

# INSECT PEST COMPLEX AND CROP LOSSES IN PIGEON PEA IN MEDIUM ALTITUDE HILL OF MEGHALAYA

SANDIP PATRA<sup>1</sup>, D. M. FIRAKE<sup>1</sup>, N. S. AZAD THAKUR<sup>1</sup> AND A. ROY<sup>2</sup>

<sup>1</sup>Division of Crop Protection,  
ICAR Research Complex for NEH Region, Umiam - 793 103, Meghalaya, INDIA

<sup>2</sup>Division of Social Science,  
ICAR Research Complex for NEH Region, Umiam - 793 103, Meghalaya, INDIA

e-mail: sandipatra47@gmail.com

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\*Corresponding  
author

## ABSTRACT

Field experiments were carried out at ICAR Research Complex for North Eastern Hill Region, Umiam, Meghalaya to study the pest complex and crop losses in pigeon pea (Var: Bahar) during 2009-10 and 2010-11. Weekly observation was taken through Plant Inspection Method (PIM) from 30 plants since seedling stage to till maturity of the crop. Total 41 insect species comprising 11 Coleoptera, 13 Hemiptera, 3 Orthoptera, 1 Diptera, 1 Thysanoptera, 11 Lepidoptera and 1 Hymenoptera were recorded. Several natural enemies including 8 coccinellid beetles, 1 yellow wasp, 1 predatory bug and 2 unidentified parasitoids and some spiders were recorded during the crop seasons. Pod damage caused by different insect pests were recorded 8.75 and 6.25% by *Helicoverpa armigera*, 7.50 and 5.25% by *Lampides boeticus*, 31.25 and 67.5% by *Apion clavipes* and 44.94 and 17.75% by *Melanagromyza obtusa* during first and second seasons, respectively. Mean pod damage caused by *H. armigera*, *L. boeticus*, *A. clavipes* and *M. obtusa* were found to be 7.50, 6.38, 49.38 and 31.35%, respectively. Results revealed that pod boring insects (*H. armigera*, *L. boeticus*, *A. clavipes* and *M. obtusa*) caused major crop losses to pigeon pea in this region.

## INTRODUCTION

Pigeon pea or Red gram (*Cajanus cajan* (L.) Millsp.) is one of the most important legume crops of the tropics and subtropics of Asia and Africa. India has the largest area (3.38 million ha) and accounts for over 70% of the World's production and the per capita availability of protein is 28 g/day which is much lower than the FAO recommended level of 80g/day (Nagy *et al.*, 2013, Prasad *et al.*, 2013, Saroj *et al.*, 2013). Per capita pulses consumption over the years has come down from 61g/day in 1951 to 30 g/day in 2008 (Reddy, 2009). Insect pests is one of the major constrains for poor productivity of pulses including pigeon pea. About 250 insect species belonging to 8 orders and 61 families have been found to infest pigeon pea from seedling to harvesting stage and virtually no plant part is free from insect infestation (Upadhyay *et al.*, 1998). Among these, nearly a dozen of insects cause heavy crop losses. On an average 2-2.4 million tonnes of pulses with a monetary value of nearly Rs 6,000 crore are lost annually due to ravages of insect pest complex (Reddy, 2009). Though, several insect pests recorded in pigeon pea earlier from different parts of the country by many workers (Srivastava, 1964; Davies and Lateef, 1975; Khokhar and Sing, 1983 and Subharani and Singh, 2004) but insect pest complex on a particular crop is vary from region to region. Meghalaya is being famous for its rich biodiversity with enormous species of flora and fauna, pigeon pea may attract a number of insect fauna throughout its growth period. As the region is the wettest

place in India with highly weather dynamic favors growth of different insect fauna on vegetation and at the same time under changing climatic condition some insect pests are also attacking new hosts. Therefore, up to date knowledge about the pest complex of a particular crop is essential for implementation of effective control measures against economically important pests. Hence, the present experiments were conducted to study the insect pest complex and crop losses in pigeon pea for this region.

