



E-ISSN: 2320-7078

P-ISSN: 2349-6800

JEZS 2019; 7(3): 270-272

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Received: 23-03-2019

Accepted: 25-04-2019

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Germplasm screening against major insect pests in field pea

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Abstract

Among 50 field pea germplasm screened leaf miner, aphid and pod borer were recorded as major insect pests. The population of leaf miner and aphid were observed 20 DAS while pod borer at 50% flowering till harvesting of the crop which ranged in leaf miner, aphid and pod borer from 12.0 to 22.80, 19.33 to 20.80 and 0.17 to 4.47 respectively. Forty eight out of 50 germplasm screened against leaf miner fell under resistant category while two germplasm were found moderately resistant. All the 50 germplasm screened against aphid fell under moderately resistant category. Maximum pod borer population of 4.47/5 plants was found in the germplasm VL 58 and Pant P 195. Lowest population of 0.17 pod borer/ 5 plants was recorded in the germplasm IPFD 12-2 and RG 3.

Keywords: Germplasm, susceptible, screening and resistant

Introduction

In India during 2017 the field pea was grown on an area of 0.90 m ha with production of 0.74 m tonnes and productivity of 8.21 q/ha. In Uttar Pradesh during the year 2017 the total area under pea cultivation was 0.286 m ha, production 0.285 m tonnes and productivity of 9.97 q/ha^[2]. The productivity of pea is low as compared to cereals. One of the main reasons for the low yield is attack by many insect-pests at various stages of the crop. The crop has been recorded to harbour a large number of insect-pests of which *Agrotis* spp. *Plusia aurichalcea*, *Autographa nigrisigna*, *Ophiomyia phaseoli*, *Chromatomyia horticola*, *Aphis craccivora*, *Acyrtosiphum pisum*, *Etiella zinckenella*, and *Helicoverpa armigera* are noteworthy. The crop is attacked by many insect-pests among which pea pod borer and stem fly are serious pests in Uttar Pradesh^[6]. Bijur and Verma (1997)^[5] reported 57 species of insects attacking pea crop with an annual monetary loss of 540 million Indian Rupees. Pea pod borer is a major pest of field pea causing as high as 50.9% pod infestation with 77.64% seed damage resulting in 23.9% loss in the grain yield^[3]. Yadav and Chauhan (2000)^[11] observed that *Etiella zinckenella* caused 3.5% to 30.8% pod damage in pea crop in Uttar Pradesh alone. It is distributed throughout India with particular reference to Uttar Pradesh, Bihar, Madhya Pradesh and Punjab^[8].

As such the studies were undertaken to find out the resistant germplasm of the field pea so as to develop suitable pest management strategies against these major insect pests.

Materials and Methods

A total of 50 germplasm were sown in 2 rows in 2m length in RBD with three replication for screening major insect pests under field conditions on 2nd November, 2017 and all the recommended agronomical practices were used to raise a good crop. Leaf miner population were recorded by damaged leaves/ total leaves on 5 randomly selected plants at weekly interval starting with 20 days after sowing (DAS). Population of aphid were recorded by counting nymphs and adults present on 2.5 cm long top shoots on 5 randomly selected plants at weekly interval starting with 20 DAS visually and also by volumetric method^[4] and were grouped into 4 different categories. Larval population of pod borer was recorded on 5 randomly selected plants at weekly intervals starting with pod initiation till harvest. The genotypes were screened for resistance to leaf miner (RLM) under natural insect infestation, in the field, during spring. Resistance for leaf minor damage in field pea genotypes was rated using a scale of 1-9 as reported.^[10] For screening of pod borer complex range of population was recorded.

