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Evaluating Field Pea Genotypes for Resistance against Key Insect Pests

Bhavna Chouhan [a++], Deepali Vishwakarma [b#*], Sanju Singh [c†], Shreya Soneshwar [d#], Rajkumar Bajya [e#], Kailash Kumar [f] and A. K. Bhowmick [g‡]

[a] Madhya Pradesh State Rural Livelihood Mission Bhopal, (Govt. of M.P.), 462027, India.
[b] Department of Entomology, RVSKVV, Madhya Pradesh, 474002, India.
[c] Department of Agriculture, Fatehpur, (Govt. of U.P). 212601, India.
[d] Department of Entomology, Sardar Vallabh Bhai Patel University of Agriculture & Technology, Meerut, Uttar Pradesh, 250110, India.
[e] Department of Entomology, SKNAU, Jobner, 303328, Rajasthan, 303328. India.
[f] Department of Forestry, College of Agriculture, JNKVV, Jabalpur, M.P.482004. India.
[g] Department of Entomology, Jawahar Lal Nehru Krishi Vishwa Vidyalaya, Jabalpur, Madhya Pradesh, 482004, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

In the rabi season of 2020-21, a field trial was executed at the Breeder Seed Production Farm, JNKVV, Jabalpur, M.P., aimed at assessing the resistance of 71 field pea genotypes against Aphid, Leaf hopper, and Gram pod Borer. Through weekly observations and subsequent statistical

[++] Young Professionals;
[#] Research Scholar;
[†] Technical Assistant;
[‡] Retired Professor and Head;
**Corresponding author: E-mail: 97deepalivishwakarma@gmail.com;*

analysis, genotypes were categorized into distinct resistance groups. Prominent findings revealed that JP-180, Matar Rangpur, and Aman 1-206 exhibited high resistance to aphids and pod borers. Additionally, Kashi Samriddhi, JP-180, and Matar Rangpur demonstrated resistance to leafhoppers. Conversely, B-22, DDR-39, and KPMR-485 displayed high susceptibility to Aphids, while Batri patiram, VL-3, and VL-3 were highly susceptible to Gram pod borer. KPMR-485, VL-3, and VL-1 were found to be susceptible to both Aphid and Gram pod borer. The study further revealed that the genotype KPMR-485 achieved the highest pea yield, closely followed by Jayanti and IPF-99-25. In contrast, Safed Batra Gudda, Matar Rangpur, and Aman 1-206 exhibited the minimum yield. These findings provide valuable insights into the resistance patterns of field pea genotypes, aiding in the selection of cultivars with enhanced resistance and productivity for sustainable agricultural practices.

Keywords: Screening; resistance; susceptible; yield; aphid; pod borer; leafhopper.

1. INTRODUCTION

Field pea, a diploid crop that undergoes self-pollination, holds significant agricultural importance as a high-quality protein source. This annual crop is predominantly cultivated in cooler temperate zones and tropical highlands globally. While versatile in adapting to various soil types, ranging from light sandy loam to heavy clays, it is sensitive to both saline and waterlogged conditions [1,2].

Field peas boast a rich content of high-quality vegetable protein, encompassing all essential amino acids. While sulfur-containing amino acids like cysteine and methionine are relatively scarce, field peas are abundant in lysine and other essential amino acids. With a protein content ranging from 23% to 25%, field peas serve as a valuable source of essential amino acids, providing substantial nutritional benefits, particularly for low-income families [3].

Moreover, peas are a plentiful source of essential minerals, including calcium, phosphorus, and iron—nutrients that are often deficient in cereals [4,5,6]. Globally, peas serve as a significant export and cash crop, contributing to approximately 40% of the total world pulse trade. Notably, peas have the unique ability to fix atmospheric nitrogen, making it available for the crop, further enhancing their agricultural value [7-10].

Field peas are commonly integrated into forage crop mixtures alongside small grains. The protein content in field pea forage typically falls within the range of 18-20%. When inter-seeded at a rate of 60-100 pounds per acre with a small grain like oats, field peas can enhance the protein concentration of the mixed forage by 2-4% points, thereby elevating the relative feed value by 20 points [11-14].

Insect pests pose significant biotic challenges, leading to substantial global losses. Notably, pests such as pea leaf miner (Chromatomyia horticola Goureau), pea aphid (Acrythosiphon pissum), pod borer complex (Helicoverpa armigera (H), Lampides boeticus (L), and (Etiella zinckenella Tr.), and thrips (Caliothrips indicus Bagnall) are prominent among these constraints, causing considerable damage to the crop [15-19].

The American bollworm, H. armigera, is a widely distributed pest with a global presence in Africa, Asia, Europe, and Australia. Among its host plants is the field pea, where the larvae inflict damage by creating circular holes in pea pods, directly feeding on the seeds [20-24]. This feeding behavior often leads to substantial seed damage.

The pea aphid (Acyrthosiphon pissum), commonly found in field pea crops, is a small insect measuring approximately 3 millimeters (1/8 inches) in length. It has a light green color and long legs, and individuals may either be wingless or possess prominent, translucent wings. By extracting sap from the plant, the pea aphid weakens the field pea directly. When aphids feed on peas during the early pod stage, it can result in reduced yields due to diminished seed formation and smaller seed size. Although protein content and other quality aspects do not seem to be affected, the overall health and productivity of the plant are compromised.

2. MATERIALS AND METHODS

The experiment was carried out at the Experimental Field of the Department of Plant Breeding, Seed Breeding Farm, JNKVV Jabalpur (MP) during the Rabi season of 2020-21. A Randomized Block Design (RBD) was employed,

with a plot size of 10x10 and three replications, incorporating 71 genotypes. The spacing maintained was 30x10 cm. Throughout the growing season, no pesticidal treatment was administered to the crop. Regular observations were conducted during various weather weeks to document the density of major insect pests affecting field pea, namely Pea Aphids (Acyrthosiphon pissum), Pod Borer (Helicoverpa armigera H.), and Leaf Hopper (Empoasca fabae).

The sample unit for recording the density of sucking pests, such as aphids, was defined as the top 10 cm apical twig of the sample plant. Five plants were randomly selected from each plot, and observations were recorded weekly. Pest population assessments were conducted at different crop stages during varying weather weeks. Weekly observations were made to record borer density, sucking insect pests like aphids, pod damage (%), and pea yields under different treatments. The collected data were tabulated into transformed values and subjected to statistical analysis using the Analysis of Variance technique at a 5% level of significance.

3. RESULT AND DISCUSSION

71 genotypes of pea, were screened for relative resistance to major sucking insect pests during the year, 2020-21. The infestation was recorded at weekly interval on five randomly selected and tagged plants just after initiation of sucking insect pests to disappearance.

3.1 Aphid

The first observation recorded on 30 DAS. The mean aphid population ranged from 8.08 (B-22) to 16.35 (IPF-99-25(Local check) /10 cm apical twigs/ plant. The minimum infestation was observed on genotype B-22 followed by KPMR-420, IPF-99-25, P-3, Batri patiram, VL-3, VL-1, KPMR-485, Jayanti, DDR-39 which were statistically at par with each other. The maximum infestation was observed on genotype IPF-99-25 (Local check) followed by Safed Batra gudda, Demo-JP-180, JP-885 (local check), Matar Rangpur, Double Branching, Aman 1-206, Kashi Samriddhi, JPMR-402 and NDVP-20. These were statistically significant in degree of infestation with IPF-99-25 (Local check).

Based on overall mean population of the season on different genotypes of pea, it was minimum on genotype B-22 (19.57 aphid/ 10 cm apical twigs) followed by DDR-39, KPMR-485, JFP-99-25, VL-3, Jayanti, KPMR-420, Shikha, P-3, Batri patiram, VL-1, these were found at par with each other (except B-22). The maximum population of aphid was recorded in the genotype Double branching (31.15 aphid/ 10 cm apical twigs) followed by Demo-JP-180, Safed Batra Gudda, Double branching, Matar Rangpur, NDVP-20, IPF-99-25 (local check), Aman 1-206 and KPMR-402, which were found at par with each other.

Present findings also supported with the findings of Wale (2002) Identified *Acyrthosiphon pissum* (Harris), a pea aphid that was once a minor pest in Ethiopia, has recently emerged as a major pest of field pea (*Pisum sativum* L.) in the northwestern region. Field experiments were performed in Adet and Zema in northwestern Ethiopia in 1994, 1995, and 1996 to determine the pest's population dynamics. In May, June, and July, planting dates were spaced 15 days apart. In August, aphid colonies at Adet were at their peak. In both 1994 and 1995, weekly counts of pea aphid numbers peaked in late August, and in mid- to late-August in 1996. In 1995, a delay in sowing date resulted in a large increase in pea aphid numbers, and a nearly identical increase in 1996.

3.2 Leaf Hopper

The first observation was taken on 24th December. The mean leaf hopper population ranged from 0.22 (KPMR-420) to 2.62 (Demo-JP-180) leaf hopper/six leaves/ plant. The

Table 1. Categorization of pea genotypes into degree of susceptibility against Aphid

S. No.	Mean aphid population/ 10 cm apical twigs	Name of genotypes	Category
1	19.57-24.02	B-22, DDR-39, KPMR-485, JFP-99-25, VL-3, Jayanti, KPMR-420, Shikha, P-3, Batri Patiram and VL-1	Least susceptible
2	24.16-25.18	IPF-99-25, SPS-2, KPMR-30, NDVP-4, PP-14, Dhanoli Batri, Kala matar, HUVP-2, DDR-43, DDR-27, KPMR-503, PP-155, NDVP-20, Chhoti safed Anju, Atru matar, LEP-260, PP-96, JFP-27, PP-96, KFP-151, PP-86, HUVP-12, DDP 94-14, Batana Moolchand, Kashmiri samriddhi, DDR-44, Gol Batra Tenduna, DDR-23, DDR-54, Late sown, Dhan Batri, Rachna, HUP-2, HFP-94-12, KPMR-327, KPMR-504, RP-3, JM-91-01, KPMR-402, DDR-52, KPMR-302, Kali Batri, KPMR-400, KPMR-486 and HFP-94-13	Moderately susceptible
3	>25.18	Triple branching, Demo-JP-180, Safed Batra Gudda, Double branching, Kashi samriddhi, Matar Rangpur, NDVP-20, IPF-99-25 (Local check), Aman 1-206, KPMR-402 and JP-885 (local check)	Highly susceptible

minimum infestation was observed on genotype, KPMR-420 followed by KPMR-485, VL-1, B-22, DDR-39, Batri patiram, IPF-99-25, Jayanti, Shikha, P-3, VL-3, and these were statistically at par with each other. The maximum infestation was observed on genotype Demo-JP-180 followed by Kashi samriddhi, Double branching, Aman 1-206, Matar rangpur, NDVP-20, Safed Batra Gudda and KPMR-402 were found at par with each other.

Based on the overall mean population of the season on different genotypes of a pea, it was minimum on genotypes KPMR-485 (1.73 leaf hopper/six leaves) followed by VL-3, KPMR-420, VL-1, Shikha, Jayanti, B-22, Batri patiram, DDR-39, JFP-99-25 and P-3, these were found at par with each other. The maximum population of leaf hopper was recorded in the genotypes Kashi samriddhi (4.13 leaf hopper/six leaves) followed by Demo-JP-180, Double branching, Matar Rangpur, Triple branching, Aman 1-206, NDVP-20, Safed Batra Gudda and KPMR-402, which were found at par with each other. The average population data of leafhoppers revealed that all genotypes differed from one another in terms of population leafhopper/six leaves/plant. Among the screened genotypes **t**he highest population of leaf hopper was recorded in genotype Kashi samriddhi followed by JP-180, matar rangpur while minimum was recorded in genotype KPMR-485 followed by VL-3, VL-1. The genotype KPMR-485 was superior amongst all concerning the lowest leafhopper population.

