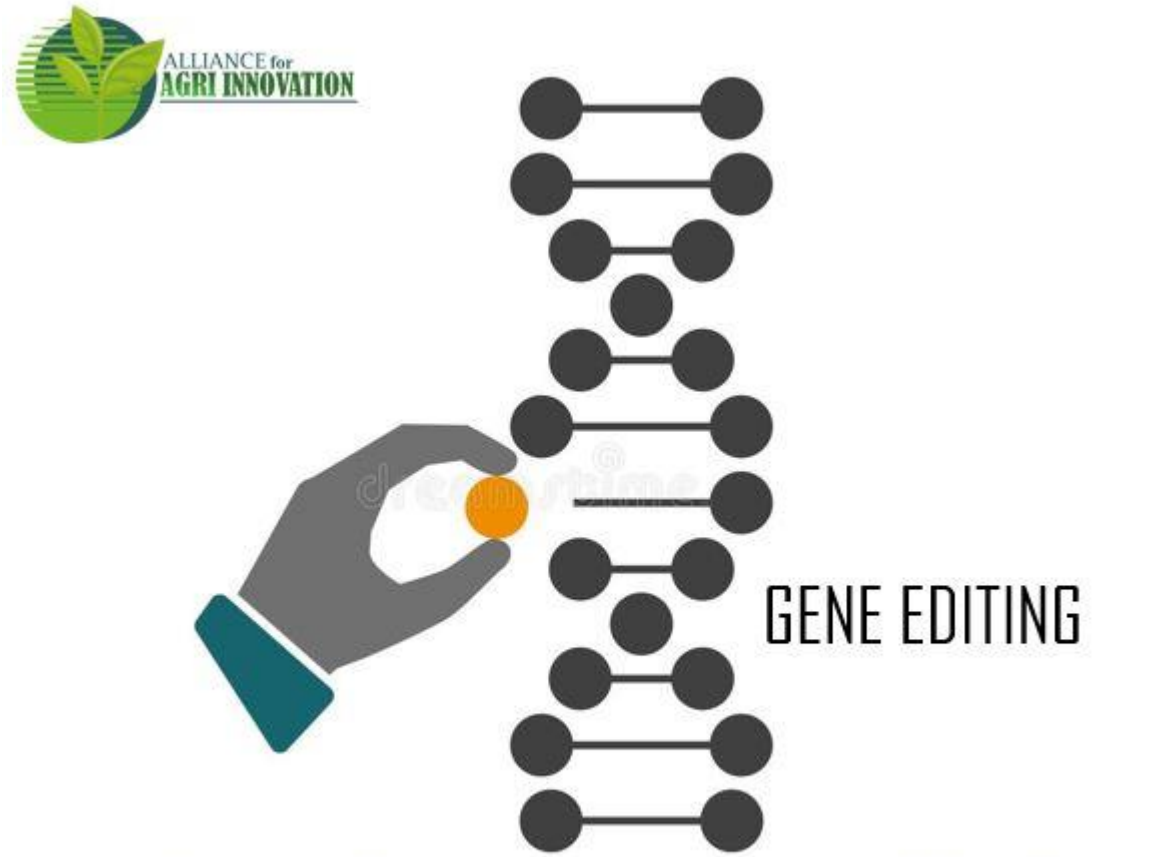

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For several years, through conventional breeding, people have selected superior varieties of plants present in nature either through existing natural variation in the germplasm arising through spontaneous mutation and recombination or those produced by chemical or radiation induced mutation and artificial hybridisation. Conventional breeding involves selection of desired traits based on physical properties such as plant height and seed size in rice and wheat, bigger potato tubers, sweeter strawberries, size and colour of fruits and the overall yield. While these traits can be easily selected, physical traits such as disease resistance, drought tolerance, root traits, nutritional and processing quality are very difficult to select. Effect of environment and growth stage of the plant on how the trait will develop makes the selection even more difficult.

Now, a more powerful tool that is used by scientist is genome editing, where it gives scientist the ability to make changes in an organism's DNA. Gene editing helps scientists to make precise changes in the DNA in a specific plant to get desirable traits in that plant.

Given the new technological benefits that can help the scientists and researchers, Government of India recently introduced a guideline on Genome Edited Organisms. While the guidelines are a welcome step to start the conversation around the technology, ambiguity remains in how it will be implemented. Taking the conversation forward, National Academy of Agricultural Sciences (NAAS) developed a Regulatory Framework for Genome Edited Plants taking suggestions from industry and other stakeholders and provided few recommendations to remove the ambiguity.

