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Insect Pest Complex of Chickpea Crop

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ABSTRACT: Chickpea is an important pulse crop grown worldwide. Looking into the significance of chickpea, as it finds a pride place among pulses across the world and India therefore current study was carried out during *kharif* (2020) to observe various insect pests on chickpea crop. Nearly 7 insect species have been found as main damaging pests in the crop, out of which three were soil borne *viz.* whitegrub (*Holotrichia longipennis*), wireworm (*Agriotes* spp.) and cutworm (*Agrotis ipsilon*) and four were foliage pests *viz.* black aphid (*Aphis craccivora*), gram pod borer (*Helicoverpa armigera*), semilooper (*Thysanopulsia orichalcea*) and flea beetle (*Altica himensis*). Apart from insect pests, non-insect pest *i.e.* field rat was also found to damage the crop. Among insect pests, *H. armigera* pest severely attacks the chickpea right from vegetative phase to maturity stage. The present study advocates wide range of location specific pest complex in chickpea to develop prophylactic reproducible practices for long term sustainable management programmes.

Keywords: Chickpea, pest complex, insect damage, sucking pests, foliage feeders.

INTRODUCTION

Chickpea is the crop of family leguminosae and subfamily papilionaceae. It is a self-pollinated crop rich in proteins, carbohydrates and fats and forms a very essential component of the diet of Indian people as most of the Indian's are vegetarian (Katerji *et al*., 2001). Humans utilize chickpea as fresh immature seed, whole seed, daal or flour. Since chickpea is a very important protein rich diet for vegetarian people, it is called as poor man's meat. Additionally, it is abundant in fibre and minerals and it's lipid fraction is rich in unsaturated fatty acids (Williams and Singh, 1987). Chickpea is rich in vitamins (particularly vitamin B) and also helps in increasing soil fertility by fixing atmospheric nitrogen (Kailas and Chaudhary, 2021). Chickpea finds a pride place among the pulses grown in our country. India is the single largest producer of chickpea within the world (Mallikarjuna *et al*., 2017; Gaur *et al*., 2019). In India, chickpea occupying part of 8,927,600 hectares with 41,827,500 tones production and also the typical yield is 935.34 kg/hectare (FAOSTAT, 2019). However, chickpea production is not fully achieved amid different biotic and abiotic stresses (Chaturvedi *et al*., 2018; Roorkiwal *et al*. 2018). Among biotic factors, diseases, insect pests, nematodes, birds and vertebrates harm the crop but damage due to insects is more striking than others. In chickpea, the number of pests are observed by different scientists such as black aphids (*Aphis craccivora*), pea aphids (*Acrythosiphum pisum*), jassids (*Empoasca kerri*), thrips (*Megalurothrips usitatus*), whitefly (*Bemisia tabaci*) (Mosier *et al*., 2004; Anandhi *et al*., 2011; Sachan and Katti, 1994), semilooper (*Autographa nigrisigna*), termites (*Odontotermes obesus* Ramb. and *Microtermes obesi* Heomgr), cutworm (*Agrotis ipsilon* Rott), whitegrub, (*Holotrichia* spp.) (Kambrekar, 2012; Saha *et al.*, 2015; Kumar *et al*., 2017). In addition to this, *H. armigera* has been found to exist in large numbers at both vegetative and pod formation stages of chickpea (Lal, 1996). *H. armigera* severely attacks the crop, because it has high reproductive rate, fast generational changeover and wide genome diversity over the locations and therefore the potential to resist, digest and circumvent toxic chemicals. The pod borer can attack chickpea plants at any stage of growth, from seedling to maturity and damage branches of the plant including leaves, flowers and pods. The 1st and 2nd instar larvae first feed on leaves and tender twigs of the

plant during the vegetative stage, while the 3rd, 4th and 5th instar feed on leaves and mature pods (Patil *et al*., 2017). It was reported that pod borer causes 10-60 per cent loss in yield of chickpea under normal climatic conditions (Srivastava, 2003) and about 50-100 per cent amid favourable climatic conditions, especially in areas where rains are frequent and weather cloudy (Rheenen, 1991). It is approximated that *H. armigera* alone causes loss of more than Rs. 35000 million annually in India inspite of using heavy pesticides (Kumar & Kapur 2003), that is why pod borers have achieved the rank of national pest of India. Pod borer is said to be the most serious insect pest of chickpea. Percent larval survival and pupation were found to be the maximum on chickpea as compared to other host plants (Ullah, 2015). In general, insect pest complex of any crop is affected by geographical and environmental factors such as vegetation, topography, altitude, climate and habitat. Since North Kashmir experiences temperate climate and is rich in biodiversity in terms of flora and fauna. Thus insects are also found in abundance. In addition to this, climate change is also playing a role in changing scenario of the pests. Chickpea has been recently introduced in Kashmir, but insects were found to be major yield reducers of the crop so from Kashmir province this is the first attempt to undertake the diagnosis of insect diversity in chickpea crop. Accurate identification of insect species can give us a strong background to understand the status of different species of pests in order to plan control measures of pests or utilize beneficial ones.