3.2 Pod borer, *Helicoverpa armigera*

The first observation was recorded on 17th December, 2021. The mean *Helicoverpa* population ranged from 0.31 (KPMR-485) to 2.55 (Double branching) / plant. The minimum infestation was observed on genotype KPMR-485 followed by KPMR-420, VL-1, Batri patiram, JFP-99-25, Jayanti, B-22, DDR-39, P-3, Shikha, and VL-3 which was statistically at par with each other. The maximum infestation was observed on genotype Double branching followed by Triple branching, NDVP-20, KPMR-402, Matar Rangpur, Safed Batra Gudda, Aman 1-206, Kashi samriddhi and Demo-JP-180. These were statistically at par with each other in degree of infestation.

Based on the overall mean population of the season on different genotypes of pea, it was minimum on genotypes Batri patiram (0.14 *Helicoverpa /*plant) followed by KPMR-485, Jayanti, KPMR-420, JFP-99-25, B-22, DDR-39, Shikha, P-3, VL-3, these were found at par with each other. The maximum population of *helicoverpa* was recorded in the genotypes Matar Rangpur (1.21 *Helicoverpa*/ plant) followed by Double branching, Triple branching, Aman 1-206, Kashi samriddhi, Safed Batra Gudda, Demo-JP-180, NDVP-20 and KPMR-402, which were found at par with each other.

The average population data of pod borer revealed that all genotypes differed from one another in terms of the population of aphid/10cm apical twigs/plant. Among the screened genotypes the highest population of pod borer was recorded in genotype Matar rangpur followed by double branching, Aman1-206 while the minimum was recorded in genotype Batri patiram followed by VL-3, VL-3.

3.4 Pod Damage (%)

The minimum pod damage was recorded in genotypes KPMR-485 (2.24%) followed by genotypes B-22, KPMR-420, VL-3, DDR-39, P-3, IPF-99-25, Batri patiram, Shikha, Jayanti and VL-1, these treatments observed at par each other (except Jayanti and VL-1) as well as best in reducing the percentage of pod damage due to pod borer. The maximum infestation of by-pod borer in genotype Matar Rangpur (8.14%) followed by KPMR-402, Kashi samriddhi, NDVP-20, Aman 1-206, Triple branching, Safed Batra Gudda, Demo-JP-180, Double branching in pod damage, these treatments had remained at par with each other.

3.5 Seed Yield of Pea

The seed yield of different genotypes of field pea were observed to range from 1023 kg/ha (Safed Batra Gudda) to 1699 kg/ha (KPMR-485). Based on mean yield of pea on different genotypes of pea, was maximum seed yield 1699(kg/ha)on genotype (KPMR-485) followed by Batri patiram (1620 kg/ha), Jayanti (1611 kg/ha), IPF-99-25 (1285 kg/ha), Shikha (1599 kg/ha), KPMR-420 (1597 kg/ha), VL-1 (1588 kg/ha), VL-3 (1568 kg/ha), P-3 (1532kg/ha), DDR-39 (1514 kg/ha), and B-22 (1412kg/ha) these were found at par with each other (except KPMR-485). The minimum yield of pea was recorded in the genotypes Safed Batra Gudda (1023kg/ha) followed by Aman 1-206 (1065 kg/ha), Kashi samriddhi (1310 kg/ha), Double branching (1095 kg/ha), Matar Rangpur (1095 kg/ha), Demo-JP-180 (1100 kg/ha), Triple branching (1119 kg/ha), KPMR-402 (1165 kg/ha) and NDVP-20 (1169 kg/ha), which were found at par with each other (except KPMR-402).

Table 2. Screening of different genotypes of field pea against aphid of pea

Genotypes	Population of aphid/ 10 cm apical twigs/plant												
	30 DAS	38 DAS	47 DAS	54 DAS	61 DAS**	68 DAS	75 DAS	81 DAS	89 DAS	95 DAS	103 DAS	107 DAS	Mean
IPF-99-25	0.00	10.25	28.15	37.21	56.21	51.28	26.01	20.77	18.69	5.45	4.52	2.39	23.09
	(0.71)	**(3.28)**	**(5.35)**	**(6.14)**	**(7.53)**	**(7.20)**	**(5.15)**	**(4.61)**	**(4.38)**	**(2.44)**	**(2.24)**	**(1.70)**	**(4.86)**
B-22	0.00	8.08	26.10	34.25	50.25	48.62	20.05	14.72	12.55	3.32	2.44	0.36	19.57
	(0.71)	**(2.93)**	**(5.16)**	**(5.89)**	**(7.12)**	**(7.01)**	**(4.53)**	**(3.90)**	**(3.61)**	**(1.95)**	**(1.71)**	**(0.93)**	**(4.48)**
DDR-27	0.00	10.25	28.24	37.24	57.24	52.31	27.06	21.76	19.92	6.68	5.79	3.66	23.87
	(0.71)	**(3.28)**	**(5.36)**	**(6.14)**	**(7.60)**	**(7.27)**	**(5.25)**	**(4.72)**	**(4.52)**	**(2.68)**	**(2.51)**	**(2.04)**	**(4.94)**
PP-155	0.00	10.35	28.39	37.39	57.39	52.46	27.19	21.92	19.81	6.57	5.60	3.47	23.91
	(0.71)	**(3.29)**	**(5.37)**	**(6.16)**	**(7.61)**	**(7.28)**	**(5.26)**	**(4.73)**	**(4.51)**	**(2.66)**	**(2.47)**	**(1.99)**	**(4.94)**
Kashmiri samriddhi	0.00	11.00	29.15	38.15	58.15	53.22	27.99	22.75	20.55	7.31	6.40	4.21	24.66
	(0.71)	**(3.39)**	**(5.45)**	**(6.22)**	**(7.66)**	**(7.33)**	**(5.34)**	**(4.82)**	**(4.59)**	**(2.79)**	**(2.63)**	**(2.17)**	**(5.02)**
DDR-43	0.00	10.35	28.35	37.35	57.31	52.38	27.11	21.82	19.71	6.47	5.58	3.49	23.86
	(0.71)	**(3.29)**	**(5.37)**	**(6.15)**	**(7.60)**	**(7.27)**	**(5.25)**	**(4.72)**	**(4.50)**	**(2.64)**	**(2.47)**	**(2.00)**	**(4.94)**
DDR-44	0.00	11.10	29.16	38.16	58.11	53.18	27.92	22.61	20.55	7.33	6.42	4.33	24.67
	(0.71)	**(3.41)**	**(5.45)**	**(6.22)**	**(7.66)**	**(7.33)**	**(5.33)**	**(4.81)**	**(4.59)**	**(2.80)**	**(2.63)**	**(2.20)**	**(5.02)**
DDR-39	0.00	8.12	26.08	34.08	54.18	47.25	23.98	18.59	16.49	3.65	2.70	0.54	20.81
	(0.71)	**(2.94)**	**(5.16)**	**(5.88)**	**(7.39)**	**(6.91)**	**(4.95)**	**(4.37)**	**(4.12)**	**(2.04)**	**(1.79)**	**(1.02)**	**(4.62)**
Late sown	0.00	11.14	29.29	38.29	58.33	53.40	28.16	22.71	20.55	7.31	6.42	4.29	24.76
	(0.71)	**(3.41)**	**(5.46)**	**(6.23)**	**(7.67)**	**(7.34)**	**(5.35)**	**(4.82)**	**(4.59)**	**(2.79)**	**(2.63)**	**(2.19)**	**(5.03)**
DDR-23	0.00	11.21	29.22	38.22	58.26	53.33	28.14	22.69	20.56	7.32	6.42	4.29	24.74
	(0.71)	**(3.42)**	**(5.45)**	**(6.22)**	**(7.67)**	**(7.34)**	**(5.35)**	**(4.82)**	**(4.59)**	**(2.80)**	**(2.63)**	**(2.19)**	**(5.02)**
HUP-2	**0.00**	**10.95**	**28.99**	**37.99**	**58.62**	**53.69**	**28.40**	**23.16**	**21.03**	**7.79**	**6.88**	**4.75**	**24.94**
	(0.71)	**(3.38)**	**(5.43)**	**(6.20)**	**(7.69)**	**(7.36)**	**(5.38)**	**(4.86)**	**(4.64)**	**(2.88)**	**(2.72)**	**(2.29)**	**(5.04)**
DDP94-14	**0.00**	**10.99**	**29.05**	**38.10**	**58.10**	**53.17**	**27.88**	**22.59**	**20.49**	**7.25**	**6.36**	**4.23**	**24.60**
	(0.71)	**(3.39)**	**(5.44)**	**(6.21)**	**(7.66)**	**(7.33)**	**(5.33)**	**(4.81)**	**(4.58)**	**(2.78)**	**(2.62)**	**(2.17)**	**(5.01)**
HUVP-2	**0.00**	**10.11**	**28.26**	**37.29**	**57.29**	**52.36**	**27.07**	**21.78**	**19.69**	**6.45**	**5.56**	**3.43**	**23.79**
	(0.71)	**(3.26)**	**(5.36)**	**(6.15)**	**(7.60)**	**(7.27)**	**(5.25)**	**(4.72)**	**(4.49)**	**(2.64)**	**(2.46)**	**(1.98)**	**(4.93)**
KPMR-402	**0.00**	**14.21**	**33.39**	**42.39**	**63.69**	**57.62**	**33.47**	**29.18**	**27.11**	**10.28**	**9.39**	**6.26**	**28.93**
	(0.71)	**(3.84)**	**(5.82)**	**(6.55)**	**(8.01)**	**(7.62)**	**(5.83)**	**(5.45)**	**(5.25)**	**(3.28)**	**(3.14)**	**(2.60)**	**(5.43)**
NDVP-20	**0.00**	**13.25**	**34.29**	**43.31**	**65.36**	**59.34**	**35.14**	**30.85**	**28.72**	**9.48**	**8.57**	**5.44**	**29.42**
	(0.71)	**(3.71)**	**(5.90)**	**(6.62)**	**(8.12)**	**(7.74)**	**(5.97)**	**(5.60)**	**(5.41)**	**(3.16)**	**(3.01)**	**(2.44)**	**(5.47)**
Atru matar	**0.00**	**10.25**	**28.29**	**37.33**	**57.33**	**52.40**	**27.11**	**22.82**	**20.69**	**6.59**	**5.67**	**3.54**	**24.02**
	(0.71)	**(3.28)**	**(5.37)**	**(6.15)**	**(7.60)**	**(7.27)**	**(5.25)**	**(4.83)**	**(4.60)**	**(2.66)**	**(2.48)**	**(2.01)**	**(4.95)**
Triple branching	**0.00**	**14.82**	**34.98**	**43.98**	**66.98**	**62.05**	**39.77**	**34.48**	**32.35**	**9.62**	**8.70**	**5.24**	**31.15**
	(0.71)	**(3.91)**	**(5.96)**	**(6.67)**	**(8.21)**	**(7.91)**	**(6.35)**	**(5.91)**	**(5.73)**	**(3.18)**	**(3.03)**	**(2.40)**	**(5.63)**
Double Branching	**0.00**	**14.96**	**33.98**	**42.98**	**67.28**	**62.35**	**37.11**	**31.82**	**29.95**	**8.71**	**7.79**	**4.66**	**30.21**
	(0.71)	**(3.93)**	**(5.87)**	**(6.59)**	**(8.23)**	**(7.93)**	**(6.13)**	**(5.69)**	**(5.52)**	**(3.03)**	**(2.88)**	**(2.27)**	**(5.54)**
SPS-2	**0.00**	**10.50**	**28.52**	**37.52**	**57.00**	**52.07**	**26.81**	**21.52**	**19.39**	**5.16**	**4.24**	**2.11**	**23.45**
	(0.71)	**(3.32)**	**(5.39)**	**(6.17)**	**(7.58)**	**(7.25)**	**(5.23)**	**(4.69)**	**(4.46)**	**(2.38)**	**(2.18)**	**(1.62)**	**(4.89)**
JM-91-01	**0.00**	**11.75**	**29.75**	**38.75**	**58.75**	**53.92**	**28.53**	**23.24**	**21.11**	**7.87**	**6.95**	**3.82**	**25.18**
	(0.71)	**(3.50)**	**(5.50)**	**(6.26)**	**(7.70)**	**(7.38)**	**(5.39)**	**(4.87)**	**(4.65)**	**(2.89)**	**(2.73)**	**(2.08)**	**(5.07)**
P-3	**0.00**	**8.88**	**26.88**	**34.88**	**54.88**	**48.95**	**24.66**	**19.12**	**16.99**	**3.79**	**2.80**	**0.62**	**21.44**
	(0.71)	**(3.06)**	**(5.23)**	**(5.95)**	**(7.44)**	**(7.03)**	**(5.02)**	**(4.43)**	**(4.18)**	**(2.07)**	**(1.82)**	**(1.06)**	**(4.68)**
RP-3	**0.00**	**10.75**	**28.75**	**37.75**	**57.75**	**52.82**	**27.53**	**24.62**	**22.49**	**9.25**	**8.33**	**5.12**	**25.16**
	(0.71)	**(3.35)**	**(5.41)**	**(6.18)**	**(7.63)**	**(7.30)**	**(5.29)**	**(5.01)**	**(4.79)**	**(3.12)**	**(2.97)**	**(2.37)**	**(5.07)**
VL-3	**0.00**	**8.65**	**26.65**	**34.65**	**54.65**	**48.54**	**24.43**	**18.14**	**16.01**	**3.65**	**2.79**	**0.69**	**21.13**
	(0.71)	**(3.02)**	**(5.21)**	**(5.93)**	**(7.43)**	**(7.00)**	**(4.99)**	**(4.32)**	**(4.06)**	**(2.04)**	**(1.81)**	**(1.09)**	**(4.65)**
JFP-27	**0.00**	**10.76**	**28.76**	**37.76**	**57.76**	**52.83**	**27.54**	**22.25**	**20.12**	**6.88**	**5.96**	**3.84**	**24.27**
	(0.71)	**(3.36)**	**(5.41)**	**(6.19)**	**(7.63)**	**(7.30)**	**(5.30)**	**(4.77)**	**(4.54)**	**(2.72)**	**(2.54)**	**(2.08)**	**(4.98)**
PP-86	**0.00**	**11.01**	**29.01**	**38.01**	**58.01**	**53.08**	**27.79**	**22.50**	**20.37**	**7.13**	**6.21**	**4.11**	**24.52**

