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Screening of pigeonpea [*Cajanus cajan* (L.) mill sp.] against blue butterfly, *L. boeticus* (L.) (Lepidoptera: Lycaenidae) in long duration pigeonpea genotypes

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Abstract
The pigeon pea was infested with several insect pests at various stages of crop growth. Out of which the incidence pattern *of L. boeticus* was studied. The result of the investigation about the "Screening of pigeon pea [*Cajanus cajan* (L.) Mill sp. blue butterfly], *L. boeticus* (L.) (Lepidoptera: Lycaenidae) against in long-duration Pigeonpea genotypes" was carried out in 2018-19 at the Agricultural Research Farm, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi. This insect was studied during the reproductive phase of the crop during 2018-19. *L. boeticus* was observed at the 4th standard week with the first occurrence of a blue butterfly. Population significantly differentiated among the genotypes screened in the genotype AVT1-707 with a maximum population of (0.14 larva/plant) & AVT2-904 with the population (0.04 larva/plant) in the first week. The larval population of *L. boeticus* persisted in all genotypes from the 4th standard week through to the 12th standard week of 2018-19. The mean population of the blue butterfly was considerably different and ranged from in various genotypes. (0.20 larva/plant) in AVT2-903 to (0.27 larva/plant) in MAL-13 (AVT1) & AVT1-704. In AVT1-704 the cereal yield of different genotypes was from 617 kg/ha to 1434 kg/ha with the AVT1-708 genotype.

Keywords: Pigeon pea, *L. boeticus*, screening, damage, standard week

1. Introduction
Pigeonpea is a significant grain legume, which is grown in semi-arid tropics and subtropical regions worldwide. *Cajanus cajan* (L.) Mill sp. More than 90% of pigeon pea production and area worldwide is in India (Indian council of agricultural research, 2014; Kumar & Nath, 2003; Snapp *et al*., 2002) [2, 6]. Pigeonpea in India is cultivated in 3,88 million hectares with 3.29 million tons of annual production and 849 kg/ha of return (Ministry of Agriculture, 2014) [6]. Even though India is the leading producer of pigeon pea, it has always been a matter of productivity. The low pigeon pea productivity in the country can be attributed to numerous reasons, including significant damage caused by insect pests. In its various phases of growth more than 250 species of insects are known to infest pigeon pea crops, but only a few of these cause serious and constant harm to the crop (Gopali *et al*., 2010; Lateef & Reed, 1990) [1, 8]. The crop duration, intercropping, and numerous weather parameters play a vital role in building or deteriorating the pest's populace in pigeon pea. Thus, the management practices should be oriented based upon those fundamentals to systematically and efficiently check those nuisances in the pigeon pea field (Kumar & Nath, 2004; Rao *et al*., 2005; Shanower *et al*., 1999) [6, 10, 13]. Blue butterfly, *L. boeticus* (L.) (Lepidoptera: Lycaenidae) has become a genuine threat to the quality of grain production in pigeon pea, among the pests damaging insect pests of pigeon pea next to pod borers, *L. boeticus*. Grain yield damage as a result of a larva damage is usually between 25% and 40% (Jaisal *et al*., 2010; Kumar & Nath, 2004) [6, 3]. The total cereal loss caused by bugs in the suction of pods for U.P. alone is 50,000 tons a year (Keval *et al*., 2017; Lal & Yadava, 2012) [4, 7]; individually or in groups of 2 to 3, the incubation period lasts for 4 to 7 days. With flower bud and green pod, the newly hatched larvae develop and pupates after 9 to 27 days. Pupation occurs on the twigs of the vine or the seeds. The pupal cycle has a length of 7 to 19 days. The larvae chew pods, flowers, and bud leaves. Small holes are seen in the damaged pod. It has been acknowledged for a long time that the use of resistant varieties provides biologically, environmentally, economically, and socially acceptable crop protection for host plant resistance in integrated pest management programs (Sachan *et al*., 1994; Sachan & Lal, 1997) [11]. Since pigeon pea cultivators have to spend a great amount on inputs like chemical pesticides, it is thus also thought that the available

germplasms can be used in breeding insect-resistant cultivars to search for sources of resistance to this insect pest (Jaisal *et al*., 2010) [3]. To be able to identify resistant springs, long-term cultivars that can be less susceptible to pigeon-powder complexes have been developed in this study.