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Results and Discussion

The results of Table-1 revealed that the population of leaf miners and aphids each per 5 plants at 20 DAS till harvestation and pod borer/5 plants at 50% flowering till harvestation of field pea crop respectively ranged between 12.0 to 22.80, 19.33 to 20.80 and 0.17 to 4.47. The maximum population of leaf miner was recorded in germplasm T 163 (22.80 leaf miners/ 5 plants) followed by RAU 37 (21.10 leaf miners/5 plants) and minimum (12.0 leaf miners/ 5 plants) in germplasm Pant P 402. The maximum aphid population was recorded in germplasm Prakash, HUDP 1320, IPFD 12-2, Pant P 244 and RPF 2009-2 (20.80 aphids/ 2.5cm long shoot/ 5 plants) followed by RG 3, VL 201, T 163 and KPF 1024 (20.53 aphids/ 2.5cm long shoot/ 5 plants) and minimum population of 19.33 aphids/ 2.5cm long shoot/ 5 plants in germplasm KPMR 400, HUDP 1301, IPFD 13-22, Pant P 200, IPF 13-13, Pant P 213 and IPF 11-15. The maximum pod borer population of 4.47 pod borers/ 5 plants were recorded in germplasm VL 58 and Pant P 195 followed by HPF 12, VL 201 and IPF 13-14 (3.76 pod borers/ 5 plants) where as minimum population of 0.17 pod bore/ 5 plants in germplasm IPFD 12-2 and RG 3. The data given in Table -1 revealed that at 20 DAS till harvesting all the 50 germplasm viz. Prakash, HUDP 15, TRCP 8, HFP 8909, RG 3, HFP 9907, Pant Pea 74, HFP 4, RAU 21, KPMR 400, Adarsh, Vikas, HFP 12, HUDP 1301, HUDP 1302. Pant P 222, Pant P 223, IPFD 13-2, IPFD 13-4, HFP 6, KPMR 928, REP 2009-3, VL 201, NDP 12-102, IPFD 12-8, Pant P 200, HUDP 1209, Pant P 195, IPFD 12-2, KPMR 925, Pant P 402, KPMR 853, RFG 79, VL 59, HFP 5, IPF 13- 14, IPF 13-13, Pant P 244, Pant P 243, KPF 1036, IPF 12-17, KPF 1024, Pmt P 217, KPMR 851, VL 58, Pant P 213, RFP 2009-2 and IPF 11-15 harboured mean aphid population between 12.5-25 and fell under moderately resistant category and none of the germplasm evaluated could find places under the resistant, susceptible and highly susceptible categories. The data given in (Table-1) revealed that at 20 DAS till harvesting 48 out of 50 germplasm viz. Prakash, HUDP 15, TRCP 8, HFP 8909, RG 3, HFP 9907, Pant Pea 74, HFP 4, RAU 21, KPMR 400, Adarsh, Vikas, HFP 12, HUDP 1301, HUDP 1302. Pant P 222, Pant P 223, IPFD 13-2, IPFD 13-4, HFP 6, KPMR 928, REP 2009-3, VL 201, NDP 12-102, IPFD 12-8, Pant P 200, HUDP 1209, Pant P 195, IPFD 12-2, KPMR 925, Pant P 402, KPMR 853, RFG 79, VL 59, HFP 5, IPF 13- 14, IPF 13-13, Pant P 244, Pant P 243, KPF 1036, IPF 12-17, KPF 1024, Pmt P 217, KPMR 851, VL 58, Pant P 213, RFP 2009-2 and IPF 11-15

harboured mines in less than 20% leaflets and were placed under resistant category. However, minimum number of mines (12.00) was recorded in germplasm Pant P 402 while maximum number of mines (22.80) in germplasm T 163. Two germplasm viz. RAU 37 and T 163 respectively harboured 21.10 and 22.80 mines and were found moderately resistant. None of the germplasm evaluated fell under the very highly resistant, highly resistant, intermediate, moderately susceptible, susceptible, highly Susceptible, and very highly susceptible categories. The present study are in contrary with findings of Vishal and Ram (2005) ^[12] who Screened 165 germplasm of pea for resistance to major insect pest pea leaf miner (*Chromatomyia horticola*) and found that on the basis of leaf miner infestation index value only one germplasm (P-9107) proved resistant as it had leaf miner infestation index of 0.20 where as in the present study out of 50 germplasm screened 48 were found resistant and 2 moderately resistant. This is in partial agreement with the Abhilasha and Shekharappa (2017) ^[1] who after screening 15 varieties of pea leaf miner found that *Lyriomyza* spp. and pod borer (*Helicoverpa armigera*, *Lampodius boeticus* and *Cydia nigricana*) the varieties Arka sampurna, A. Aarthika, A. Ajit and GS-10, were found to be moderately resistant with the infestation index of 0.36, 0.39, 0.45 and 0.47 respectively. A. Sampurna found to be moderately resistant to leaf miner and resistant to pod borers. This result is in agreement with the findings in India, of Jayappa and Lingappa (1988) ^[7] who screened 105 cowpea cultivars and found that only IT 97, K-556-6 showed some level of tolerance whereas in the present study all the 50 germplasm were found moderately resistant and none of the germplasm evaluated could find places under the resistant, susceptible and highly susceptible categories. The maximum number of pod borer was recorded in germplasm VL 58 and Pant P 195 (4.47 pod borers/5 plants) followed by HFP 12, VL 201 and IPF 13-14 (3.76 pod borers/ 5 plants) and minimum 0.17 pod borer/ 5 plants in germplasm IPFD 12-2 and RG3 whereas by Abhilasha and Shekharappa (2017) ^[1] after screening of 15 varieties of pea found the minimum per cent pod damage in Emerald 10 (42.53%) followed by classic (41.95%), Arkel (42.53%), NP-20 (43.03%) and maximum per cent of pod damage (49.89%) in variety Sweet pear. The present investigations are supported by the observations of Lalasangi (1984) ^[9] who found that the varieties 52-38, P-869 and MS-90-82/2 had recorded less percentage of pod damage due to pod borers in cow pea.

