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Laboratory studies on antibiosis and antixenotic effect of soybean [*Glycine max* (L.) Merrill.] against *Spilarctia obliqua* (Walker)

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Abstract
Soybean (Kharif 2015-16) germplasms were studied for antibiosis and antixenotic effects against *Spilarctia obliqua* (Walker). In antibiosis study, JS 2089, JS 2087, VLS 89, MACS 1460, DSB 25 and Bragg showed resistance exhibiting lower larval weight, pupal weight, higher pupal period, larval period and terminal larval mortality as compared to other. In antixenosis SL 688, VLS 89, PS 1556, RCS 1046, JS 2089 and PS 1347 exhibited lower ECI, ECD value; VLS 89, SL 688, RCS 1046, NRC 94, PS 1550 and JS 2087 showed higher AD value and less preferred by the test insect. In SL 955, PS 1550, JS 2087, MACS 1460, NRC 94 showed higher ECI, ECD values. In SL 955, MACS 1460, PS 1347, JS 2089, PS 1556 showed lower AD values indicating that these germplasm preferred by the insects. DSB 25 and JS 335 having C value ranged from 1.03 and 1.00 for *Spilarctia obliqua.*

Keywords: antibiosis, antixenosis, AD, ECI, ECD, *Spilarctia obliqua*

1. Introduction
Soybean (*Glycine max* (L) Merrill) is known as "Golden Bean "and versatile crop with countless possibilities of not only getting better agriculture but also subsidiary industries [10]. Soybean was familiarized during 1960's. Globally it is the most significant legume and inhabits the fourth position among the crops next to rice, wheat, maize in term global crop production [4]. It is also considered as an imperative oilseed crop in the world for accounting more than 55 per cent of oilseeds and about 30percent of the supply of all vegetable oils. The oil of soybean is used as raw material for manufacturing antibiotics, paints, adhesives, lubricant etc. [10].
The leaf defoliation of soybean may also cause damage to the crop [6]. The two main defoliators of soybean crop are Bihar hairy caterpillar *(Spilarctia obliqua)* and *Spodoptera litura* tobacco caterpillar.
Among these two pest, Bihar hairy caterpillar, Spilosoma obliqua Walker (Lepidoptera: Arectiidae), is one of the most important defoliator pest of Soybean [Glycine max (L.) Merr.] in India [3]. Bihar hairy caterpillar is a sporadic pest and also voracious feeder, which feeds initially in the gregarious form on soybean leaves in early instars, later on, it feeds as a solitary phase and later it disperse and voraciously defoliate the leaves causing serious damage to the crop. It attacks pulses, sesame, linseed, cotton, jute, sorghum, groundnut, and some vegetables [9]**.** It is widely distributed in India, China, Bangladesh, Myanmar, Nepal and Pakistan (C.P.C.2004) In India serious attack of this pest found in Madhya Pradesh, Uttar Pradesh, Bihar, Uttarakhand, Punjab, Manipur and other states [3].

2. Material and Methods
The present study was carried out in Kharif season 2015-16 in Integrated Pest Management Laboratory Department of Entomology, College of Agriculture, G.B. Pant University of Agriculture and Technology, Pantnagar, U.S. Nagar (Uttarakhand).

a) Test insect - Bihar Hairy Caterpillar, *Spilarctia obliqua* (Lepidoptera: Noctuidae)
The crop selected was soybean which was grown in Norman E. Borlaug Crop Research Centre (NEBCRC), G.B Pant University of Agriculture And Technology Pantnagar and the number of germplasm were 15 i.e. SL 955, SL 688, JS 20 89, VLS 89, NRC 94, JS 20 87, PS 1550, MACS 1460, RCS 10 46, PS 1347, PS 1556, SL 1028, JS 335 and Bragg.

b) Culture maintenance of Bihar hairy Caterpillar *Spilarctia obliqua*

Larvae culture of *S.obliqua* was maintained properly so those sufficient amount of larvae were available during the whole experiment well in advance. Egg masses of

S. obliqua were obtained from different field conditions on different crops like soybean, chickpea, cowpea etc. After that larva were reared in laboratory condition [2, 12].

Egg masses were kept in a petri dish having (diameter 9cm) which was lined with moistened filter paper. After hatching the newly emerged larvae were shifted to a plastic box containing fresh leaves of soybean with the help of a finebrush. Fresh food was supplied daily and proper hygiene condition was maintained. A wet piece of cotton swab was used for covering the petiole to protect it from drying. When the larvae were about to pupate, they were kept in glass jars with the bottom lining of moistened filter paper and a 2 cm thick layer of sand underneath. Fresh leaves of soybean were provided for egg laying. Cotton soaked in 10per cent sucrose solution and some drops of multivitamin were also added to the solution and it was kept inside the jar as a food source for emerging adults. The top of the jar was covered with a muslincloth. The egg masses so obtained were used for raising the culture and accompanying the experiment for new generation.

c) Experimentation

1) Weight of leaves – Fresh weight of 15 soybean germplasm as mentioned above were taken and then these leaves were weighed with the help of electric weighing balance for antibiosis. While in the case of antixenosis leaves were oven dried at 50^0C for 15 minutes in a hot air oven and weighed with the help of electric weighing balance. This relation was used between the fresh and dry weight of leaves for calculating FI (i.e. food ingested).