Genotypes	Population of aphid/ 10 cm apical twigs/plant												
	30 DAS	38 DAS	47 DAS	54 DAS	61 DAS**	68 DAS	75 DAS	81 DAS	89 DAS	95 DAS	103 DAS	107 DAS	Mean
	(0.71)	(3.39)	(5.43)	(6.21)	(7.65)	(7.32)	(5.32)	(4.80)	(4.57)	(2.76)	(2.59)	(2.15)	(5.00)
NDVP-4	0.00	10.05	28.09	37.09	57.09	52.16	26.87	21.58	19.45	6.21	5.29	3.16	23.59
	(0.71)	(3.25)	(5.35)	(6.13)	(7.59)	(7.26)	(5.23)	(4.70)	(4.47)	(2.59)	(2.41)	(1.91)	(4.91)
NDVP-20	0.00	9.65	27.69	37.69	57.65	52.77	27.43	22.14	20.14	6.90	5.98	3.85	23.97
	(0.71)	(3.19)	(5.31)	(6.18)	(7.63)	(7.30)	(5.28)	(4.76)	(4.54)	(2.72)	(2.55)	(2.09)	(4.95)
KFP-151	0.00	9.99	27.99	37.99	58.22	53.36	28.00	22.69	20.59	7.35	6.43	4.30	24.41
	(0.71)	(3.24)	(5.34)	(6.20)	(7.66)	(7.34)	(5.34)	(4.82)	(4.59)	(2.80)	(2.63)	(2.19)	(4.99)
HUVP-12	0.00	10.14	28.15	38.15	58.34	53.41	28.12	22.83	20.73	7.49	6.57	4.44	24.54
	(0.71)	(3.26)	(5.35)	(6.22)	(7.67)	(7.34)	(5.35)	(4.83)	(4.61)	(2.83)	(2.66)	(2.22)	(5.00)
LEP-260	0.00	10.62	28.71	37.71	57.61	52.68	27.39	22.10	19.98	6.79	5.87	3.74	24.16
	(0.71)	(3.33)	(5.40)	(6.18)	(7.62)	(7.29)	(5.28)	(4.75)	(4.53)	(2.70)	(2.52)	(2.06)	(4.97)
Dhanoli Batri	0.00	9.35	27.33	37.33	57.39	52.46	27.17	21.95	19.82	6.59	5.66	3.53	23.66
	(0.71)	(3.14)	(5.28)	(6.15)	(7.61)	(7.28)	(5.26)	(4.74)	(4.51)	(2.66)	(2.48)	(2.01)	(4.92)
Gol Batra Tenduna	0.00	9.66	27.69	38.69	58.62	53.69	28.64	24.00	21.87	7.16	6.29	4.16	24.68
	(0.71)	(3.19)	(5.31)	(6.26)	(7.69)	(7.36)	(5.40)	(4.95)	(4.73)	(2.77)	(2.61)	(2.16)	(5.02)
Matar Rangpur	0.00	15.35	34.05	43.05	65.05	60.05	34.88	30.59	28.49	10.25	8.33	5.10	29.69
	(0.71)	(3.98)	(5.88)	(6.60)	(8.10)	(7.78)	(5.95)	(5.58)	(5.38)	(3.28)	(2.97)	(2.37)	(5.49)
Kashi samriddhi	0.00	14.22	33.85	42.85	66.81	61.57	36.61	31.32	29.35	10.16	8.64	5.29	30.15
	(0.71)	(3.84)	(5.86)	(6.58)	(8.20)	(7.88)	(6.09)	(5.64)	(5.46)	(3.26)	(3.02)	(2.41)	(5.54)
Kala matar	0.00	10.20	28.25	37.25	57.25	52.32	27.03	21.74	19.61	6.37	5.45	3.32	23.75
	(0.71)	(3.27)	(5.36)	(6.14)	(7.60)	(7.27)	(5.25)	(4.72)	(4.48)	(2.62)	(2.44)	(1.95)	(4.92)
KPMR-503	0.00	10.36	28.39	37.39	57.39	52.46	27.17	21.88	19.75	6.51	5.59	3.46	23.89
	(0.71)	(3.30)	(5.37)	(6.16)	(7.61)	(7.28)	(5.26)	(4.73)	(4.50)	(2.65)	(2.47)	(1.99)	(4.94)
DDR-52	0.00	11.71	29.75	38.75	58.75	53.82	28.53	23.24	21.11	7.87	6.95	4.82	25.25
	(0.71)	(3.49)	(5.50)	(6.26)	(7.70)	(7.37)	(5.39)	(4.87)	(4.65)	(2.89)	(2.73)	(2.31)	(5.07)
DDR-54	0.00	11.24	29.25	38.25	58.25	53.32	28.03	22.74	20.61	7.37	6.45	4.32	24.76
	(0.71)	(3.43)	(5.45)	(6.22)	(7.66)	(7.34)	(5.34)	(4.82)	(4.59)	(2.81)	(2.64)	(2.20)	(5.03)
PP-96	0.00	10.75	28.74	37.74	57.74	52.81	27.52	22.23	20.10	6.86	5.94	3.81	24.25
	(0.71)	(3.35)	(5.41)	(6.18)	(7.63)	(7.30)	(5.29)	(4.77)	(4.54)	(2.71)	(2.54)	(2.08)	(4.97)
KPMR-30	0.00	9.92	27.96	36.96	56.96	52.03	26.74	21.45	19.32	6.08	5.16	3.10	23.47
	(0.71)	(3.23)	(5.33)	(6.12)	(7.58)	(7.25)	(5.22)	(4.69)	(4.45)	(2.57)	(2.38)	(1.90)	(4.90)
JFP-99-25	0.00	8.98	26.68	34.68	53.68	48.69	23.46	18.22	16.95	3.69	2.77	0.63	21.12
	(0.71)	(3.08)	(5.21)	(5.93)	(7.36)	(7.01)	(4.89)	(4.33)	(4.18)	(2.05)	(1.81)	(1.06)	(4.65)
PP-96	0.00	10.35	28.35	37.35	57.35	52.42	27.13	21.91	21.51	8.27	7.35	4.29	24.39
	(0.71)	(3.29)	(5.37)	(6.15)	(7.61)	(7.27)	(5.26)	(4.73)	(4.69)	(2.96)	(2.80)	(2.19)	(4.99)
PP-14	0.00	9.67	27.67	36.67	56.67	51.74	26.45	21.35	20.26	7.02	6.15	4.02	23.61
	(0.71)	(3.19)	(5.31)	(6.10)	(7.56)	(7.23)	(5.19)	(4.67)	(4.56)	(2.74)	(2.58)	(2.13)	(4.91)
Aman1-206	0.00	14.25	33.25	42.25	63.65	58.71	34.55	30.26	28.13	9.89	8.97	5.47	29.14
	(0.71)	(3.84)	(5.81)	(6.54)	(8.01)	(7.69)	(5.92)	(5.55)	(5.35)	(3.22)	(3.08)	(2.44)	(5.44)
Demo-JP-180	0.00	15.66	35.66	44.66	66.64	61.46	37.42	33.13	31.00	10.24	9.32	5.62	31.04
	(0.71)	(4.02)	(6.01)	(6.72)	(8.19)	(7.87)	(6.16)	(5.80)	(5.61)	(3.28)	(3.13)	(2.47)	(5.62)
Chhoti safed Anju	0.00	10.32	28.32	37.32	57.32	52.39	27.10	22.18	20.05	6.81	5.89	3.76	23.98
	(0.71)	(3.29)	(5.37)	(6.15)	(7.60)	(7.27)	(5.25)	(4.76)	(4.53)	(2.70)	(2.53)	(2.06)	(4.95)
Batana Moolchand	0.00	10.28	28.28	37.28	57.28	52.35	27.06	23.77	21.64	8.40	7.48	5.35	24.62
	(0.71)	(3.28)	(5.36)	(6.15)	(7.60)	(7.27)	(5.25)	(4.93)	(4.71)	(2.98)	(2.82)	(2.42)	(5.01)
Batri patiram	0.00	8.75	26.75	35.75	54.67	49.71	24.45	19.16	17.03	3.56	2.69	0.53	21.48
	(0.71)	(3.04)	(5.22)	(6.02)	(7.43)	(7.09)	(4.99)	(4.43)	(4.19)	(2.01)	(1.79)	(1.01)	(4.69)
Rachna	0.00	10.62	28.69	37.69	57.69	52.76	27.47	24.18	23.50	8.26	7.34	4.29	24.93
	(0.71)	(3.33)	(5.40)	(6.18)	(7.63)	(7.30)	(5.29)	(4.97)	(4.90)	(2.96)	(2.80)	(2.19)	(5.04)
Shikha	0.00	8.65	26.71	35.71	54.71	49.72	24.15	18.86	16.73	3.49	2.69	0.56	21.39
	(0.71)	(3.02)	(5.22)	(6.02)	(7.43)	(7.09)	(4.96)	(4.40)	(4.15)	(2.00)	(1.79)	(1.03)	(4.68)
KPMR-420	0.00	9.10	27.15	36.15	55.15	48.65	23.93	18.64	16.51	3.27	2.35	0.22	21.35
	(0.71)	(3.10)	(5.26)	(6.05)	(7.46)	(7.01)	(4.94)	(4.37)	(4.12)	(1.94)	(1.69)	(0.85)	(4.67)

