

III. Integrated Pest Management strategies

The following Good Agricultural Practices should be adopted for the management of various brinjal pests:

- Destruction of debris, crop residues, weeds & other alternate hosts and deep summer ploughing.
- Adoption of proper crop rotation and avoid growing of Malvaceae crops in sequence.
- Use of resistant and tolerant varieties recommended by the State Agricultural Universities of the region.
- Use well decomposed FYM @ 8-10 tones per acre or vermi-compost @ 5 tons per acre treated with *Trichoderma* sp. and *Pseudomonas* sp. @ 2 kg per acre for seed / nursery treatment and soil application.
- Apply neem cake @ 100 kg per acre for reducing nematode population.
- Weeding and earthing up in rows should be done 25-30 days after sowing to prevent soil based pupation.
- Field should be kept free from weeds.
- Grow tall crops like maize, sorghum and pearl millet on border of the field to reduce white fly population.
- Pheromone traps for *Leucinodes orbonalis* should be installed @ 4-5 traps per acre. Install the traps with distance of more than 75 feet in the vicinity of selected field. Fix the traps to the supporting poles at a height of one foot above the plant canopy. Change the lures after 2-3 weeks interval.
- Set up yellow/blue traps/ sticky traps 15 cm. above the crop canopy for monitoring and mass trapping of Thrips, White fly, Aphids, Jassids @ 10-20 traps per acre.
- Collect and destroy the infested fruits with fruit and shoot borer infestation.
- Conserve the existing bio-control agents like Spiders, Coccinellids, Syrphid flies etc. in the field by avoiding, delaying and reducing the use of chemical pesticides and promoting the use of bio-pesticides including botanicals and microbial.
- Augment the bio-control agents like egg parasitoids- *Trichogramma* sp., *Telenomus* sp., *Encarsia* spp.; larval parasitoid- *Bracon* sp., *Campoletis chloridaeae*, *Chelonus blackburni*; predators like *Chrysopa* sp., *Coccinella* sp.
- Apply chemical pesticides strictly as per the recommendation of CIB&RC (www.cibrc.gov.in) as a last resort.

Some recommended pesticides against Brinjal insect pests				
Pests/Pesticides	Dosage			Waiting Period (days)
	a.i (gm)	Formula tion (gm/ml)	Dilution (Litre)	
Fruit and Shoot borer				
Azadirachtin 1% (10000 PPM)	-	1000-1500	500	3
Chlorpyrifos 20% EC	200	1000	500-1000	-
Cypermethrin 25% EC	37-50	150-200	500	1
Fenvalerate 20% EC	75-100	375-50	600-800	5
Lambda-Cyhalothrin 4.9% CS	15	300	500	5
Jassid				
Cypermethrin 25% EC	37-50	150-200	500	1
Phosphamidon 40% SL	250-300	625-750	500	10
Whitefly				
Diafenthiuron 50%WP	300	600	500-750	3
Thiamethoxam 25% WG	50	200	500	3
Aphids				
Phosphamidon 40% SL	250-300	625-750	500	10
Thrips				
Phorate 10% CG	1000	10000		
Red spider mites				
Fenazaquin 10% EC	40	400	400-500	5
Fenpropathrin 30% EC	75-100	250-340	750-1000	7
Flumite 20% SC / Flufenzine 20%SC	80-100	400-500	500-1000	5
Propargite 57% EC	570	1000	400	6
Spiromesifen 22.9% SC	96	400	500	5

Important activities for pest free Brinjal production for export



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Integrated Pest Management (IPM) in Brinjal (*Solanum melongena*) for export purpose



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Brinjal/Eggplant (*Solanum melongena*) is the most common and extensively grown vegetable all over the country (0.39 m ha) and occupy an important place in the food basket. Due to tender and supple nature of the plant and cultivation is done under high moisture & input regimes, brinjal is more prone to pest attack and at a conservative estimate cause about 35-40% losses. Fruit and shoot borer, Jassids, Whitefly, Aphids, Thrips, Mealybug, are most serious pests from quarantine point of view as these pests may find a place in the pathway of brinjal export to European Union.

