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Combat recurrence of papaya mealy bug, farmers told



A papaya fruit seen with high infestation of the Mealy bug in Coimbatore.

COIMBATORE: Vice-Chancellor of Tamil Nadu Agricultural University (TNAU) P. Murugesu Boopathi has advised farmers to take up immediate control measures to prevent the spread of the papaya mealy bug that has recurred.

According to a release, he has cautioned the incidence of the bug, which is moderate now, can escalate to larger proportions if left unchecked. "Farmers should take up integrated pest management measures on a war footing and in a co-operative manner," he said.

The mealy bug was a polyphagous sucking pest that infested crops like cotton, papaya, tapioca, mulberry, jatropha and other cultivable crops. The pest sucked the sap of the plant and weakened it. The honey dew secreted by the bug resulted in the formation of black sooty mould that caused further damage to the crops.

E.I. Jonathan, Director of the Centre for Plant Protection Studies of the university, said the bug assumed the status of a major pest in 2009 when it caused severe damage to crops and huge losses to farmers in Coimbatore, Erode and Tirupur.

“TNAU responded to this outbreak by initiating appropriate research and carrying out intensive extension programmes. The opportunity was used to conduct awareness programmes and demonstrations on control measures and the pest was brought under control. Recently, the recurrence of the mealy bug has been noticed in Coimbatore, Erode, Salem, Tirupur, Namakkal and Karur districts,” Mr. Jonathan said.

Farmers were advised to follow the integrated pest management measures like removing alternate weed hosts, pruning severely affected parts of the crop regularly, conserving natural enemies, using botanical insecticides like neem oil, fish oil and rosin soap, spraying of profenophos or dimethoate, etc.

The university has cautioned that if control measures were not taken immediately, farmers may lose their entire crop because of the high temperature, low humidity, dry wind and no rain.

For details, contact Head, Department of Agricultural Entomology, TNAU, Coimbatore – 641003; or call 0422-6611214, or e-mail to entomology@tnau.ac.in.

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The path of science for GM crops in India

Decisions on GM crops should be taken on the basis of sound science only after incorporating known advances in plant transformation technology.

The recent restraint on commercial release of Bt brinjal despite approval of the Genetic Engineering Approval Committee has become controversial. The step was taken after consultations with diverse stakeholders in several states. The majority view in the consultations was that commercial release of Bt brinjal could wait. Reasons included cautionary advice of European scientists about inadequate bio-safety assessment by seed producer company Mahyco and possible threats to indigenous brinjal biodiversity. Some scientists and politicians consider the decision a setback to advances in agriculture biotechnology and therefore to attainment of food security in the long-term. Many biotechnology researchers have taken it as a blow to their efforts. So we must carefully chart the way ahead for introduction of genetically modified (GM) crops and for relevant avenues of biotechnology research, especially in genetic engineering.

Bt brinjal is a genetically engineered brinjal containing the Bt toxin gene from the soil bacterium *Bacillus thuringiensis* (therefore, Bt). The Bt toxin confers resistance to two pests — fruit and shoot borer (FSB, *Leucinodes orbonalis*) and fruit borer (*Helicoverpa armigera*). Genetic engineering (GE) or recombinant DNA technology (r-DNA) is a path-breaking technique compared to conventional plant breeding, as it allows genes to be transferred across species, from animals to plants, microbes to higher organisms and vice versa. Like other GM crops, commercial production of agriculturally suitable Bt brinjal involves two steps. First is the production of the primary transformant by GE. The gene to be transferred (transgene), for instance, the Bt gene, is inserted into a chromosome of a target crop variety, which is most amenable for its cellular acceptance and integration by a particular r-DNA protocol. The host variety for this primary event has high acceptance for the transgene, but is usually not agriculturally suitable and therefore, we need a second step, namely, the production of the commercially viable and agriculturally suitable GM hybrid or variety. This is done by transferring the Bt gene from the primary transformant to a hybrid or variety by a conventional plant breeding technique based on cross-pollination.

In the first step, GE is used to ensure that an alien gene of a desired trait can be inserted and integrated into a crop of interest. In nature a gene, on accidental entry into an alien cell, is immediately destroyed. The exceptions are the DNA of parasitic bacteria and viruses. They have some DNA of unique mobility and protective armour which confer on them the property of crossing species barriers and infecting and surviving in alien host cells. Genetic engineers have taken advantage of this phenomenon. The transgene is attached to such mobile microbial DNA, which acts as a carrier and then by suitable protocols this recombinant DNA is transferred to host cells. From these transformed host cells, whole plants or primary transformants are developed using tissue culture techniques. Seeds of these are collected for future use.

In the second step, the primary transformant is crossed with suitable hybrids or varieties to produce the usable GM crop. The favoured method for this is backcrossing, to obtain homozygous plants which have uniform expression of the transgene, reliable performance and which breed true with regard to the inheritance of the transgene.