## MATERIALS AND METHODS

The experiment was conducted at Entomology Farm, ICAR Research Complex for North Eastern Hill Region, Umiam, Meghalaya, India during 2009-2010 and 2010-2011 crop seasons to study the pest complex, their succession and crop loss in pigeon pea. Bahar variety of pigeon pea was sown in the month of June during both the seasons in 5mX 4m with spacing of 60cm X 30cm and replicated thrice in Randomized Block Design (RBD). All recommended management practices were followed for raising the crop except plant protection measures. Ten plants from each replication were randomly selected and tagged for observation. Weekly observations were taken through Plant Inspection Method (PIM) starting from seedling stage to till maturity of the crop (Subharani and Singh, 2004). Insect species were categorized into major, minor and stray pests according to their incidence pattern. Of these, some insects infested the crop continuously after their

first appearance in considerable numbers were designated as major pests and insect species which appeared occasionally or in small number were designated as minor pests whereas insect species whose present was scare and population was very low were considered as stray pests. Two hundred pods were picked thrice each sampling at 15 days interval to record the pod borers infestation and converted into percent pod damage.

## RESULTS AND DISCUSSION

### Insect pest complex

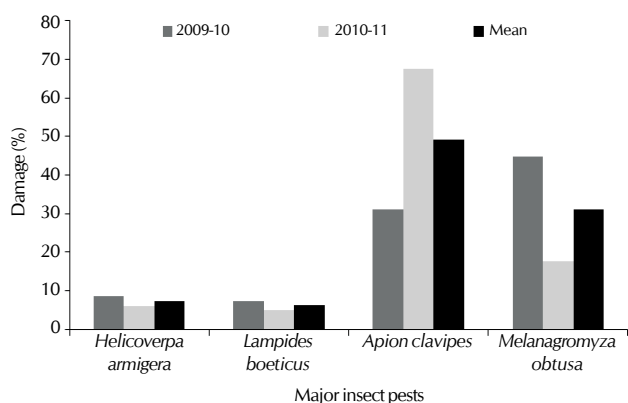
Insect pests recorded during 2009-2011 on pigeon pea (variety-Bahar) are presented in Table 1. All parts of pigeon pea were infested by different insect pests in an overlapping manner. Total 41 insects were found infesting pigeon pea since seedling to maturity. Recorded insect pests belonging to seven orders *i.e.* 11 Coleoptera, 13 Hemiptera, 3 Orthoptera, 1 Diptera, 1 Thysanoptera, 11 Lepidoptera and 1 Hymenoptera. Among these, *Empoasca kerri* Pruthi was first appeared on the crop after 10 days of germination and continued its presence till pod filling stage. Subsequently overlapping attacked by *Alcidodes* sp, *Apion clavipes* Gerst., and *Monolepta signata* Oliv. were observed, *Alcidodes* sp