Genotypes	Population of aphid/ 10 cm apical twigs/plant												
	30 DAS	38 DAS	47 DAS	54 DAS	61 DAS**	68 DAS	75 DAS	81 DAS	89 DAS	95 DAS	103 DAS	107 DAS	Mean
KPMR-402	0.00	10.35	28.14	37.14	57.14	52.21	26.92	26.63	24.50	9.14	8.22	5.68	25.20
	(0.71)	(3.29)	(5.35)	(6.14)	(7.59)	(7.26)	(5.24)	(5.21)	(5.00)	(3.10)	(2.95)	(2.49)	(5.07)
KPMR-327	0.00	10.39	28.39	37.40	57.40	52.47	27.18	25.84	23.88	8.69	7.77	5.92	25.14
	(0.71)	(3.30)	(5.37)	(6.16)	(7.61)	(7.28)	(5.26)	(5.13)	(4.94)	(3.03)	(2.88)	(2.53)	(5.06)
KPMR-302	0.00	11.00	29.00	38.05	58.05	53.12	27.83	23.54	22.65	9.41	8.49	5.95	25.34
	(0.71)	(3.39)	(5.43)	(6.21)	(7.65)	(7.32)	(5.32)	(4.90)	(4.81)	(3.15)	(3.00)	(2.54)	(5.08)
KPMR-485	0.00	8.35	26.33	35.15	54.16	48.22	23.99	18.70	16.57	3.33	2.42	0.29	20.99
	(0.71)	(2.97)	(5.18)	(5.97)	(7.39)	(6.98)	(4.95)	(4.38)	(4.13)	(1.96)	(1.71)	(0.89)	(4.64)
Kali Batri	0.00	10.21	29.35	38.35	58.35	53.42	28.13	24.82	24.62	11.38	9.62	6.10	25.89
	(0.71)	(3.27)	(5.46)	(6.23)	(7.67)	(7.34)	(5.35)	(5.03)	(5.01)	(3.45)	(3.18)	(2.57)	(5.14)
Safed Batra Gudda	0.00	15.75	34.04	43.14	66.35	61.34	36.13	30.84	28.71	11.62	9.71	5.98	30.45
	(0.71)	(4.03)	(5.88)	(6.61)	(8.18)	(7.86)	(6.05)	(5.60)	(5.40)	(3.48)	(3.20)	(2.55)	(5.56)
Dhan Batri	0.00	9.68	29.66	38.69	58.69	53.76	28.47	23.39	21.26	8.02	7.10	4.97	24.86
	(0.71)	(3.19)	(5.49)	(6.26)	(7.69)	(7.37)	(5.38)	(4.89)	(4.66)	(2.92)	(2.76)	(2.34)	(5.04)
Jayanti	0.00	8.26	26.26	35.29	54.29	48.35	24.17	18.88	16.75	4.01	3.09	0.96	21.21
	(0.71)	(2.96)	(5.17)	(5.98)	(7.40)	(6.99)	(4.97)	(4.40)	(4.15)	(2.12)	(1.89)	(1.21)	(4.66)
VL-1	0.00	8.55	26.51	35.26	55.16	49.22	24.81	19.50	17.37	4.13	3.21	1.08	21.61
	(0.71)	(3.01)	(5.20)	(5.98)	(7.46)	(7.05)	(5.03)	(4.47)	(4.23)	(2.15)	(1.93)	(1.26)	(4.70)
KPMR-504	0.00	10.35	29.35	38.35	58.35	53.42	28.23	23.94	21.81	8.57	7.65	5.52	25.16
	(0.71)	(3.29)	(5.46)	(6.23)	(7.67)	(7.34)	(5.36)	(4.94)	(4.72)	(3.01)	(2.85)	(2.45)	(5.07)
KPMR-400	0.00	11.00	30.01	39.01	60.01	55.08	29.91	25.00	22.87	9.63	8.71	5.58	26.15
	(0.71)	(3.39)	(5.52)	(6.29)	(7.78)	(7.46)	(5.51)	(5.05)	(4.83)	(3.18)	(3.03)	(2.47)	(5.16)
KPMR-486	0.00	11.35	30.31	39.31	60.31	55.38	30.19	25.15	23.02	9.78	8.86	5.73	26.40
	(0.71)	(3.44)	(5.55)	(6.31)	(7.80)	(7.48)	(5.54)	(5.06)	(4.85)	(3.21)	(3.06)	(2.50)	(5.19)
HFP-94-13	0.00	11.36	32.25	41.25	61.25	56.32	31.06	25.78	23.66	9.42	8.52	5.39	26.97
	(0.71)	(3.44)	(5.72)	(6.46)	(7.86)	(7.54)	(5.62)	(5.13)	(4.92)	(3.15)	(3.00)	(2.43)	(5.24)
HFP-94-12	0.00	11.71	29.69	38.69	58.69	53.76	28.52	23.29	21.00	7.76	6.89	3.76	25.12
	(0.71)	(3.49)	(5.49)	(6.26)	(7.69)	(7.37)	(5.39)	(4.88)	(4.64)	(2.87)	(2.72)	(2.06)	(5.06)
JP-885 (Local check)	0.00	15.65	33.63	42.66	62.58	57.66	32.39	27.15	25.02	9.89	8.74	5.61	28.55
	(0.71)	(4.02)	(5.84)	(6.57)	(7.94)	(7.63)	(5.73)	(5.26)	(5.05)	(3.22)	(3.04)	(2.47)	(5.39)
IPF-99-25 (Local check)	0.00	16.35	34.35	43.39	63.64	58.65	33.42	28.19	26.16	9.92	8.95	5.48	29.24
	(0.71)	(4.10)	(5.90)	(6.62)	(8.01)	(7.69)	(5.82)	(5.36)	(5.16)	(3.23)	(3.07)	(2.45)	(5.45)
SEm±		0.14	0.27	0.34	0.27	0.25	0.31	0.24	0.22	0.13	0.11	0.09	0.28
CD (p=0.05)		(0.40)	(0.76)	(0.94)	(0.76)	(0.71)	(0.86)	(0.66)	(0.60)	(0.38)	(0.32)	(0.25)	(0.79)

** Mean of three replications*
*** Peak population of aphid*
Figures in the parentheses are $\sqrt{X+0.5}$ *values*

Table 3. Categorization of pea genotypes into the degree of susceptibility against leaf hopper

S. No.	Mean leaf hopper population/ six leaves	Name of genotypes	Category
1	2.97-1.77	KPMR-485, VL-3, KPMR-420, VL-1, Shikha, jayanti, B-22, Batri Patiram, DDR-39JFP-99-25 and P-3	Least susceptible
2	1.77-3.28	PP-14, KPMR-30, Kali Batri, Atru matar, SPS-2, PP-86, JFP-27, RP-3, Gol Batra Tenduna, NDVP-4, Kala matar, DDP 94-14, DDR-44, PP-96, DDR-54, KFP-151, Batana Moolchand, HFP-94-13, JPF-99-25, Kashmiri samriddhi, DDR-43, NDVP-20, Dhan Batri, KPMR-503, HUVP-12, DDR-23, Lat sown, IPF-99-25 (local check), KPMR-504, Dhanoli Batri, KPMR-302, Rachna, JP-885 (Local check), KPMR-400, KPMR-327, DDR-27, KPMR-402, HUVP-2, PP-96, KPMR-486, Chhoti safed Anju, LEP-260, HFP-94-12, DDR-52, PP-155, JM-91-01 and HUP-2	Moderately susceptible
3	>3.28	Kashi samriddhi, Demo-JP-180, Double branching, Matar Rangpur, Triple branching, Aman 1-206, NDVP-20, Safed Batra Gudda and KPMR-402	Highly susceptible

