Insect Pest Complex Of Field Pea Crop

ABSTRACT

A study on diverse insect pest complex of field pea was made in both the years of experimentation i.e. during *rabi* 2021-22 and 2022-23 at Crop Research Centre, College of Agriculture, SVPUA&T, Meerut. As many as 15 insect species were recorded during the study period which belongs to different orders *viz.* Orthoptera (one species), Hemiptera (four species), Lepidoptera (seven species), Isoptera (one species) and Diptera (two species). All the major parts of this legume plant *viz.*, pod/seed, leaf, root and stem were found to be infested by the insect pests. Sucking insect pests appear during the seedling and vegetative stage of crop i.e. 1st week of December to 2nd week of January. Gram pod borer, pea pod borer and blue butterfly are the pod borer complex that appeared from flowering to maturity stage *i.e.* 1st week of January to 2nd week of February. Among all the fifteen insect pests, only two pod borers, *Etiella zinckenella* (Treitschke) and *Helicoverpa armigera* (Hübner) were found as major pests of field pea with severe economic status to this area during successive *rabi*, seasons.

Keywords: field pea, insect pest complex, gram pod borer, pea pod borer, *Etiella zinckenella*, *Helicoverpa armigera.*

INTRODUCTION

The field pea (*Pisum sativum* L.) is a nutritionally rich, cool weather legume crop grown around the world for food, animal feed, and fodder, providing nutritional security for economically disadvantaged populations across numerous developing nations. It is one of the most popular food crops in the world as it is very nutritious and it's cultivation is quite effortless.

It is usually grown in the cold areas of the world unlike the other major pulses of the world. It is also known as 'Dry peas' and called as 'Matar' in India. Dry pea seeds has varied uses as dhal, boiled pea as snack food, or as a supplement to wheat flour to make nutritious breads. Field pea is cultivated for the fresh green seeds, tender green pods and dried seeds and foliage. It is highly nutritive and contains high proportion of digestible protein (22.5%), carbohydrates (62.1%), Fats (1.8%), minerals (Ca – 64mg/100g, Fe – 4.8mg/100g) and vitamins (Riboflavin – 0.15mg/100g, Thiamin – 0.72mg/100g and Niacin – 2.4mg/100g). Pea contributes about 3% in total pulse area and about 5% in total pulse production of India. They have high levels of minerals like potassium, phosphorus, calcium, iron and vitamins viz., vitamin A and C, riboflavin, thiamine, niacin and folate, as well as their digestible fibre content (5.9-12.7 per cent), have been shown to benefit heart health, digestive health, and cancer prevention **(Murade *et al*., 2014)**. India is the largest producer as well as consumer of pulses in the world. Among all the pulses, productivity of field pea is highest in India. Among the *rabi* pulse crops, field pea accounts for about 7 per cent of total pulse production in India. The major field pea producing states in India are Uttar Pradesh, Madhya Pradesh, Jharkhand, Assam, Odisha, Manipur, West Bengal and Bihar**.** Uttar Pradesh ranked 1st both in area and production with (46% and 55%) followed by Madhya Pradesh (26% area and 19% production) and Jharkhand (8% area and 8% production). In India, Field pea is grown in 7.45 lakh ha with an annual production of 9.10 lakh tonnes and productivity of 1222 kg ha^{-1}. In Uttar Pradesh, it occupies an area of 3.43 lakh ha with a production of 5.03 lakh tonnes and productivity of 1467 kg ha^{-1} **(Annonymous, 2021).**

The productivity of field pea is limited by many biotic and abiotic factors. Among the biotic factors, insect-pests are probably the main constraint in limiting the yield of crop. Right from seedling stage to the harvesting stage, large number of insect pests attack all parts of the plant at different stages. As many as 24 insect species have been reported infesting the pea crop at different stages of the crop **(Bijjur and Verma, 1995)**, 5 insect pests belonging to three orders and 3 families were recorded at different stages of crop growth in an overlapping manner **(Yadav and Patel, 2015)** and 7 species of insect pests were recorded in all growth stages of pea **(Yadav *et al*., 2019).** Among the insect pests, pea stem fly (*Melanagromyza phaseoli* Tryon), pea leaf miner (*Chromatomyia horticola* Goureau), pea aphid (*Áyrthosiphon pisum*), and pod borer complex (*Helicoverpa armigera* (Hubner), *Lampides boeticus* (L.) and *Etiella zinckenella* (Treitschke) and thrips (*Caliothrips indicus* Bagnall) often cause substantial loss to the crop.