Keeping in mind these views, the present study was conducted to collect information about pest complex of chickpea and their potentiality to cause damage to the crop for this region.

MATERIAL AND METHODS

The present investigation was carried out at FoA, Wadura, SKUAST-K. The crop was examined in field during *kharif* season 2020. Insect pests were observed on chickpea plants by plant inspection method (PIM) (Subharani and Singh 2004). In addition to this light traps and yellow sticky traps were also installed in the field for trapping of insects (Fig. 1). Everyday traps were checked for insects and plants were also observed weekly for infestation by insect pests and various damage symptoms were recorded (Patra *et al*., 2013). In order to check soil borne insects, the pits were dug in dimensions of 20 × 20 × 10 centimetre (Chandla, 1986) or 20 × 20 × 21 centimetre (Toba and Turner, 1981). Insect species were grouped into major and minor pests according to their occurrence and economic threshold levels. Insects which were found on the crop continuously in good numbers were categorized as major pests and insect species which appeared in small numbers were classified as minor pests. The insect pests so recorded were preserved at experimental laboratory, Division of Entomology, FoA, Wadura and identified at Division of Entomology, SKUAST-K and Zoological survey of India, Kolkata.

Chickpea crop


Light trap


Yellow sticky trap

Table 1: Insect pest complex of Chickpea Crop.

Sr. No.	Common name	Scientific name	Family and Order	Nature of damage	Period of prevalence	Period of peak incidence	Status
1.	Whitegrub	*Holotrichia longipennis*	Scarabaeidae: Coleoptera	Grub feed on roots, destroying seedling	June - October	2nd fortnight of July	Minor
2.	Cutworm	*Agrotis ipsilon*	Noctuidae: Lepidoptera	Larvae cut young seedlings	June	Ist fortnight of June	**Major**
3.	Wireworm	*Agriotes* spp.	Elateridae: Coleoptera	Damaging roots inside soil.	June- October	2nd fortnight of July	Minor
4.	Black aphid	*Aphis craccivora*	Aphididae: Hemiptera	Suck cell sap from tender parts	July-Oct	2nd fortnight of August	Minor
5.	Gram pod borer	*Helicoverpa armigera*	Noctuidae: Lepidoptera	Caterpillars mainly act as defoliators	June- October	August	**Major**
6.	Semilooper	*Thysanoplusia orichalcea*	Noctuidae: Lepidoptera	Caterpillars mainly act as defoliators	July- October	2nd fortnight of August	Minor
7.	Flea beetle	*Altica himensis*	Chrysomelidae: Coleoptera	Adults cause holes on the leaves	July- October	Ist fortnight of July	Minor

RESULTS AND DISCUSSIONS

Results from the experimental site depicted seven insect species attacking the chickpea crop during the year 2020. Among these, three species were soil borne *viz.* whitegrub (*Holotrichia longipennis*), cutworm (*Agrotis ipsilon*) and wireworm (*Agriotes* spp.) and four foliage feeders include gram pod borer (*H. armigera*), semilooper (*Thysanopulsia orichalcea*) (Fab.) and flea beetle (*Altica himensis*). Apart from these insect pests, one non insect pest that is field rat was also found to damage the crop. Three species *i.e.* cutworm, gram pod borer, semilooper belong to order lepidoptera, whereas three species *i.e.* whitegrub, wireworm and flea beetle belong to order coleoptera and black aphid to hemiptera (Fig. 2).

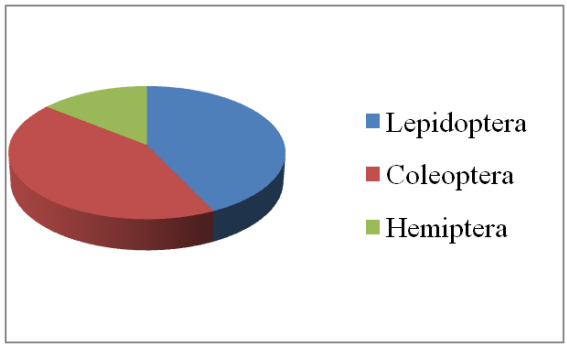


Fig. 2.