Thus, Mahyco produced Bt brinjal primary transformant by incorporating the Bt gene into a bacterial plasmid DNA (pMON10518) and transferring this r-DNA by the common agrobacterium-mediated transformation technology to a brinjal variety. This primary transformant was crossed with several brinjal hybrids (MHB 4, 9, 10, 80, 99 etc) to produce the Bt MHB lines for commercial release.

What is not so well-known, however, is that for most commercially released GM crops the protocols still date from as far back as the mid-1990s, overlooking the many advances in GE technology since then. For instance, Mahyco uses a slightly modified technique enunciated by M. Fari et al in 1995 (Fari et al, *Plant Cell Report*, pp.82-86, 1995). The plasmid used continues to have, besides the Bt transgene, antibiotic resistance markers (npt II and aad) and the 35S CaMV promoter. Over the last two decades, however, plant transformation technology has moved ahead rapidly as scientists around the world have endeavoured to make the technology bio-safe. They recognise the danger that since the transgene-vector recombinant DNA had the capacity of 'jumping into' alien species, it could also 'jump out' of a transgenic crop and 'jump into' another species causing gene contamination. In this context, a major apprehension was that the antibiotic resistance marker DNA fragments could spread to other species from the GM crop. To take

care of these dangers, genetic engineers developed safe markers and protocols for obtaining marker-free transgenic crops.

Similarly, scientists had reservations about the gene switch (promoter) derived from the Cauliflower Mosaic Virus (35 S CaMV) as parts of its base sequence resembled some sections of the HIV virus. To avoid it, safe promoters have been designed. Innovations on promoters have also focused on tissue-specific promoters for tissue-specific transgene expression in plants. For instance, at present in the commercially released Bt crops, Bt gene expression being non-specific, Bt toxin is formed in all organs of the plant. It would be better if it were expressed only in the susceptible tissues and not everywhere including the roots. With new tools it is now possible to have expression of a gene, only where it is needed and by using controls of temporal expression, when it is needed. Random unpredictable insertion of the transgene into the genomic DNA has been another concern of the researchers. Such random insertion, even in non-genic segments of the genome, could have unintended negative consequences. Therefore, attempts for site-directed non-random insertion of a transgene have been a thrust area of research with some success in the case of plants. A rapidly developing area constitutes attempts to insert multiple genes in a crop or gene stacking. One such example, besides Golden Rice, is the production of GM cotton with the Bt gene along with a gene for resistance to sucking pests developed at the National Botanical Research Institute, Lucknow under the leadership of Rakesh Tuli.

Many such advances have been made in plant transformation technology to make it more efficient, relevant and bio-safe and this is a continuing effort around the world, including India. However, it is disconcerting to note that in India the GM crops released or waiting to be released have been produced through an underdeveloped technology dating from the mid-1990s.

A key concern regarding the second step of transfer of the transgene from the primary transformant to a suitable hybrid or variety through repeated backcrossing is the choice of the acceptor host hybrid or variety. In India with diverse agro-climatic zones a preferable strategy would be to use acceptor lines which are best adapted to particular zones of cultivation of a crop. This approach is being followed for Bt cotton being developed by the Central Institute for Cotton Research (CICR), Nagpur, under the stewardship of K.R. Kranthi. However, commercial release of GM crops tends to take a short-run view and to attract farmers, companies use very high yielding hybrid lines as acceptors. These very high yielding hybrids and their Bt counterparts require much higher inputs of fertilizers and irrigation than even the Green Revolution hybrids. The even more important point is that world-over the higher yields of GM crops are not because of the inserted transgenes but due to the use of very high yielding hybrids or varieties as the acceptor host.

In view of the above considerations, it would be wiser to take precautionary measures and not rush into commercialisation of a technology that is currently still being perfected by our scientists. One should wait till truly bio-safe GM crops, especially bio-safe food crops have been produced using advances in plant transformation technology. Researchers are already working towards producing marker-free GM crops, with safe promoters, site-directed insertion of single or stacked genes, genes expressing in specific tissues, and other necessary attributes for bio-safety. A major endeavour of genetic engineers is the production of transplastomic GM crops through chloroplast transformation rather than nuclear transformation. In such transgenic crops there is enhanced formation of the

transgene product, as a plant cell contains only one nucleus but many chloroplasts. Further, with transplastomics there is little chance of gene contamination by pollen flow. This should become a thrust area of plant transformation initiatives. In this context, the proposal that GM research should mainly be in the public sector is of great relevance. There could also be public-private partnered GM crop production.