Insect pest damage to this crop imposes severe limits in its production. On an average, 2.5 to 3.0 million tonnes of pulses are lost annually due to pest complex with a monetary value of nearly Rs. 6,000 crores because of damages caused by insect-pests **(Reddy, 2009).** Hence, there is a great scope to study on insect pests complex of field pea. An attempt is made here to determine what appear to be the major pests of field pea crop at Meerut.

MATERIALS AND METHODS

The field experiment was conducted at Crop Research Centre (CRC) at Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, Uttar Pradesh during two successive *Rabi* seasons of 2021-22 and 2022-23. Seeds of field pea (variety 'Rachna') were sown on 15th November in a plot size of 100 m^2 with row to row and plant to plant spacing of 30cm and 10 cm, respectively, by following standard agronomical practices and maintained without insecticidal application to study the about the insect pests complex associated with field pea crop. The field was monitored either daily or at an interval of 1-2 days for the observation of insect-pests occurring on crop right from germination till harvesting stage. The immature stages of the pests were collected and brought to the laboratory for rearing. The collected adult insects were also killed in killing bottle, mounted either on insect pins or paper points depending on its size and labeled properly. The specimens were identified in Department of Entomology at SVPUA&T, Meerut.

RESULTS

The studies on diverse insect pest complex of field pea was made for two successive years of experimentation *i.e. rabi*, 2021-22 and 2022-23. The results obtained in the study indicates that field pea crop was attacked by number of insect pests at different crop growth stages. Efforts were also made to arrange the insect-pests with their systematic position by incorporating the information on their common name, scientific name, order, family, stages of insect pest and economic status as well. The various insect pests recorded from experimental location during study period presented in Table-1. The insect abundance, which occurred consistently ubiquitously and causing appreciable damage, were categorized as major insect pests while those insects appeared for a short period or in fairly low numbers were categorized as minor pests and the insects which were very few in numbers and appeared after a considerable

time lag were taken as 'stray'. Out of fifteen insect-pest observed, pea pod borer (*Etiella zinckenella*) and gram pod borer (*Helicoverpa armigera*) were recorded as major pests. The bean aphid, *Aphis craccivora* (Koch), aphid, *Macrosiphum pisum* (Harris), tobacco caterpillar, *Spodoptera litura* (Hb.), semilooper, *Plusia orichalcea* (Fab.), army worm, *Mythimna separata* (Walker), blue butterfly, *Lampides boeticus* (Linnaeus) and leaf miner, *Chromatomyia horticola* (Goureau) were recorded as 'minor' pests. During both the years of experimentation almost similar trend of pests' succession was observed. The remaining insect species were present only sporadically over the two seasonal study period.

4.1.1. Orthopteran insect pests

4.1.1.1. Surface Grasshopper, *Chrotogonus trachypterous* (Blance)

Nymphs and mature grasshoppers were observed intermittently eating leaves during the rabi growing seasons of 2021-2022 and 2022-2023. Irregular cuts found along the edges of leaves out in fields were attributed to these insects. Grasshoppers were additionally documented as a minor pest of vegetable peas in this region over the course of the study period.

4.1.2. Hemipteran insect pests

4.1.2.1. Bean aphid, *Aphis craccivora* (Koch)

Over the course of the rabi growing seasons of 2021-2022 and 2022-2023, aphids were observed infesting vegetable peas at low economic levels. Both nymphs and adult aphids were spotted feeding on the undersides of leaves, top shoots, and stems by sucking out cell sap.

4.1.2.2. Aphid, *Macrosiphum pisum* (Harris)

Over the rabi growing seasons of 2021-2022 and 2022-2023, nymphs and adults of the species Macrosiphum pisum were spotted on the undersides of leaves and shoots feeding on leaf sap. This insect pest was observed in the region at minor economic infestation levels during both seasons. The nymphs and mature insects tapped the tender leaves, stems, and pods for plant sap, largely colonizing the young leaves and growth points, leading to characteristic deformations.

4.1.2.3. Green Peach Aphid, *Myzus persicae* (Suls.)

A minor green aphid measuring 1.8 to 2.1 millimeters was observed, featuring a black head and thorax contrasting with a yellow-green abdomen marked by a dark dorsal patch. Both adult and nymph stages were spotted on plant leaves. The early stage nymphs presented greenish but

transitioned to a more yellowish hue in later phases. Wingless adult specimens, similar in appearance to nymphs, spanned 1.7 to 2.0 millimeters in length.

4.1.2.4. Whitefly, *Bemisia tabaci* (Genn.)

The nymphs looked elliptical with yellowish bodies lightly covered in a white, powdery wax and were found feeding on the plant tissues by fixing their mouth parts. Both nymphal and adult stages were documented puncturing cells to draw sap through their feeding sites.. They were found very sparingly distributed with stray economic status during both the years i.e. rabi 2021-22 and 2022-23, in this area.