Table 4. Screening of different genotypes of pea against leafhopper of pea

Genotypes	Population of leaf hopper/ six leaves/ plant												
	30 DAS	38 DAS	47 DAS	54 DAS	61 DAS**	68 DAS	75 DAS	81 DAS	89 DAS	95 DAS	103 DAS	107 DAS	Mean
IPF-99-25	0.00	1.39	4.39	4.52	5.61	5.3	3.99	2.66	2.01	1.35	1.05	0.00	2.97
	(0.71)	(1.37)	(2.21)	(2.24)	(2.47)	(2.41)	(2.12)	(1.78)	(1.58)	(1.36)	(1.24)	(0.71)	(1.86)
B-22	0.00	0.36	3.09	3.18	4.27	3.96	2.45	1.15	0.55	0.42	0.1	0.00	1.8
	(0.71)	(0.93)	(1.89)	(1.92)	(2.18)	(2.11)	(1.72)	(1.28)	(1.02)	(0.96)	(0.77)	(0.71)	(1.52)
DDR-27	0.00	1.69	4.71	4.88	5.97	5.66	4.14	2.84	2.26	1.75	1.32	0.00	3.25
	(0.71)	(1.48)	(2.28)	(2.32)	(2.54)	(2.48)	(2.15)	(1.83)	(1.66)	(1.50)	(1.35)	(0.71)	(1.94)
PP-155	0.00	1.92	4.94	5.01	6.1	5.79	4.32	3.04	2.31	1.82	1.1	0.00	3.36
	(0.71)	(1.56)	(2.33)	(2.35)	(2.57)	(2.51)	(2.20)	(1.88)	(1.68)	(1.52)	(1.26)	(0.71)	(1.96)
Kashmiri samriddhi	0.00	2.21	4.23	4.33	5.42	5.11	3.82	2.48	1.86	1.98	1.15	0.00	2.99
	(0.71)	(1.65)	(2.17)	(2.20)	(2.43)	(2.37)	(2.08)	(1.73)	(1.54)	(1.57)	(1.28)	(0.71)	(1.87)
DDR-43	0.00	1.49	4.43	4.51	5.6	5.29	3.99	2.69	2.06	1.49	1.16	0.00	3.01
	(0.71)	(1.41)	(2.22)	(2.24)	(2.47)	(2.41)	(2.12)	(1.79)	(1.60)	(1.41)	(1.29)	(0.71)	(1.87)
DDR-44	0.00	1.33	4.31	4.38	5.47	5.16	3.86	2.52	1.88	1.33	1	0.00	2.88
	(0.71)	(1.35)	(2.19)	(2.21)	(2.44)	(2.38)	(2.09)	(1.74)	(1.54)	(1.35)	(1.22)	(0.71)	(1.84)
DDR-39	0.00	0.36	3.08	3.2	4.29	3.98	2.68	1.39	0.76	0.44	0.11	0.00	1.87
	(0.71)	(0.93)	(1.89)	(1.92)	(2.19)	(2.12)	(1.78)	(1.37)	(1.12)	(0.97)	(0.78)	(0.71)	(1.54)
Late sown	0.00	2.26	4.28	4.44	5.53	5.22	3.92	2.66	2.03	1.95	1.21	0.00	3.07
	(0.71)	(1.66)	(2.19)	(2.22)	(2.46)	(2.39)	(2.10)	(1.78)	(1.59)	(1.57)	(1.31)	(0.71)	(1.89)
DDR-23	0.00	2.21	4.23	4.49	5.58	5.27	3.95	2.62	1.99	1.88	1.25	0.00	3.06
	(0.71)	(1.65)	(2.17)	(2.23)	(2.47)	(2.4)	(2.11)	(1.77)	(1.58)	(1.54)	(1.32)	(0.71)	(1.89)
HUP-2	0.00	1.95	4.98	5.11	6.2	5.89	4.57	3.26	2.63	1.95	1.29	0.00	3.49
	(0.71)	(1.57)	(2.34)	(2.37)	(2.59)	(2.53)	(2.25)	(1.94)	(1.77)	(1.57)	(1.34)	(0.71)	(2.00)
DDP94-14	0.00	1.98	4	4.1	5.19	4.88	3.56	2.25	1.62	1.98	1.33	0.00	2.83
	(0.71)	(1.57)	(2.12)	(2.14)	(2.39)	(2.32)	(2.01)	(1.66)	(1.46)	(1.57)	(1.35)	(0.71)	(1.82)
HUVP-2	0.00	1.68	4.7	4.82	5.91	5.6	4.28	2.97	2.34	1.68	1.35	0.00	3.25
	(0.71)	(1.48)	(2.28)	(2.31)	(2.53)	(2.47)	(2.19)	(1.86)	(1.69)	(1.48)	(1.36)	(0.71)	(1.94)
KPMR-402	0.00	2.26	5.34	5.45	6.54	6.23	4.91	3.6	2.97	2.4	1.95	0.00	3.83
	(0.71)	(1.66)	(2.42)	(2.44)	(2.65)	(2.59)	(2.33)	(2.02)	(1.86)	(1.70)	(1.57)	(0.71)	(2.08)
NDVP-20	0.00	2.45	5.49	5.6	6.69	6.38	5.06	3.75	3.12	2.49	1.88	0.00	3.95
	(0.71)	(1.72)	(2.45)	(2.47)	(2.68)	(2.62)	(2.36)	(2.06)	(1.90)	(1.73)	(1.54)	(0.71)	(2.11)
Atru matar	0.00	1.54	3.99	4.1	5.19	4.88	3.5	2.19	1.56	1.54	1.21	0.00	2.73
	(0.71)	(1.43)	(2.12)	(2.14)	(2.39)	(2.32)	(2.00)	(1.64)	(1.44)	(1.43)	(1.31)	(0.71)	(1.80)
Triple branching	0.00	2.51	5.53	5.64	6.73	6.42	5.1	3.79	3.16	2.51	1.98	0.00	3.99
	(0.71)	(1.73)	(2.46)	(2.48)	(2.69)	(2.63)	(2.37)	(2.07)	(1.91)	(1.73)	(1.57)	(0.71)	(2.12)
Double Branching	0.00	2.55	5.57	5.68	6.77	6.46	5.14	3.83	3.2	2.55	2	0.00	4.03
	(0.71)	(1.75)	(2.46)	(2.49)	(2.70)	(2.64)	(2.37)	(2.08)	(1.92)	(1.75)	(1.58)	(0.71)	(2.13)
SPS-2	0.00	1.11	4.13	4.24	5.33	5.02	3.7	2.39	1.76	1.11	0.78	0.00	2.73
	(0.71)	(1.27)	(2.15)	(2.18)	(2.41)	(2.35)	(2.05)	(1.70)	(1.50)	(1.27)	(1.13)	(0.71)	(1.80)
JM-91-01	0.00	1.82	4.84	4.95	6.04	5.73	4.42	3.11	2.48	1.82	1.39	0.00	3.37
	(0.71)	(1.52)	(2.31)	(2.33)	(2.56)	(2.50)	(2.22)	(1.90)	(1.73)	(1.52)	(1.37)	(0.71)	(1.97)
P-3	0.00	0.62	3.15	3.21	4.3	3.99	2.67	1.32	0.62	0.62	0.18	0.00	1.9
	(0.71)	(1.06)	(1.91)	(1.93)	(2.19)	(2.12)	(1.78)	(1.35)	(1.06)	(1.06)	(0.82)	(0.71)	(1.55)
RP-3	0.00	1.12	4.14	4.25	5.34	5.03	3.71	2.4	1.77	1.12	0.79	0.00	2.74
	(0.71)	(1.27)	(2.15)	(2.18)	(2.42)	(2.35)	(2.05)	(1.70)	(1.51)	(1.27)	(1.14)	(0.71)	(1.80)
VL-3	0.00	0.62	2.94	2.95	4.04	3.73	2.44	1.19	0.56	0.62	0.15	0.00	1.77
	(0.71)	(1.06)	(1.85)	(1.86)	(2.13)	(2.06)	(1.71)	(1.30)	(1.03)	(1.06)	(0.81)	(0.71)	(1.51)
JFP-27	0.00	1.84	3.86	3.97	5.06	4.75	3.43	2.12	1.52	1.84	1.51	0.00	2.73
	(0.71)	(1.53)	(2.09)	(2.11)	(2.36)	(2.29)	(1.98)	(1.62)	(1.42)	(1.53)	(1.42)	(0.71)	(1.80)
PP-86	0.00	1.11	4.13	4.24	5.33	5.02	3.70	2.39	1.77	1.11	0.78	0.00	2.73

Genotypes	Population of leaf hopper/ six leaves/ plant												
	30 DAS	38 DAS	47 DAS	54 DAS	61 DAS**	68 DAS	75 DAS	81 DAS	89 DAS	95 DAS	103 DAS	107 DAS	Mean
	(0.71)	(1.27)	(2.15)	(2.18)	(2.41)	(2.35)	(2.05)	(1.70)	(1.51)	(1.27)	(1.13)	(0.71)	(1.80)
NDVP-4	0.00	1.16	4.18	4.29	5.38	5.07	3.75	2.44	1.79	1.16	0.83	0.00	2.77
	(0.71)	(1.29)	(2.16)	(2.19)	(2.42)	(2.36)	(2.06)	(1.71)	(1.51)	(1.29)	(1.15)	(0.71)	(1.81)
NDVP-20	0.00	1.85	4.34	4.45	5.54	5.23	3.91	2.6	1.98	1.85	1.12	0.00	3.02
	(0.71)	(1.53)	(2.20)	(2.22)	(2.46)	(2.39)	(2.10)	(1.76)	(1.57)	(1.53)	(1.27)	(0.71)	(1.88)
KFP-151	0.00	1.3	4.32	4.43	5.52	5.21	3.89	2.58	1.95	1.3	0.97	0.00	2.9
	(0.71)	(1.34)	(2.20)	(2.22)	(2.45)	(2.39)	(2.10)	(1.75)	(1.57)	(1.34)	(1.21)	(0.71)	(1.84)
HUVP-12	0.00	1.44	4.46	4.57	5.66	5.35	4.11	2.8	2.17	1.44	1.11	0.00	3.05
	(0.71)	(1.39)	(2.23)	(2.25)	(2.48)	(2.42)	(2.15)	(1.82)	(1.63)	(1.39)	(1.27)	(0.71)	(1.88)
LEP-260	0.00	1.74	4.76	4.87	5.96	5.65	4.36	3.05	2.42	1.76	1.13	0.00	3.29
	(0.71)	(1.50)	(2.29)	(2.32)	(2.54)	(2.48)	(2.20)	(1.88)	(1.71)	(1.50)	(1.28)	(0.71)	(1.95)
Dhanoli Batri	0.00	1.53	4.55	4.66	5.75	5.44	4.12	2.81	2.18	1.55	1.15	0.00	3.11
	(0.71)	(1.42)	(2.25)	(2.27)	(2.50)	(2.44)	(2.15)	(1.82)	(1.64)	(1.43)	(1.28)	(0.71)	(1.90)
Gol Batra Tenduna	0.00	1.16	4.18	4.29	5.38	5.07	3.75	2.42	1.79	1.16	0.83	0.00	2.77
	(0.71)	(1.29)	(2.16)	(2.19)	(2.42)	(2.36)	(2.06)	(1.71)	(1.51)	(1.29)	(1.15)	(0.71)	(1.81)
Matar Rangpur	0.00	2.46	5.51	5.66	6.75	6.44	5.12	3.81	3.18	2.46	2.01	0.00	3.99
	(0.71)	(1.72)	(2.45)	(2.48)	(2.69)	(2.63)	(2.37)	(2.08)	(1.92)	(1.72)	(1.58)	(0.71)	(2.12)
Kashi samriddhi	0.00	2.62	5.68	5.81	6.9	6.59	5.31	4.00	3.37	2.62	1.99	0.00	4.13
	(0.71)	(1.77)	(2.49)	(2.51)	(2.72)	(2.66)	(2.41)	(2.12)	(1.97)	(1.77)	(1.58)	(0.71)	(2.15)
Kala matar	0.00	1.32	4.34	4.45	5.54	5.23	3.42	2.11	1.48	1.32	0.99	0.00	2.8
	(0.71)	(1.35)	(2.20)	(2.22)	(2.46)	(2.39)	(1.98)	(1.62)	(1.41)	(1.35)	(1.22)	(0.71)	(1.82)
KPMR-503	0.00	1.46	4.48	4.59	5.68	5.37	4.05	2.74	2.11	1.46	1.13	0.00	3.05
	(0.71)	(1.40)	(2.23)	(2.26)	(2.49)	(2.42)	(2.13)	(1.80)	(1.62)	(1.40)	(1.28)	(0.71)	(1.88)
DDR-52	0.00	1.76	4.78	4.89	5.98	5.67	4.35	3.06	2.31	1.76	1.33	0.00	3.31
	(0.71)	(1.50)	(2.30)	(2.32)	(2.55)	(2.48)	(2.20)	(1.89)	(1.68)	(1.50)	(1.35)	(0.71)	(1.95)
DDR-54	0.00	1.31	4.33	4.44	5.53	5.22	3.90	2.59	1.96	1.23	0.90	0.00	2.90
	(0.71)	(1.35)	(2.20)	(2.22)	(2.46)	(2.39)	(2.10)	(1.76)	(1.57)	(1.32)	(1.18)	(0.71)	(1.84)
PP-96	0.00	1.81	4.83	4.94	6.03	5.72	4.14	2.83	2.18	1.62	1.29	0.00	3.27
	(0.71)	(1.52)	(2.31)	(2.33)	(2.56)	(2.49)	(2.15)	(1.82)	(1.64)	(1.46)	(1.34)	(0.71)	(1.94)
KPMR-30	0.00	1.1	4.12	4.23	5.32	5.00	3.68	2.37	1.74	1.10	0.77	0.00	2.71
	(0.71)	(1.26)	(2.15)	(2.17)	(2.41)	(2.35)	(2.04)	(1.69)	(1.50)	(1.26)	(1.13)	(0.71)	(1.79)
JFP-99-25	0.00	0.44	3.16	3.22	4.31	3.99	2.67	1.39	0.76	0.44	0.11	0.00	1.89
	(0.71)	(0.97)	(1.91)	(1.93)	(2.19)	(2.12)	(1.78)	(1.37)	(1.12)	(0.97)	(0.78)	(0.71)	(1.55)
PP-96	0.00	1.29	4.31	4.42	5.51	5.19	3.87	2.56	1.93	1.29	0.96	0.00	2.89
	(0.71)	(1.34)	(2.19)	(2.22)	(2.45)	(2.39)	(2.09)	(1.75)	(1.56)	(1.34)	(1.21)	(0.71)	(1.84)
PP-14	0.00	1.02	4.04	4.15	5.24	4.92	3.60	2.29	1.66	1.02	0.69	0.00	2.64
	(0.71)	(1.23)	(2.13)	(2.16)	(2.40)	(2.33)	(2.02)	(1.67)	(1.47)	(1.23)	(1.09)	(0.71)	(1.77)
Aman1-206	0.00	2.47	5.52	5.63	6.72	6.40	5.08	3.79	3.19	2.31	1.98	0.00	3.97
	(0.71)	(1.72)	(2.45)	(2.48)	(2.69)	(2.63)	(2.36)	(2.07)	(1.92)	(1.68)	(1.57)	(0.71)	(2.11)
Demo-JP-180	0.00	2.62	5.68	5.79	6.88	6.56	5.24	3.96	3.33	2.12	1.79	0.00	4.06
	(0.71)	(1.77)	(2.49)	(2.51)	(2.72)	(2.66)	(2.40)	(2.11)	(1.96)	(1.62)	(1.51)	(0.71)	(2.13)
Chhoti safed Anju	0.00	1.76	4.78	4.89	5.98	5.66	4.34	3.03	2.4	1.55	1.22	0.00	3.28
	(0.71)	(1.50)	(2.30)	(2.32)	(2.55)	(2.48)	(2.20)	(1.88)	(1.70)	(1.43)	(1.31)	(0.71)	(1.95)
Batana Moolchand	0.00	1.35	4.37	4.48	5.57	5.25	3.93	2.62	1.99	1.35	1.02	0.00	2.94
	(0.71)	(1.36)	(2.21)	(2.23)	(2.46)	(2.40)	(2.10)	(1.77)	(1.58)	(1.36)	(1.23)	(0.71)	(1.86)
Batri patiram	0.00	0.42	3.2	3.26	4.35	4.03	2.34	1.06	0.43	0.42	0.09	0.00	1.82
	(0.71)	(0.96)	(1.92)	(1.94)	(2.20)	(2.13)	(1.69)	(1.25)	(0.96)	(0.96)	(0.77)	(0.71)	(1.52)
Rachna	0.00	1.58	4.6	4.71	5.80	5.48	4.16	2.85	2.22	1.58	1.25	0.00	3.15
	(0.71)	(1.44)	(2.26)	(2.28)	(2.51)	(2.45)	(2.16)	(1.83)	(1.65)	(1.44)	(1.32)	(0.71)	(1.91)
Shikha	0.00	0.56	2.94	3.11	4.20	3.88	2.36	1.08	0.45	0.56	0.23	0.00	1.78
	(0.71)	(1.03)	(1.85)	(1.90)	(2.17)	(2.09)	(1.69)	(1.26)	(0.97)	(1.03)	(0.85)	(0.71)	(1.51)
KPMR-420	0.00	0.22	2.97	3.1	4.19	3.87	2.51	1.26	0.63	0.32	0.14	0.00	1.77
	(0.71)	(0.85)	(1.86)	(1.90)	(2.17)	(2.09)	(1.73)	(1.33)	(1.06)	(0.91)	(0.80)	(0.71)	(1.51)