2. Materials and Methods

This study was conducted during Kharif 2018-19 at the Institute of Agricultural Sciences, Banaras Hindu University, Varanasi. The research Field follows Randomized Block Design method. Seeds were seeded from row to row (75 cm) and spaced manually between plants (25 cm). During the first ten acquisitions, the field experiment was undertaken in a separate trial with 18 pigeon pea additions and in the second trial 8, the initial varietal and advanced varietal testing were used, respectively. This causes substantial damage to buds, flowers, and tender pods, and remains active on pigeon pea from the last week of November to the first week of March. The eggs are laid on flower buds, green pods, and occasionally on shoots and leaves individually or in groups of 2 to 3, the incubation period lasts for 4 to 7 days. With flower bud and green pod, the newly hatched larvae develop and pupate after 9 to 27 days. Pupation occurs on the twigs of the vine or the seeds. The pupal cycle has a length of 7 to 19 days. The larvae chew pods, flowers, and bud leaves. Small holes are seen in the damaged pod. Every genotype has been individually harvested when the crop has matured, threshed separately and grain yields per grain were recorded and converted into kg/ha. All recorded data were calculated statistically according to the randomized design method of the block, with insect population data transformed using a transformable square root method, and harm assessment data transformed using a sin (q=sin-1x) transformed method.

$$\% \text{ Pod damage} = \frac{\text{Number of damaged pods}}{\text{Total number of pods}} \times 100$$

$$\% \text{ Grain damage} = \frac{\text{Number of damaged grains}}{\text{Total number of grains}} \times 100$$

$$\% \text{ Grain damage} = \frac{\text{Number of damaged grains}}{\text{Total number of grains}} \times 100$$

3. Result and Discussion

Based on the above research it can be concluded that resistance to host plants plays a very important role in determining the level of infestation of pigeon pea and screening is a suitable method for the identification of resistant genotypes. Blue butterfly, *Lampides boeticus* is a cardinal insect pest in this area and is increasing with the growth of crop life. The real damage to financial products also occurs in the case of pulses after flowering. The pooled mean population of blue butterfly also differed significantly among the genotypes where the highest population was recorded in MAL-13 (AVT1) (check) & AVT1-704 (0.27 larva/plant) followed AVT1-701 & AVT1-706 (0.25 larvae/plant) followed MAL-13 (AVT2) (0.24 larva/plant) and AVT1-702 & AVT1-705 and AVT2-901 (0.22 larva/plant) and lowest in AVT2-906 & AVT1-709 (0.21 larva/plant) followed by AVT2-903 (0.20 larva/plant), AVT2-902 (0.19 larva/ plant), AVT2-904 , AVT2-905, AVT2-907, AVT1-703 & AVT1-707 (0.17 larva/ plant) AVT1-708 (0.16 larva/plant) table no. 1 and 2. Table 3 contains information on grain yield per hectare for various genotypes. There was a significant difference in grain yield between genotypes Throughout the AVT1-704 genotype, the genotype AVT1-708 ranges from 617 kg/ha to 1434 kg/ha. The genotypes AVT1-707, AVT1-706, AVT1-709, AVT2-901, AVT2-907, MAL- 13 (AVT2), AVT1-702, AVT1-705, AVT1-703, AVT2-902, AVT2-906, AVT2-903, AVT2-905, AVT2-904, and MAL 13 (AVT1) produce higher yields, i.e., 1233 kg/ha, 1025 kg/ha, 1017 kg/ha, 1000 kg/ha, 900 kg/ha, 850 kg/ha, 840kg/ha, 767 kg/ha, 748 kg/ha, 717 kg/ha and 667 kg/ha respectively as compared to AVT1-708 giving yield 617 kg/ha. These findings are consistent with those reported by Lal & Yadava, 2012 [7]. Sachan & Lal, 1997 [11], also reported higher yield potential in pigeon pea genotypes with lower pod borer incidence. The most resistance to pod damage and improved yield was found among the nine genotypes screened for the AVT1-7-08. The most resistant to larva damage was found and better performance was also recorded. For the successful control, *Lampides boeticus* of this genotype is therefore recommended to farmers in the area of Varanasi.

Table 1: Blue butterfly [*L. boeticus* (L.)] population per plant on pigeon pea genotypes of long duration during *Kharif* 2018-19