Being different in nature and use in the country in relation to any consequential risks to environment or biosafety of the resultant plants, animals, human somatic cells and microbes, any policy decision on use of the technology has to be specific and unambiguous to each of these products. Therefore, the guidelines should be prioritized and developed separately for each sector.

A science-based differentiated and disaggregated approach must be followed and therefore, a separate guideline should be introduced for genome edited plants. The categorisation of genome edited organism should align with global defined terms such as SDN1, SDN2, SDN3 as it should be in harmony with countries such as Australia, Brazil, Canada, China, Japan and USA to facilitate smooth international trade of genome edited products, and for effective exchange and sharing of genetic material for research and development.

Since the end products will be indistinguishable as to from where it originated such as conventional breeding or induced mutation, it is not scientifically possible to regulate these products under Environmental Protection Act and hence should also be exempted from regulation and risk assessment.

Further, benefits and safety of the new genome editing tools should be communicated to general public, policy makers and farmers in a simplified manner.

In this newsletter, we have captured similar interesting developments and research work from around the world in the agri industry. We hope you find it a good read.

Shivendra Bajaj
Executive Director
Federation of Seed Industry of India-Alliance for Agri innovation

AgBiotech News

Experts divided on Bt brinjal safety

(Business Standard)

The recent approval for field trials of two new varieties of Bt brinjal has rekindled the debate on whether India has adequate biosafety standards to allow the commercial cultivation of genetically modified crops. The Engineering Appraisal Committee (GEAC), in a meeting held a few months ago, had approved additional field trials of two new indigenously developed varieties of BT brinjal — Janak and BSS-793, containing Bt Cry1fa1 gene (Event 142). The trials will be conducted in Madhya Pradesh, Karnataka, Bihar, Chhattisgarh, Jharkhand, Tamil Nadu, and West Bengal during 2020-23, and are subject to the applicant receiving a NOC from the agriculture department of the state concerned.

Gene editing: The next gen plant breeding tool for breeders

(Agriculture Post)

The basis of plant breeding is the availability of trait variation and diversity in different crops that can be brought together into a variety or hybrid with multiple superior qualities or characteristics. Plant breeders have been collecting wild variants of different crops for transferring better traits from wild to domesticated varieties. Random genetic variation historically has also been generated by treating seeds with various agents and selecting for plants with superior traits. These breeding methods were limited to plants that could be crossed with each other. However, genetic modification gave the breeders an opportunity to incorporate genes from different species into the plants, thereby increasing manifold, the available repertoire of genetic variation.

Indian scientists call out anti-GMO groups trying to block insect-resistant Bt eggplant safety field trials

(GLP)

The current Bt Brinjal which is going for field trials was developed by the ICAR-National Institute of Plant Biotechnology and has been licensed to an Indian company for commercialization. This technology is different from the Bt Brinjal technology, which despite approval by GEAC, was put under moratorium in India but [has been] grown commercially by farmers in Bangladesh since 2014. According to a peer reviewed study published in 2019, net returns to farmers from Bt brinjal crop averaged US$2151/ha compared to US$357/ha [for the conventional, non BT crop, an approximate 600% improvement].

Alliance for Agri Innovation urges GOI to allow Bt Brinjal trials

(Agri News Network)

Alliance for Agri Innovation (AAI), a special interest group of Federation of Seed Industry of India (FSII) urges the Central and State Governments to allow field trials of Bt Brinjal in India. A letter has been sent to the Ministry of Agriculture and Chief Ministers of Madhya Pradesh, Karnataka, Bihar, Chhattisgarh, Jharkhand, Tamil Nadu, Odisha and West Bengal to bring their attention to this matter. Mr Ram Kaundinya, Director General, FSII-AAI said that Brinjal is one of the most pesticide consuming crops among vegetables. Farmers spray pesticides more than 25 times in a single crop season of Brinjal. The deadly Fruit & Shoot borer is a menace for the farmers and its caterpillar also finds its way into our homes through infected brinjals. By controlling this with Bt technology we can save farmers income, reduce pesticide loan on the environment and provide pesticide and insect free brinjals to the consumers. The indigenous technology developed by our national institute must get an opportunity for getting tested in the field.