Genotypes	Population of leaf hopper/ six leaves/ plant												
	30 DAS	38 DAS	47 DAS	54 DAS	61 DAS**	68 DAS	75 DAS	81 DAS	89 DAS	95 DAS	103 DAS	107 DAS	Mean
KPMR-402	0.00	1.68	4.7	4.81	5.9	5.58	4.26	2.95	2.32	1.72	1.39	0.00	3.25
	(0.71)	(1.48)	(2.28)	(2.30)	(2.53)	(2.47)	(2.18)	(1.86)	(1.68)	(1.49)	(1.37)	(0.71)	(1.94)
KPMR-327	0.00	1.62	4.64	4.75	5.84	5.52	4.2	2.89	2.26	1.62	1.29	0.00	3.19
	(0.71)	(1.46)	(2.27)	(2.29)	(2.52)	(2.45)	(2.17)	(1.84)	(1.66)	(1.46)	(1.34)	(0.71)	(1.92)
KPMR-302	0.00	1.54	4.56	4.67	5.76	5.44	4.12	2.81	2.18	1.54	1.21	0.00	3.12
	(0.71)	(1.43)	(2.25)	(2.27)	(2.50)	(2.44)	(2.15)	(1.82)	(1.64)	(1.43)	(1.31)	(0.71)	(1.90)
KPMR-485	0.00	0.29	3.01	3.01	4.1	3.78	2.42	1.14	0.52	0.29	0.15	0.00	1.73
	(0.71)	(0.89)	(1.87)	(1.87)	(2.14)	(2.07)	(1.71)	(1.28)	(1.01)	(0.89)	(0.81)	(0.71)	(1.49)
Kali Batri	0.00	1.10	4.12	4.23	5.32	5.00	3.69	2.38	1.77	1.1	0.77	0.00	2.72
	(0.71)	(1.26)	(2.15)	(2.17)	(2.41)	(2.35)	(2.05)	(1.70)	(1.51)	(1.26)	(1.13)	(0.71)	(1.79)
Safed Batra Gudda	0.00	2.39	5.41	5.52	6.61	6.29	4.97	3.66	3.06	2.39	2.06	0.00	3.9
	(0.71)	(1.70)	(2.43)	(2.45)	(2.67)	(2.61)	(2.34)	(2.04)	(1.89)	(1.70)	(1.60)	(0.71)	(2.10)
Dhan Batri	0.00	1.46	4.48	4.59	5.68	5.36	4.04	2.73	2.12	1.46	1.13	0.00	3.05
	(0.71)	(1.40)	(2.23)	(2.26)	(2.49)	(2.42)	(2.13)	(1.80)	(1.62)	(1.40)	(1.28)	(0.71)	(1.88)
Jayanti	0.00	0.46	3.18	3.18	4.27	3.95	2.13	1.14	0.51	0.46	0.13	0.00	1.8
	(0.71)	(0.98)	(1.92)	(1.92)	(2.18)	(2.11)	(1.62)	(1.28)	(1.00)	(0.98)	(0.79)	(0.71)	(1.52)
VL-1	0.00	0.32	3.12	3.22	4.31	3.99	2.18	1.07	0.44	0.32	0.10	0.00	1.77
	(0.71)	(0.91)	(1.90)	(1.93)	(2.19)	(2.12)	(1.64)	(1.25)	(0.97)	(0.91)	(0.77)	(0.71)	(1.51)
KPMR-504	0.00	1.52	4.54	4.65	5.74	5.42	4.10	2.79	2.16	1.52	1.19	0.00	3.1
	(0.71)	(1.42)	(2.24)	(2.27)	(2.50)	(2.43)	(2.14)	(1.81)	(1.63)	(1.42)	(1.30)	(0.71)	(1.90)
KPMR-400	0.00	1.58	4.64	4.75	5.84	5.52	4.20	2.89	2.26	1.58	1.25	0.00	3.18
	(0.71)	(1.44)	(2.27)	(2.29)	(2.52)	(2.45)	(2.17)	(1.84)	(1.66)	(1.44)	(1.32)	(0.71)	(1.92)
KPMR-486	0.00	1.73	4.76	4.82	5.91	5.59	4.27	2.96	2.33	1.73	1.38	0.00	3.27
	(0.71)	(1.49)	(2.29)	(2.31)	(2.53)	(2.47)	(2.18)	(1.86)	(1.68)	(1.49)	(1.37)	(0.71)	(1.94)
HFP-94-13	0.00	1.39	4.41	4.48	5.57	5.25	3.94	2.65	2.02	1.39	1.06	0.00	2.97
	(0.71)	(1.37)	(2.22)	(2.23)	(2.46)	(2.40)	(2.11)	(1.77)	(1.59)	(1.37)	(1.25)	(0.71)	(1.86)
HFP-94-12	0.00	1.75	4.77	4.86	5.95	5.63	4.31	3.01	2.38	1.75	1.42	0.00	3.30
	(0.71)	(1.50)	(2.30)	(2.32)	(2.54)	(2.48)	(2.19)	(1.87)	(1.70)	(1.50)	(1.39)	(0.71)	(1.95)
JP-885(Local check)	0.00	1.54	4.58	4.70	5.79	5.47	4.21	2.92	2.36	1.54	1.21	0.00	3.16
	(0.71)	(1.43)	(2.25)	(2.28)	(2.51)	(2.44)	(2.17)	(1.85)	(1.69)	(1.43)	(1.31)	(0.71)	(1.91)
IPF-99-25 (Local check)	0.00	1.48	4.54	4.68	5.77	5.45	4.18	2.84	2.33	1.32	0.99	0.00	3.09
	(0.71)	(1.41)	(2.24)	(2.28)	(2.50)	(2.44)	(2.16)	(1.83)	(1.68)	(1.35)	(1.22)	(0.71)	(1.90)
SEm±		0.05	0.11	0.11	0.14	0.13	0.09	0.08	0.08	0.05	0.04	0.00	0.07
CD (p=0.05)		0.145	0.304	0.318	0.379	0.351	0.25	0.234	0.227	0.13	0.122	0.00	0.202

*** Peak population of leafhopper,*
Figures in the parentheses are √ X +0.5 values

Table 5. Screening of different genotypes of pea against pod borer, *Helicoverpa armigera* / plant of pea

Genotypes	Population of pod borer, *helicoverpa armigera*												
	30 DAS	38 DAS	47** DAS	54 DAS	61 DAS	68 DAS	75 DAS	81 DAS	89 DAS	95 DAS	103 DAS	107 DAS	Mean
IPF-99-25	**1.42**	**0.99**	**1.35**	**0.92**	**0.75**	**0.60**	**0.45**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.63**
	(1.39)	**(1.22)**	**(1.36)**	**(1.19)**	**(1.12)**	**(1.05)**	**(0.97)**	**(0.71)**	**(0.71)**	**(0.71)**	**(0.71)**	**(0.71)**	**(1.06)**
B-22	**0.46**	**0.15**	**0.56**	**0.22**	**0.14**	**0.05**	**0.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.16**
	(0.98)	**(0.81)**	**(1.03)**	**(0.85)**	**(0.80)**	**(0.74)**	**(0.77)**	**(0.71)**	**(0.71)**	**(0.71)**	**(0.71)**	**(0.71)**	**(0.81)**
DDR-27	**1.80**	**1.16**	**1.58**	**1.12**	**0.92**	**0.62**	**0.42**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.74**
	(1.52)	**(1.29)**	**(1.44)**	**(1.27)**	**(1.19)**	**(1.06)**	**(0.96)**	**(0.71)**	**(0.71)**	**(0.71)**	**(0.71)**	**(0.71)**	**(1.12)**
PP-155	**1.92**	**1.35**	**1.77**	**1.16**	**0.98**	**0.53**	**0.33**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.79**
	(1.56)	**(1.36)**	**(1.51)**	**(1.29)**	**(1.22)**	**(1.01)**	**(0.91)**	**(0.71)**	**(0.71)**	**(0.71)**	**(0.71)**	**(0.71)**	**(1.14)**
Kashmiri samriddhi	**2.00**	**1.16**	**1.61**	**1.13**	**0.99**	**0.69**	**0.36**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.77**
	(1.58)	**(1.29)**	**(1.45)**	**(1.28)**	**(1.22)**	**(1.09)**	**(0.93)**	**(0.71)**	**(0.71)**	**(0.71)**	**(0.71)**	**(0.71)**	**(1.13)**

