

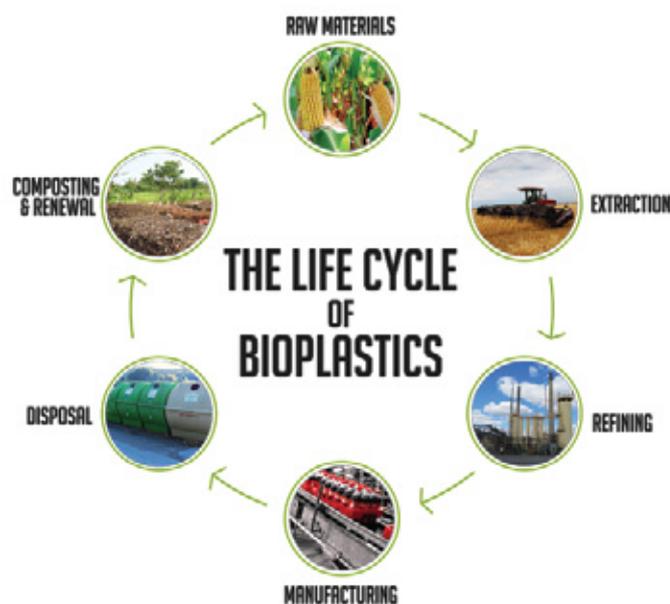
Alternative Plastic-Bioplastics: Starting a Paradigm Shift

Bioplastics are biodegradable materials used as eco-friendly alternatives to traditional plastics. These are derived from biological substances or renewable biomass sources. In contrast, traditional plastics are derived from petroleum which is not a renewable source. It is an irony that we are using traditional plastics, which lasts for up to hundred years, to package things which have a shelf life of a couple of months. However, a paradigm shift can now be observed with the emergence of Bioplastics.

Not only the decomposition but also the production of Bioplastics is sustainable in nature. Because it uses sources such as vegetable fats and oils, corn starch, or microbiota. With the ongoing efforts in research, scientists are now

looking for different efficient ways of producing more Bioplastics with enhanced features. Obtaining natural polymers from agricultural, cellulose or potato and corn starch waste is a very common process in this regard. Now new technology is underway to introduce innovative manufacturing process for the production of polylactic acid-based Bioplastics from agricultural waste. By adopting such technologies, we can use the inedible parts of plants, such as seeds, husks, bagasse, grasses, etc. Large-scale production of such Bioplastics can pave the way of utilizing agricultural waste for our farmers in the long run.

Dr. F H Ansarey
Executive Director
ACI Agribusiness



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Plant Tissue Culture is an established part of Biotechnology. Through this technique plant tissues are grown aseptically in an appropriate sterilized container without any change in genetic makeup of the materials.



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Fixin® Vet



ACI Animal Health launched Fixin® Vet injection on 21 May 2017. Each ml injection contains Flunixin Meglumine USP 83 mg (Eqv. to 50 mg Flunixin).

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On 24 May 2017, ACI Seed organized a field day at Muslimgonj Bazar, Kalai, Joypurhat to present the field performance of the new hybrid rice variety named Winall 301.



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Have Scientists Found the Brain of a Plant?



A plant's decision about when to germinate is one of the most important it will make during its life

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Plant Tissue Culture, a venture capital based industry



Plant Tissue Culture is an established part of Biotechnology. Through this technique plant tissues are grown aseptically in an appropriate sterilized container without any change in genetic makeup of the materials. This is one of the key tools being extensively used to produce planting materials of **high-value low-volume** crops in agriculture. Now the technique is used also for somatic embryogenesis, somatic hybridization, virus elimination, protoplast culture, cryopreservation, genetic engineering, micro-mutation, anther culture.

The technology which previously would be used only for research purpose has been modified for commercial needs worldwide including India, Thailand, Japan, South and Central America, Africa, Europe, etc. The demand in these countries for tissue cultured plants is continuously on the rise.

In Bangladesh commercial production of virus free potato plantlets for large scale seed production is in the rise. The private sector has also tried production of disease free plantlets of banana & ornamentals with limited commercial success although has high potentials.

