



## Cultivation of Field Bean [*Lablab purpureus* (L.) Sweet] and Its Bio-Intensive Pest Management

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### Abstract

Common bean or Hyacinth bean or Field bean (*Lablab purpureus*) is widely cultivated indigenous legume crop in India. It is cultivated for both green pods as well as dried seed (as pulse). Two different growth types viz., pole type and bush type exists. The available varieties for cultivation in each type were listed. Insect pest are major impediments in realizing the good harvest and yield. The damage symptoms of the seven major insect pest and their ecofriendly pest management strategies were explained. The pod borer complex and the pod bug complex are the key insect pests that inflict direct damage to pods and seeds. IPM practices like intercropping with Marigold or sorghum or cluster bean, pheromone traps, spraying of biopesticides like *Bt*, *Hear NPV* or neem oil helps in reducing the pest infestation.

**Keywords:** *Bacillus thuringiensis*, Dolichos bean, IPM, *Maruca vitrata*

### Introduction

The field bean is commonly known as 'Indian Bean' or 'Hyacinth Bean' or 'Country Bean' or 'Dolichos Bean'. It is referred as 'sem', 'avarai', 'avare' in various local languages in India. The scientific name of this legume crop is *Lablab purpureus* (L.) Sweet, with a chromosome number 22 in diploid state and belongs to Fabaceae. Two subtypes viz., '*Lablab purpureus* var. *typicus*' (vegetable type) and '*L. purpureus* var. *lignosus*' (legume type) exists in India. However, both are cross compatible. It fixes nitrogen up to 22 kg/1000 kg of dry shoot mass. It is cultivated as multi-purpose crop and it's utilized as vegetable (immature pods and seeds), legume (mature dried seeds), fodder or green manure crop in India and Africa (Sserumaga *et al.*, 2021). Field bean crop is nutritionally rich in protein (20-25%), amino acids, vitamin A, C and B<sub>2</sub> and minerals like Ca, P, K, Fe and Zn (Deka and Sarkar, 1990). Further, green pods and seeds are good source of dietary fiber with minimum amount of carbohydrates and lipids. Despite of this nutritional attribute, seeds to some extent also have anti-nutritional factors like other pulses. Photo insensitive determinate

types were released for cultivation by UAS Bengaluru, TNAU Coimbatore, ICAR-IIHR and ICAR-IARI. The crop has 2 growth types viz., Bush type ("Co6, Co7, Co8, Co9, Co 10, Co 11, Co 12, Co 13, Co (Gb)14, Arka Jay and Arka Vijay") and pole type ("Co1, Co2, Co3, Co4, Co5 and Pusa Early Prolific"). Even some of the proteins in lablab were reported to be isoforms of arcelins 3 and 4 that had showed resistance to storage pest like *Rhyzopertha dominica* and *Oryzaphileus surinamensis*. Field bean occupies 0.228 mha in India with 2.51 mT of production.

### Sowing and Agronomic Packages

Bush type of field bean can be cultivated anytime in the year whereas pole type can be sown during July-August or September-October. The crop needs frost free environment. Seed rate for bush type and pole type is 25 kg ha<sup>-1</sup> and 5 kg ha<sup>-1</sup> respectively. The land preparation involves preparing fine tilth with a pH of 4.5 to 7.0 is required. Bush types have to be sown in ridges and furrows (60 cm apart) with plant to plant distance of 30 cm by dibbling. Whereas for pole type 2 to 3 seeds pit<sup>-1</sup> (30 cm × 30 cm × 30 cm) along with 10 kg FYM as basal application. Additionally, 100 g of NPK

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(6:12:12) mixture has to be applied basally followed by 10 g nitrogen in each pit after 30 days of sowing. For good yield apply biofertilizers like *Azospyrillum* and *Phosphobacterium* at 2 kg ha<sup>-1</sup> at sowing.

Irrigation should be done 3<sup>rd</sup> day after sowing, thereafter at weekly intervals as per requirement. Crop experiences severe competition from weeds in initial stages further initial 20-30 days has to be maintained weed free as it is the critical period. Hand hoeing can be done after 25 days of sowing. The crop matures in 95 to 100 days and harvested for seed purpose whereas for vegetable purpose harvest can be done in 65 to 70 days.

