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Seasonal profile of different insect-pests of black gram in the western region of Uttar Pradesh

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Abstract

The present experiment was conducted to study the seasonal profile of different insect-pests in blackgram ecosystem. On the basis of occurrence of insect pests, the pests observed regularly on weekly basis and causing appreciable visual damage up to the extent of 10 per cent or more were categorized as 'major' pests, whereas, insects which appeared irregularly for a short period and in low numbers were considered as 'minor' pests. Thirteen species of insect pests were observed to attack the blackgram var. IPU-43' at different stages of crop growth in an overlapping manner.

Maximum number of 6 species belonged to the order Lepidoptera followed by Hemiptera (5 species), whereas, Diptera and Coleoptera shared with one species each constituting 46.15, 38.46, 7.69 and 7.69 per cent of the total pests on black gram, respectively.

Keywords: black gram, insect-pests, pest profile, seasonal activity

Introduction

Pulses, the food legumes, have been grown by farmers since millennia providing nutritionally balanced food to the people of India ^[1] and many other countries in the world. Pulses are important dietary component in south Asia and growing legume pulses enriches soil health due to the root nodule fixing atmospheric nitrogen in soil. Pulses in India have long been considered as the poor man's only source of protein. India is reportedly the largest pulse growing country in the world both in terms of area as well as production covering 43.30 per cent of land area under pulses with 33.15 per cent production. In another report, it has been described that India is the largest producer and consumer of pulses in the world accounting for 33 per cent of world's area and 22 per cent of world's production of pulses. The area covered by pulses in the country is 14.35 per cent of the total cropped area. The production of total pulses during 2011-12 as per the Fourth Advanced Estimate of the Agricultural Ministry was put at 172.1 lakh tonnes. The Planning Commission of India has estimated the demand for pulses in the country during 2011-12 as 191.1 lakh tonnes.

Pulse crops have a unique position in sustainable crop production as they provide highly nutritive food and keep the soil alive and productive. Though India has the distinction of being the world's largest producer of pulses, the average productivity is very low because of the abiotic and biotic stresses. Due to decline in productivity, the net availability of pulses has come down from 60g/day/person in 1951 to 31g/day/person in 2008. Annually about 2.0 to 2.4 million tonnes of pulses with approximate monetary value of Rs. 6000 crores are lost due to the damage caused by insect pests ^[2]. More than 250 insect pests are reported to affect pulses in India. The major insect pests during vegetative stage are thrips, whitefly, leafhopper, black aphid, Bihar hairy caterpillar, stem fly which cause appreciable damage ^[3].

Among the pest affecting pulse crops, nearly twelve insect species causes considerable yield loss in black gram. Insect pest damage constitutes a serious limiting factor in pulse cultivation leading to reduce production and productivity. Blackgram is damaged by an array of insect pests from sowing to harvest in the field as well as in the harvested produce in storage ^[4]. Among these, spotted pod borer, *Maruca vitrata* (Geyer), Gram pod borer, *Helicoverpa armigera* (Hubner.), blue butterfly, *Lampides boeticus* (L), Plume moth *Exelastis atomosa* (Waisingham) and pod bug, *Clavigralla gibbosa* (Spinola) are considered important in causing economic losses to the farmers ^[5].

Materials and Methods

Experimental site: The present study was conducted at the experimental Crop Research centre, (Chirori farm) of Sardar Vallabhbhai Patel university of Agriculture and technology Modipuram, Meerut 250110 (U.P.) during kharif season 2018 and 2019 in a Randomized Block Design (RBD) per plot of size 4 m x 3 m and Row to row and plant to plant spacing was 30 cm and 10 cm, having three replications and light treatment. The Crop Research Centre is situated at the distance of about 10 Km. from Meerut city on Delhi - Dehradun National Highway (NH-58). It lies between 29° 17' N latitude and 77° 42' longitudes at an altitude of 237 meter above mean sea level. The total geographical area of Meerut district is 2564 km². Meerut is located in the North-East of Delhi in Western Plain Zone of Uttar Pradesh.

Observations were recorded on 10 randomly selected tagged plants per each replication in intercrops. The insects were collected and reared up to adult stage wherever necessary. Adult insects were preserved and identified. The nature and extent of damage caused by various insect pests were also recorded to assess the economic status of the pest. Incidence of sucking pests viz: whitefly, Jassid, and thrips were recorded on leaves and top of plant. Aphid's infestations were computed as per cent plants infested. Observations on pod borer, *H. armigera*, spotted bollworm and leaf eating caterpillar *Spodoptera litura* will be recorded on plants and plant parts. Data on larval population will be grouped as *Helicoverpa armigera* and adult population of natural enemies.

Results

On the basis of occurrence of insect pests, the pests observed regularly on weekly basis and causing appreciable visual damage up to the extent of 10 per cent or more were categorized as 'major' pests, whereas, insects which appeared irregularly for a short period and in low numbers were considered as 'minor' pests. Thirteen species of insect pests were observed to attack the blackgram var. IPU-43' at different stages of crop growth in an overlapping manner.

Maximum number of 6 species belonged to the order Lepidoptera followed by Hemiptera (5 species), whereas, Diptera and Coleoptera shared with one species each constituting 46.15, 38.46, 7.69 and 7.69 per cent of the total pests on black gram, respectively, (Table 2 and Figure 1).

