II. Pest Surveillance

Weekly monitoring should be done through pest scouting with the help of monitoring devices like pheromone and colored sticky traps. For field scouting 300 fruits from 100 plants per acre should be observed. Minimum 15 spots at reasonable distance with each other following a cross diagonal pattern moving zig zag manner for counting all type of insects. Pest monitoring for fruit flies using traps should be done regularly from fruiting stage onwards. If 95% plants are found free from insect pests then the field will be considered fit for export.

III. Integrated Pest Management strategies

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

- Destruction of debris, crop residues, weeds, rouging of Bean Mosaic virus (BMV) infected plants & other alternate hosts
- Deep summer ploughing.
- Adoption of proper crop rotation and avoid growing of leguminous crops in sequence. Intercropping with mustard and American marigold is recommended where nematodes are problem. Besides this, American marigold also acts as trap crop for *Helicoverpa armigera*.
- Mulching with straw/pine needles/*Eucalyptus* leaves also manages nematodes.
- Use of resistant and tolerant varieties recommended by the State Agricultural Universities of the region. Kapasi, JNP-4 and Katargam are resistant to Anthracnose.
- Use well decomposed FYM @ 8-10 tones per acre or wormi-compost @ 5 tons per acre treated with *Trichoderma* sp. and *Pseudomonas sp.* @ 2 kg per acre as 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.
- Field should be kept free from weeds.
- Pheromone traps insects' viz. *Helicoverpa armigera* should be installed @ 4-5 traps per acre.
- Set up yellow/blue traps/ sticky traps 15 cm. @ 10-20 traps per acre.
- Set up light traps @ one trap per ha.15 cm.
- Conserve the existing bio-control agents like reduviius sp., *Lysiphlebus sp*, *Diaeretiella sp*, *Aphidius colemani,*. *Aphytis* spp., *Lipolexix scutellaris* etc.
- Augment the bio-control agents like egg parasite *Trichogramma chelonis, Trichogramma achaeae*, *Telenomus* sp., *Encarsia* spp. larval parasite *Bracon* sp., *Campoletis chlorideae, Chelonus blackberneii* predators like *Chrysopa sp., Anaceuous bombewala.*
- Install bird percher to conserve predatory birds.
- Spray NPV @ 250LE per hectare to control *H. armigera* and *Spodoptera litura.* Spray *Beauveria bassiana1%* P @1500-2000 g in 160-200l of water/acre.
- Spray neem seed kernel extract (NSKE) 5% to manage white fly problem. Spray Azadirachtin 0.03% (300ppm) neem oil based WSP @1000-2000ml in 200-400 l of water/ acre or Azadirachtin 5% W/W neem extract concentrate @80 ml in 160 l of water/acre.
- Keep the field weed free in the initial 25-40 days through intercultural operations and hand weeding
- Handpick and kill caterpillars or feed them to poultry. This helps when their numbers are low and in small fields.
- However, if possible wear gloves when handling hairy caterpillars. Some of them have urticating hairs, which may cause skin irritation.
- Spray *Bacillus thuringiensis* 5 WG @ 1.0 g/l and *Beauveria bassiana* 1% WP Strain No.NBRI9947 @3kg in 500 l of water.

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Integrated Pest Management (IPM) in Lablab Beans (*Lablab purpureus*) for export purpose

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Lablab bean or Dolicus beans is an ancient legume crop widely grown throughout the world for its vegetable or pulse for human consumption or as animal forage or feed. It belongs to family Fabaceae. It is also called hyacinth bean, dolichos bean, seim bean, Egyptian kidney bean, Indian bean, chicharo and Australian pea. It is the only species in the monotypic genus lablab.

I. <u>Identification pest of Lablab beans</u>

1. **Lycaenid pod borer (*Lampides boeticus*):**

Larvae is about 0.8-0.9 mm, pale yellow in colour and cylindrical in shape, sporting moderately long fine setae, the larvae bore into young pods. The entry hole gets blocked after sometime. The pest can be monitored by the presence of the bored holes. When the larvae attain fourth instars, they migrate and cause extensive damage to flower buds and pods. Adult male is dull purple with two black round spots on each hind wing. The female is brown with wing bases pale shining blue.

Damage symptoms in lablab bean are noticed when the larvae bore into flower buds. When the larvae attain fourth instars, they migrate and cause extensive damage to flower buds flowers and young pods with bored holes. One can also see the presence of slug like caterpillar on pods.


2. Spotted Pod Borer (*Maruca testulalis*):

Larvae are pale cream with two rows of distinctive paired black markings on their back. In the final instar, these markings are often very pale. Larvae can reach 18 mm in length. Young larvae feed inside flowers for 5-7 days before moving to the pods. After completing their development larvae exit pods and pupate in the soil.

Adult have a 20-25 mm wingspan and a slender body. They have brown forewings with a white band extending two-thirds down the wing from the leading edge.

Larvae bore holes on the buds, flowers and pods; infested pods and flowers are webbed together. Seeds within damaged pods are totally or partially eaten out by the larvae. Entry holes also let in water, which stains the remaining non-eaten seeds.


3. Field bean pod borer (*Adisura atkinsoni*):

Eggs are laid on tender pods. The young larvae bore into these pods, feed on seeds and develop inside and come out after attaining fourth instar, which is a migratory stage. The larva is robust and varies in colour from green to brown. Adult moth is straw yellow, flecked with small brown marks. Fore wings are buff coloured with 'V' shaped specks and hind wings have pale brown markings.

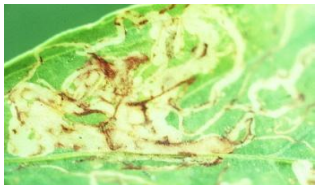

4. Gram Pod Borer (*Helicoverpa armigera*):

This polyphagous pest attacks peas occasionally along with *L. boeticus*. The habit of egg laying and larval feeding are the same as pea blue butterfl y. Egg are **s**pherical, yellowish eggs are laid singly on tender parts and buds of plants. The egg period lasts for 2-4 days.

Caterpillars are of varying colour, initially brown and later turn greenish with darker broken lines along the side of the body. Body covered with radiating hairs. When full grown, they measure 3.7-5 cm in length. The larval period lasts for 18-25 days. Moth is stout, medium sized with brownish/greyish forewings with a dark cross band near outer margin and dark spots near costal margins, with a wing expanse of 3.7 cm.

5. Bean stem fly (*Ophiomyia phaseoli*):

The adults are small flies and lay eggs in the unifoliate leaves that come immediately after germination. It punctures the leaf, lays eggs under the leaf epidermis which turn into white spots, often confused with disease. Small, yellow coloured, maggots are cream with dark mouthparts and reach 3 mm in length. The larvae mine the leaf lamina, veins, midrib, and petiole and enter the stem resulting in mortality of the seedlings. Adults are small (3 mm long) and shiny black with clear wings.

6. Red spider mites (*Tetranychus sp*.)

Adult mites have eight legs and an oval body with two red eyespots near the head end. Infested leaves turn yellow and fall of prematurely. In severe cases, intense webbing occurs giving a dusty appearance to under surface of leaves. As mite numbers increases these white speckles will increase in number, the leaf will take on a bleached appearance and die.