Example of the potentials of commercial use of this technique is India which is the largest producer of tissue culture plants in Asia. They are also the largest exporter of tissue cultured banana plantlets in the world. Some of the crops which are produced through tissue culture with a rise in demand are banana, grapes, pineapple, pomegranate, strawberry, sugarcane, potato, turmeric, ginger, cardamom, vanilla and ornamentals like anthuriums, orchids, chrysanthemums, rose, lily, gerberas and also aloe vera. In fact, the demand is so high that the sector is increasing at a rate of 20-25% annually.

There is ample scope for Bangladesh to expand commercial use of plant tissue culture. The need is organized low cost labs for which **venture capital**, which the government and banks can provide to experienced manpower available in the country. *Assistance of Adeeba Raihan, Senior Scientist and Saiful Islam, Scientist, ASRBC, CI Ltd., is acknowledged.*

Prof. Lutfur Rahman,
Advisor, Agribusinesses, ACI Ltd.



Flowchart for Potato tissue culture and disease free potato seed production

Innovation and New Products

Fixin® Vet

ACI Animal Health launched Fixin® Vet injection on 21 May 2017. Each ml injection contains Flunixin Meglumine USP 83 mg (Eqv. to 50 mg Flunixin). Fixin® Vet is a fast acting pain killer which is manufactured for the 1st time in Bangladesh. It is 4 times stronger than others, nontoxic and safe for all animals in all stages. Moreover, it has lesser side effects and no drug-drug interaction. For cattle, Fixin® Vet can be used for the control of pyrexia associated with bovine respiratory disease and endotoxemia and acute bovine mastitis. It can be prescribed also for the control of inflammation in endotoxemia. In case of horse, it can be used for the alleviation of inflammation and pain associated with musculoskeletal disorders and for the alleviation of visceral pain associated with colic in the horse. Fixin® Vet is available in 25 ml pack.



New Catch

New Catch is a Nano-Encapsulated Liquid Antiviral Supplement for poultry. Each liter of New Catch contains-Zinc 8,000 mg, Copper 5,000 mg, Selenium 100 mg, Lactic acid 1,000 mg, Citric acid 1,300 mg, Beta-glucan 40 mg, Phytogenic encapsulation 5,000 mg and Carrier q.s.to 1 liter. Enhanced active absorption, controlled release of active ingredient and improved bioavailability are the direct benefits of Nano-Encapsulation. New Catch is effective against viral diseases specially Gumboro, Newcastle diseases, Avian Influenza, Fowl Pox etc. It improves the immune system and growth rate while increasing anti-microbial activity. Survival rate and meat yield are also increased with regular usage. New Catch helps to make eggs shell stronger and increase egg production. It is manufactured by Vet Superior Consultant Co. Ltd (Thailand). ACI Animal Health launched New Catch on 16 May 2017 and it is now available in 100 ml pack.



NUTARIN Liquid

On 8 May 2017, ACI Animal Health launched NUTARIN Liquid. It is an oral liquid solution in a nano-encapsulated form that is effective against disease caused by Clostridium perfringens, E. coli and Salmonella. As a very effective nano-encapsulated acidifier, each liter of NUTARIN contains Lactic acid 11 g, Formic acid 5 g, Citric acid 2 g, Phytogenics extract 5 g and Excipients q. s. to 1 liter. It increases anti-microbial and antiviral activity. Moreover, improvement in growth performance, survival rate and meat yield are also observed with regular usage. Besides, improved nutrient digestibility and feed conversion ratio help to increase the production and quality of eggs. On the other hand, NUTARIN helps to reduce stress. It is manufactured by Vet Superior Consultant Co. Ltd (Thailand) and available in 1 liter pack.



Farmers to Adopt Winall 301 Rice Variety



On 24 May 2017, ACI Seed organized a field day at Muslimgonj Bazar, Kalai, Joypurhat to present the field performance of the new hybrid rice variety named Winall 301. About 70 prospective farmers, 2 local retailers, 2 dealers and the local Sub Assistant Agriculture Officer attended the field day. The newly released rice variety is available for Boro season to the farmers, dealers, retailers.