Genotypes	4th SW	5th SW	6th SW	7th SW	8th SW	9th SW	10th SW	11th SW	12th SW	Average
AVT1-701	.08(1.039)	.2(1.095)	.18(1.086)	.23(1.109)	.27(1.127)	.32(1.149)	.36(1.166)	.34(1.158)	.29(1.136)	0.25
AVT1-702	.04(1.020)	.08(1.039)	.16(1.077)	.3(1.140)	.23(1.109)	.3(1.140)	.38(1.175)	.29(1.136)	.24(1.114)	0.22
AVT1-703	.02(1.010)	.06(1.030)	.12(1.058)	.16(1.077)	.19(1.091)	.26(1.122)	.27(1.127)	.28(1.131)	.2(1.095)	0.17
AVT1-704	.09(1.044)	.12(1.058)	.14(1.068)	.24(1.114)	.36(1.166)	.34(1.158)	.43(1.196)	.39(1.179)	.3(1.140)	0.27
AVT1-705	.01(1.005)	.1(1.049)	.15(1.072)	.22(1.105)	.25(1.118)	.31(1.145)	.33(1.153)	.3(1.140)	.28(1.131)	0.22
AVT1-706	.07(1.034)	.15(1.072)	.08(1.039)	.21(1.100)	.3(1.140)	.4(1.183)	.41(1.187)	.32(1.149)	.33(1.153)	0.25
AVT1-707	.14(1.068)	.13(1.063)	.11(1.054)	.2(1.095)	.14(1.068)	.22(1.105)	.25(1.108)	.16(1.077)	.22(1.105)	0.17
AVT1-708	.03(1.015)	.03(1.015)	.21(1.100)	.12(1.058)	.17(1.082)	.23(1.109)	.23(1.109)	.2(1.095)	.18(1.086)	0.16
AVT1-709	0(1.000)	.1(1.049)	.13(1.063)	.19(1.091)	.28(1.131)	.32(1.149)	.3(1.140)	.35(1.162)	.25(1.118)	0.21
MAL-13	.12(1.058)	.07(1.034)	.17(1.082)	.32(1.149)	.31(1.145)	.38(1.175)	.4(1.183)	.4(1.183)	.23(1.109)	0.27
SE(m)±	0.003	0.008	0.003	0.008	0.002	0.008	0.008	0.013	0.012	
CD at 5%	0.009	0.025	0.008	0.023	0.007	0.025	0.024	0.039	0.035	

Figures in parenthesis are Arc Sine Percentage transformed values

Table 2: Blue butterfly [*L. boeticus* (L.)] population per plant on pigeon pea genotypes of long duration during *Kharif* 2018-19

Genotypes	4th SW	5th SW	6th SW	7th SW	8th SW	9th SW	10th SW	11th SW	12th SW	Average
AVT2-901	.08(1.039)	.05(1.025)	.09(1.044)	.19(1.091))	.32(1.149)	.29(1.136)	.34(1.158)	.28(1.131)	.32(1.149)	0.22
AVT2-902	.01(1.005)	.06(1.030)	.14(1.068)	.15(1.072)	.25(1.118)	.23(1.109)	.33(1.153)	.26(1.122)	.27(1.127)	0.19
AVT2-903	.09(1.044)	.04(1.020)	.2(1.095)	.13(1.063)	.3(1.140)	.21(1.100)	.3(1.140)	.24(1.114)	.28(1.131)	0.2
AVT2-904	.04(1.020)	.01(1.005)	.15(1.072)	.17(1.082)	.17(1.082)	.2(1.095)	.32(1.149)	.25(1.118)	.26(1.122)	0.17
AVT2-905	.07(1.034)	.02(1.010)	.12(1.058)	.16(1.077)	.18(1.086)	.25(1.118)	.2(1.095)	.21(1.100)	.29(1.136)	0.17
AVT2-906	.04(1.020)	.08(1.039)	.19(1.091)	.2(1.095)	.19(1.091)	.4(1.183)	.29(1.136)	.31(1.145)	.15(1.072)	0.21
AVT2-907	.03(1.015)	.07(1.034)	.11(1.054)	.12(1.58)	.23(1.109)	.24(1.114)	.26(1.122)	.23(1.109)	.21(1.100)	0.17
MAL-13	.06(1.029)	.13(1.063)	.3(1.140)	.21(1.100)	.15(1.072)	.27(1.127)	.35(1.162)	.4(1.183)	.33(1.153)	0.24
SE(m)±	0.003	0.003	0.012	0.009	0.013	0.014	0.009	0.009	0.002	
CD at 5%	0.01	0.01	0.038	0.027	0.027	0.042	0.027	0.029	0.006	

Figures in parenthesis are Arc Sine Percentage transformed values

Table 3: Pigeonpea genotypes yield for the year during *Kharif* 2018-19

Sr. No.	Genotypes	Grain Yield (kg/ha)
1	AVT1-701	777
2	AVT1-702	1000
3	AVT1-703	900
4	AVT1-704	617
5	AVT1-705	1000
6	AVT1-706	1233
7	AVT1-707	1233
8	AVT1-708	1433
9	AVT1-709	1233
10	MAL-13 (Check)	667
SE(m)±		1.210
CD at 5%		3.622

Table 4: Pigeonpea genotypes yield for the year during *Kharif* 2018-19

Sr. No.	Genotypes	Grain Yield (Kg/ha)
1	AVT2-901	1233
2	AVT2-902	850
3	AVT2-903	767
4	AVT2-904	717
5	AVT2-905	748
6	AVT2-906	840
7	AVT2-907	1025
8	MAL-13 (Check)	1017
SE(m)±		1.729
CD at 5%		5.296

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Conflict of interest
The authors have no conflict of interest.

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