longan package

Dimocarpus longan (Sapindaceae) is commonly known as the longan that produces edible fruit. This fruit is similar to the lychee (Litchi chinensis) and Rambutan (Nephelium lappaceum), belonging to the same family. It is native to tropical Asia and is currently grown in China, Taiwan, Thailand, Malaysia, Myanmar, Indonesia, Cambodia, Laos, Vietnam, India, Bangladesh, Sri Lanka, and the Philippines in Asia; Mauritius, Kenya, and South Africa in Africa; Queensland in Australia; and Florida in the United States. Major production of longan occurs in China, Taiwan, Thailand, and Vietnam. In recent years, production of longan has increased due to improvements in agronomic practices and other aspects of crop management such as improved postharvest treatments and handling protocols and interest in exotic fruits in other parts of the world. Longan is an evergreen, subtropical tree with dense, dark green foliage, and can grow over 100 feet. Since it naturally grows in tropical conditions, it does not tolerate freezing temperatures. Short, dry, and frost-free winters are ideal for the development of flower panicles. Warm spring temperatures (ranging from 20 to 30°C) followed by high summer temperatures (ranging from 27 to 35°C) are best for fruit development. The peel (skin) of the fruit is tan or light brown, thin, leathery, and smoother than that of the lychee. The fruit is sweet, juicy, and succulent and apart from being eaten raw, it is also used in soups, snacks, and desserts. Longan trees are grown best in well-drained rich and sandy loam soils. Wattage temperatures (ranging from 20 to 30°C) followed by high summer temperatures (ranging from 27 to 35°C) are best for fruit development. The peel (skin) of the fruit is tan or light brown, thin, leathery, and smoother than that of the lychee. The fruit is sweet, juicy, and succulent and apart from being eaten raw, it is also used in soups, snacks, and desserts. Longan trees are grown best in well-drained rich and sandy loam soils. Major abiotic stresses for this crop include salinity, flooding, and cold temperatures. Major biotic stresses include fungal diseases such as anthracnose, ceratocystis blight, and fruit rot, and insect pests such as fruit and shoot borers, mealybugs, scale insects, and mites. Longan fruit ripens in the hot season and therefore has a short shelf life at ambient temperatures. Other than high temperatures, pericarp browning and pathological decay is also a concern for fruit appearance.

WHAT IS IPM?
Integrated pest management (IPM), an environmentally-sound and economical approach to pest control, was developed in response to pesticide misuse in the 1960s. Pesticide misuse has led to pesticide resistance among prevailing pests, a resurgence of non-target pests, loss of biodiversity, and environmental and human health hazards.

WHAT ARE IPM PACKAGES?
The IPM Innovation Lab has developed and tested robust IPM packages, holistic suites of IPM recommendations and practices for the production of vegetables and other crops. Farmers who use IPM packages in planting, production, and throughout the supply chain in their crops. The recommended practices in IPM packages cover major biotic stresses for this crop include salinity, flooding, and cold temperatures. Major abiotic stresses for this crop include salinity, flooding, and cold temperatures. Major biotic stresses include fungal diseases such as anthracnose, ceratocystis blight, and fruit rot, and insect pests such as fruit and shoot borers, mealybugs, scale insects, and mites. Longan fruit ripens in the hot season and therefore has a short shelf life at ambient temperatures. Other than high temperatures, pericarp browning and pathological decay is also a concern for fruit appearance.
DISEASES

Fruit Rot  
[Phytophthora palmivora (Peronosporales: Peronosporaceae)]

This is one of the most serious fungal diseases of longan. Young shoots, panicles, and fruits can suffer in the soil and can spread through irrigation, ants, and human contact. This disease is particularly harmful during cool weather after 2-3 days of rain. Proper sanitation, aeration, and reducing humidity by pruning decreases disease incidence.

Anthracnose  
[Colletotrichum gloeosporioides (Incertaesedis: Glomerellaceae)]

It is a foliar fungal disease and attacks both leaves and fruits. Symptoms on older leaves that appear as small spots in the margins coalesce to form large patches with brown borders. On young leaves and fruits dark brown lesions appear on the surface. Wet conditions increase its infection rates. Proper sanitation, aeration, and reducing humidity by pruning decreases disease incidence.

Sooty mold  
[Meliola sp. (Meliolales: Meliolaceae)]

Sooty mold fungus affects both fruit and leaves of longan that are attacked by sap-sucking insects, Planococcus lilacinus, Pseudococcus sp., and Nipaecoccus sp. These insects secrete honeydew that nourishes the sooty mold. Although it does not cause direct damage, it reduces photosynthetic surface on leaves and infected fruits are downgraded. Controlling these insects, this fungus can be managed.

