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To survey the incidence of insect-pests of pulses in South-West Haryana

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Abstract

Pulses occupy a unique position in the agricultural economy of India and are recognized as the rich source of proteins, vitamins and minerals and play a vital role in the diet of vegetarians after cereals. Insect pests and diseases are among the major constraints responsible for the low production and productivity of pulses in India. The insect pest spectrum of pulses is quite complex and as many as 250 species of insect pest have been recorded on these crop throughout the India. Pulses are damaged by insect pests from sowing to harvesting in the field as well as the harvested produce in the storage Survey revealed that the population of leafhopper (6.96 leafhopper/plant), hairy caterpillar (0.85 larvae/plant), aphid (12.04 aphid/plant), whitefly (7.71 whitefly/plant), spotted pod borer (2.75 larvae/plant), blister beetle (13.24 adults/plant) and tur pod bug (6.63 bugs/plant) was more abundant in Gurugram district as compared to Mahendragarh and Rewari.

Keywords: Survey, incidence, insect-pest, pulses crop, spotted pod borer and population

Introduction

Pulses, the food legumes, have been grown by farmers since ancient time providing nutritionally balanced food to the people of many countries in the world (Nene, 2006) [13]. They occupy a unique position in the agricultural economy of India and are recognized as the rich source of proteins, vitamins and minerals and play a vital role in the diet of vegetarians after cereals (Saxena *et al.*, 2010) [16]. Their seeds contain about 20 percent protein, 5 percent fat and 55 percent carbohydrate which contribute significantly to the nutritional security of the country (Singh *et al.*, 2013) [19]. The most commonly grown pulses in India include chick pea, pigeon pea, green gram, black gram, field bean, horse gram, cowpea etc. These play a unique role for sustainable agriculture as they improve physical, chemical and biological properties of soil and maintain soil fertility by biological nitrogen fixation through bacteria, *Rhizobium* sp. prevalent in their root nodules. The total area covered under pulses in India was 29.03 million hectares with the total production of 25.72 million tonnes (Anonymous, 2020-21) [1].

Insect pests and diseases are among the major constraints responsible for the low production and productivity of pulses in India. The insect pest spectrum of pulses is quite complex and as many as 250 species of insect pest have been recorded on these crop throughout the India. Pulses are damaged by insect pests from sowing to harvesting in the field as well as the harvested produce in the storage (Lal and Sachan, 1987) [11]. Among them, whitefly (*Bemisia tabaci*), aphid (*Aphis craccivora*), flower thrips (*Megalurothrips distalis*), gram pod borer (*Helicoverpa armigera*), spotted pod borer (*Maruca vitrata*), hairy caterpillar (*Spilarctia obliqua*), tur pod bug (*Clavigralla gibbosa*) and blister beetle (*Myllabris pustulata*) were recorded as major pests on different pulses (Kumar *et al.*, 2007) [9]. In pigeonpea, about 70 to 80 percent yield loss reported due to the pest infestation (Singh, 1999) whereas it was 17 to 53 percent in cowpea (Liao and Lin, 2000), about 25 to 50 percent in green gram (Sandhyarani and Eswari, 2008) [15] and 100 percent in urd bean (Giraddi *et al.*, 2000) [6]. Before developing insect pest management programme for specific agro ecosystem, it is necessary to have basic knowledge on abundance and distribution of insect pests as it helps to determine the appropriate time of action and suitable effective method of control. Hence, an attempt has been made to study the incidence of major insect pest complex of pulses.