**Table 1: List of insect pests recorded in pigeon pea at Umiam, Meghalaya during 2009-2011**

Sl. No.	Common name	Scientific name	Crop stages	Status 2009-10	2010-11
Coleoptera					
1.	Blue beetle	<i>Altica</i> sp	Vegetative	Minor	Minor
2.	Chrysomellid	<i>Agasta formosa</i> Lat.	Vegetative	-	Stray
3.	Chrysomellid	<i>Dercetina flavocincta</i> Hope	Vegetative	Minor	-
4.	Pod boring weevil	<i>Apion clavipes</i> Gerst.	Seedling-pod maturity	Major	Major
5.	Chrysomellid	<i>Cryptocephalus</i> sp	vegetative	Stray	-
6.	Weevil	<i>Alcidodes</i> sp	Seedling	Stray	Stray
7.	Hadda beetle	<i>Epilachna macularis</i> Mul.	Vegetative	Stray	-
8.	White spotted flea beetle	<i>Monolepta signata</i> Oliv.	Seedling-flowering	Minor	Minor
9.	Pulse beetle	<i>Callosobruchus chinensis</i> L.	Pod filling-maturity	Minor	Minor
10.	Long horned beetle	<i>Aristobia testudo</i> Voet.	Vegetative	Minor	Minor
11.	Blister beetle	<i>Mylabris pustulata</i> Thun.	Flowering	Minor	Minor
Hemiptera					
12.	Lab-lab bug	<i>Coptosoma cribraria</i> Fab.	Vegetative	Minor	Minor
13.	Horned coreid bug	<i>Cletus</i> sp	Vegetative-pod filling	Minor	Minor
14.	Bug	<i>Eysarcorisa</i> sp	Vegetative	Minor	Minor
15.	Green jassid	<i>Empoasca kerri</i> Pruthi	Seedling-pod filling	Major	Major
16.	Cotton aphid	<i>Aphis gossypii</i> G.	Vegetative-pod filling	Minor	Minor
17.	Bean aphid	<i>Aphis craccivora</i> Koch.	Vegetative-pod filling	Minor	Minor
18.	Scale insect	Unidentified	Vegetative -pod maturity	Minor	Minor
19.	Tur pod bug	<i>Clavigralla gibbosa</i> Spin.	Vegetative-pod filling	Major	Major
20.	Brown coreid bug	<i>Riptortus pedestris</i> Fab.	Vegetative-pod filling	Minor	Minor
21.	Green stink bug	<i>Nezara viridula</i> Fab.	Vegetative-pod filling	Major	Major
22.	Painted bug	<i>Bagrada hiliaris</i> Burm.	Vegetative	Minor	Minor
23.	Cow bug	<i>Oxyrachis tarandus</i> F.	Vegetative	Minor	Minor
24.	Indian stink bug	<i>Dolycoris indicus</i> Stal.	Vegetative-pod filling	Minor	Minor
Orthoptera					
25.	Short horned grasshopper	<i>Atractomorpha crenulata</i> Fab.	Vegetative	Minor	Minor
26.	Short horned grasshopper	<i>Hieroglyphus banian</i> Fab.	Vegetative	Stray	Stray
27.	Long horn grasshopper	Unidentified	Vegetative	Stray	-
Diptera					
28.	Tur pod fly	<i>Melanagromyza obtusa</i> Mall.	Pod filling-pod maturity	Major	Major
Thysanoptera					
29.	Thrips	<i>Megaleurothrips</i> sp	Flowering	Major	Major
Lepidoptera					
30.	Pale grass blue butterfly	<i>Zizeeria</i> sp	Flowering-pod filling	Minor	Minor
31.	Blue butter fly	<i>Lampides boeticus</i> Linn.	Flowering-pod filling	Major	Major
32.	Hairy caterpillar	<i>Euproctis fraternal</i> Moore	Vegetative-flowering	Minor	Minor
33.	Gram pod borer	<i>Helicoverpa armigera</i> Hubner	Flowering-pod filling	Major	Major
34.	Plume moth	<i>Exelastis atomosa</i> Wals.	Flowering-pod filling	Minor	Minor
35.	Slug caterpillar	Unidentified	Vegetative	Stray	Stray
36.	Bean pod borer	<i>Maruca testulalis</i> Gay.	Flowering-pod filling	Minor	Minor
37.	Leaf webber	<i>Grapholita critica</i> Mey.	Vegetative	Minor	Minor
38.	Lentil pod borer	<i>Etiella zinckenella</i> Treit.	Flowering-pod filling	Minor	Minor
39.	Bag worm	Unidentified	Vegetative	-	Stray
40.	Tussock moth	Unidentified	Vegetative	Minor	Minor
Hymenoptera					
41.	Leaf cutter bee	<i>Megachile</i> sp	Vegetative	Minor	Minor