Safety and regulation of GM crops in India

(Agriculture Times)

The need to increase agricultural productivity without increasing the area under cultivation to support our increasing demand for quality food remains a challenge for the Indian farmers. The erratic and severe weather changes have also added to the farmer's woes, such that his inputs costs have to be reduced to assure some profit. With multiple variables impacting farm yields, we cannot go back to traditional ways for increasing productivity and farm profits. We must adopt new technologies to keep up with the challenges of safeguarding our environment and resources. Agricultural biotechnology is a part of the package of solutions that we need to use in this endeavour. As is true of any new technology, safety plays a crucial role in adoption of the technology.

To Bt or not to Bt – does this question persist anymore?

(Agriculture Post)

Whenever a new technology is introduced, there are always some who will challenge the usefulness of such technology. It may be either a fear of unknown or just being plain scepticism, but we always see the debate on both sides. This debate is good as long it is healthy and allows everyone to put forward their viewpoints and let the data and science to speak for itself. The debate about Genetically Modified (GM) crops is no exception. However, the fact is, GM technology is not new anymore. This year is the 25th anniversary of the commercialisation of GM crops. During these 25 years of cultivation, more than a trillion meals have been served which had one or more ingredients derived from GM crops and there is not a single substantiated claim of any ill effect on health which could be attributed to GM crops. In India, GM cotton or commonly known as Bt cotton (because of Bt gene that controls a certain group of insects) has been successfully cultivated for the last 18 years and today more than 95 percent cotton growing area in India is under Bt cotton.

Gene editing boosts canola oil levels in U.S.

(The Western Producer)

A U.S. company is developing new canola varieties that have higher oil content and improved yields. That’s not massive news. Many companies are working on new and improved canola varieties. The difference is that the company is using genome editing to breed new types of canola. It’s a technology where scientists precisely delete or add genes to a plant’s DNA. It’s not transgenic because added genes normally come from the same species of plant. Gene editing of crops is unregulated in the United States, so American bioscience firms are gaining an advantage over their competitors in Canada. The new trait that will increase oil content in canola, is called C3007.

Genetic molecular markers to accelerate genetic gains in crops

(Future Science)

The advent of molecular marker technology changed methods of plant breeding in a positive direction. Since the boom of the genomic sequencing era, several advancements and innovations originating in the field of molecular markers are enhancing the pace of crop improvement. Over the decades, many reviews on molecular markers have been published, especially pertaining to their application in plant breeding. Here we provide an update on the evolution of marker technologies and their applications for accelerating genetic gains in crops.

Scientists want to step up DNA editing to make Alabama crops better

(Alabama.com)

Imagine plants that can "soak up" heavy metals contaminating wastewater outside an Alabama factory. Or plants that can produce edible protein in space for astronauts on long trips to Mars. Imagine familiar Alabama crops like soybeans, cotton and corn modified genetically to fight off viruses and pests for bigger yields and profits for Alabama farmers. All this and more is increasingly possible in the fast-changing world of plant genetics, and Alabama scientists are pushing the frontiers at Huntsville's HudsonAlpha Institute for Biotechnology and Auburn University.

Insect-resistant cowpea demonstrations across Nigeria aim to build farmer support for GMO crop

(GLP)

The Institute for Agricultural Research, Ahmadu Bello University (IAR/ABU) Zaria and the African Agricultural Technology Foundation (AATF) have concluded arrangements for nationwide on-farm demonstrations to raise farmer awareness on the new genetically modified Pod Borer Resistant (PBR)cowpea variety, commercialized as SAMPEA-20T. The demonstration trials will be managed solely by farmers on their plots and supervised by government extension agents to ensure that the farmers follow laid down protocols.

Extreme weather and crop disease hit East Anglia's sugar industry

(Eastern Daily Press)

British Sugar is predicting a 15pc drop in sugar beet yields for the forthcoming harvest after extreme weather and diseases put a dent in a decade of crop improvements. Aided by new seed varieties and the development work of the British Beet Research Organisation (BBRO), the yields of this staple East Anglian crop have increased by 25pc during the last 10 years. But this year's beet has been hit hard by prolonged dry periods earlier in the growing season – including the driest May on record – and damaging infestations of aphids carrying virus yellows disease, following the ban on neonicotinoid seed treatments which previously protected the plants from these pests.