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Materials and Methods

A survey on different insect pests of major *Kharif* pulses (black gram, green gram, cowpea and pigeonpea) was carried out for acquiring basic information on abundance and distribution of insect pest in Mahendergarh, Rewari and Gurugram districts of Haryana during *Kharif* 2020 and 2021. The fixed plot survey was conducted on farmer's field at weekly interval from second fortnight of June 2020 and 2021 to first fortnight of October 2020 and 2021 in Mahendergarh, Rewari and Gurugram district of Haryana. Ten farmers field were selected in each district, 10 plants in each field were selected randomly and observation on the population of insect pest of pulses was taken. The population of aphid, Jassid, thrips and whitefly were counted from 10 representative sites in field. The populations were counted on 3 leaves per plant at lower, middle and upper leaves of plant. In case of pod borer and pod bug, the larval populations of *H. armigera*, *M. vitrata* and adult population of tur pod bug were recorded. The

observations of hairy caterpillar and tobacco caterpillar were recorded on the ten randomly selected plants in each field at weekly interval. The adults of blister beetle were counted visually on ten representative plants at flowering stage of crop during morning and evening hours.

Statistical analyses

The obtained observations on population of insect pests were recorded, averaged and statistically analyzed and tabulated for interpreting the results of the survey.

Results and Discussion

The results revealed that a total number of 13 species of insects and 4 species of natural enemy were found in different pulses crop. The list of insect pests noticed during both the year is presented in table 1. The population of major insect pests during the investigation is shown in table 2, 3 and 4.

Table 1: Insect pests complex recorded on pulses crop in South West Haryana (*Kharif* 2020 and 2021)

Sr. No.	Common Name	Scientific Name	Order: Family
1	Green leafhopper	<i>Empoasca kerri</i> (Pruthi)	Hemiptera: Cicadellidae
2	Whitefly	<i>Bemisia tabaci</i> (Gennadius)	Hemiptera: Aleyrodidae
3	Aphid	<i>Aphis craccivora</i> (Kuch)	Hemiptera: Aphididae
4	Thrips	<i>Scirtothrips dorsalis</i> (Hood)	Thysanoptera: Thripidae
5	Blue butterfly	<i>Lampides boeticus</i> (Linn.)	Lepidoptera: Lycaenidae
6	Tur pod bug	<i>Clavigralla gibbosa</i> (Fab.)	Hemiptera: Coreidae
7	Chafer beetle	<i>Oxycetonia versicolor</i> (Raj.)	Coleoptera: Cetoniidae
8	Tobacco caterpillar	<i>Spodoptera litura</i> (Fab.)	Lepidoptera: Noctuidae
9	Blister beetle	<i>Mylabris pustulata</i> (Thunberg)	Coleoptera: Meloidae
10	Legume pod borer	<i>Maruca vitrata</i> (Geyer)	Lepidoptera: Pyralidae
11	Bihar hairy caterpillar	<i>Spilosoma obliqua</i> (Walker)	Lepidoptera: Arctiidae
12	Grey weevil	<i>Mylocherus undatus</i>	Coleoptera: Curculionidae
13	Pod borer	<i>Helicoverpa armigera</i> (Hubner)	Lepidoptera: Noctuidae
Natural enemies			
1	Lady bird beetle	<i>Coccinella septempunctata</i>	Coleoptera: Coccinellidae
2	Three-striped lady- beetle	<i>Brumoides suturalis</i>	Coleoptera: Coccinellidae
3	Zigzag ladybird beetle	<i>Cheilomenes sexmaculata</i>	Coleoptera: Coccinellidae
4	Technid fly	Technid spp.	Diptera: Tachinidae

Thrips, *Scirtothrips dorsalis* (Hood)

The infestation of thrips was started from early stage of crop on different pulses grown at farmer fields of Mahendergarh, Rewari and Gurugram districts and it remained active upto 40th SMW. The population of thrips was varied from 1.41 to 11.79 thrips per three leaves in Mahendergarh, 1.82 to 11.72 thrips per three leaves in Rewari and 1.01 to 11.73 thrips per three leaves in Gurugram district. The peak infestation was

seen on 29th SMW during the survey. Similar observation were recorded by Chandra and Rajak (2004) [5] who reported the population of thrips at vegetative stage of crop in 40th SMW and thrips incidence was also recorded from flowering to pod filling stage. Shlokeshwar *et al.* (2015) [18] recorded that the population of thrips increased with increase in the crop age up to reproductive stage in black gram.