The stem fly, *Ophiomyia phaseoli* (Tryon) first appeared after two weeks of crop germination. The pests viz., leafhopper, *Empoasca kerri* and white fly, *Bemisia tabaci* marked their first appearance from seedling to pod filling stage while bean aphid, *Aphis craccivora* appeared at vegetative stage of the crop. Green semilooper, *Trichoplusia ni*, tobacco caterpillar, *Spodoptera litura*, bihar hairy caterpillar, *Spilosoma obliqua* and weevil, *Apion sp.* appeared from vegetative to pod maturity stage (Table 1).

Larvae of blue butterfly, *Lampides boeticus* and pod borer, *Helicoverpa armigera* exhibited their incidence from flowering to pod formation stage while legume pod borer, *Maruca vitrata* appeared from flowering stage to pod maturity. Two insect species viz., green bug, *Nezara viridula*, and pod bug, *Riptortus pedestris* were observed from pod filling to pod maturity stage of the crop (Table 6) Out of thirteen species of insect pests, three species viz., *B. tabaci* (sap sucking), *T. ni* *Spodoptera litura*, and *Maruca vitrata* were observed as the pests of major importance as evidenced by their higher relative abundance (Table 1).

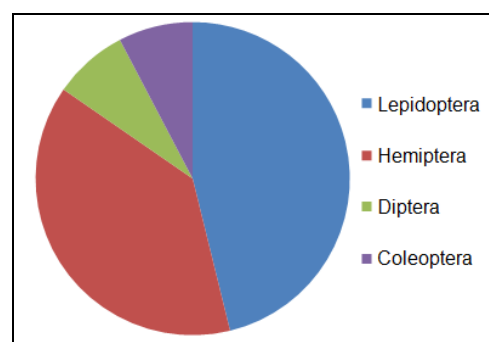


Fig 1: Total pests on black gram

Table 1: Seasonal profiles of different insect-pests of black gram

Insect-pests	Crop stages and insects appearance					
	Germination	Seedling	Vegetative	Flowering	Pod formation	
					Pod filling	Pod maturity
Stem fly	■	■				
Jassids		■	■	■	■	
Whiteflies		■	■	■	■	
Aphids			■			
Semilooper			■	■	■	■
Tobacco caterpillar			■	■	■	■
Bihar hairy caterpillar			■	■	■	■
Beetle			■	■	■	■
Blue butterfly				■	■	■
Pod borer				■	■	■
Spotted pod borer				■	■	■
Green sting bug					■	■
Pod bug					■	■

Table 2: Insect-pest complex associated with Black gram during *Kharif*, 2018-2019

Common name	Scientific name	Order and family	Damaging Stage of the pest	Associated with crop stage	Economic status
1	2	3	4	5	6
		Orthoptera			
Surface Grasshopper	<i>Chrotogonus trachypteros</i>	Pyragamorphidae	Nymph & adult	Seedling pod formation	Minor
		Hemiptera			
Aphids	<i>Aphis craccivora</i>	Aphididae	Nymph & adult	Vegetative stage young pods	Minor
Leaf hopper	<i>Empoasca kerri</i>	Cicadellidae	Nymphs & adult	Vegetative stage	Major
Pod bugs	<i>Riptortus pedestris</i>	Coreidae	Adult	Pod formation stage	Minor
Whitefly	<i>Bemisia tabaci</i>	Aleyrodidae	Nymph & adult	Vegetative stage	Minor
		Lepidoptera			
Gram pod borer	<i>Helicoverpa armigera</i>	Noctuidae	Larvae	Active Vegetative stage pod formation	Major
Spotted pod borer	<i>Maruca vitrata</i>	Pyralidae	Larvae	Vegetative stage pod formation	Major
Blue butterfly	<i>Lampides boeticus</i>	Lycanidae	Adult	Pod formation stage	Major
Tobacco caterpillar	<i>Spodoptera litura</i>	Noctuidae	Larvae	Vegetative and Reproductive	Major
Semilooper	<i>Plusia orichalcea</i>	Noctuidae	Larvae	Vegetative	Major
Bihar hairy caterpillar	<i>Spilosoma obliqua</i>	Arctiidae	Larvae	Vegetative and Reproductive	Major
		Coleoptera			
Blister beetle	<i>Mylabris phalerata</i>	Meloidae	Adult	Flowering stage	Minor

Discussions

As many as 200 insect-pests are associated on green gram and black gram on different part of world. Around 60 insect species has been reported on blackgram crop from India, attacking at different stages of crop growth with different time period [6]. A total of seven insect pests have been reported previously on *Vigna mungo* out of which two insects viz., *Bemisia tabaci* and *Spodoptera litura* were found to be major insects [7]. However, in the study of [8] whitefly was noticed as a minor pest regularly occurred from seedling to pod formation stage during *Kharif* season. In our recent study, thirteen insect-pests were observed on black gram infesting crop at different developmental stage in overlapping manner. Whitefly and Jassid were appeared first on the crop at early stage and continued throughout the crop growth stage [9] while aphid population was noticed during vegetative stage [10]. Spotted pod borer, *Maruca vitrata* was observed in early pod formation stage [11].

Out thirteen pests we observed on black gram, *Spodoptera litura*, *Bemisia tabaci*, *Empoasca kerri*, *Maruca vitrata*, *Trichoplusia* and *Helicoverpa armigera* were the most destructive and major pests. Our findings are supported by [4] who reported *Helicoverpa armigera* and *Maruca testulalis* as the major pests affecting the crop yield. In another study, [12] found 64 insect pests from black gram belonging to seven orders and 32 families. Among these, nine species were recorded as major pest while 30 were recorded as minor and remaining 25 were recorded as negligible pests.

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