4.1.3. Lepidopteran insects

4.1.3.1. Cut worm, *Agrotis ipsilon* (Hufnagel)

Larvae of the Agrotis ipsilon species were documented cutting the tender stems of 10-12 day old crops over the course of the study period. However, infestation rates were small, so the economic impact of this insect pest was minimal. It was categorized as an occasional pest in the region during the rabi growing seasons of 2021-2022 and 2022-2023.

4.1.3.2. Tobacco Caterpillar, *Spodoptera litura* (Hb.)

Over the study period, the tobacco caterpillar Spodoptera litura (Hb.) was identified as a minor insect pest causing limited damage. Newly hatched larvae were spotted feeding on restricted parts of leaves, yet older caterpillars consumed entire leaves, buds, and flowers.

4.1.3.3. Semilooper, *Plusia orichalcea* (Fab.)

Green and plump Plusia orichalcea Fab. caterpillars were documented feeding in limited areas of fields by making holes in the foliageThey were found from active vegetative stage to pod formation stage as minor pest of the pea crop in this area during both the seasons of study.

4.1.3.4. Pod borer, *Helicoverpa armigera* (Hub.)

Over the course of the study, Helicoverpa armigera Hub. larvae were observed feeding on leaves, flowers, pods, and seeds, causing economically significant infestations that categorize this as a major regional pest during both periods. Early larval stages bored into flower buds and young pods while later instars targeted mature and growing pods, chewing circular holes into individual seeds.

4.1.3.5. Army Worm, *Mythimna separata* (Walker)

The larvae of *Mythimna separata* were found feeding on the leaves of the plants during *rabi* season of both the years. The greenish colour larvae were found as minor pest of the pea crop infesting that at some places in the field of this area.

4.1.3.6. Blue butterfly, *Lampides boeticus* (Linnaeus)

Newly emerged larvae presented yellowish-green bodies with black heads and dark brown prothoracic patches, plus scattered hairs along their cylindrical shapes. They were spotted boring into flower buds and pods to feed from the inside. Despite such feeding habits, this species did not become a major threat and was designated a minor pest..

4.1.3.7. Pea pod borer, *Etiella zinckenella* (Treit.)

Over the course of the study, the pea pod borer *Etiella zinckenella* (Treit.) was identified as a potentially damaging insect pest. The larvae entered pods to feed on the ripening seeds, leaving fecal pellets visible inside afflicted pods. First appearing in early November, this insect remained active through the duration of the crop cycle.

4.1.4. Isopteran insect

4.1.4.1. Termite, *Odontotermus obesus* (Rambur)

Termites were observed attacking the crop sporadically after germination and at various growth stages. Workers were spotted on roots, the outer stem surface, and inside hollow stem interiors, which they partially filled with soil. Over the rabi seasons of 2021-2022 and 2022-2023, termites were designated a minor insect pest of the pea crop.

4.1.5. Dipteran insects

4.1.5.1. Stem fly, *Melanagromyza phaseoli* (Tryon)

During the rabi experimentation periods of 2021-2022 and 2022-2023, stem flies attained low pest status. Maggots were observed on leaf surfaces and boring into stems at the crop's early stage, with only a few desiccated central shoots spotted in the vegetable pea fields.

4.1.5.2. Pea leaf miner, *Phytomyza atricornis* (Meigen)

During the rabi seasons of 2021-2022 and 2022-2023, this pest was classified as minor, appearing from the seedling through pod formation stages. The larvae were found making prominent whitish tunnels in the leaves which could be seen by holding the leaves against bright light.

Out of the fifteen insect species observed, solely the pea pod borer *Etiella zinckenella* (Treitschke) and *Helicoverpa armigera* (Hübner) caterpillars qualified as economically damaging major regional pests of vegetable peas over the *rabi* seasons.

Table 1: Insect pest complex associated with field pea during *Rabi*, 2021-22 and 2022-23