Mr. Shafiqul Islam, ASM, Bogra and Mr. Khandakar Riad Hassan, RSM, Rangpur from ACI Seed facilitated the audience to observe and evaluate the benefits of cultivating Winall 301. Compared to the top hybrid rice varieties in the market, its yielding ability and field standing was remarkable. Participants of the field easily made the comparison as Md. Mahamudul Hassan, a demonstration farmer, shared his experience. He had cultivated Winall 301 variety in his 54 decimal of land in the

last Boro season and got 10.6 MT/ha yield through a disease-free and pest-free cultivation. Participants of the field day realized the potentials of the new rice variety and are planning to adopt it in the Boro season.



ACI & BINA signed TOT MoU



On 29 May 2017, ACI Limited and Bangladesh Institute of Nuclear Agriculture (BINA) signed a Memorandum of Understanding (MOU) regarding the transfer of “BINA-Biofertilizer Technology” (Rhizobium Biofertilizer). This Transfer of Technology (TOT) MoU signing ceremony was held at BINA, Mymensingh where Director General (DG)-BINA Dr. Md. Amjad Hossain, Dr. Md. Mohsin Ali-CSO & Head of Soil Science Division-BINA, Dr. Md. Zahurul Islam-PSO, Soil Science Division-BINA, Bashir Ahmed-Business Director,

Events and Activities

ACI Fertilizer, and Md. Asadur Rahman-Assistant Product Manager, ACI Fertilizer represented signing parties. As a result of this MoU, ACI Limited will get the opportunity to use the Biofertilizer Technology for 2 years consecutively with all the technical support from BINA. In the long run, ACI Fertilizer will be able to enrich its product basket

and make Biofertilizer widely available to farmers through its marketing and distribution facility. Farmers will get financial benefit by using Biofertilizer instead of Urea for the production of oil seed (8 types) & pulse crops as it helps to improve soil fertility. Besides, Biofertilizer is Eco-friendly which will help to preserve the environment.

Country's 1st Farm Mechanization Training Center at Jessore



ACI Motors, the largest Agri-Machineries company in Bangladesh inaugurated country's first Modern Training Center at Chakra More, Jessore on 15 May 2017. This Training Center consists of a fully automated cut section tractor, through which training of engine, hydraulics, gear and other parts of the tractor will be conducted.

Agricultural machinery users and technicians would be trained with technical and entrepreneurial skills through this training center. This is remarkable that, Sonalika Tractor is the highest selling tractor in the Country and this is the only company providing after sales service within 6 hours anywhere in the country.

Events and Activities

The inauguration program was covered by a number of electronic and print media. In the program, Director Sales Mr. Md. Azam Ali, General Manager Service Engr. Asif Uddin, Marketing Manager Mr. Munem Shahriyar, Sales Manager Mr. Prabir Kumar Adhikary, Regional Sales

Manager Mr. Abu Al Emran and Asst. Product Manager Mr. Tanmoy Majumder were present from ACI Motors. On behalf of International Tractor Ltd. India, Deputy General Manager Mr. Sunil Sondhi, Manager Service Mr. Diptendu Roy and other high officials were present along with customers and well-wishers.

ACI Motors' Dealer Manager Workshop 2017



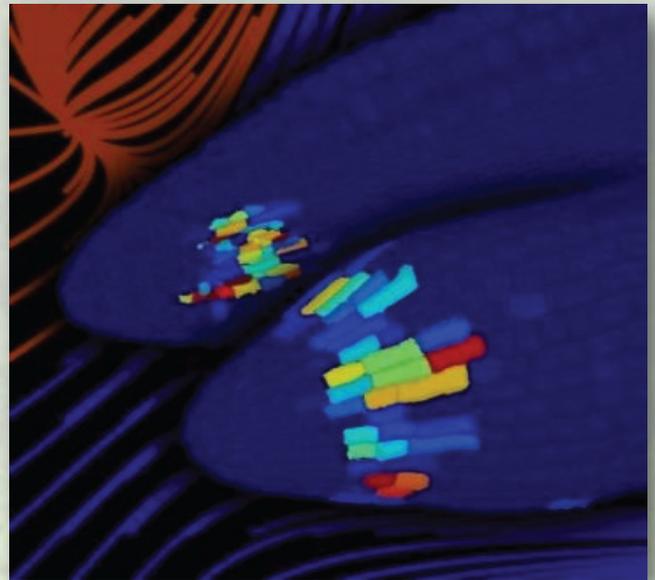
ACI Motors arranged a Workshop for the Dealer Managers of Power Tiller – Diesel Engine on 13-14 May 2017. On the first day of the workshop, the invited participants enjoyed their time in an amusement park nearby Dhaka. On the second day, the invited dealer point managers attended training sessions at ACI Center, Dhaka. The training sessions included sales and product training.