Whitegrubs are the larvae of May or June beetles or chaffer beetles or scarab beetles. They are C-shaped larvae feeding on variety of materials and all stages of development take place in the soil. Whitegrubs are mostly found in the soils having high organic matter. Whitegrubs were found to either attack roots or cut the seedlings just underneath the ground. Several workers *i.e* (Manjunath *et al*., 1989; Yadav & Jat, 2009; Atwal and Dhaliwal, 2005; Kumar *et al*., 2017) also reported the whitegrub as a minor pest of chickpea crop.

Wireworms, are the soil inhabiting larvae of click beetles. Larvae are slim, bright, yellowish brown, with six tiny legs. Full grown larvae range from 1.2 to 2.5 cm long. Larvae are capable to attack many different plant species including Chickpea. Larvae started attacking chickpea immediately after the crop is seeded and eat the seed and leave behind only the seed coat. Wireworms are considered as generalist herbivores that attack belowground parts of field crops worldwide (Milosavljevic *et al*., 2017). Wireworm cause injury to seeds, roots, stems and belowground harvestable plant parts; facilitates infection by secondary plant pathogens; reduces plant growth; and lowers crop yield and/or value (Keiser *et al*., 2012). The feeding injury symptoms of wireworms are larval tunneling through germinating seeds or seedlings, and wilted dying plants (Traugott *et al*., 2015).

Cutworm larvae come out of their hiding places at night and damaged the plants under the cover of darkness. The larvae were observed to attack the crop at seedling stage by cutting the tender plants at an average height of 5 cm from the ground surface. Their number was observed highest during early June. Similarly, Sharma *et al*., (2020) considered cutworm as important chickpea pest. The attack of *A. ipsilon* on chickpea crop has also been reported from different parts of country (Reed & Pawar 1892; Islam *et al*, 1987; Manjunath, *et al* 1989). The damage by cutworm has been also reported by Atwal and Dhaliwal, (2005) on various agricultural crops. Similarly Farhat *et al*., (2014) documented the occurrence of various insects on chickpeas including cutworm.

Black aphids were found to attack chickpea crop. These were found active throughout the crop season, However peak infestation was found during second fortnight of August. Damage was caused by both nymphal and adult stages by sucking the sap from leaves, stem, buds and pods. Although, abundance of aphids was found fairly good, but vitality of the plant was not much affected. However, Acharjee and Sarmah (2013) reported black aphids as one of the most important pest of chickpea but earlier several workers (Islam *et al*., 1987; Lal, 1996) reported that the aphid species on chickpea crop caused minor damage as compared to *H. armigera.*

