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Spotted Pod Borer

A potential threat to short duration pigeonpea

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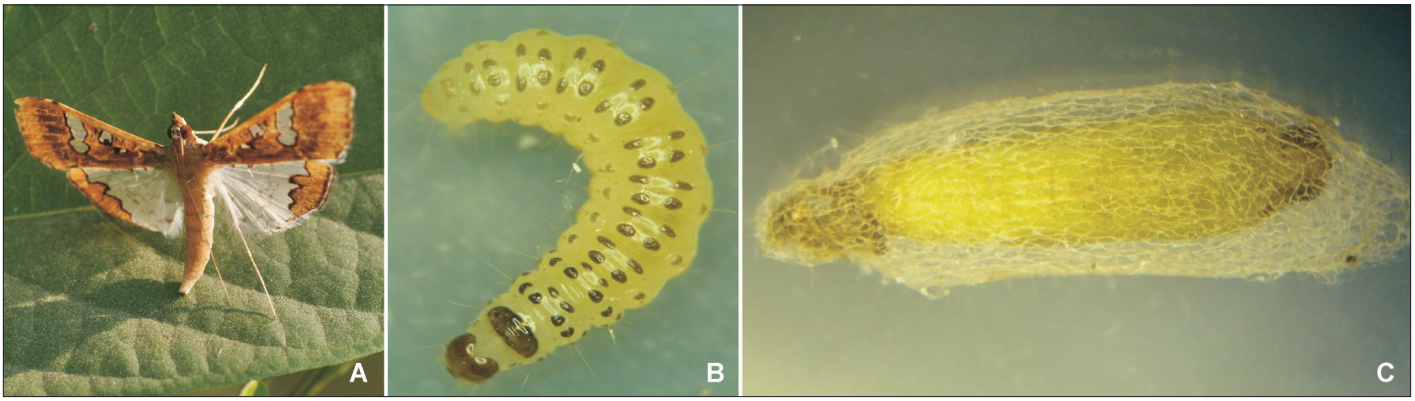
Spotted pod borer (Maruca vitrata) is one of the major pests of grain legumes feeding on variety of plants belonging to Fabaceae, Malvaceae and Mimosaceae. The typical habit of feeding inside the webbed flowers, buds and pods protects the larvae from natural enemies and other adverse factors including insecticides. In recent years, Maruca *has attained the status of a major pest especially in short duration pigeonpea growing areas in India. So, there is a need to take up a holistic approach to manage this noxious pest to avert any impeding losses in short duration pigeonpea.*



Maruca vitrata: (a) Moth with wing expanse, (b) Late instar larva, (c) Pupa within silken threads

WITH the introduction of short duration pigeonpea for cultivation, spotted pod borer *Maruca vitrata* (Geyer) has emerged as one of the major constraints because of the coincidence of high humidity and moderate temperature in September - October coinciding with the flowering of the crop in India. Besides, the importance of *Maruca* as a pest of grain legumes is also because of its destructive nature to reproductive parts of plants. In the absence of the alternate hosts such as *Vigna* sp., beans, soybean, pea, *Maruca* survives on wild leguminous shrubs and trees such as *Tephrosia purpurea*, *Crotalaria juncea,* etc. Losses in grain yield due to *Maruca* have been reported to be up to 80%. In pigeonpea, the losses have been estimated to be $US 30 million annually.