Mr. Subrata Ranjan Das, Chief Business Officer, ACI Motors encouraged the workshop participants while Director Sales Mr. Md. Azam Ali, General Manager Service Engr. Asif Uddin, Sales Manager Mr. Prabir Kumar Adhikary, and Asst. Product Manager Arafat Hossain were also present from ACI Motors.

Have Scientists Found the Brain of a Plant?

A plant's decision about when to germinate is one of the most important it will make during its life. Too soon, and the plant may be damaged by harsh winter conditions; too late, and it may be outcompeted by other, more precocious plants. In a study published on 5 June 2017 in Proceedings of the National Academy of Sciences (PNAS), scientists from the University of Birmingham have shown that this trade-off between speed and accuracy is controlled by a small group of cells within the plant embryo that operate in similar way to the human brain.

The scientists showed that the 'decision-making centre' in a plant called Arabidopsis, or thale cress, contains two types of cell -- one that promotes seed dormancy, and one that promotes germination. These two groups of cells communicate with each other by moving hormones, an analogous mechanism to that employed by our own brains when we decide whether or not to move. The scientists used mathematical modelling to show that communication between the separated elements controls the plant's sensitivity to its environment. Following this theory, they used a mutant plant where cells were more chemically linked -- essentially enhancing



3D digital reconstructions of plant embryos where the components that make the decision in these are located.

Photo Credit: University of Birmingham

communication between circuit elements -- to show that germination timing depends on these intra-region signals.

(Source: Agriculture and Food News, ScienceDaily. www.sciencedaily.com)

Indica Rice Genotype showed Hybrid Rice like Yield

Although the rice growth response to FACE (free-air CO₂ enrichment) has been widely studied and is considered important within the scientific community, few studies have attempted to examine the effects of FACE on the yield of indica rice, which is typically the parent of indica hybrids in China. The effects of FACE on the yield, yield components, biomass, N uptake and leaf photosynthesis of Yangdao 6 Hao (an indica rice) in China were examined over 2 years. The grain yield increased over 30%, the panicle number increased 12.4% on average, and the spikelet number per panicle also showed an average increase of 8.2% at elevated CO₂. FACE caused a significant enhancement in both the filled spikelet percentage (+5.9%) and the individual grain weight (+3.0%). Compared with three prior FACE studies on rice, a similar enhancement of yield in hybrid indica was shown under FACE, with much a higher value than for the japonica rice cultivar (approximately + 13%)



because of indica's stronger sink generation and N uptake capacity, which help coordinate the C/N balance to avoid photosynthetic acclimation. The high enhancement of the indica rice yield under FACE holds promise for improved cultivar selection for future food security.

(Source: Scientific Reports, Nature.com Link: www.nature.com/scientificreports)

Decomposing Leaves: Source of Greenhouse Gases

Michigan State University scientists have pinpointed a new source of nitrous oxide, a greenhouse gas that's more potent than carbon dioxide. The culprit? Tiny bits of decomposing leaves in soil. This new discovery is featured in the current issue of *Nature Geoscience*, could help refine nitrous oxide emission predictions as well as guide future agriculture and soil management practices. "Most nitrous oxide is produced within teaspoon-sized volumes of soil, and these so-called hot spots can emit a lot of nitrous oxide quickly," said Sasha Kravchenko, MSU plant, soil and microbial scientist and lead author of the study. "But the reason for occurrence of these hot spots has mystified soil microbiologists since it was discovered several decades ago." Part of the vexation was due, in part, to scientists looking at larger spatial scales. It's difficult to study and label an entire field as a source of greenhouse gas emissions when the source is grams of soil harboring decomposing leaves. Changing the view from binoculars to microscopes will help improve N₂O emission predictions, which traditionally are about 50 percent accurate, at best. Nitrous oxide's global warming potential is 300 times greater than carbon dioxide, and emissions are largely driven by agricultural practices. "This work sheds new light on



Photo Credit: patpitchaya / Fotolia

what drives emissions of nitrous oxide from productive farmlands," said John Schade, a program director for the National Science Foundation's Long-Term Ecological Research program, which co-funded the research with NSF's earth sciences division. "We need studies like this to guide the creation of sustainable agricultural practices necessary to feed a growing human population with minimal environmental impact."