Table 2: Incidence of major insect pests on pulses crop in Mahendergarh district (*Kharif* 2020 and 2021)

SM W	Thrips/3 leaves	Leafhopper/3 leaves	Hairy caterpillar/plant	Tobacco caterpillar/plant	Whitefly/3 leaves	Pod borer/plant	Aphid/3 leaves	Spotted pod borer/plant	Blister beetle/plant	Tur pod bug/plant
Kharif 2020										
26	8.83	-	-	-	-	-	-	-	-	-
27	10.31	2.56	-	-	-	-	-	-	-	-
28	11.38	3.08	-	-	-	-	-	-	-	-
29	11.94	3.58	-	-	-	-	-	-	-	-
30	10.57	3.67	0.43	-	-	-	-	-	-	-
31	8.58	3.85	0.58	-	2.37	-	-	-	-	-
32	7.78	4.64	0.72	0.41	2.73	0.42	-	-	-	1.54
33	7.51	5.15	0.76	0.54	3.59	0.47	-	-	-	2.86
34	7.50	5.51	0.82	0.57	5.21	0.54	-	-	-	3.53
35	5.82	6.87	0.75	0.61	5.35	0.63	-	-	-	3.87
36	2.84	4.45	0.34	0.65	6.65	0.67	2.82	0.55	2.67	5.56

37	3.62	4.31	0.22	0.73	5.83	0.72	5.87	0.76	5.69	6.48
38	3.45	3.81	0.18	0.78	5.39	0.87	11.58	1.62	11.08	4.53
39	2.55	3.43	0.14	0.62	5.02	0.65	10.06	2.47	8.72	3.31
40	1.45	2.89	0	0	4.73	0.59	5.27	1.84	5.29	3.23
Kharif 2021										
26	6.43	-	-	-	-	-	-	-	-	-
27	8.35	1.81	-	-	-	-	-	-	-	-
28	10.47	2.19	-	-	-	-	-	-	-	-
29	11.65	2.63	-	-	-	-	-	-	-	-
30	11.87	3.41	-	-	1.15	-	-	-	-	-
31	9.83	3.82	-	0.24	1.74	-	-	-	-	-
32	6.56	4.62	0.54	0.33	2.85	-	-	-	-	2.38
33	6.45	5.21	0.62	0.56	3.89	0.51	-	-	-	2.79
34	5.57	5.58	0.68	0.58	4.43	0.56	-	-	-	3.67
35	4.83	4.79	0.73	0.62	4.25	0.62	-	0.31	-	4.38
36	2.81	4.68	0.79	0.84	5.21	0.65	6.34	0.64	-	4.75
37	2.47	4.36	0.45	0.67	5.79	0.69	7.36	1.07	6.05	6.53
38	2.08	3.74	0.24	0.50	4.67	0.72	10.76	2.49	10.14	7.32
39	1.83	2.32	0.11	0.48	3.34	0.78	11.96	2.38	10.46	5.02
40	1.37	1.46	0.07	0.21	2.63	0.46	4.76	1.76	7.86	4.65

Leafhopper, *Empoasca kerri* (Pruthi)

The incidence of leafhopper initiated in the early vegetative stage of crops which attained its peak on 35th SMW (5.83 leafhopper/three leaves) in Mahendergarh and Rewari (5.79 leafhopper/three leaves) and on 34th SMW (6.96 leafhopper/three leaves) in Gurugram districts. The maximum infestation was found in the month of August. The present findings are supported by Singh *et al.*, (2019) [20] who recorded the least population of leafhopper (1.70 leafhopper/three leaves) on 32nd SMW and reached at its peak (12.90 leafhopper/three leaves) on 37th SMW at Jobner, Rajasthan. Bairwa and Singh (2016) [20] recorded the highest population of leafhopper was found in 34th SMW having 7.01 leafhopper/cage/plant.