Genotypes	Population of pod borer, *helicoverpa armigera*												
	30 DAS	38 DAS	47** DAS	54 DAS	61 DAS	68 DAS	75 DAS	81 DAS	89 DAS	95 DAS	103 DAS	107 DAS	Mean
DDR-43	1.55	1.20	1.63	1.10	1.02	0.77	0.51	0.00	0.00	0.00	0.00	0.00	0.76
	(1.43)	(1.30)	(1.46)	(1.26)	(1.23)	(1.13)	(1.00)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.12)
DDR-44	1.39	1.00	1.42	1.08	1.00	0.69	0.49	0.00	0.00	0.00	0.00	0.00	0.68
	(1.37)	(1.22)	(1.39)	(1.26)	(1.22)	(1.09)	(0.99)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.09)
DDR-39	0.54	0.23	0.68	0.28	0.20	0.08	0.05	0.00	0.00	0.00	0.00	0.00	0.20
	(1.02)	(0.85)	(1.09)	(0.88)	(0.84)	(0.76)	(0.74)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(0.84)
Late sown	1.95	1.16	1.52	1.11	1.04	0.52	0.32	0.00	0.00	0.00	0.00	0.00	0.74
	(1.57)	(1.29)	(1.42)	(1.27)	(1.24)	(1.01)	(0.91)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.11)
DDR-23	1.89	1.12	1.50	1.1	0.99	0.62	0.33	0.00	0.00	0.00	0.00	0.00	0.73
	(1.55)	(1.27)	(1.41)	(1.26)	(1.22)	(1.06)	(0.91)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.11)
HUP-2	1.92	1.15	1.52	1.14	0.92	0.62	0.36	0.00	0.00	0.00	0.00	0.00	0.74
	(1.56)	(1.28)	(1.42)	(1.28)	(1.19)	(1.06)	(0.93)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.11)
DDP94-14	1.99	1.10	1.43	1.05	0.97	0.72	0.30	0.00	0.00	0.00	0.00	0.00	0.72
	(1.58)	(1.26)	(1.39)	(1.24)	(1.21)	(1.10)	(0.89)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.11)
HUVP-2	1.68	1.17	1.47	1.09	1.01	0.77	0.37	0.00	0.00	0.00	0.00	0.00	0.73
	(1.48)	(1.29)	(1.40)	(1.26)	(1.23)	(1.13)	(0.93)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.11)
KPMR-402	2.40	1.55	2.00	1.42	1.34	0.98	0.58	0.00	0.00	0.00	0.00	0.00	1.00
	(1.70)	(1.43)	(1.58)	(1.39)	(1.36)	(1.22)	(1.04)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.22)
NDVP-20	2.49	1.62	2.08	1.38	1.30	0.99	0.61	0.00	0.00	0.00	0.00	0.00	1.02
	(1.73)	(1.46)	(1.61)	(1.37)	(1.34)	(1.22)	(1.05)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.23)
Atru matar	1.61	0.98	1.38	0.98	0.90	0.75	0.45	0.00	0.00	0.00	0.00	0.00	0.68
	(1.45)	(1.22)	(1.37)	(1.22)	(1.18)	(1.12)	(0.97)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.09)
Triple branching	2.51	1.99	2.41	1.98	1.41	1.00	0.66	0.00	0.00	0.00	0.00	0.00	1.17
	(1.73)	(1.58)	(1.71)	(1.57)	(1.38)	(1.22)	(1.08)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.29)
Double Branching	2.55	2.00	2.42	1.92	1.35	1.02	0.72	0.00	0.00	0.00	0.00	0.00	1.18
	(1.75)	(1.58	(1.71)	(1.56)	(1.36)	(1.23)	(1.10)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.29)
SPS-2	1.21	0.69	1.09	0.71	0.63	0.48	0.38	0.00	0.00	0.00	0.00	0.00	0.50
	(1.31)	(1.09)	(1.26)	(1.10)	(1.06)	(0.99)	(0.94)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.00)
JM-91-01	1.62	1.05	1.41	1.03	0.95	0.80	0.42	0.00	0.00	0.00	0.00	0.00	0.70
	(1.46)	(1.24)	(1.38)	(1.24)	(1.20)	(1.14)	(0.96)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.10)
P-3	0.58	0.27	0.68	0.35	0.27	0.12	0.06	0.00	0.00	0.00	0.00	0.00	0.23
	(1.04)	(0.88)	(1.09)	(0.92)	(0.88)	(0.79)	(0.75)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(0.85)
RP-3	1.16	0.85	1.26	0.87	0.79	0.64	0.44	0.00	0.00	0.00	0.00	0.00	0.58
	(1.29)	(1.16)	(1.33)	(1.17)	(1.14)	(1.07)	(0.97)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.04)
VL-3	0.66	0.35	0.66	0.36	0.28	0.13	0.03	0.00	0.00	0.00	0.00	0.00	0.24
	(1.08)	(0.92)	(1.08)	(0.93)	(0.88)	(0.79)	(0.73)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(0.86)
JFP-27	1.80	1.19	1.55	1.17	1.00	0.85	0.51	0.00	0.00	0.00	0.00	0.00	0.78
	(1.52)	(1.30)	(1.43)	(1.29)	(1.22)	(1.16)	(1.00)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.13)
PP-86	1.15	0.84	1.26	0.88	0.8	0.65	0.46	0.00	0.00	0.00	0.00	0.00	0.58
	(1.28)	(1.16)	(1.33)	(1.17)	(1.14)	(1.07)	(0.98)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.04)
NDVP-4	1.14	0.83	1.27	0.89	0.81	0.69	0.39	0.00	0.00	0.00	0.00	0.00	0.58
	(1.28)	(1.15)	(1.33)	(1.18)	(1.14)	(1.09)	(0.94)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.04)
NDVP-20	1.82	1.05	1.35	1.07	0.99	0.74	0.34	0.00	0.00	0.00	0.00	0.00	0.71
	(1.52)	(1.24)	(1.36)	(1.25)	(1.22)	(1.11)	(0.92)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.10)
KFP-151	1.35	1.04	1.42	1.06	0.98	0.73	0.33	0.00	0.00	0.00	0.00	0.00	0.67
	(1.36)	(1.24)	(1.39)	(1.25)	(1.22)	(1.11)	(0.91)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.08)
HUVP-12	1.46	1.15	1.53	1.15	0.97	0.72	0.32	0.00	0.00	0.00	0.00	0.00	0.71
	(1.40)	(1.28)	(1.42)	(1.28)	(1.21)	(1.10)	(0.91)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.10)
LEP-260	1.77	1.16	1.52	1.14	1.06	0.69	0.35	0.00	0.00	0.00	0.00	0.00	0.74
	(1.51)	(1.29)	(1.42)	(1.28)	(1.25)	(1.09)	(0.92)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.11)
Dhanoli Batri	1.58	1.27	1.6	1.29	1.21	0.88	0.38	0.00	0.00	0.00	0.00	0.00	0.80
	(1.44)	(1.33)	(1.45)	(1.34)	(1.31)	(1.17)	(0.94)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.14)
Gol Batra Tenduna	1.16	0.85	1.25	0.87	0.79	0.64	0.34	0.00	0.00	0.00	0.00	0.00	0.57

Genotypes	Population of pod borer, *helicoverpa armigera*												
	30 DAS	38 DAS	47** DAS	54 DAS	61 DAS	68 DAS	75 DAS	81 DAS	89 DAS	95 DAS	103 DAS	107 DAS	Mean
	(1.29)	(1.16)	(1.32)	(1.17)	(1.14)	(1.07)	(0.92)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.03)
Matar Rangpur	2.36	2.05	2.36	2.18	1.54	1.19	0.66	0.00	0.00	0.00	0.00	0.00	1.21
	(1.69)	(1.60)	(1.69)	(1.64)	(1.43)	(1.30)	(1.08)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.31)
Kashi samriddhi	2.21	1.90	2.12	1.82	1.44	1.09	0.71	0.00	0.00	0.00	0.00	0.00	1.10
	(1.65)	(1.55)	(1.62)	(1.52)	(1.39)	(1.26)	(1.10)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.27)
Kala matar	1.12	0.81	1.21	0.83	0.75	0.6	0.33	0.00	0.00	0.00	0.00	0.00	0.55
	(1.27)	(1.14)	(1.31)	(1.15)	(1.12)	(1.05)	(0.91)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.02)
KPMR-503	1.32	1.01	1.40	1.02	0.94	0.79	0.36	0.00	0.00	0.00	0.00	0.00	0.66
	(1.35)	(1.23)	(1.38)	(1.23)	(1.20)	(1.14)	(0.93)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.08)
DDR-52	1.66	1.16	1.46	1.08	1.00	0.75	0.41	0.00	0.00	0.00	0.00	0.00	0.72
	(1.47)	(1.29)	(1.40)	(1.26)	(1.22)	(1.12)	(0.95)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.11)
DDR-54	1.19	0.88	1.27	0.89	0.81	0.66	0.38	0.00	0.00	0.00	0.00	0.00	0.59
	(1.30)	(1.17)	(1.33)	(1.18)	(1.14)	(1.08)	(0.94)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.04)
PP-96	1.55	1.12	1.33	1.12	1.04	0.69	0.32	0.00	0.00	0.00	0.00	0.00	0.70
	(1.43)	(1.27)	(1.35)	(1.27)	(1.24)	(1.09)	(0.91)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.09)
KPMR-30	1.12	0.81	1.15	0.86	0.78	0.63	0.33	0.00	0.00	0.00	0.00	0.00	0.55
	(1.27)	(1.14)	(1.28)	(1.17)	(1.13)	(1.06)	(0.91)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.02)
JFP-99-25	0.44	0.17	0.55	0.19	0.11	0.14	0.04	0.00	0.00	0.00	0.00	0.00	0.16
	(0.97)	(0.82)	(1.02)	(0.83)	(0.78)	(0.80)	(0.73)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(0.81)
PP-96	1.29	0.98	1.38	1.02	0.92	0.57	0.36	0.00	0.00	0.00	0.00	0.00	0.63
	(1.34)	(1.22)	(1.37)	(1.23)	(1.19)	(1.03)	(0.93)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.06)
PP-14	1.12	0.81	1.20	0.82	0.74	0.59	0.40	0.00	0.00	0.00	0.00	0.00	0.55
	(1.27)	(1.14)	(1.30)	(1.15)	(1.11)	(1.04)	(0.95)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.02)
Aman1-206	2.31	2.00	2.10	1.88	1.42	1.07	0.67	0.00	0.00	0.00	0.00	0.00	1.12
	(1.68)	(1.58)	(1.61)	(1.54)	(1.39)	(1.25)	(1.08)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.27)
Demo-JP-180	2.10	1.79	2.18	1.71	1.33	1.00	0.71	0.00	0.00	0.00	0.00	0.00	1.06
	(1.61)	(1.51)	(1.64)	(1.49)	(1.35)	(1.22)	(1.10)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.25)
Chhoti safed Anju	1.56	1.25	1.65	1.27	1.00	0.72	0.32	0.00	0.00	0.00	0.00	0.00	0.76
	(1.44)	(1.32)	(1.47)	(1.33)	(1.22)	(1.10)	(0.91)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.12)
Batana Moolchand	1.39	1.08	1.48	1.10	0.82	0.57	0.36	0.00	0.00	0.00	0.00	0.00	0.67
	(1.37)	(1.26)	(1.41)	(1.26)	(1.15)	(1.03)	(0.93)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.08)
Batri patiram	0.42	0.16	0.49	0.11	0.13	0.12	0.02	0.00	0.00	0.00	0.00	0.00	0.14
	(0.96)	(0.81)	(0.99)	(0.78)	(0.79)	(0.79)	(0.72)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(0.80)
Rachna	1.58	1.27	1.65	1.12	0.94	0.69	0.44	0.00	0.00	0.00	0.00	0.00	0.75
	(1.44)	(1.33)	(1.47)	(1.27)	(1.20)	(1.09)	(0.97)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.12)
Shikha	0.58	0.27	0.66	0.33	0.25	0.10	0.06	0.00	0.00	0.00	0.00	0.00	0.22
	(1.04)	(0.88)	(1.08)	(0.91)	(0.87)	(0.77)	(0.75)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(0.85)
KPMR-420	0.32	0.16	0.58	0.26	0.18	0.08	0.04	0.00	0.00	0.00	0.00	0.00	0.16
	(0.91)	(0.81)	(1.04)	(0.87)	(0.82)	(0.76)	(0.73)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(0.81)
KPMR-402	1.72	1.41	1.75	1.40	1.32	0.77	0.46	0.00	0.00	0.00	0.00	0.00	0.86
	(1.49)	(1.38)	(1.50)	(1.38)	(1.35)	(1.13)	(0.98)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.17)
KPMR-327	1.62	1.31	1.68	1.30	1.22	0.69	0.42	0.00	0.00	0.00	0.00	0.00	0.80
	(1.46)	(1.35)	(1.48)	(1.34)	(1.31)	(1.09)	(0.96)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.14)
KPMR-302	1.58	1.27	1.66	1.12	1.04	0.89	0.41	0.00	0.00	0.00	0.00	0.00	0.78
	(1.44)	(1.33)	(1.47)	(1.27)	(1.24)	(1.18)	(0.95)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.13)
KPMR-485	0.31	0.15	0.56	0.18	0.10	0.11	0.01	0.00	0.00	0.00	0.00	0.00	0.14
	(0.90)	(0.81)	(1.03)	(0.82)	(0.77)	(0.78)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(0.80)
Kali Batri	1.10	0.79	1.19	0.81	0.73	0.58	0.38	0.00	0.00	0.00	0.00	0.00	0.54
	(1.26)	(1.14)	(1.30)	(1.14)	(1.11)	(1.04)	(0.94)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.02)
Safed Batra Gudda	2.35	1.9	2.23	1.57	1.19	0.96	0.69	0.00	0.00	0.00	0.00	0.00	1.07
	(1.69)	(1.55)	(1.65)	(1.44)	(1.30)	(1.21)	(1.09)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.25)
Dhan Batri	1.46	1.15	1.52	1.17	1.09	0.64	0.41	0.00	0.00	0.00	0.00	0.00	0.72
	(1.40)	(1.28)	(1.42)	(1.29)	(1.26)	(1.07)	(0.95)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.11)