FDA launches high-school curriculum to teach students about GMOs, CRISPR

(FDA)

Food agriculture is a topic of great interest to farmers, consumers, scientists, educators, and many people of all ages. After all, all people and animals eat. Science and Our Food Supply: Exploring Food Agriculture and Biotechnology introduces science-based agricultural concepts of crop characteristics, planning, and selection. This new curriculum introduces selective breeding and a subset of techniques commonly referred to as genetic engineering (GE). GE techniques allow scientists to specifically modify DNA of a microorganism, plant, or animal in order to achieve a desired trait. For example, genetic engineering can be used to add one or more genes to an organism to confer a trait the organism does not have or to modify a trait already existing in the organism (increasing or decreasing the expression of a particular trait).

Wakiso farmers want NARO to fast track the release of disease-free cassava seeds

(New Vision)

Using biotechnology, researchers have developed cassava crops that are resistant to brown streak and mosaic and have been tested in research stations across the country, to understand their adaptability to different agro-ecologies, with the participation of farmers. A farmer narrates her story on dealing with the disease in cassava crop and was helped by a researcher to identify the problem. She was backed by Nakanwagi Aida, another farmer who wondered whether NARO cannot use other laws to release the varieties to farmers as they wait for the pending the law. The importance of involving

farmers in the GMO harvests is part of the recommendations by the Cartagena Protocol on Biosafety that encourages participation of stakeholders like farmers who are direct beneficiaries of biotechnology research products. The importance of involving farmers in the GMO harvests is part of the recommendations by the Cartagena Protocol on Biosafety that encourages participation of stakeholders like farmers who are direct beneficiaries of biotechnology research products.

Agri scientists welcome GEAC's decision to allow confined field trials of Bt Brinjal, move to set up farm biotech research

(The Times of India)

In a move which may be in sync with the government's priority to focus on technological interventions in the farm sector and pursuit of its 'Atma Nirbhar Bharat' (self-reliant India) goal, the latest decision of the central regulator to allow biosafety field trials of indigenously developed Bt Brinjal will step up scientific research in the field of GM technology in the country.

US farm productivity shows Europe why rejecting biotech crops was a mistake

(GLP)

Over the past two decades, Europe has decided to go its own way in agricultural policy. While both North and South America and Japan have moved to even more technology-driven modern agriculture, Europe has gone backwards and forbids more and more scientifically proven advances in agriculture. With the help of genetic engineering, scientists have found a way to reduce the use of traditional pesticides while increasing crop yields. Once again, political distrust of agrotechnical innovations is blocking the way into the future. In this case the GMO Directive of 2001, which forbids practically all genetic engineering for the purposes of useful plants.

First detection test developed for gene-edited crop, campaign groups claim

(Euractiv)

The first open-source detection method for a gene-edited crop has been developed, according to a scientific paper. Environmental NGOs and campaign groups said this could hypothetically allow the EU to carry out checks to prevent unauthorised imports, but the EU seed sector quickly refuted this claim. The new paper, published in the scientific journal Foods after peer review, offers a method able to detect 'SU Canola', a herbicide-tolerant rapeseed variety that was developed by the American gene-editing company, Cibus. The European Court of Justice ruled two years ago that gene-edited organisms fall, in principle, under the EU's GMO directive. However, this decision was followed by much debate as to whether these crops can be distinguished from naturally derived crops, and therefore if it could be upheld. With no way of identifying gene-edited from conventionally selected varieties, EU countries have thus far been unable to test their imports for the presence of gene-edited crops, despite calls for more stringent monitoring processes.

'Biotechnology: A strong investment for African farmers'

(Vanguard)

Biotechnology remains a strong investment for African farmers as gains globally showed that for each dollar invested in biotech crop seeds more than a threefold return of approximately $3.5 was attained. Dr Sylvester Oikeh, a scientist with the African Agricultural Technology Foundation, AATF, who disclosed during a one-day interaction with editors in Lagos recently, said that, in 2016, farmers in developing countries received $5.1 for each dollar invested in biotech crop seeds.