Hairy caterpillar, *Spilosoma obliqua* (Walker)

The incidence of hairy caterpillar was commenced from 29th SMW and it remained upto 40th SMW in all three districts. The population to caterpillar was ranged from 0.03 to 0.74, 0.10 to 0.74 and 0.14 to 0.85 larvae per plant in Mahendergarh, Rewari and Gurugram districts, respectively.

The present findings are in agreement with Yadav *et al.*, (2015) [22, 23] who reported that hairy caterpillar was appeared from 39th SMW to 45th SMW which was ranged from 7.00 larvae/m² to 29.50 larvae/m² during the crop growth period at Pantnagar, Uttarakhand. According to Kumar *et al.* (1998) [10], the maximum population of hairy caterpillar was observed during the crop growth period on soyabean crop.

Tobacco caterpillar, *Spodoptera litura* (Fabricius)

Larvae of *S. litura* were noticed from 31st SMW with scanty population and then due to favourable climate larvae reached at its peak on 36th and 37th SMW in all three districts. The abundance of caterpillar was ranged from 0.10 to 0.74, 0.21 to 0.81 and 0.11 to 0.69 caterpillars per plant in Mahendergarh, Rewari and Gurugram districts, respectively. The results of current investigation are in conformity with Yadav *et al.*, (2015) [22, 23] who reported that the maximum infestation of tobacco caterpillar in 40th SMW (3.83 larvae/m²) and the larvae was ranged from 0.10 to 3.38 larvae/m² throughout the crop growth at Pantnagar, Uttarakhand.

Table 3: Incidence of major insect pests on pulses crop in Rewari district (Kharif 2020 and 2021)

SMW	Thrips/3leaves	Leafhopper/3 leaves	Hairy caterpillar/plant	Tobacco caterpillar/plant	Whitefly/3 leaves	Pod borer/plant	Aphid/3 leaves	Spotted pod borer/plant	Blister beetle/plant	Tur pod bug/plant
Kharif 2020										
26	9.16	-	-	-	-	-	-	-	-	-
27	9.44	1.67	-	-	-	-	-	-	-	-
28	10.76	2.52	-	-	-	-	-	-	-	-
29	11.19	2.81	-	-	-	-	-	-	-	-
30	11.55	3.52	-	-	-	-	-	-	-	-
31	12.23	3.66	0.47	-	1.47	-	-	-	-	-
32	7.38	4.25	0.64	0.34	2.65	-	-	-	-	1.45
33	6.74	5.84	0.68	0.41	3.26	0.36	-	-	-	3.48
34	5.61	5.37	0.72	0.46	3.82	0.43	-	-	-	4.05
35	5.53	4.86	0.79	0.54	4.59	0.49	-	-	-	4.39
36	3.72	4.25	0.49	0.65	5.36	0.54	5.28	0.53	3.25	5.28
37	3.14	4.14	0.27	0.82	7.19	0.62	8.76	1.47	7.89	5.67
38	2.85	3.79	0.22	0.74	6.58	0.76	12.95	1.64	9.72	7.73
39	2.58	2.68	0.14	0.68	5.53	0.81	7.12	2.56	6.83	6.24
40	2.23	2.26	0.05	0.24	5.16	0.57	6.43	2.12	4.48	4.27
Kharif 2021										
26	7.28	-	-	-	-	-	-	-	-	-
27	8.49	2.44	-	-	-	-	-	-	-	-
28	11.23	2.86	-	-	-	-	-	-	-	-

29	11.89	3.31	-	-	-	-	-	-	-	-
30	11.63	3.68	0.54	0.42	-	-	-	-	-	-
31	10.34	3.83	0.59	0.51	-	-	-	-	-	-
32	8.40	4.62	0.63	0.55	3.50	0.45	-	-	-	-
33	6.73	5.11	0.67	0.64	3.84	0.54	-	-	-	2.64
34	5.48	5.56	0.81	0.67	5.35	0.59	-	-	-	3.76
35	4.27	6.38	0.59	0.72	5.76	0.63	-	0.38	-	4.33
36	3.95	4.73	0.44	0.75	5.83	0.72	3.56	0.76	-	6.64
37	3.49	3.54	0.37	0.79	6.17	0.84	7.57	0.94	5.42	5.87
38	2.78	3.84	0.32	0.65	4.97	0.93	10.78	1.89	8.57	4.69
39	2.24	2.18	0.24	0.43	3.68	0.63	8.05	1.37	11.89	4.38
40	1.41	1.69	0.15	0.38	3.31	0.37	4.81	1.12	8.69	3.67