### Pest Infesting Lablab purpureus

The major insect pests hindering the common bean yield are enlisted in table 1.

In general, the following nematodes attack pulse crops viz., *Meloidogyne* sp., *Heterodera* sp., *Pratylenchus* sp., *Rotylenchulus* sp., *Tylenchorhynchus* sp. and *Helicotylenchus* sp. The major diseases that infest field bean are bean mosaic yellow virus, powdery mildew (*Erysiphe polygoni*), Anthracnose (*Xanthomonas campestris* pv. *phaseoli*) and wilt (*Fusarium oxysporum* f.sp. *phaseoli*).

### Bio-Intensive Pest Management

#### 1. Aphids (*Aphis craccivora*)

##### Damage Symptoms

The aphids are tiny black insects that colonise growing shoot tips, leaves, inflorescence and young pods. They suck the plant sap and results in stunting of plants. The honey dew secreted by aphids attracts ants and causes sooty mould. They also act as vector for transmission of BYMV.

##### Management

Spray neem seed kernel extract (NSKE) 5% or neem oil 3 ml L<sup>-1</sup> of water as prophylactic. Conserve natural enemies like *Coccinella septempunctata* or *Cheilomenus sexmaculata* or

*Chrysoperla zastrowi* by planting nectar and pollen offering plants (Coriander, maize or sorghum) as refugia. Deploy yellow pan water or yellow sticky traps (15 cm × 7.5 cm) at 15 cm above the canopy at 4 to 5 traps acre<sup>-1</sup>. It helps in monitoring whitefly, aphid and jassid.

#### 2. Leaf Hoppers (*Empoasca kerri*)

##### Damage Symptoms

The leafhoppers are wedge shaped green insects found on the abaxial leaf surface. Both nymphs and adults suck the plant sap and results in cupping of leaves. The infested leaves become mottled and yellowish in colour.

##### Management

Spray NSKE 5% or neem oil 3 ml L<sup>-1</sup> of water. Conserve natural enemies like coccinellids, spiders, etc. Deploy yellow pan water or yellow sticky traps (15 cm × 7.5 cm) at 15 cm above the canopy at 4 to 5 traps acre<sup>-1</sup>.

#### 3. Whiteflies (*Bemisia tabaci*)

##### Damage Symptoms

The whiteflies are tiny whitish creatures present on the underside of leaf (Figure 1A). They also act as vector for transmitting YMV and other related viruses etc.

##### Management

Spray NSKE 5% or neem oil 3 ml L<sup>-1</sup> of water. Conserve natural enemies like coccinellids, spiders, etc. Deploy yellow pan water or yellow sticky traps (15 cm × 7.5 cm) at 15 cm above the canopy at 4 to 5 traps acre<sup>-1</sup>.

#### 4. Stem fly (*Ophiomyia phaseoli*)

##### Damage Symptoms

The adult flies lay the eggs on lower epidermis of leaf, the maggots on hatching start mining into the leaves and reach nearest petiole and from there it reaches the stem. The main feeding of maggot occurs in the cortical region of stem and sometimes it reaches the taproot.

Table 1: Major insect pest infesting field bean

Sl. No.	Common name	Scientific name	Family: Order	Damaging stage
1	Cowpea aphids	<i>Aphis craccivora</i> Koch	Aphididae: Hemiptera	Nymphs and adult
2	Leaf hoppers	<i>Empoasca kerri</i> Pruthi	Cicadellidae: Hemiptera	Nymphs and adult
3	Whiteflies	<i>Bemisia tabaci</i> Gennadius	Aleyrodidae: Hemiptera	Nymphs and adult
4	Stem fly	<i>Ophiomyia phaseoli</i> Tryon	Agromyzidae: Diptera	Maggots
5	Pod borer complex	<i>Helicoverpa armigera</i> Hubner	Noctuidae: Lepidoptera	Larvae
		<i>Maruca vitrata</i> Fabricius	Crambidae: Lepidoptera	
		<i>Lampides boeticus</i> Linnaeus	Lycaenidae: Lepidoptera	
		<i>Etiella zinckinella</i> Treitschke	Pyalidae: Lepidoptera	
		<i>Adisura atkinsoni</i> Moore	Noctuidae: Lepidoptera	
6	Pod bugs	<i>Megacopta cribraria</i> Fabricius	Plataspidae: Hemiptera	Nymphs and adult
		<i>Riptortus pedestris</i> Fabricius	Alydidae: Hemiptera	
		<i>Nezara viridula</i> (Linnaeus)	Pentatomidae: Hemiptera	
7	Mites	<i>Tetranychus utricae</i> Koch	Tetranychidae: Trombidiformes	Nymphs and adult