Origin Agritech Announces Commercialization Agreement for New Generation Insect-resistant GMO Corn Gene

(Cision)

Origin Agritech Ltd., an agriculture technology company, announced that it has entered a commercialization agreement with Institute of Plant Protection(IPP) of the Chinese Academy of Agricultural Sciences (CAAS) for a new generation insect-resistant GMO corn gene. Origin has been collaborating closely with CAAS for more than 10 years, and IPP supplied Origin with the insect-resistant gene and with technological support. Origin has since taken the gene and created transgenic corn and further went on to validate the efficacy of the insect-resistant gene. Given that the project has cleared this major hurdle, the parties have expanded their collaboration into a commercialization agreement. Under the terms of the agreement, the parties will continue to work together and intend

to jointly file for patents on the transgenic corn and other crops created from this gene. Origin will be responsible for obtaining a bio-safety certificate, a key step needed before commercialization in China. Origin will retain exclusive worldwide rights to commercialize all crop seed containing this gene and in return will pay a single-digit percentage of sales royalty to IPP.

CRISPaper: Understanding gene-editing through art
(Berkeley)
To Sheng-Ying Pao, the power of reframing CRISPR lies in what is absolutely ordinary: paper. In CRISPaper, Pao revisited a cultural past in the ancient art of papermaking. Over thousands of years, farmers painstakingly converted the wild rice plant into a staple crop. Today, researchers are using CRISPR to change genes to optimize grain yield. However, rice is more than food. In ancient China, it was used to make paper. Pao took rice stalks from plants edited with CRISPR and ground the fibers into pulp. She then poured the pulp over a mesh screen. Every time she dipped the screen into water, the plant fibers would lift and resettle on top of the mesh, eventually making paper. Through the genome-edited rice plant, an ancient practice was juxtaposed with cutting-edge technology. Pao's meditative ritual of papermaking is a counterbalance to the strangeness of the source material.

Cuba expects massive crop yield increase with GMO insect-resistant, herbicide-tolerant corn
(GLP)
In the midst of a deep food crisis and a shortage of supplies in the country, the Cuban regime opened the door to transgenic crops as a "complement to conventional agriculture." According to a television report in the state press, "for next year it is expected to plant 8 thousand hectares of transgenic hybrid corn on the island." So far, "during the Spring Campaign, little more than 500 hectares have been planted in the provinces of Matanzas, Sancti Espíritus and Ciego de Ávila," the report states.

Oilseed extractors want GM crop for reducing dependence on imports
(Business Standard)
The Solvent Extractors Association (SEA), a lobby group of domestic oilseed extractors, has demanded the introduction of genetically modified oilseed crops to boost the country's local production by 15-20% and lower its reliance on imported edible oil. It made the suggestion in a presentation to Union food secretary as part of the action plan to raise domestic edible output and cut down dependence on imports.

Comparison of a hundred tomato varieties' genetic sequences
(Hortidaily)
Tomatoes come in a dizzying array of shapes, sizes and flavors—and a new study uses state-of-the-art DNA-sequencing technology to finally trace the genetic underpinnings of these differences. The comparison of 100 tomato varieties' genetic sequences reveals more than 230,000 variations within their DNA.

ISAAA Answers Top 10 Myths about Agricultural Biotechnology
(ISAAA)
Since 1996, global agriculture has been engrossed in debates over agricultural biotechnology and genetically modified (GM) crops. This debate includes science, economics, politics, and even religion, and has taken place almost everywhere. It has been going on in research labs, corporate boardrooms, legislative chambers, newspaper editorial offices, religious institutions, schools, supermarkets, coffee shops, and even in private homes. Scientists who have conducted research on GM crops have attested to the safety of such crops and their contributions to global agricultural productivity and alleviating poverty and hunger. Farmers and their families who have planted biotech crops enjoy their benefits. However, critics believe otherwise, saying GM crops are not likely to help contribute to global food security.

GMOs a 'corporate plot' to control the food supply, and 9 other biotech myths, debunked
(GLP)
GMO stands for "genetically modified organism." It most commonly refers to organisms—often plants—that have been modified to achieve desired traits, like drought-tolerance and pest-resistance, using recombinant DNA techniques or genetic engineering (GE). It's a misleading term, since we've

been modifying the genetics of organisms since the dawn of agriculture. But the name isn't the only thing that people get wrong.

Research

Chile poised to tackle food shortages and climate change with 'Golden Apple' and other CRISPR-edited crops

(GLP)

Chile is in desperate need of longer-term responses to worsening climactic conditions that threaten to intensify existing food shortages and jeopardize the nation's vital agriculture industry. Biochemist and president of the Chilean Society of Plant Biology Dr. Claudia Stange believes she is part of the solution. Climate change is here to stay, she believes, so it's time to mobilize genetic technology and adapt. Stange and her colleagues at the University of Chile are gene editing new varieties of apple, kiwi and tomato to improve their nutritional content and resistance to drought and saline soils.