I. Identification of important pest

1. **Fruit and shoot borer (*Leucinodes orbonalis* Guenee):**

FSB is mostly monophagous. Eggs becomes creamy white after laying and turn red before hatching. Adult lays egg singly or in groups of two to five on the under surfaces of leaves, tender shoots, flower buds, or the base of developing fruits. The larva is creamy white to pink in color. The full-grown larva measures about 16-23 mm in length. The larva usually has five instars, sometimes six. In the initial stages, larvae bore into shoots and the growing point is killed. Typical symptom of infestation is wilted and dropping shot. Later larvae bore into fruits which become unfit for consumption. The larva pupates under the dry plant parts or plant debris on the soil surface, or rarely, under the soil. The moth is white or dirty white with pale brown or black spots on the dorsum of thorax and abdomen. The female is bigger than male, with a bulged abdomen.



Damage, Larva (inset)

Damage fruit

Adult moth

2. **Jassids (*Amrasca biguttula biguttula* Ishida):**

Both nymphs and adults are wedge-shaped, pale greenish coloured and suck the sap from the lower surface of the leaves. When several insects suck the sap from the same leaf, yellow spots appear on the leaves, followed by crinkling, curling, bronzing and drying or "hopper burn". Fruit setting is adversely affected by the infestation. They also transmit mycoplasma disease like little leaf and virus disease like mosaic.



Adult

Hopper burn

Little leaf

3. **Whitefly, *Bemisia tabaci* (Gennadius):**

Adults are soft-bodied, moth-like fly, yellowish dusted with white waxy powder and 1.0- 1.5 mm in length. The females mostly lay eggs near the veins on the underside of leaves. They prefer hairy leaf surfaces to lay more eggs. Upon hatching the nymph moves on the leaf surface to locate a suitable feeding site. The wings are covered with powdery wax and the body is light yellow in color. Both adults and nymphs suck plant sap and reduce vigor of the plant. When the population is high they secrete large quantities of honeydew, which favours the growth of sooty mould.



Whitefly

Aphids

4. **Aphids (*Myzus persicae* Sulzar):**

Adults are small soft bodied found in colonies in tender parts. Damage is caused by both nymphs and adults by sucking cell sap. Black sooty molds develop on honey dew secreted by aphids on leaves. Dry condition favours population flourish.

5. **Thrips (*Thrips palmi* Karny):**

The females lay bean-shaped and yellowish-white eggs within the leaf tissues. The larva resembles the adult but is smaller and lacks wing buds or wings. The pre-pupa has two shorter wing buds and flexible antennae. The pupa has longer wing buds and fused antennae with the body. The adults with black line from the juncture of wings runs along the back of the body. Slender fringed wings are pale. Fringe is shorter on the anterior edge than posterior. Body is 0.8 -1.0 mm, antenna seven segmented and ocelli red pigmented. Thrips prefer to feed mostly on foliage, sometimes on fruit. Slightly infested leaves

exhibit silvery feeding scars on the lower leaf surfaces, especially along the mid-rib and veins. In severe infestations, the leaves turn yellow or brown and dry on the lower leaf surfaces. Infested fruit is scarred and deformed.



Thrips palmi

Thrips feeding damage

6. **Mealybug (*Phenacoccus solenopsis* Tinsley):**

Nymphs and adults of mealy bugs suck sap from the leaves, tender shoots, and the fruits. Leaves show characteristic curling symptoms similar to that of a virus. A heavy black sooty mould may develop on the honeydew like droplets secreted by mealy bugs. If the flower blooms are attacked, the fruit set is affected.

7. **Red spider mite (*Tetranychus* spp.):**

Mites are minute in size and vary in colour with two dark spots on the body. Infestation usually observed during warm and dry periods. Damage is done by sucking cell sap, that turns grey patches on leaves and leaves become brown and fall. In severe infestation webbing is observed in plants.



Red mite feeding

leaf damage by mites

II. Pest Surveillance

Weekly monitoring through pest scouting with the help of monitoring device like pheromone traps, colored sticky traps should be practiced from fruiting to harvesting stage. For field scouting 300 fruits in 100 plants/ acre in a cross diagonal pattern through zig zag manner is required to be observed for counting of each and every type of insects. If 95% plants are found free from insect pests then the field will be considered fit for export.