### Management

Intercropping onion with common bean helps in reducing the stem fly infestation. Dead end trap cropping with mothbean, lentil, chickpea or clusterbean can help in managing this pest. Earthing up followed by basal application of neem cake 3 days after the seedling occurrence will also help in reducing the infestation.

### 5. Pod Bugs

#### Damage Symptoms

Among the pod bug complex *Megacopta cribraria* is major pest in lablab cultivating area. It is commonly known as 'globular stink bugs' as it emits a stinky odour (Figure 1B). The eggs are laid in paired row fashion (Figure 1C). Both nymphs and adult damage young leaves, shoots and pods by sucking their sap. Due to the pod damage the developing seeds become shrivelled and pod gets distorted. It along with *Riptortus pedestris* (slender brown bugs) and *Nezara viridula* (green stink bugs) inflicts a heavy yield loss during its favourable climatic conditions.

#### Management

Spray neem oil at 3 ml L<sup>-1</sup> or pongamia oil or *Arka pongamia* soap to ward off the pod bug damage during podding.

### 6. Pod Borer Complex

#### Damage Symptoms

The *Helicoverpa armigera* is major pod borer among the 5 insect pests in pod borer complex. The larva is typically greenish or yellowish or brownish in colour. The anterior

portion will be thrust inside the pod and only posterior portion will be visible outside (Figure 1D). The legume pod borer, *Maruca vitrata* is creamish yellow-coloured larva with prominent black spots on dorsal side (Figure 1E). It typically webs together the flowers and pods together in rachis and feeds inside the web. The blue butterfly larvae are greenish apodous thick slug like in appearance (Figure 1F). It penetrates inside the pod through irregular holes and feeds the developing seed. The Pod borer complex infestation occurs throughout India wherever *Lablab purpureus* is cultivated. Rashmi *et al.* (2019) reported that it infests during 40<sup>th</sup> to 47<sup>th</sup> standard meteorological week (SMW) with a highest incidence of 3.13 larvae plant<sup>-1</sup>; whereas *H. armigera* occurred during 39<sup>th</sup> to 48<sup>th</sup> SMW with a peak incidence of 4.60 larvae plant<sup>-1</sup> at Mandya, Karnataka. The scenario is reverse in Jobner wherein *M. vitrata* (9.80 plant<sup>-1</sup>) recorded highest population in lablab than *H. armigera* (7.90 plant<sup>-1</sup>) further its infestation was recorded during 33<sup>rd</sup> to 42<sup>nd</sup> SMW (Kantegari *et al.*, 2020).

#### Management

Conserve the natural enemies like coccinellids, green lace wings (Rashmi *et al.*, 2019) and hymenopteran parasitoids viz., *Bassus relativus*, *Trathala flavoorbitalis* and *Phanerotoma hendecasisella* (Gupta *et al.*, 2013). Intercropping with marigold or sorghum or cluster bean will help in reducing the pod borers. For *H. armigera* pheromone traps at 12 nos. ha<sup>-1</sup> can be installed for monitoring. Spray neem oil at 3 ml L<sup>-1</sup> or Hear NPV 500 LE ha<sup>-1</sup> or *B. thuringiensis*