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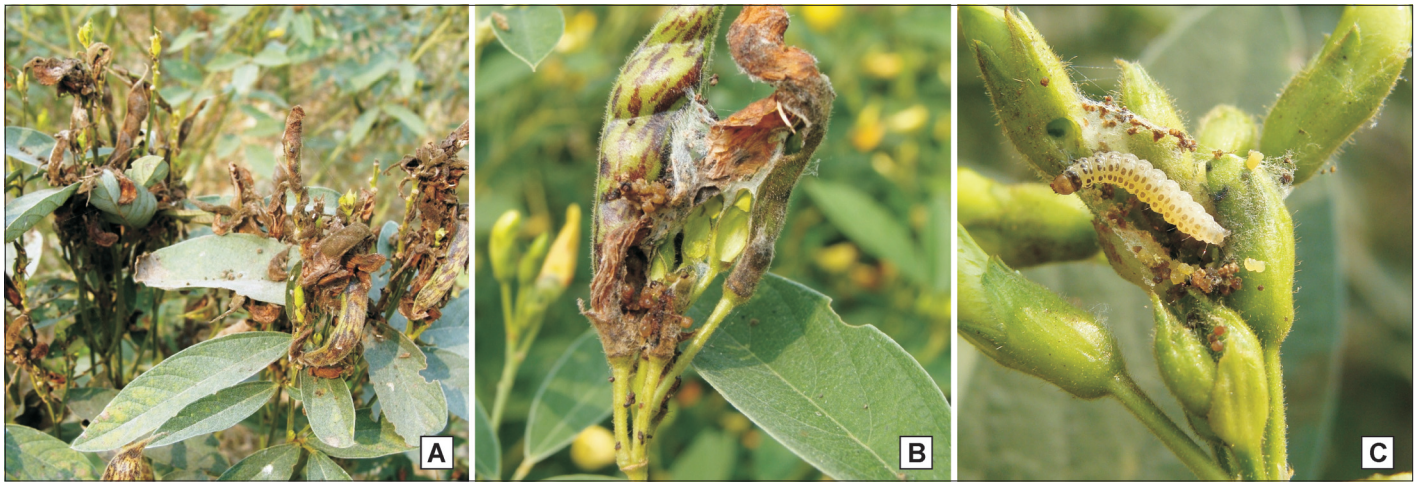
Biology and Life Cycle

Female moths normally lay up to 400 eggs usually in small clusters of 4-6, though up to 16 eggs have been found in some groups on floral buds and flowers, although oviposition on leaves, leaf axils, terminal shoots, and pods has also been recorded. Eggs are light yellow, translucent, and have faint reticulate sculpturing on the delicate chorion, and measure 0.65 x 0.45 mm. The incubation period ranges 2-4 days with an average of 3.31 days. A fully grown larva measures 25 mm in length with a pale body lined by rows of conspicuous black spots on its dorsal surface. They are pale cream, with two rows of markings on their backs. They grow to 18 mm before they



Symptoms of *Maruca* infestation in pigeonpea: (a) View of infested pigeonpea plants, (b) larval feeding sign on tender pods, (c) webbed floral buds with entry hole

leave the pods. Pupation occurs either on the plant or in the soil in a silken cocoon covered with webbed leaves/ pods and lasts 5-10 days. The moths have light brown forewings with silvery white patches. The hind wings are mostly white with irregular brown border. Moths may be confused with the amaranth leaf-webber, (*Spoladea recurvalis*). The life cycle is completed in 18 to 35 days.

Nature of damage

Crops are infested from early budding onwards. Young larvae feed on the style, stigma, anther, filaments and ovary inside the flowers for 5-7 days before moving to the pods when mid-sized. Favoured entry points are where flowers and pods are touching. Occasionally the larvae indulge in vegetative feeding and have been observed tunnelling in the stems and feeding inside the rolled and webbed leaves of luxuriantly growing (moisture-stress-free) pigeonpea. The larvae move from one flower to another with the help of silken threads and consume 4-6 flowers to complete larval development. Seeds within damaged pods are partially or totally eaten by *Maruca* larvae. Entry holes also wet in water, which stains the remaining non-eaten seeds. A crown mass of excrement is seen at the entrance into the larval burrow. Pigeonpea with determinate growth habit, where pods are bunched together at the top of the plant, are more prone to *Maruca* damage.

Population dynamics

In short duration pigeonpea, the *Maruca* larval incidence commenced from second week of August, which lasts till last week of November. The peak infestation of *Maruca* has been observed during second week of September (first peak) and first week of October (second peak) with larval counts varying 0.8-18.2 per plant. High humidity, moderate temperature and rainfall have positive effect on the *Maruca* incidence. Although, mean total rainfall is important, the spread over time is crucial. Thus, the rainfall over short period may not be adequate for the *Maruca* population build up.

Monitoring and action threshold

The early sign of activity is the webbing of flowers. Infested pods have a well-defined entry hole frequently ringed with moist larval frass. Flowers from as many racemes as possible should be looked for larvae (at least 10 racemes randomly sampled across a crop) to ascertain action threshold. The indicative threshold is three larvae per square metre, but accurate assessments are difficult where larvae are in flowers.