(Source: Agriculture and Food News, ScienceDaily. www.sciencedaily.com)

Gene Helps Time Spring Flowering in Grass Crops

Winter is no time to flower, which is why so many plants have evolved the ability to wait for the snow to melt before investing precious resources in blooms. Waking up to flower as the warmer, longer days of spring arrive -- and the risk of a damaging frost recedes -- requires a process called vernalization, in which flowering is blocked until the plant senses a sufficient cold spell. Researchers at the University of Wisconsin-Madison have identified a gene that keeps grasses from entering their flowering cycle until the season is right, a discovery that may help plant breeders and engineers get more from food and energy crops.

"For many plants -- some varieties of wheat are a good example -- it's advantageous to get established in the fall but avoid flowering before it gets really cold," says Rick Amasino, a UW-Madison professor of biochemistry and genetics. "By becoming established in the fall, such plants can take full advantage of the window of the growing season when it opens in the spring." Much has been done to identify genes involved in flowering, including one in



Waiting through a cold season to flower weighs heavily on the amount of biomass a plant accumulates. The *Brachypodium* grass on the right holds out through winter before beginning vernalization and flower production. The plant on the left flowers without vernalization, and does less work to establish roots and leaves.

Photo Credit: Daniel Woods/UW-Madison

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grasses called VRN1 that helps get the vernalization ball rolling by spurring groups of other genes into action. But just what keeps VRN1 in check, so flowering does not occur in the fall or in a winter warm spell, was unclear until Amasino, postdoctoral researcher Daniel Woods and others began putting a small Mediterranean grass called *Brachypodium*, or false purple brome, through false cold seasons in lab refrigerators. "Getting at the genetics underlying complex processes is difficult in many crop species,

so we've used a small plant with a compact genome as a model to get at the molecular underpinnings of how a vernalization requirement is established," says Woods, first author on the study published in the journal *Proceedings of the National Academy of Sciences*. "What we found is a gene that represses the VRN1 gene prior to winter."

(Source: Agriculture and Food News, ScienceDaily. www.sciencedaily.com)

Engineered Rice Shows Resistance to Multiple Diseases at Once

Scientists have successfully engineered a rice plant with an adjustable immune system to make it resistant to multiple diseases at once without decreasing its yield. "For as long as I have been in this field, people have been scratching their heads about how to activate a defense system where and when it is needed," says Jonathan Jones, a professor at the Sainsbury Laboratory in Norwich, U.K. "It is among the most promising lines of research in this field that I have seen."

The gene known as NPR1 has been explored by many scientists to improve the immune system of rice, wheat, apple, and other plants. Duke University scientist, Xinnian Dong, has been studying this gene for two decades and referred to it as the "master regulator" of plant defense. When this gene is turned on for immunity, it backfires on the growth of the plant resulting in stunting and zero production for farmers. This led Dong and other researchers to another immune system-activating protein in *Arabidopsis*, the TBF1. They discovered a complicated system that involves readily available messenger RNA molecules that encode TBF1, and instantly translating these molecules into TBF1 proteins, causing an immune response. Dong copied the segment of the DNA that functions as a switch for immune response and placed it along



side and in front of the NPR1 in rice. This led to a rice plant with a boosted immune system strong enough to ward off pathogens in short periods of time to avoid stunting. The engineered rice has shown effective resistance against rice blight (*Xanthomonas oryzae* pv. *oryzae*), leaf streak (*X. oryzae* pv. *oryzicola*), and blast disease (*Magnaporthe oryzae*).