Downy Blossom Blight  
[Peronophythora litchi (Pythiales: Pythiaceae)]

This fungal disease is common on litchi. On longan, it was first reported in 2000 in Taiwan. This disease causes droopy leaves and leaf blight. Water-soaked lesions appear on young leaves, which turn into brown, round, or irregular lesions. Diseased leaves wither and collapse eventually. Humid conditions and continuous rain are favorable for this disease.

MINOR PESTS

Leafminer  
[Acrocercops cramerella (Lepidoptera: Gracillariidae)]

Mealybug  
[Pseudococcus sp. (Hemiptera: Pseudococcidae)]

Spherical mealybug  
[Nipaecoccus sp. (Hemiptera: Pseudococcidae)]

Grasshopper  
[Oxya sp. (Orthoptera: Acrididae)]

Indian wax scale  
[Ceroplastes ceriferus (Hemiptera: Coccidae)]

Sheathoid nematode  
[Unidentified nematode (Hemicyriconemoides litchi (Tylenchida: Criconematidae)]

The sheathoid nematodes are root-ectoparasitic. Recently, a nematode is found to be associated with the root system of longan in Taiwan. This nematode causes root blight and nutrient loss in trees. Depending on the disease severity, affected plants may not show symptoms immediately.
**Fruit pests**

*Conogethes punctiferalis* (Lepidoptera: Crambidae)

The adults are peach-yellow with scattered black spots. Older larval stages are light brown with dark brown heads and dark spots on the body. Damage is caused to the fruits when larvae bore into the fruits. The presence of frass on the fruit surface is an indication of the infestation. It pupates in soil and sometimes on fallen leaves. Monitoring by pheromone and/or light traps is recommended and pheromones are available. Bagging fruit clusters at 15 days after fruit set and destroying infested fruits helps in managing this pest. Application of neem formulations repels moths laying eggs on the fruits. In India augmentative release of *Trichogramma* sp. (Hymenoptera: Trichogrammatidae) and *Chelonus blackburni* (Hymenoptera: Braconidae) is used for control of this pest.

*Conopomorpha sinensis* (Lepidoptera: Crambidae)

Fruit borer and shoot borers *Conopomorpha sinensis, Conopomorpha itichiella* (Lepidoptera: Gracillariidae)

Fruit borers are major pests wherever longan is grown. The adults are straw-colored moths mature larvae are brownish or green in color. Larvae of *C. sinensis* bore into the shoots one larva survives on each shoot or fruit. Pupation takes place under mature leaves. In survive by feeding on young leaves or shoots. Larvae bore into fruits and feed on the seed. This damage to the fruits and seeds makes the fruits prone to infection by various microorganisms and causes fruit drop. Larvae of *C. litchiella* are pale green and mine in the leaf blades. The mature larvae prefer to feed on the mid-rib and veins of young leaves causing distortion and twisting of young leaves. The density of fruit borers is high during the rainy season. Pruning of neem formulations are of this pest. Pheromone and/or light traps could be used for monitoring the population. Larval parasitoids *Tetrastichus Elatus* sp. and *Apteles* sp. (Hymenoptera: Braconidae) are known to occur on this pest.

*Eudocima phalonia* (Lepidoptera: Erebidae)

Fruit piercing moth *Eudocima phalonia* (Lepidoptera: Erebidae)]

These large noctuid moths are serious adult pests of ripe and ripening fruits. Both sexes penetrate the skin and pulp mouthparts (proboscis) to withdraw juice and can cause crop losses of more than 50%. Microbial contamination from the proboscis of these moths results in rotting and premature fruit falling from the pierced fruits. Damaged a threat to sound fruit through pathogenic breakdown.

Prevents damage by this moth. Egg parasitoids *Trichogramma* sp. (Hymenoptera: *Telenous* sp. (Hymenoptera: *Ooencyrtus* sp. (Hymenoptera: parasitoids *Eueactus* spp. (Hymenoptera: *Eriophyes diocarp* (Acari: Eriophyidae)]) have been reported on this pest.

This mite occurs in all growing areas of longan. The mite population increases in the dry season. It has been reported to be associated with longan witches’ broom syndrome. Mite feeding on meristems is a major problem in longan growing countries. This syndrome causes infected trees to have abnormally crowded panicles that lose resulting in the characteristic broom-like appearance of stops young leaves from expanding and distorts mature leaves and leaves also show and become crinkled. To on longan trees should be removed and destroyed. Entomopathogenic fungus *Paecilomyces Ablyseius* sp. (Acari: Phytosyidae)] have been reported on this pest.
Lychee giant stink bug
[Tessaratoma papillosa (Hemiptera: Tessaratomidae)]

It is a polyphagous sap-sucking major pest of lychee and longan. Adults are golden brown and nymphs rectangular (later instars) and orange-reddish. It has one generation per year. Infestation can cause 80–90% yield loss. Entomopathogenic fungi, %HXY HULDEDVVLQDG Paeaciomyces sp., and MetarhiziumVSDUHHFWLYH in controlling mealybug populations. Parasitoids, Tetracnemoidea indica (Hymenoptera: Encyrtidae), and Aprostocetus purpureus (Hymenoptera: Eulophidae), and the Triommatia coccidivora (Diptera: Cecidomyiidae), and Cacoxenus perspicax (Diptera: Drosophilidae) are reported on P. lilacinus in Asia.