Whitefly, *Bemisia tabaci* (Gennadius)

Whitefly population marked its first appearance on 31st SMW and present throughout the crop growth period. Maximum population of whitefly was attained (5.93 whiteflies/three leaves) on 36th SMW in Mahendergarh and on 37th SMW in Rewari and Gurugram district (6.68 and 7.71 whiteflies/three leaves), respectively. The current findings are in agreement with Biswas and Banerjee (2018) [4] who recorded maximum population of whitefly in second fortnight of September during *Kharif* season and the population was ranged from 1.22 to 13.66 whiteflies/three leaves in variety Pant U-19 and 2.0 to 20.8 whiteflies/three leaves in Pant U-31 variety of Urdbean. The results are also confirmation with Singh *et al.*, (2019) [20] who reported the maximum infestation of whitefly in the month of September and the population varied from 2.70 to 14.20 whiteflies/three leaves at Jobner, Rajasthan.

Pod Borer, *Helicoverpa armigera* (Hubner)

The incidence of pod borer initiated from early flowering stage i.e. 32nd SMW and reached at its peak on 38th and 39th SMW in all three districts. Larval population of pod borer varied from 0.21 to 0.79, 0.23 to 0.84 and 0.19 to 0.84 larvae/plant in Mahendergarh, Rewari and Gurugram districts, respectively. The results are in accordance with Meena *et al.*, (2021) [12] who recorded the appearance (0.50 larvae/10 plant) of pod borer from 31st SMW and it reached its peak (8.50 larvae/10 plants) on 36th SMW and thereafter the population started decline.

Aphid, *Aphis craccivora* (Kuch)

The population of aphid varied from 4.58 to 11.17 aphids/three leaves in Mahendergarh, 4.42 to 11.86 aphids/three leaves in Rewari and 7.67 to 12.04 aphids/three leaves in Gurugram district. Maximum infestation of aphid

was recorded on 38th SMW in Mahendergarh and Rewari district whereas on 39th SMW in Gurugram district. The findings are parallel with Sharma *et al.*, (2019) [17] who recorded aphid population on cowpea varied from 7.47 to 17.27 aphids per plant in Udaipur, Rajasthan and maximum infestation was found on 38th SMW. Arif *et al.*, (2006) [2] and.

Spotted pod borer, *Maruca vitrata* (Geyer)

In the present study, the incidence of *M. vitrata* in pulses was commenced from 35th SMW and it remained upto the harvesting of crop. Larval population varied from 0.15 to 2.42, 0.19 to 1.96 and 0.13 to 2.75 larvae per plant in Mahendergarh, Rewari and Gurugram district, respectively whereas maximum infestation was seen on 39th SMW. Similarly, these finding are in agreement with Yadav and Singh (2015) [22, 23] who revealed that the population was varied from 0.2 to 2.4 larvae per plant and the incidence initiated from 35th SMW and attained a peak on 38th SMW. Patel and Borad (2016) [14] recorded the incidence of *M. vitrata* in green gram from 35th SMW and higher activity was seen in 38th SMW at Anand, Gujarat.

Blister beetle, *Mylabris pustulat* ((Thunberg)

The incidence of blister beetle was found at flowering stage only and the maximum population was observed on 38th SMW in Mahendergarh and Gurugram whereas on 39th SMW in Rewari district. The population of beetle varied from 1.33 to 10.61 beetles/plant in Mahendergarh, 1.62 to 9.36 beetles/plant in Rewari and 1.28 to 13.24 beetles/plant in Gurugram district. The current findings are in confirmation with Hansa *et al.*, (2017) [17] who surveyed that its maximum infestation was found on floral parts of pulse crops from 33rd to 38th SMW in Udaipur, Rajasthan.