As Prof. M.S. Swaminathan has said, "Unless R&D efforts on GM foods are based on principles of bio-ethics, bio-safety, bio-diversity conservation and bio-partnerships, there will be serious public concern in India, as well as many developing countries, about their ultimate nutritional, social, ecological and economic consequences."

(The writer is Director, Bio-Science, Samaj Pragati Sahayog, Madhya Pradesh. Former Professor of Botany at CCS University, Meerut, he was associated with pioneering work on agrobacterium-tobacco DNA combination at the Roswell Park Memorial Cancer Research Institute, New York.)

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More trees planned on private land



Volunteers of the Centre of Excellence for Change interact with morning walkers at the Elliot's Beach to spread awareness on water related issues.

CHENNAI: The State has for the first time created an Environment Protection and Energy Development Fund with a starting allocation of Rs.10 crore in the current budget, said M. Naganathan, Vice-Chairman, State Planning Commission.

"Tree-plantation activity in private fallow land will also be intensified," he said inaugurating a seminar 'Looking forward: Challenges of climate on water and land' here on Monday.

The event was organised by Anna University along with the State Planning Commission and the Tamil Nadu Forest Department to celebrate World Water Day.

Pointing out that issues of sanitation and access to clean drinking water have socio-economic dimensions, Dr. Naganathan said: "While 92 per cent of the urban population has access to clean drinking water, only 72 per cent of the rural population has such access."

Anna University Vice-Chancellor P. Mannar Jawahar said the city would experience water shortage if it continued to meet 80 per cent of its drinking water needs by tapping groundwater.

Stressing that forest cover and water availability are inter-related, Environment and Forests Secretary Debendranath Sarangi said: "Proactive measures must be made to preserve and expand existing forest cover."

Officials from various government departments and college students distributed questionnaires on the Marina and Elliot's beaches to understand the level of public awareness on water-related issues. At another meeting, speakers said that the city's water systems need proactive attention by the multiplicity of agencies.

"This is not rocket science," said K Phanindra Reddy, member secretary of Chennai River Restoration Trust, slamming the Tamil Nadu Pollution Control Board, Chennai Metropolitan Development Authority, Slum Clearance Board and others for their laxity in sewage treatment among other concerns.

Mr. Reddy was responding to recommendations that were the result of a day of deliberation between scientists, NGOs and representatives of the CMDA, TNPCB, Sewage Board, Tamil Nadu Planning Commission and Department of Environment and Forests at IIT Madras on Monday.

These included ensuring better coordination of departments and introducing a water protection force .

Market pricing is a fallacy in agriculture

By

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The Planning Commission's call for wide-ranging reforms in agriculture in a draft report of its mid-term appraisal of the 11th Five-Year Plan, and its stressing of a market-oriented pricing system that would be delinked from procurement prices, does not have any new ideas, which are needed to increase agricultural growth and give it its rightful place in the GDP of the country. It is currently barely three per cent of GDP. The government has been saying many of these things for the last 15 years. Its other suggestion, according to news reports, is to do away with levies and stocking limits, allow free movement of goods across the country, remove bans on exports and futures trading, and take technology to the farmers. These are vague statements and unlikely to solve the ground-level issues that plague Indian agriculture. In addition to the fact that agriculture and allied activities provide livelihoods to more than 60 per cent of the country's 1.2 billion people, 70 per cent of the population has no purchasing power. There is a lot of double-speak when it comes to tackling agriculture. The talk about leaving pricing to market forces vanishes when prices go up as a measure of the supply and demand equation. For instance, when international prices are low, the government imports to depress prices domestically. India imports 50 per cent of her requirement of edible oils — around 12 lakh tonnes annually. When prices of palm oil were high at around \$1,400 per tonne, the government had reduced import duties to zero from 85 per cent to make imports cheap and depress domestic prices (Rs 80 per kg of soyabean oil at that time). But now that prices have fallen in the international market to \$800 per tonne, the government has not reimposed import duty, which is why edible oil is cheap compared to two years ago. The consumer is happy with cheap palm oil but the farmer does not get a fair price and that's why oilseed production is not increasing. However, in the case of petroleum, when a barrel was \$144, the government reduced import duty by 7.5 per cent. When prices fell to \$80 per barrel the government reimposed the import duty, which is why prices have gone up by Rs 2.50 per litre in the cases of petrol and diesel. So the government plays a double game with the farmers, and that is why the farmers have no incentive to produce enough food grains or edible oils. The government is caught between pleasing consumers, particularly vocal middle-class consumers, with cheap food grains and the like, and depriving farmers of remunerative prices. While industry can raise its price every time raw material prices go up, the farmer cannot and has therefore been the loser. The government has to find a way to harmonise the needs of consumers with that of farmers. The government has for some inexplicable reason done away with the PDS for people above the poverty line while it has badly mismanaged the system for those below the poverty line. The Planning Commission's draft report is now trying to mask its failure by trying to do away with the procurement policy. It has said procurement price should be delinked from the minimum support price it gives to farmers. The problem is not procurement but distribution. The government has been unable to provide an efficient distribution network, which

is why we have hundreds of tonnes of grain lying rotting in the open in Punjab.