Genotypes	Population of pod borer, *helicoverpa armigera*												
	30 DAS	38 DAS	47** DAS	54 DAS	61 DAS	68 DAS	75 DAS	81 DAS	89 DAS	95 DAS	103 DAS	107 DAS	Mean
Jayanti	0.45	0.14	0.42	0.18	0.10	0.09	0.05	0.00	0.00	0.00	0.00	0.00	0.14
	(0.97)	(0.80)	(0.96)	(0.82)	(0.77)	(0.77)	(0.74)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(0.80)
VL-1	0.32	0.16	0.49	0.16	0.08	0.10	0.08	0.00	0.00	0.00	0.00	0.00	0.14
	(0.91)	(0.81)	(0.99)	(0.81)	(0.76)	(0.77)	(0.76)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(0.80)
KPMR-504	1.52	1.21	1.61	1.23	1.15	0.62	0.32	0.00	0.00	0.00	0.00	0.00	0.75
	(1.42)	(1.31)	(1.45)	(1.32)	(1.28)	(1.06)	(0.91)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.12)
KPMR-400	1.58	1.27	1.66	1.29	1.21	0.68	0.38	0.00	0.00	0.00	0.00	0.00	0.79
	(1.44)	(1.33)	(1.47)	(1.34)	(1.31)	(1.09)	(0.94)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.13)
KPMR-486	1.73	1.12	1.52	1.14	1.06	0.66	0.36	0.00	0.00	0.00	0.00	0.00	0.73
	(1.49)	(1.27)	(1.42)	(1.28)	(1.25)	(1.08)	(0.93)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.11)
HFP-94-13	1.39	1.08	1.48	1.10	1.02	0.71	0.33	0.00	0.00	0.00	0.00	0.00	0.69
	(1.37)	(1.26)	(1.41)	(1.26)	(1.23)	(1.10)	(0.91)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.09)
HFP-94-12	1.77	1.19	1.59	1.15	1.07	0.72	0.40	0.00	0.00	0.00	0.00	0.00	0.77
	(1.51)	(1.30)	(1.45)	(1.28)	(1.25)	(1.10)	(0.95)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.12)
JP-885 (Local check)	1.53	1.22	1.60	1.16	1.00	0.68	0.39	0.00	0.00	0.00	0.00	0.00	0.74
	(1.42)	(1.31)	(1.45)	(1.29)	(1.22)	(1.09)	(0.94)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.11)
IPF-99-25 (Local check)	1.35	1.00	1.48	0.98	0.85	0.55	0.35	0.00	0.00	0.00	0.00	0.00	0.64
	(1.36)	(1.22)	(1.41)	(1.22)	(1.16)	(1.02)	(0.92)	(0.71)	(0.71)	(0.71)	(0.71)	(0.71)	(1.07)
SEm+	0.05	0.04	0.05	0.03	0.03	0.03	0.02	-	-	-	-	-	0.03
CD (p=0.05)	0.137	0.119	0.132	0.097	0.089	0.073	0.057	-	-	--	-	--	0.088

Table 6. Categorization of pea genotypes into the degree of susceptibility against pod borer

S. No.	Mean pod borer/ plant	Name of genotypes	Category
1	0.63-0.68	Batri patiram, VL-1, KPMR-485, Jayanti, KPMR-420, JFP-99-25, B-22, DDR-39, Shikha, P-3, VL-3	Least susceptible
2	0.78-1.06	PP-14, KPMR-30, Kali Batri, Atru matar, SPS-2, PP-86, JFP-27, RP-3, Gol Batra Tenduna, NDVP-4, Kala matar, DDP 94-14, DDR-44, PP-96, DDR-54, KFP-151, Batana Moolchand, HFP-94-13, JPF-99-25, Kashmiri samriddhi, DDR-43, NDVP-20, Dhan Batri, KPMR-503, HUVP-12, DDR-23, Lat sown, IPF-99-25 (local check), KPMR-504, Dhanoli Batri, KPMR-302, Rachna, JP-885 (Local check), KPMR-400, KPMR-327, DDR-27, KPMR-402, HUVP-2, HUP-2 KPMR-486, Chhoti safed Anju, LEP-260, HFP-94-12, DDR-52, PP-155, JM-91-01 and PP-96	Moderately susceptible
3	>1.06	KPMR-402, NDVP-20, Demo-JP-180, Safed Batra Gudda, Kashi samriddhi, Aman 1-206, Triple branching, Double branching and Matar Rangpur	Highly susceptible

Table 7. Yield and pod damage in different genotypes of pea

S. No	Genotypes	Pod damage (%)	Yield of pea (kg/ha)
1	IPF-99-25	6.95(15.29)	1285
2	B-22	2.25(8.63)	1412
3	DDR-27	6.35(14.60)	1291
4	PP-155	6.33(14.57	1299
5	Kashmiri samriddhi	5.39(13.42)	1301
6	DDR-43	5.21(13.19)	1285
7	DDR-44	5.29(13.30)	1287
8	DDR-39	2.55(9.19)	1514
9	Late sown	5.35(13.37)	1265
10	DDR-23	5.39(13.42)	1271
11	HUP-2	5.10(13.05)	1275
12	HUVP-2	5.32(13.34)	1275
13	KPMR-402	8.15(16.59)	1165
14	NDVP-20	58.35(16.80)	1169
15	Atru matar	5.95(14.12)	1312
16	Triple branching	8.36(16.81)	1119
17	**Double Branching**	**8.84(17.30)**	**1095**
18	SPS-2	5.25(13.25)	1295
19	NDVP-20	5.24(13.25)	1335
20	KFP-151	5.29(13.30)	1268
21	HUVP-12	5.46(13.51)	1275
23	Dhanoli Batri	5.85(14.00)	1278
24	Gol Batra Tenduna	5.68(13.79)	1225
25	Matar Rangpur	8.14(16.58)	1095
26	Kashi samriddhi	8.19(16.39)	1080
27	Kala matar	5.58(13.66)	1267
28	KPMR-503	5.68(13.79)	1278
29	DDR-52	5.66(13.76)	1245
30	DDR-54	5.26(13.26)	1225
31	PP-96	5.45(13.50)	1300
32	KPMR-30	5.55(13.63)	1325
33	IPF-99-25	2.72(9.49)	1610
34	PP-96	5.58(13.66)	1315
35	PP-14	5.95(14.12)	1311
36	Aman1-206	8.35(16.80)	1065
37	Demo-JP-180	8.68(17.13)	1100
38	Chhoti safed Anju	5.65(13.75)	1350
39	Batana Moolchand	5.69(13.80)	1322
40	Batri patiram	2.75(9.55)	1620
41	Rachna	5.69(13.80)	1325
42	Shikha	2.79(9.62)	1599
43	KPMR-420	2.26(8.65)	1597
44	KPMR-402	5.26(13.26)	1312
45	KPMR-327	5.49(13.55)	1327
46	KPMR-302	5.56(13.64)	1295
47	KPMR-485	2.24(8.61)	1699
48	Kali Batri	5.15(13.12)	1323
49	Safed Batra Gudda	8.64(17.09)	1023
51	Dhan Batri	5.32(13.34)	1351
52	Jayanti	3.56(10.88)	1611
53	VL-1	3.59(10.92)	1588
54	KPMR-504	5.11(13.06)	1314
55	KPMR-400	5.69(13.80)	1295
56	KPMR-486	5.78(13.91)	1313
57	HFP-94-13	5.79(13.92)	1269
58	HFP-94-12	5.69(13.80)	1299
59	JP-885 (Local check)	5.84(13.98)	1310
60	IPF-99-25 (Local check)	5.94(14.11)	1324
61	Batri patiram	2.75(9.55)	1620
62	Rachna	5.69(13.80)	1325
63	Shikha	2.79(9.62)	1599
64	KPMR-420	2.26(8.65)	1597
65	KPMR-402	5.26(13.26)	1312
66	KPMR-327	5.49(13.55)	1327
67	KPMR-302	5.56(13.64)	1295
68	KPMR-485	2.24(8.61)	1699
69	Kali batri	5.15(13.12)	1323
70	Aman1-206	8.35(16.80)	1065
71	Demo-JP-180	8.68(17.13)	1100
		SEm±0.11	**74**
		CD (p=0.05)	**208**

** Mean of three replications*
Figures in the parentheses are angular transformation value

4. CONCLUSION

In conclusion, the field pea crop faced significant challenges from aphids, pod borers, and leafhoppers, all contributing to a substantial reduction in overall yield. Among the genotypes studied, Double Branching exhibited the highest susceptibility to aphids, while Matar Rangpur showed pronounced vulnerability to pod borers. Leafhopper populations varied across genotypes, with Kashi Samriddhi displaying the highest susceptibility. The lowest pod damage was

observed in the KPMR-485 genotype, highlighting its relative resistance. Overall, genotypes such as B-22 and KPMR-485 demonstrated better resistance to insect pests, resulting in higher pea yields. These findings underscore the importance of selecting resistant genotypes for effective pest management and improved field pea productivity.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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