**Table 2: Natural enemies recorded during 2009-2011 in pigeon pea field at Umiam, Meghalaya**

Sl No.	Common name	Scientific name	Family	Crop stages
1	Coccinellid beetle	<i>Coccinella septempunctata</i> Lin.	Coccinellidae	Vegetative-pod filling
2	Coccinellid beetle	<i>Coccinella transversalis</i> Fab.	Coccinellidae	Vegetative- pod filling
3	Coccinellid beetle	<i>Micraspis discolor</i> Fab.	Coccinellidae	Vegetative- pod filling
4	Coccinellid beetle	<i>Coelophora bissellata</i> Mul.	Coccinellidae	Vegetative- pod filling
5	Coccinellid beetle	<i>Oenopia kirbyi</i> Mul.	Coccinellidae	Vegetative- pod filling
6	Coccinellid beetle	<i>Oenopia sexareata</i> Mul.	Coccinellidae	Vegetative- pod filling
7	Coccinellid beetle	<i>Harmonia dimidiata</i> Fab.	Coccinellidae	Vegetative- pod filling
8	Coccinellid beetle	<i>Harmonia</i> sp	Coccinellidae	Vegetative- pod filling
9	Predatory bug	<i>Podisus maculiventris</i> Say	Pentatomidae	Vegetative-pod filling
10	Yellow wasp	Unidentified	-	Vegetative-flowering
11	Spiders	Unidentified	-	Seedling-maturity
12	Parasitoids from the grub of <i>Apion clavipes</i> Gerst.	Unidentified	-	Pod filling-maturity

**Figure 1: Crop losses by major insect pests**

restricted only at seedling stage and appeared as stray pest but latter were persisted up to the maturity of the crop with considerable numbers. A numbers of insect pests was found infesting during vegetative growth with overlapping manner by each other's viz. *Altica* sp, *Agasta formosa* Lat., *Dercetina flavocincta* Hope, *Cryptocephalus* sp, *Epilachna macularis* Mul., *Aristobia testudo* Voet., *Coptosoma cribraria* Fab., *Eysarcorisa* sp, *Bagrada hiliaris* Burm., *Oxyraxis tarandus* F., *Atractomorpha crenulata* Fab., *Hieroglyphus banian* Fab., Long horn grasshopper, Slug caterpillar, *Grapholita critica* Mey., Bag worm, Tussock moth and *Megachile* sp. Most of the species recorded from vegetative stage were categorized as minor pests except *Agasta formosa* Lat., *Cryptocephalus* sp, *Epilachna macularis* Mul., *Hieroglyphus banian* Fab., Long horn grasshopper, Slug caterpillar and Bag worm which were appeared as only stray pests. Incidence of *Euproctis fraternal* Moore was found from vegetative to flowering stage while *Cletus* sp, *Aphis gossypii* G., *Aphis craccivora* Koch., *Clavigralla gibbosa* Spin., *Riptortus pedestris* Fab., *Nezara virudula* Fab., *Dolycoris indicus* Stal. though started their attack at vegetative stage but remained till pod filling stage of the crop. *Mylabris pustulata* Thun. and *Megaleurothrips* sp were infested only during flowering stage with overlapping attacked by *Zizeeria* sp, *Lampides boeticus* Linn., *Exelastis atomosa* Wals., *Helicoverpa armigera* Hubner, *Maruca testulalis* Gay. and *Etiella zinckenella* Treit. whose attack continued up to pod filling stage of the crop. Scale insect was persisted from

vegetative to maturity of the crop whereas *Melanagromyza obtusa* Malloch and *Callosobruchus chinensis* L. infested the crop from pod filling stage to till maturity of the crop. Among recorded insect pests, eight insects were major, twenty five were minor and rests were stray pests. Major insect pests viz. *Apion clavipes* Gerst., *Monolepta signata* Oliv., *Mylabris pustulata* Thun., *Empoasca kerri* Pruthi, *Clavigralla gibbosa* Spin., *Nezara virudula* Fab., *Melanagromyza obtusa* Malloch, *Megaleurothrips* sp, *Lampides boeticus* Linn. and *Helicoverpa armigera* Hubner. Out of the major pests, *Apion clavipes* Gerst., *Melanagromyza obtusa* Malloch, *Lampides boeticus* Linn. and *Helicoverpa armigera* Hubner were found to be most destructive as they directly infested economic part of the crop with considerable numbers. Pest complex in pigeon pea varied region to region depending upon agro-climatic condition. Nair (1975) recorded from all over India as many as 96 pests occurring on this crop. Singh and Singh (1978) recorded seventeen insects in which eight attained major status at Varanasi while Sekhar et al. (1991) recorded thirty nine insects among which nine attained major status under Delhi condition. Reddy et al. (1998) reported that 38 species include major, minor and stray pests infesting pigeon pea at Delhi. Subharani and Singh (2004) recorded 30 insect species from pigeon pea among which eleven attained major status in agro-ecosystem of Manipur. Total 18 species of insect pests were encountered on pigeon pea out of which 7 were categorized as major pests in Gulbarga, Karnataka (Srilaxmi and Paul, 2010)