Integrated Management

Maruca control mainly relies on use of chemical insecticides, many of which are effective but simultaneously kill natural predators and parasitoids. Chemical insecticides are often less effective as *Maruca* larvae are well protected in floral parts and pods of pigeonpea. Improper timing of spray also results in a poor level of control of *Maruca*, which consequently increases crop damage, costs of re-treating the field, insecticide resistance by exposing larvae to doses of insecticide. Timing and coverage are both critical to achieve good control of *Maruca* larvae, whether using a chemical insecticide or a biopesticide. Targeting the most susceptible stages, the first and second instars, is the best way to manage *Maruca*. Regular crop scouting determines both the number of *Maruca* larvae in the crop and the age structure of the population. Recently *Maruca* has also acquired reduced susceptibility to insecticides that have been previously effective and failure by synthetic insecticides has also been reported. Therefore, a holistic approach with the integration of cultural, biological and chemical control is to be adopted for managing this pest.

Biological control

A variety of predatory and parasitic insects, birds, spiders and diseases

Natural enemies of *Maruca:* (a) Yellow wasp (*Vespa orientalis*) predating on the late instar larva (b) Parasitized larva by *Bracon hebetor* (c) NPV infected larva

attack *Maruca* at different stages of its lifecycle. Natural enemies will rarely eradicate all eggs or larvae, but may reduce infestations to below economic threshold if predators and parasitoids are not disrupted by broad-spectrum insecticides.

Predators: The most common *Maruca* predators prevailing in short duration pigeonpea ecosystems include lady bird beetle, *Coccinella septempunctata* L. and *Cheilomenes sexmaculata* (Fab.); sting bug; dragonfly, *Crocothemis servilla* Drury; green lace wings, *Chrysoperla zastrowi arabica* Henry; common wasp, *Vespa orientalis* L., spider, *Clubiona* sp., *Araneus* sp.; Indian myna, *Acridotheris tristis* L. and house crow, *Corvus splendens* Vieillot, which help in restricting the population of *Maruca* considerably. Some predators are relatively permanent residents in fields, others migrate from nearby fields, other vegetation or even from elsewhere.

Parasitoids: Some wasps and flies attack *Maruca* eggs, larvae and pupae. The parasitoids most active in field crops include braconids such as *Apanteles teragamae* Vierek, *Bracon hebetor* Say, *Chelonus* sp scelionids such as *Telenomus*. In order to achieve the objective of sustainable management of the pests in short duration pigeonpea ecosystems, *in-situ* conservation and maintenance of these predators may be considered so as to reduce the pesticide load in pigeonpea ecosystem.

Microbial Pathogens: Pathogens are viruses, fungi or bacteria that infect *Maruca*. Many naturally occurring diseases infect and kill the insect. The fungal pathogens that infect *Maruca* larvae are *Metarhizium anisopliae* and *Beauveria bassiana*. Application of *Bt* @1.5 kg/ ha with UV retardant (tinopol @ 0.1%) at intervals of 10 days provides significant reduction. NPV, a highly selective biopesticide that causes pathogenesis in insects, has been recently reported in *Maruca* populations from India. NPV is harmless to humans, wildlife and beneficial insects.

Chemical control: If insecticides are necessary, use weekly foliar application of lambda cyhalothrin 5EC or rynaxypyr 20EC @ 0.4 ml or indoxacarb 14.5SC @ 1 ml or spinosad 45SC@ 0.4 ml/l water. Systemic pesticides may be more effective than contact insecticides. When insecticides are sprayed alone, the *Maruca* do not come in contact with insecticides because of its typical feeding habit inside web. So, when the chemical insecticides are sprayed in combination with fumigants, especially DDVP, the larva come out of the web due to suffocation and on coming in contact with sprayed particles of insecticides lead to the death of the larva. So, one application of rynaxypyr 20EC @ 0.4 ml or profenphos 50EC @ 2.0 ml or monocrotophos 36SL @ 2.0 ml or methomyl 40SP @ 1.0 g/l in combination with DDVP @ 0.5 ml/l of water or garlic bulb extract @ 1% + rynaxypyr 20EC @ 0.4 ml/ lit of water at the time of flowering and podding is quite effective in combating the pest.

SUMMARY

In recent years the spotted pod borer, *Maruca vitrata* (Geyer) has emerged as a major pest in short duration pigeonpea growing areas of India. Because of the high humidity and moderate temperature during flowering, this pest has emerged as a destructive one on short duration pigeonpea varieties having clustering type of branching habit. Application of rynaxypyr 20EC @ 0.4ml or profenphos 50EC @ 2.0 ml or methomyl 40SP @ 1.0 g in combination with DDVP @ 0.5 ml/ l of water or garlic bulb extract @ 1% + rynaxypyr 20EC @ 0.4ml/ l of water at the time of flowering and podding saves the crop from *Maruca* infestation. ■