Table 1: Screening of germplasm against major insect pests of field pea crop during Rabi season, 2017-18

S. No.	Entries	Mean population of insect pest		
		Leaf miners/5 plants (% leaf damages)	Aphids /2.5cm long shoots/5 plants	Larval population of pod borers/5 plants
1.	Prakash	15.26	20.80	0.37
2.	HUDP 15	14.84	19.60	0.93
3.	TRCP 8	15.17	19.87	2.42
4.	HFP 8909	15.35	20.00	3.01
5.	RG 3	19.00	20.53	0.17
6.	HFP 9907	15.87	20.07	0.19
7.	Pant P 74	15.55	19.60	0.37
8.	HFP 4	16.66	19.53	0.37
9.	RAU 21	20.20	20.47	0.93
10.	KPMR 400	15.76	19.33	1.09
11.	Adarsh	14.34	19.60	2.42
12.	Vikash	15.35	19.53	3.01
13.	HFP 12	18.80	20.47	3.76
14.	HUDP 1301	15.76	19.33	0.19
15.	HUDP 1302	14.34	20.80	0.37

16.	Pant P 222	15.35	19.53	0.37
17.	Pant P 223	15.00	20.47	0.93
18.	IPFD 13-2	15.87	19.33	1.09
19.	IPFD 13-4	15.55	19.60	2.42
20.	RAU 37	21.10	19.53	3.01
21.	HFP 6	19.20	19.60	1.09
22.	KPMR 928	14.84	19.87	2.42
23.	RFP 2009-3	15.17	20.00	3.01
24.	VL 201	15.35	20.53	3.76
25.	NDP 12-102	15.26	19.53	0.18
26.	IPFD 12-18	14.84	20.47	1.18
27.	Pant P 200	12.17	19.33	2.20
28.	HUDP 1209	15.35	19.60	2.37
29.	Pant P 195	15.00	19.53	4.47
30.	IPFD 12-2	15.87	20.80	0.17
31.	KPMR 925	15.55	19.60	0.19
32.	Pant P 402	12.00	19.87	0.37
33.	KPMR 853	15.55	20.00	0.37
34.	T 163	22.80	20.53	0.93
35.	RFG 79	14.34	20.07	1.09
36.	VL 59	15.35	19.60	2.42
37.	HFP 5	18.84	19.53	3.01
38.	IPF 13-14	15.17	20.47	3.76
39.	IPF 13-13	15.35	19.33	0.19
40.	Pant 244	15.26	20.80	0.37
41.	Pant 243	14.84	19.60	0.37
42.	KPF 1036	15.17	19.87	0.93
43.	IPF 12-17	15.35	20.00	0.18
44.	KPF 1024	14.34	20.53	1.18
45.	Pmt P 217	15.35	19.60	2.20
46.	KPMR 851	14.84	19.53	2.37
47.	VL 58	15.26	20.47	4.47
48.	Pant P 213	14.84	19.33	0.93
49.	RFP 2009-2	15.17	20.80	0.18
50.	IPF 11-15	15.35	19.33	1.18

Conclusion

Forty eight out of 50 germplasm screened against leaf miners were found resistant and two moderately resistant. Minimum population of 12.0 leaf miners/5 plants were found in germplasm Pant P 402. All the 50 germplasm screened against aphid fell under moderately resistant category. Seven pea germplasm screened against aphid were least effective with 19.33 aphids/2.5cm long shoot/ 5 plants. Pod borer population ranged between 0.17-4.47 pod borer/5 plants. Minimum population of 0.17 pod borer/5 plants were found in germplasm IPFD12-2 and RG 3 while maximum of 4.47 borers/5 plants in germplasm VL 58 and Pant P 195.

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