#### Natural enemies

Several biotic agents were found to be regulated insect pests in pigeon pea (Table 2). Among these, eight coccinellid viz. *Coccinella septempunctata* Lin., *Coccinella transversalis* Fab., *Micraspis discolor* Fab., *Coelophora bissellata* Mul., *Oenopia kirbyi* Mul., *Oenopia sexareata* Mul., *Harmonia dimidiata* Fab. and *Harmonia* sp (unidentified); predatory bug, *Podisus maculiventris* Say, yellow wasp, spiders and parasitoids from grub of *Apion clavipes* Gerst. were recorded during study period. Most of the coccinellids and predatory bugs were abundant from vegetative to pod filling stage. Yellow wasp was appeared during vegetative stage and remained up to flowering stage while spiders were found throughout the crop growth period. Parasitoids (two) found to be attacked *Apion* grub inside the pods starting from pod filling to till maturity of the crop. Reddy et al. (1998) recorded seven species of natural

enemies including Spiders, Coccinellid beetles, Lace wing, Ear wig, *Apanteles* and Yellow wasp in pigeon pea at Delhi.

### Crop loss

Among major pests, pod damage were counted for *Apion clavipes* Gerst., *Melanagromyza obtusa* Malloch, *Lampides boeticus* Linn. and *Helicoverpa armigera* Hub. and presented in Fig. 1. During first year, highest pod damage caused by *Melanagromyza obtusa* Malloch (44.94%) followed by *Apion clavipes* Gerst., *Helicoverpa armigera* Hub., and *Lampides boeticus* Linn. with 31.25, 8.75 and 6.25 % pod damage, respectively while in second year highest pod damage caused by *Apion clavipes* Gerst. followed by *Melanagromyza obtusa* Malloch, *Helicoverpa armigera* Hubner and *Lampides boeticus* Linn. with 67.5 and 17.75, 6.25 and 5.25%, respectively. Mean pod damage caused by *Melanagromyza obtusa* Malloch, *Apion clavipes* Gerst., *Helicoverpa armigera* Hubner, and *Lampides boeticus* Linn. were 31.35, 49.38, 7.50 and 6.38%, respectively. Crop loss due to pod fly has been estimated from 10-95% (Gangrade, 1963; Bindra and Jakhmola, 1967; Srivastava, *et al.*, 1971 and Kooner, *et al.*, 1972) and about 70-80% by Adgokar *et al.* (1993) in different parts of India. Present finding regarding the pod damage by pod fly, *M. obtusa* are in agreements with the findings of Yadav and Yadav (2013) who reported 40.00% pod damage caused by this pest. Crop loss due to *Apion clavipes* are in conformation with Azad Thakur *et al.* (1995) who reported that the grub enters into the seeds and start feeding on developing grain, causing 77.8% damage to pod and 43.1% damage to grain. Among the insect species infesting pigeon pea, the pod borer complex is reported to reduce the yield up to 27.77 per cent (Sahoo and Senapati, 2000). Results are in agreement with Khan *et al.* (2014) who reported that 21.00 to 38.50% pod and 12.29 to 19.87% seed damaged by pod fly and 5.50 to 12.50 % pod damaged by Lepidopterous pod borer.

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