S.NO.	SCIENTIFIC NAME	COMMON NAME	ORDER	FAMILY	DAMAGING STAGE	CROP STAGE	ECONOMIC STATUS
1.	*Ophiomyia phaseoli* (Tryon)	Stem fly	Diptera	Agromyzidae	Maggot	Seedling and Vegetative	Minor
2.	*Phytomyza atricornis* (Meigen)	Pea leaf miner	Diptera	Agromyzidae	Maggot	Vegetative	Minor
3.	*Chrotogonous trachypterous* (Blanchard)	Surface Grass Hopper	Orthoptera	Acrididae	Nymph and Adult	Vegetative and young pods stage	Minor
4.	*Bemisia tabaci* (Gennadius)	White fly	Hemiptera	Aleyrodidae	Nymph and Adult	Vegetative stage	Stray
5.	*Aphis craccivora* (Koch)	Bean aphid,	Hemiptera	Aphididae	Nymph and Adult	Vegetative stage	Minor
6.	*Macrosiphum pisum* (Harris)	Aphid	Hemiptera	Aphididae	Nymph and Adult	Vegetative stage	Minor
7.	*Myzus persicae* (Sulzer)	Green Peach Aphid	Hemiptera	Aphididae	Nymph and Adult	Vegetative stage	Stray
8.	*Odontotermus obesus* (Rambur)	Termite	Isoptera	Termitidae	Nymphs and adult stages of worker	Roots, seedling to maturity stage	Stray
9.	*Spodoptera litura* (Fabricus)	Tobacco caterpillar	Lepidoptera	Noctuidae	Larva	Vegetative stage and pod formation	Minor
10.	*Plusia orichalcea*	Semilooper	Lepidoptera	Noctuidae	Larva	Vegetative	Minor

	(Fabricus)					stage	
11.	*Agrotis ipsilon* (Hufnagel)	Cut worm	Lepidoptera	Noctuidae	Larva	Seedling and Vegetative	Stray
12.	*Mythimna separata* (Walker)	Army Worm	Lepidoptera	Noctuidae	Larva	Seedling and Vegetative	Minor
13.	*Helicoverpa armigera* (Hubner)	Gram pod borer	Lepidoptera	Noctuidae	Larva	Flowering and Podding	Major
14.	*Etiella zinckenella* (Treitschke)	Pea pod borer	Lepidoptera	Noctuidae	Larva	Flowering and Podding	Major
15.	*Lampides boeticus* (Linn.)	Blue butterfly	Lepidoptera	Lycaenidae	Larva	Flowering and Podding	Minor

4. DISCUSSION

Over the course of study from November 2021-March 2022 and November 2022-March 2023, fifteen insect pest species were observed infesting pea crops in the field: stem fly (*Ophiomyia phaseoli* Tryon), white fly (*Bemisia tabaci* Genn.), aphid (*Aphis craccivora* Koch.), leaf miner (*Phytomyza atricornis* Meign.), gram pod borer (*Helicoverpa armigera* Hub.), pea pod borer *Etiella zinckenella* (Treitschke), blue butterfly (*Lampides boeticus* Linn.), surface grass hopper Chrotogonous trachypterous (Blanchard), bean aphid Aphis craccivora (Koch), aphid *Macrosiphum pisum* (Harris), green peach aphid *Myzus persicae* (Sulzer), termite *Odontotermus obesus* (Rambur), tobacco caterpillar *Spodoptera litura* (Fabricus), semilooper *Plusia orichalcea* (Fabricus), cut worm *Agrotis ipsilon* (Hufnagel), and army worm *Mythimna separata* (Walker). Several prior studies have documented various insect pests attacking pea crops in India. Prasad et al. (1983) listed 19 Delhi pea pests from seedling to pod stages, while Bijjur and Verma (1995) cataloged 24 Delhi species, highlighting leaf miner *Chromatomyia horticola* (Gour.), aphids like *Aphis craccivora* (Koch) and *Macrosiphum pisum* (Harris), and semilooper caterpillars such as *Plusia orichalcea* (Fab.) and *P. eriosoma* (D.) as major threats. Tomer *et al.* (2004) observed 9 Jabalpur insect pests across vegetative to harvest periods in the 2002-03 *rabi* season. Shantibala *et al.* (2007) recorded 19 pea crop pests representing 6 orders and 13 families. Mittal and Ujagir (2007) documented 32 Pantnagar pests, dominated by *Etiella zinckenella*, *Helicoverpa armigera*, *Lampides boeticus* and *Euchrysops cnejus*. Yadav et al. (2019) noted 7 pea insect species across all growth stages. At Pantnagar, Yadav and Patel (2015)

tracked 5 overlapping pea pest species across crop development. Similar results were reported in past work by Sharma (1994) and Kushwaha (2002).

CONCLUSION

Fifteen insect pest species were documented infesting pea crops. The gram pod borer and pea pod borer attained major pest status, while nine others were categorized as minor threats: stem fly, aphid, bean aphid, tobacco caterpillar, semilooper, army worm, leaf miner, surface grass hopper, and blue butterfly. The remaining four – whitefly, cutworm, green peach aphid, and termites – were occasional visitors. As the two key pests pose significant yield reduction threats, ongoing regional surveys of three or more years should continuously monitor the associated pest complex to definitively establish local pest statuses.

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