The report talks about making the system more market-price-oriented. But nowhere in the world are prices based on market forces. Every government subsidises its farmers heavily; the US government leads in this. In fact, as the Planning Commission members are probably aware, the whole fight at the WTO is about farm subsidies. The Doha Round has been languishing for several years because the US and Europe do not want to give up their subsidy regime while calling upon India and other developing countries to cut subsidies.

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Disappering speck of nature

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Until the Jawaharlal Nehru Port Trust was established here to decongest the Mumbai Port, Uran was a quaint little fishing village, known to the avid birdwatchers of Mumbai as a birding hotspot. And to those interested in history, it was known as the naval base of that fisherman-turned- master naval strategist of Shivaji, Kanhoji Angre. The one who held sway over every single fort on the coast of Konkan, including a few fabulous forts built in the middle of the Arabian Sea.

Today, Uran is on the verge of a sea-change. From a mere fishing village, it's about to be converted into a concrete

jungle. Frenetic activity is going on to make it an S.E.Z, a sobriquet that ill fits it unless it means Special Ecological Zone.

With the Sewri-Nhava Sheva Sea Link looming ominously on the horizon, the destruction of Uran is near complete. In a matter of weeks, an array of mountains between Panvel and Uran has made way for monstrous container yards. Their voracious appetite unsatiated, gigantic earth-moving equipment continue to gnaw at the insides of the mountains. And dumpers stand in endless queues, waiting to transport the debris, and dump it into the home of over a 100 species of wetland birds.

Pink stop

A little while ago, as the tide rose steadily, thousands of flamingos that come to the mangroves between Sewri and Mahul used to take off into the skies forming gigantic pink clouds, and land in the inviting wetlands of Uran. Imagine the trauma they must have gone through when they looked down from the skies and discovered to their dismay that what was once their homeland has been conquered by the greed of man. There is a tiny bit of this exotic wetland that still remains intact. A handful of migratory birds forage here for food, blissfully unaware of the happenings around them.

But the dumpers in the distance filled with what was once a mountain are a grim reminder that this too will disappear, leaving no trace whatsoever of what was once a paradise for birds. To be lost, forever.

Old fishing village

Along the white sands of the beaches of Uran, you can still see all the typical activities of a fishing village, especially when a boat arrives with its catch of seafood. You can also see really large boats being built there, in continuation of a tradition perfected over 300 nautical years. After that, you could drive further down the coast to see history frozen in the ruins of the Karanja Fort.

After exploring the remnants of Uran, you could head off on a jungle trail towards Karjat and continue through the forests, till you reach Neral in the foothills of Matheran.

The lotus pond with lotuses in full bloom, and beautiful birds called bronze-winged jacanas walking gingerly on those delicate lotus leaves, is a sight worth going miles to see. And of course, the sights and sounds of other forest birds, scrubland earth for preys, make it a truly refreshing experience.

Fragile environment

When you get back to base camp in Uran, recharged, take a second look at the wanton destruction around you, and pose this question to yourself: What are we going to pass on to our next generation, from whom we have borrowed

this fragile earth?

Habitats where the miracles of nature surprise you every living moment, or a vast wasteland of memories turned brown?

Uran. See it this weekend. The next one may be too late.

Gangadharan is a wildlife writer and photographer. He heads the recently-launched Junglens, an NGO working for the conservation of nature and wildlife.



Paddy on 4,000 acres in Ramnad withering

By Express News Service

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MANAMADURAI: Standing paddy crop on 4,000 acres under the Vaigai third reach irrigation system to the left of the main canal of Parthibanur regulator has started withering for lack of water. The Melanettur and T Pudukkottai canals in Manamadurai panchayat union get their supply of water from the third reach irrigation system of river Vaigai. Though these canals are at the border of Sivaganga district, they get their water only when water is released from the Parthibanur regulator at the border of Ramanathapuram district, for irrigation of lands in that district.

When water was released from river Vaigai in December last year for irrigating lands in Ramanathapuram district, water started flowing in the Melanettur and T Pudukkottai canals. Making use of this water, the farmers in Melanettur and T Pudukkottai raised paddy on 4,000 acres. But due to failure of rains and water not being released in Vaigai, paddy crop started withering in many areas.

In some villages, there was no water even for transplanting paddy saplings from the nurseries. Most of the farmers in state of distress, said that they were not even cutting the dried paddy stalks but were letting them remain as fodder for cattle.

They also said that they were facing unprecedented losses due to lack of water.said that this was being.