinion on the safety of GM maize MON 95379.

**Philippines Continues Biotech Lead in Southeast Asia - USDA FAS Report**

<https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=19906>

In its November 14, 2022, *Agricultural Biotechnology Annual*, the US Department of Agriculture Foreign Agricultural Service reports that the Philippines continues to be a leader in biotechnology in Southeast Asia, having been the first in the region to have a regulatory framework on genetically engineered (GE) crops.

**Despite Knocks and Shocks, Mahyco Reapplies 'In Good Faith' For Nod To Herbicide Tolerant Cotton**

<https://www.bqprime.com/business/despite-knocks-and-shocks-mahyco-reapplies-in-good-faith-for-nod-to-herbicide-tolerant-cotton>

If genetically modified herbicide-tolerant and insect-resistant cotton is approved for environmental release and commercial cultivation, it would once again show that the path for products of agribiotechnology research from the lab to farmers' fields is never straight but marred with litigation, regulatory uncertainty, and illegality.

**SC: Is there a compelling reason to permit release of GM mustard?**

<https://www.veetrack.com/showarticles.aspx?UName=496465616C6D65646961&id=3233353536323434>

Venkataramani dismissed the need to look for a "compelling reason" as an argument based on

ideology. He said the government had taken a policy decision. A regulatory process has been put in place. The review of the GM crop had been undertaken minutely over a lengthy period of time.

#### **GMOs can aid our climate change adaptation efforts**

<https://nation.africa/kenya/blogs-opinion/blogs/gmos-can-aid-our-climate-change-adaptation-efforts-4035094>

GMOs make readily available all year round food, medication and industrial products at a fairer deal than natural organics. They are simply a means of climate change adaptation. In agriculture, genetic engineering has produced maize, cotton, wheat and soybeans that are fast-maturing, resistant to drought, high-yielding and hardy towards pests and diseases.

#### **Food and nutritional security: Can science provide a helping hand?**

<http://risingkashmir.com/food-and-nutritional-security-can-science-provide-a-helping-hand>

In the Indian context, since the late 1980s, the Government of India has given high priority and strong support to the development of agro-biotechnology in the country. Hence, such innovative technologies can be game changers for the Indian agriculture taking India to the forefront as a major food provider. It is important that a strong innovative ecosystem is developed and supported to ushering India in this direction.

#### **Call to overcome regulatory hurdles limiting the use of resistant varieties**

[https://www.adnkronos.com/appello-per-superare-gli-ostacoli-normativi-che-limitano-luso-di-variet%C3%A0-resistenti\\_3kKTaGfpY6J6pQ0ZzoZX6q?refresh\\_ce](https://www.adnkronos.com/appello-per-superare-gli-ostacoli-normativi-che-limitano-luso-di-variet%C3%A0-resistenti_3kKTaGfpY6J6pQ0ZzoZX6q?refresh_ce)

As part of the conference “The role of genetic innovation for a new model of viticulture: tools, obstacles and timing” organized and promoted by the Alleanza Cooperative Agroalimentari and by the UGIVI–Union of Vine and Wine Jurists , last Saturday 19 November in Trentino Alto Adige an appeal has also been launched in favor of resistant vines. The request that emerged from the conference is to proceed with unity of purpose and maximum cohesion between the world of wine and that of research , to try to overcome the current regulatory obstacles that prevent the use of varieties resistant/tolerant to plant diseases for the production of DOC wines and, in terms of Assisted Evolution Technologies (Tea) , field experimentation.

#### **First crop of controversial GM rice 20 years late**

<https://www.derstandard.at/story/2000141257527/erste-ernte-von-umstrittenem-gentechnik-reis-mit-20-jahren-verspaetung>

The history of the genetically modified Golden Rice is a prime example of how shattered the relationship between science and society is in some areas. It is also a story that makes it clear how important open dialogue between researchers and society is in order to increase the acceptance of science.

## **Drones will have multi-faceted use in agriculture**

Union Minister of Agriculture and Farmers Welfare Shri Narendra Singh Tomar today inaugurated and addressed the conference on “Promoting Kisan Drones: Issues, Challenges and the Way Ahead” organized as part of Azadi Ka Amrit Mahotsav. Shri Tomar said that the government is promoting the use of drones for the convenience of the farmers, reducing the cost and increasing the income. For promoting use of Kisan Drones, the government is providing 50% or maximum Rs. 5 lakh subsidy to SC-ST, small and marginal, women and farmers of northeastern states to buy drones. For other farmers, financial assistance will be given upto 40 percent or maximum Rs.4 lakh, the Minister Added.

## **30% edible oil consumption in a year from GM sources**

<https://www.veetrack.com/showarticles.aspx?UName=496465616C6D65646961&id=3233353837333733>

Around 30 per cent of India’s estimated annual consumption of edible oil comes from sources, which are directly or indirectly produced from genetically modified (GM) crops. These include both imported oils and domestically produced cotton seed oil, bulk of which are produced from GM cotton, trade and industry sources said.

## **The GM mustard debate**

<https://www.veetrack.com/showarticles.aspx?UName=496465616C6D65646961&id=3233353836323834>

The Debate over the use of genetically modified crops is raging again, with familiar arguments and objections being made. A few weeks ago, the government had cleared the ‘environmental release’ of a genetically modified (GM) variety of mustard, DMH 11, developed by the Centre for Genetic Manipulation of Crop Plants (CGMCP) at Delhi University.