Table 4: Incidence of major insect pests on pulses crop in Gurugram district (*Kharif* 2020 and 2021)

SMW	Thrips/3 leaves	Leafhopper/3leaves	Hairy caterpillar/plant	Tobacco caterpillar/plant	Whitefly/3 leaves	Pod borer/plant	Aphid/3 leaves	Spotted pod borer/plant	Blister beetle/plant	Tur. pod bug/plant
<i>Kharif 2020</i>										
26	7.72	-	-	-	-	-	-	-	-	-
27	9.56	3.01	-	-	-	-	-	-	-	-
28	10.47	3.45	-	-	-	-	-	-	-	-
29	12.87	3.92	-	-	-	-	-	-	-	-
30	13.67	4.08	-	-	-	-	-	-	-	-
31	10.90	4.36	0.47	0.27	-	-	-	-	-	-
32	8.38	5.74	0.66	0.44	3.52	0.39	-	-	-	2.81
33	5.46	6.98	0.71	0.53	3.34	0.45	-	-	-	3.44
34	5.33	7.96	0.78	0.57	4.52	0.58	-	-	-	4.79
35	5.13	5.52	0.82	0.61	5.77	0.73	-	0.26	2.56	6.48
36	3.70	4.65	0.93	0.86	6.22	0.78	6.26	0.76	5.63	8.46
37	3.41	4.14	0.65	0.57	7.89	0.94	8.12	1.44	7.02	5.75
38	2.89	3.78	0.38	0.32	9.65	0.61	8.95	3.12	13.86	5.41

39	2.37	2.92	0.25	0.21	7.43	0.46	13.43	2.67	11.36	3.87
40	1.24	1.30	0.15	0.06	5.96	0.28	5.31	2.05	7.12	2.06
Kharif 2021										
26	5.49	-	-	-	-	-	-	-	-	-
27	7.67	-	-	-	-	-	-	-	-	-
28	9.73	2.94	-	-	-	-	-	-	-	-
29	10.59	3.28	0.32	-	-	-	-	-	-	-
30	8.25	3.65	0.37	-	-	-	-	-	-	-
31	8.13	3.72	0.46	-	1.36	-	-	-	-	-
32	7.37	4.18	0.62	0.32	2.71	-	-	-	-	1.34
33	6.34	6.57	0.65	0.38	5.42	-	-	-	-	2.86
34	4.75	5.96	0.73	0.43	6.83	0.56	-	-	-	3.39
35	3.98	5.54	0.84	0.53	7.22	0.63	-	-	-	3.65
36	3.20	4.62	0.78	0.57	8.59	0.68	9.08	0.59	-	4.80
37	3.07	4.38	0.54	0.64	7.53	0.74	11.64	0.92	9.60	7.25
38	2.86	3.87	0.42	0.69	5.19	0.79	12.21	1.68	12.62	5.21
39	1.73	3.79	0.39	0.47	4.48	0.61	10.65	2.84	11.03	4.63
40	0.79	2.48	0.13	0.17	4.13	0.43	7.83	1.78	9.07	3.01

Tur pod Bug, *Clavigralla gibbosa* (Spinola)

In respect to tur pod bug, the infestation was appeared in 32nd SMW and maximum infestation found at pod development stage of crop. The population of bug was varied from 1.96 to 6.51, 0.72 to 6.21 and 2.07 to 6.63 bugs/plant in Mahendergarh, Rewari and Gurugram district, respectively. The findings are in accordance with Khamoria *et al.*, (2017)^[8] who recorded the population of bug was ranged from 1.23 to 5.81 bugs/plant during *Kharif* season at Varanasi, U.P. According to Mandang *et al.*, (2012), the infestation was highest at reproductive stage of crop with peak population of 6.78 bugs/plant.

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