Scale insect
[Drepanococcus chiton (Hemiptera: Coccidae)]

Drepanococcus chiton is a polyphagous pest in south and southeast Asia. They suck sap from host plants and excrete honeydew on fruits and leaves, leading to the growth of sooty mold. In severe infestations, fruits are underdeveloped. Ants play a major role in the dispersal of mealybugs. Ants are used for control of ants and help in reducing populations of mealybugs. Entomopathogenic fungus, Metarhizium Paecilomyces sp., and MetarhiziumVSDUHHFWLYH in controlling mealybug populations. Parasitoids, Tetracnemoidea indica (Hymenoptera: Encyrtidae), and Aprostocetus purpureus (Hymenoptera: Eulophidae), and the Triommatia coccidivora (Diptera: Cecidomyiidae), and Cacoxenus perspicax (Diptera: Drosophilidae) are reported on P. lilacinus in Asia.

Mealybug [Planococcus lilacinus (Hemiptera: Pseudococcidae)]

The mealybug Planococcus lilacinus is distributed throughout the tropics and suck the sap from host plants and excrete honeydew on fruits and leaves, which causes growth of sooty mold. In severe infestations, fruits are underdeveloped. Ants play a major role in the dispersal of mealybugs. Ants are used for control of ants and help in reducing populations of mealybugs. In controlling mealybug populations, Parasitoids, Tetracnemoidea indica (Hymenoptera: Encyrtidae), and Aprostocetus purpureus (Hymenoptera: Eulophidae), and the Triommatia coccidivora (Diptera: Cecidomyiidae), and Cacoxenus perspicax (Diptera: Drosophilidae) are reported on P. lilacinus in Asia.

Oriental Fruit Fly
[Bactrocera dorsalis (Diptera: Tephritidae)]

This is a polyphagous pest infesting more than 200 species of host plants. It lays pale yellow eggs under the skin of ripened or ripening fruits. The physical damage caused by ovipositional punctures as well as feeding damage by maggots leads to the rotting of fruits. Bagging the fruits to meet quarantine regulations of importing countries.

Psyllid [Corneegenapsylla sinica (Hemiptera: Aphalaridae)]

This sap-sucking insect is found in Southeast Asia. This psyllid induces pit gall on young leaves of longan. The female adults are small with an average size of about 1.5 mm in length. Eggs are laid singly into the veins on the adaxial sides of the leaves. There are four nymph instars and they remain inside the galls. There are 3–5 generations per year. The psyllid is most abundant in summer. Feeding and gall induction causes economic damage due to direct feeding. Pruning and disposal of the MHUHODFWGHVKKRVDUH recommended.

Lychee giant stink bug
[Tessaratoma papillosa (Hemiptera: Tessaratomidae)]

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To increase fruit-bearing area, improve tree structure, and reduce wind damage, pruning should be done on young plants.

To manage weeds, a 5–10 cm thick layer of mulch can suppress weed and sorghum stubble can be used as mulching material.

Fertilize the trees with compost inoculated with the antagonistic fungus, *Trichoderma* sp.

Bag the fruit cluster 15 days after the fruit set.

Need-based pesticide application at the various stages of growth to manage diseases and insect pests. Use safe pesticides as the last option and do not use pesticides with the same mode of action continuously. Consult local extension agents or *Paecilomyces* sp. to control eriophyid mite.

Set up methyl eugenol traps and protein bait for controlling fruit flies.

Set up light and/or pheromone traps to monitor fruit borer, litchi shoot borer, leafminer, and other pests.

Trees can be netted to protect the fruit from birds, bats, and large insects.

Set up ant baits for managing ants, mealybugs, and scale insects.

Apply *Paecilomyces* sp., or *Metarhizium* sp. for controlling stink bugs.

Spray sulfur, neem oil, petroleum oil, or *Paecilomyces* sp. to control eriophyid mite.

The Feed the Future Innovation Lab for Integrated Pest Management (IPM IL) develops sustainable and economical pest control methods to improve livelihoods for farmers worldwide. The program’s work is based in seven countries and is engaged with scientists, extension agents, students, and farmers in the tropical and subtropical world. The IPM IL is funded by USAID (Lead award number: AID-OAA-L-15-00001) and housed at Virginia Tech in Blacksburg, Virginia.

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