Engineering rice plant roots increases crop yields in salty soil, study shows

(PNAS

Genetically improving the root system architectures of plants is an effective strategy for developing climate-resilient crops. In this study, a cloned rice quantitative trait locus associated with root growth angle, qSOR1, is a DRO1 homolog involved in root gravitropic responses. The loss-of-function allele qsor1 resulted in roots that developed on the soil surface and enabled plants to avoid the reducing stress found in saline paddy soils and, consequently, increased yields. It shows that the DRO1 homologs could be useful for the controlled breeding of root system architectures that are adapted to the abiotic stress conditions caused by global climate change. The root system architecture (RSA) of crops can affect their production, particularly in abiotic stress conditions, such as with drought, waterlogging, and salinity. Salinity is a growing problem worldwide that negatively impacts on crop productivity, and it is believed that yields could be improved if RSAs that enabled plants to avoid saline conditions were identified.

New sequencing technique boosts gene editing potential

(The Western Producer)

University of Saskatchewan and Agriculture Canada researchers said they had decoded the full genome of the black mustard plant. Black mustard is grown in India and other countries in South Asia. It's closely related to the mustard and canola grown in Western Canada. Andrew Sharpe, director of the Plant Phenotyping and Imaging Research Centre at the U of Sask said that this work provides a new model for building other genome assemblies for crops such as wheat, canola and lentils. Essentially, it's a recipe for generating a genome sequence that works for any crop. This means we can make breeding more efficient because we can more easily select genes for specific desired traits. The scientists used Nanopore, a long read sequencing technology developed in England, to piece together the black mustard genome. In a paper published in Plant Nature, the researchers said the technology could unravel the mysteries within a plant's DNA.

Inheritance in plants can now be controlled specifically

(Science Daily)

A new application of the CRISPR/Cas molecular scissors promises progress in crop cultivation. Researchers have succeeded in modifying the sequence of genes on a chromosome using CRISPR/Cas. For the first time, they took a known chromosome modification in the thale cress model plant and demonstrated how inversions of the gene sequence can be undone and inheritance can thus be controlled.

Gene cloning breakthrough proves potential for GM crop protection, say scientists

(Eastern Daily Press)

Genes which protect wheat from a deadly plant disease have been successfully cloned and transferred into barley by Norwich scientists – a breakthrough hailed as a glimpse into the future of crop protection. A team from the John Innes Centre at the Norwich Research Park, working with scientists

in the USA and Australia, used genetic modification (GM) techniques to fortify barley plants with genes proven to give wheat plants resistance to a yield-destroying infection called stem rust.

Grant funds UC-Berkeley research into wheat gene-editng

(Capital Press)

A grant to the University of California-Berkeley will pay for research into advanced gene editing aimed at developing wheat that is resistant to pathogens. The grant comes from the Foundation for Food and Agriculture Research in Washington, D.C. The 2Blades Foundation and Innovative Genomics Institute provided matching funds, for a total $3.2 million investment. FFAR builds public-private partnerships to support agricultural research. If successful, the three-year project could help growers reduce fungicide use by developing crops with improved resistance, Jeff Rosichan, director of the Crops of the Future collaborative for the foundation, told the Capital Press.

ICAR scientists develops bio pesticide to control Fusarium Wilt in Banana

(AgroSpectrum)

The scientists of Indian Council of Agriculture Research (ICAR), have found a cure for one of the most dreaded agricultural diseases. The fungal disease, called Fusarium Wilt, is popularly known as the 'Panama Disease' and afflicts banana plants. For the first time, Indian scientists have brought out a bio pesticide that can control the disease. This bio pesticide has been made using another fungus. For a long time, banana cultivators have been struggling with the Panama Disease. This disease affects the Cavendish variety or the G9 Banana cultivar, which is the most widely grown banana in the world. In India, more than 60 per cent of bananas are of the G9 variety. They go by names like 'Grand Naine', 'Robusta', 'Bhusaval', 'Basrai' and 'Shrimanth'. Farmers in at least four Indian states — Bihar, Gujarat, Madhya Pradesh and Uttar Pradesh — have been badly affected by this disease. All these are areas where the Cavendish variety is grown.

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