(Source: Crop Biotech Update, International Service for Acquisition of Agri-Biotech Applications. www.isaaa.org)

CAAS Scientists Develop Herbicide Resistant Cotton

Glyphosate resistant crops have been widely adopted by North and South American farmers. However, the adoption of glyphosate resistant crops in China has been hampered by several factors, including labor markets and the residual effects of glyphosate in transgenic plants. Chengzhen Liang from the Chinese Academy of Agricultural Sciences reported the co-expression of codon-optimized forms of GR79 EPSPS and N-acetyltransferase (GAT) genes in cotton. Two co-expression cotton lines, GGCO2 and GGCO5, exhibited five times more resistance to glyphosate with a 10-fold reduction in glyphosate residues.

The GGCO2 line was then used in a hybridization program to develop new glyphosate resistant cotton varieties. Field trials consisted of three growing seasons showed that pGR79-pGAT transgenic cotton lines had the same agronomic performance as conventional varieties, but were cheaper to produce per hectare. The strategy to pyramid these genes offers an attractive approach for engineering



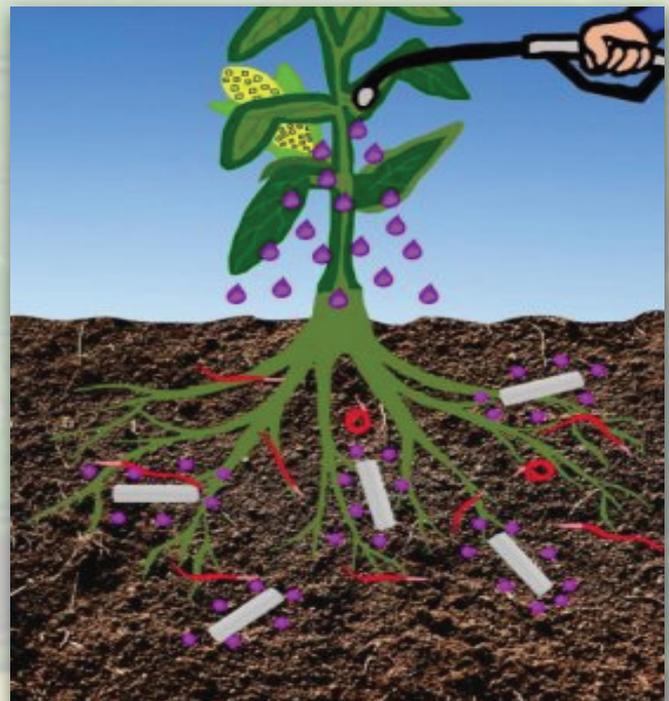
and breeding of highly resistant low-glyphosate-residue cotton varieties.

(Source: Crop Biotech Update, International Service for Acquisition of Agri-Biotech Applications. www.isaaa.org)

Promise for Controlling Crop Parasites

Researchers at Case Western Reserve University are applying drug-delivery technology to agriculture to control parasitic roundworms more effectively and safely. The tiny roundworms, or nematodes, cause \$157 billion in crop failures worldwide each year, other researchers estimate, largely because they're beyond the reach of pesticides. The chemicals disperse poorly into soil, while the parasites feed at plant roots well below the surface. As a result, farmers apply large amounts of pesticides, which can increase the chemical concentrations in food or run off and damage other parts of the environment, all of which have costs. But biomedical engineering researchers at Case Western Reserve may have found an effective solution.

"We use biological nanoparticles -- a plant virus -- to deliver a pesticide," said Paul Chariou, a PhD student in biomedical engineering at Case Western Reserve and author of a study on the process published in the journal ACS Nano. "Use of the nanoparticle increases soil diffusion while decreasing the risk of leaching and runoff, reducing the amount of chemical in food crops and reducing the cost to treat crops." Chariou worked with Nicole Steinmetz,



This image shows roots of a corn plant infected by endoparasitic nematodes (in red). The plant is being treated with a pesticide (purple sphere) encapsulated into Tobacco mild green mosaic virus (grey rods). The virus enhances the diffusion of the pesticide to the root level of the plant, where the nematode resides, thus increasing treatment efficacy.

Photo Credit: Paul Chariou

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the George J. Picha Professor in Biomaterials appointed by the Case Western Reserve School of Medicine. Parasitic nematodes feed on a wide range of crops, including corn, wheat, coffee, soybeans, potatoes and a host of fruit trees.

Damage they cause at the roots impairs the plants' ability to absorb water and nutrients, which can kill young plants and reduce yields in mature plants.