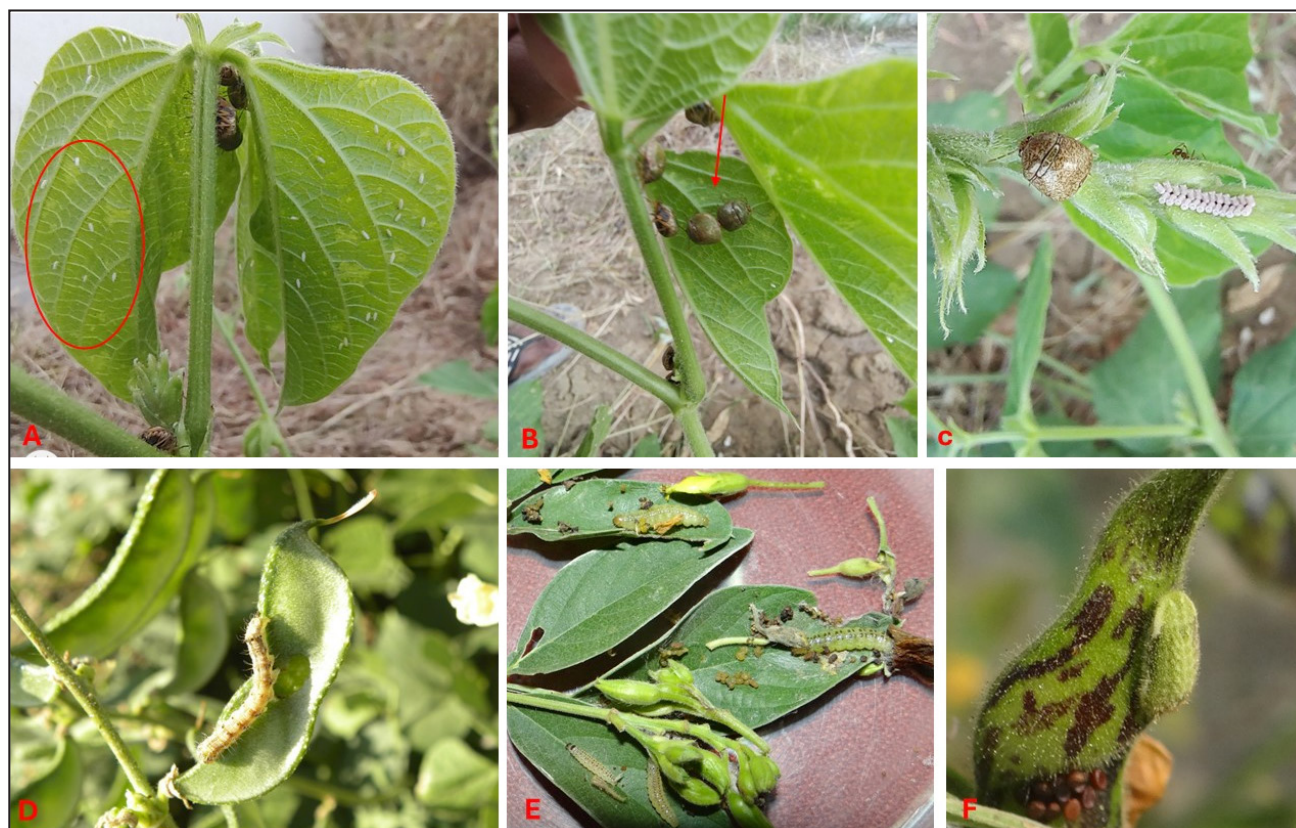


Figure 1: Major insect pest infesting lablab

var. *kurstaki* 5% WP at 1000 to 1250 g ha<sup>-1</sup> or Spinosad 45% SC 125-162 ml ha<sup>-1</sup> or Emamectin benzoate 5% SG 220 g ha<sup>-1</sup>.

## 7. Two Spotted Spider Mites

### Damage Symptoms

The mites are tiny creatures that suck the sap from the abaxial side of the leaf and occasionally it forms web during severe infestation. The infested leaves show browning or bronzing symptom and leaves become rough, dry and eventually wither from the plant.

### Management

Spray neem oil at 3% during initial infestation. Regular irrigation schedule has to be practiced. Prolonged dry spell encourages mite population build up.

## Conclusion

The pod bugs and the pod borer complex are the key insect pests that inflict a heavy yield loss in *Lablab purpureus* cultivation. Hence following IPM practices intercropping with onion or any other suitable crop of the region will help in minimizing the pest infestation. Also, good agricultural practices like clean cultivation along with erecting pheromone traps, light traps, sticky traps can help in reducing pod borers and sucking pest like whitefly and leafhopper respectively. Prophylactic spray of NSKE or Neem oil or *Bt* or Hear NPV will help in reducing the pest effectively.

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