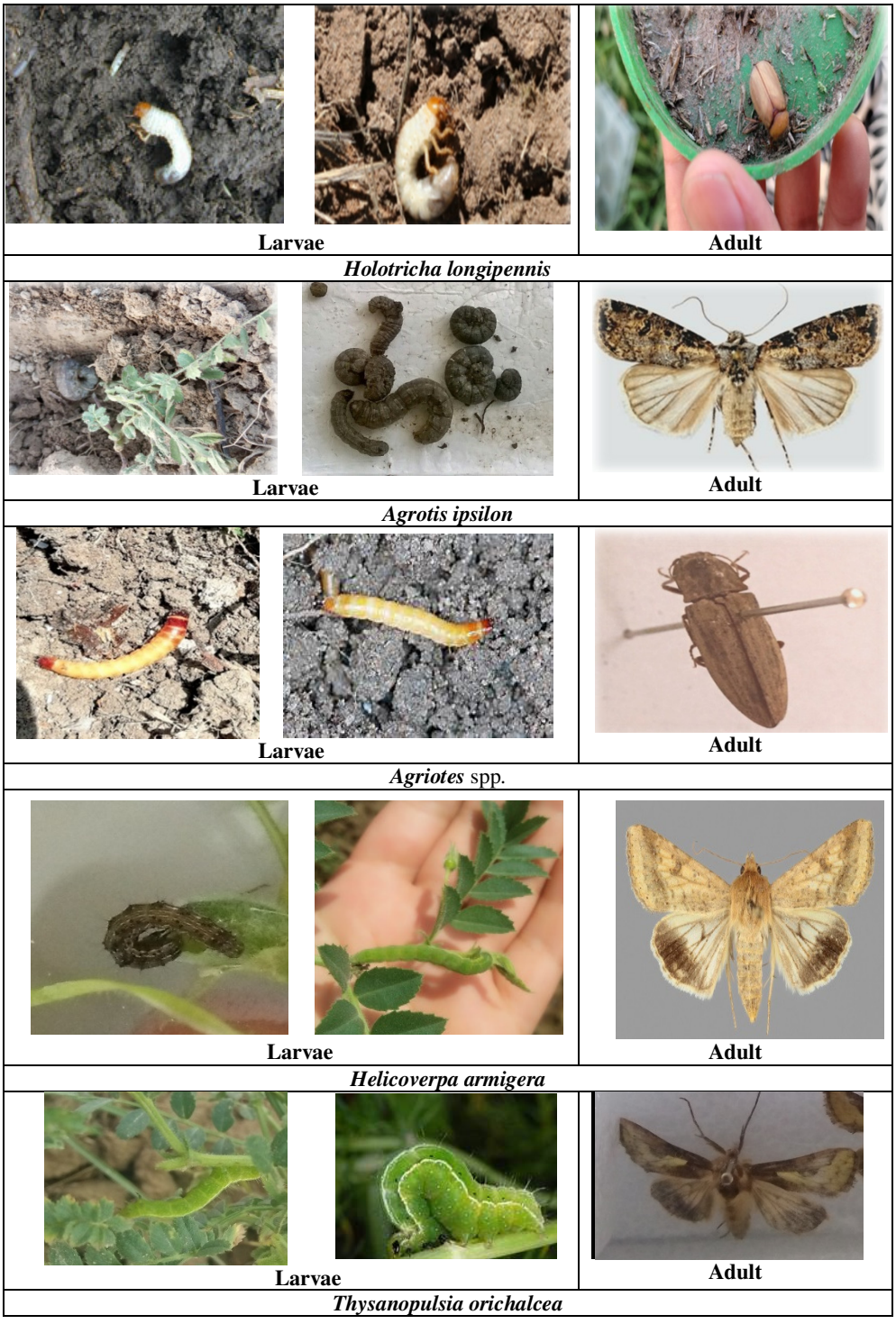
Chickpea pod borer was observed to be the most important major pest of chickpea as evidenced by its population and relative abundance, causing severe damage to the crop. It was the most active pest throughout the crop season found right from seedling stage to the harvest of the crop and the maximum incidence was during the reproductive phase of the crop. *Helicoverpa* was found to attack 90 per cent of chickpea crops in Pakistan (Juneja *et al*., 2019). Similarly, Singh *et al*., 2018 recorded it as the key pest of chickpea crop. Several workers have considered the chickpea pod borer as a severe pest in different parts of India (Atwal and Dhaliwal, 2005; Jeyarani *et al*., 2010). It causes damage percent of about 8.15 to 92.5 to the crop and yield losses of about 400 kg/ha in chickpea crop (Rahman, 1993).

Semilooper, *T. orichalcea* was also found on chickpea. However, the relative abundance of these insects was considerably lower as compared to other pests. The larvae were found attacking on leaves and leaflets by making round holes and sometimes by cutting the leaf margins. The larvae were also observed attacking the pods by making irregular cuts from the upper side of pods so as to feed the young seeds inside. Semilooper on chickpea has been reported as minor pest by many authors (Lal *et al*., 1987; Mahmood & Shah, 1984; Deka *et al*., 1987).

Flea beetles were found on the crop from July. They make circular holes on the leaves, decreasing assimilation surface and slow down the growth of the plant. But in chickpea these were found in small numbers thus not affecting the vitality of the crop.

Our studies were in conformity with Mari *et al*., (2013) who reported *H. armigera* and *A. ipsilon* from the research site of chickpea. Similarly, Saha *et al*., (2015)

recorded gram pod borer, cutworm, black aphids, semilooper, tobacco caterpillar, pod bug as pests on chickpea at Bihar, India. Kumar *et al*., (2017) studied insect fauna related to chickpea crop at Pantnagar Uttarakhand and recorded 13 species on chickpea including cutworm, whitegrub, pod borer, semilooper and black aphids. However, Singh *et al*., (2018) recorded only 4 species on chickpea *i.e*. pod borer, cutworm, tobacco caterpillar and termite. Our studies were also in partial agreement with studies of Veer *et al*., (2021) who recorded incidence of various insect pests on chickpea and recorded podborer, cutworm and termite as important pests of chickpea.



Aphis craccivora

Altica himensis

CONCLUSION

The main aim behind this research was to monitor different insect pests of chickpea crop under environmental conditions of North Kashmir. The study revealed seven different species of insects on chickpea of which three species belonged to order lepidoptera, three to coleoptera and one to hemiptera. Among all the pests, gram pod borer was found to cause severe damage to the crop. Hence proper management practices need to be adopted to control pests on chickpea particularly gram pod borer.

Knowledge gap: To develop a broad and complete understanding of the population dynamics of all chickpea pests particularly *H. armigera* in relation to abiotic factors is the basic need so that effective prediction of its infestation can be made. As the pest was found to be great yield reducer, development of proper management practices with less use of chemical insecticides is the need of hour.

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