(Source: Agriculture and Food News, ScienceDaily. www.sciencedaily.com)

Simultaneous Multiple Gene Targeting to Alter Oil Production in Camelina

Camelina sativa can easily be genetically modified using enzymes from other plants, making it an ideal platform for the production of unusual valuable lipids. However, suppression of endogenous enzyme activity to reduce competition for substrates, such as triacylglycerol, is also required to enhance the production of target compounds. Furthermore, camelina possesses a hexaploid genome, with multiple gene homeologs coding for an enzyme. Kansas State University researchers designed a guide RNA identical to all three CsDGAT1 or CsPDAT1 homeologs, to demonstrate the ability of the system in introducing mutations to the genes important for triacylglycerol (TAG) synthesis in developing seeds. Analysis from the edited T1 plants revealed that each CsDGAT1 or CsPDAT1 homeolog was altered by multiple mutations, resulting in a genetic mosaic in the plants.

Seeds harvested from both CsDGAT1- and CsPDAT1-targeted lines were often shrunken and wrinkled. Furthermore, lipid analysis revealed that



many lines produced seed with reduced oil content and altered fatty acid composition, consistent with the role of the targeted genes. CRISPR-Cas system therefore represents a useful method to alter endogenous biosynthetic pathways efficiently in polyploid species such as camelina.

(Source: Crop Biotech Update, International Service for Acquisition of Agri-Biotech Applications. www.isaaa.org)



Believe it or not!



- A mango tree can grow as tall as 100 feet.
- Mango seeds are used to make soap due to its high stearic acid content.
- 1 cup Mango can provide 100% of your daily vitamin C, 35% of your daily vitamin A and 12% of your daily fiber.
- Mangoes are related to cashews and pistachios.
- In many Latin American countries, mango on a stick with the skin peeled back is sold by street vendors



Nutrition Chart

Mango (per 100 g)			
Energy	250 kJ	Magnesium	10 mg
Carbohydrates	15 g	Manganese	0.063 mg
Fat	0.38 g	Phosphorus	14 mg
Protein	0.82 g	Potassium	168 mg
Calcium	11 mg	Sodium	1 mg
Iron	0.16 mg	Zinc	0.09 mg

Source: USDA Nutrient Database

Tips

To keep your vegetables and fruits fresher for longer, you can follow these simple tips:

- Store unripe fruits and veggies like pears, peaches, plums, kiwis, mangoes, apricots, avocados, melons, and bananas on the counter. Once they're ripe, move them to the fridge. Banana peels will turn dark brown, but it won't affect the flesh.
 - Keep potatoes, onions, and tomatoes in a cool, dry place, but not in the fridge. The cold will ruin their flavor.
 - Store salad greens and fresh herbs in bags filled with a little air and sealed tightly.
 - Citrus fruits such as oranges, tangerines, lemons, and limes, will do fine for up to a week in a cool, dark place, away from direct sunlight, but you can lengthen their lives by storing them in the fridge in a mesh or perforated plastic bag.
 - Other types of produce such as carrots, lettuce, and broccoli start to spoil as soon as they're picked, so place these in separate plastic bags in the crisper in your fridge
- Can improve soil fertility as certain mulch types decompose

(Tips courtesy: popsugar.com)

Sharing is caring!

How would you feel if you can get a touch of nature while commuting in the city? How about having a jungle ride on your way to office, school or home? That's what has been made possible in Taiwan. An ordinary single-deck city bus has been converted into a travelling mini-jungle. With moss-covered seats and an explosion of lush plants and flowers throughout its interior the "forest bus" offers a fragrant leafy ride for passengers used to crammed public transport in Taiwan's capital. The green house bus is decorated with orchids, ginger lilies and a variety of ferns and is running on a special route through Taipei, with stops including an art museum, a popular temple and a night market. Florist Alfie Lin, who created the temporary installation, said he wanted to bring a touch of nature to commuters' busy routines.



ACI Agribusinesses

ACI Centre
245 Tejgaon Industrial Area
Tejgaon, Dhaka, Bangladesh
Phone: + 88 02 887-8603
E-mail: biolife@aci-bd.com
sectoedab@aci-bd.com

www.aciagribusinesses.com



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