## **New**

## **Research**

## **Restoring the Red Seed Coat in Rice through Genome Editing**

<https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=19885>

Restoring cultivated rice varieties to red rice with premium qualities and resistance to stress is important, especially for countries that use rice as staple food. *Rc* gene codes for a protein responsible for proanthocyanidins' accumulation into the inner seed coat below the pericarp,

providing a red seed coat. Thus, the researchers used CRISPR-Cas9 to target *Rc* and develop transgenic plants with Kongyu 180 and Shangyu 453 as materials. Both transgenic rice lines exhibited restored red rice trait, as well as saline-alkali tolerance.

#### **Study Pinpoints Enzyme Linked to Rice Plant Height**

<https://www.isaaa.org/kc/cropbiotechupdate/ged/article/default.asp?ID=19869>

LecRLKs (Lectin receptor-like kinases) is an enzyme belonging to the subfamily of RLKs (receptor like kinase) and have roles in several plant biological processes linked to interaction with the environment. A study involving OsSRK1, belonging to LecRLK family in rice, revealed the role of LecRLKs in plant development.

#### **Tomatoes Can Now Come in Customized Colors Thanks to CRISPR**

<https://globalplantcouncil.org/multiplex-gene-editing-rapidly-customizes-tomato-cultivars-with-different-fruit-colors/>

The tomato is known for its red, vibrant color, a vital trait that affects consumer preferences. Using CRISPR-Cas9, Chinese scientists developed tomato genotypes that come in yellow, light yellow, yellow-green, light green, brown, and pink.

#### **Study Reveals Role of Soybean 14-3-3 Gene on White Mold Resistance**

<https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=19918>

Researchers from Ottawa Research and Development Centre and partners investigated the role of the soybean 14-3-3 gene *Glyma05g29080* on white mold resistance and nodulation using CRISPR-Cas9 editing and RNA silencing. Their findings are published in the journal *Molecular Plant-Microbe Interactions*. Results showed that the transgenic plants and their progeny were more susceptible to *Sclerotinia sclerotiorum* infection and significantly reduced nodulation. These findings confirm the role of the 14-3-3 gene in both nodulation and defense.

#### **Modified *Agrobacterium* Strain Useful for Switchgrass Transformation**

<https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=19897>

An *Agrobacterium* strain that cannot produce methionine is useful for switchgrass transformation, according to the University of Georgia and University of Colorado Boulder researchers. Their research paper is published in *Transgenic Research*.

#### **CRISPR tools found in thousands of viruses could boost gene editing**

<https://www.nature.com/articles/d41586-022-03837-8>

A systematic sweep of viral genomes has revealed a trove of potential CRISPR-based genome-editing tools. CRISPR-Cas systems are common in the microbial world of bacteria and archaea, where they often help cells to fend off viruses. But an analysis<sup>1</sup> published on 23 November in *Ce* finds CRISPR-Cas systems in 0.4% of publicly available genome sequences from viruses that can infect these microbes. Researchers think that the viruses use CRISPR-Cas to compete with one another — and potentially to manipulate gene activity in their host to their advantage.

### **Self-regulation of rice yield due to climate change**

<https://www.nikkei.com/article/DGXZQOUC01C350R01C22A2000000/>

Researchers at Konan University identified a gene that lowers rice yields as temperatures rise due to decreased function in its mRNA transporter, an issue which they hope to fix by developing an RNA spray that will make rice more resilient in the face of climate change

### **Cutting edge RNA genetic tools designed to reduce health risks**

[https://geneticliteracyproject.org/2022/12/06/pesticides-are-critical-to-grow-food-but-concerns-are-widespread-heres-why-they-are-overblown-and-a-look-at-the-cutting-edge-rna-genetic-tools-designed-to-reduce-health-risks-even/?mc\\_cid=4e893fde36&mc\\_eid=b993433273](https://geneticliteracyproject.org/2022/12/06/pesticides-are-critical-to-grow-food-but-concerns-are-widespread-heres-why-they-are-overblown-and-a-look-at-the-cutting-edge-rna-genetic-tools-designed-to-reduce-health-risks-even/?mc_cid=4e893fde36&mc_eid=b993433273)

The new pesticides are relatively short segments of double stranded RNA (dsRNA), which has emerged in recent years as an appealing alternative to induce pest resistance in genetically modified crops. Segments of dsRNA are chosen to correspond to part of the sequence of a gene for some key enzyme or other protein in the pest. There is a nearly universal mechanism within living cells that recognizes double stranded RNA as a virus threat and effectively puts up a “wanted poster” for that specific sequence.

### **Researchers Identify Genes to Help Fruit Adapt to Droughts**

Researchers from the Boyce Thompson Institute (BTI) and Cornell University have completed the first study that provides a comprehensive picture of changes in gene expression in response to water stress in tomatoes and identified genes that could help plant breeders develop fruit that can cope with drought conditions.

### **Climate Resilience Linked to Lignin Chemistry in Plants**

Plants were found to encode lignin to adapt to climate change by using different combinations of



enzymes called LACCASEs to make specific lignin chemistries. These findings can help scientists and breeders in selecting trees and agricultural plants with the best lignin chemistry that makes them better adapted to climate challenges.



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