2) Dry weight of frass – Frass of *S. obliqua* was collected from each individual tubs with the help of a brush, after that, it was oven dried at 50-degree Celsius for 15 minutes in a hot air oven and weighed. The frass was dry weighed for calculating weight of frass (Wf).

d) Statical analysis

The data obtained from the study were subjected to statistical analysis by using CRD (complete randomized design) for test insects and the software was STPR 3.

3. Result and Discussion

3.1 Antibiosis effect of different soybean germplasm against Bihar hairy caterpillar *Spilarctia obliqua*

The antibiosis effect of fifteen germplasm against third instar larvae of

S. oblique (mean larval weight= 0.11g/larvae) was assessed on the basis of larval weight, larval period, pupal period, pupal weight, terminal larval mortality and adult emergence. The detailed methodology has been presented below and the result has been presented in Table 1.

3.1.1 Effect of soybean germplasm on larval weight

The data presented in Table 1 suggests that larval weight on the 3rd days after feeding (DAF) ranged from 0.112 - 0.186 g/larvae, for 6thDAF it ranged from 0.184 –0.238 g/larvae and for the 9th DAF it ranged from 0.184 – 0.248 g/larvae.

In the present investigation the data recorded on 3 (DAF) showed that the larvae reared on SL 1028, PS 1347, PS 1556, JS 335 and RCS 1046 had higher larval weight of about 0.156, 0.152, 0.186, 0.158 and 0.148 g/larvae, respectively. Whereas larvae reared on the germplasm JS 20 89, VLS 89, JS 20 89, PS 1550 and Bragg had lower larval weight of about (0.112, 0.116, 0.118, 0.13 and 0.13 g/larvae), respectively.

A perusal of data on 6th DAF showed that the larvae reared on the SL 955, SL 688, JS 1556 , JS 335 and SL 1028 had higher larval weight of about 0.238, 0.236, 0.244, 0.248 and 0.24 g/larvae, respectively showing that the germplasm were susceptible whereas larvae reared on JS 20 89, VLS 89, JS 20 87, PS 1550 and MACS 1460 had lower larval weight of 0.184, 0.186, 0.188, 0.192 and 0.196 g/larvae, respectively indicating that these germplasm were found resistant as compared to other tested germplasm.

According to the observations recorded on 9th DAF showed that germplasm JS 20, VLS 89, JS 20 87, PS 1550 and MACS 1460 had lower larval weight of about 0.23, 0.236, 0.24, 0.248 and 0.252 g/larvae, respectively and the larvae reared on NRC 94, JS 335, SL 1028, PS 1556 and PS 1347 had higher larval weight of 0.274, 0.296, 0.286, 0.292 and 0.284 g/larvae, respectively. Germplasm JS 335 had the highest larval weight of 0.296 g/larvae, indicating that it was most susceptible among other tested germplasm. On the other hand germplasm, JS 20 89 had lowest larval weight of about 0.23g/ larvae indicating that it was resistant as compared to other tested germplasm.

Data generated from the observations which were based on different growth parameters against *S. obliqua* on different days during the experiment revealed that germplasm JS 2089 had lowest larval weight showing that it was resistant among other tested germplasm, whereas JS 335 had highest larval weight suggesting that it was most susceptible among all other tested germplasm. The present finding was in accordance with the finding of [12] who reported JS 335 as most susceptible germplasm [8] also described the antibiosis mechanism of resistance against *Spilarctia obliqua* on different germplasm of soybean

3.1.2 Effect of soybean germplasm on pupal period

The pupal period was evaluated for the 15 germplasm against third instar larvae of test insects till adult emergence ranged from 9.3 – 12.8 d. The larvae which were fed with JS 20 89, VLS 89, JS 20 87, PS 1550 and Bragg had a higher pupal period of 10.22, 10.32, 10.32, 10.4 and 12.8 d, respectively indicating that these germplasm were found resistant as compared to other tested germplasm. While on the other hand SL 955 9, SL 688, NRC 94, RCS 10 46 and PS 1347 had lower pupal period of 9.38, 9.3, 9.26, 9.4 and 9.54 d, respectively indicating that these germplasm were found susceptible to the larvae as compared to other tested germplasm.

Germplasm Bragg had longest pupal period i.e. 12.8 d showing that it was resistant among other germplasm having the best characters which were not favorable for the larvae, whereas germplasm SL 688 had shortest pupal period indicating that it was most susceptible among other tested germplasm which were fed to the larvae [10] also reported non-preference mechanism of resistance in soybean germplasm against Bihar hairy caterpillar

3.1.3 Effect of soybean germplasm on pupal weight

Pupal weight was taken for the third instar larvae of the test insects on different 15 germplasm. The data computed for the test insects showed significant influence of germplasm on the test insects and it was observed that the pupal weight ranged

from 0.136 -0.382 g./pupa, respectively. Larvae reared on JS 20 89, VLS 89, JS 20 87, PS 1550 and MACS 1460 had lower pupal weight of about 0.132, 0.138, 0.144, 0.152 and 0.16 g/pupa whereas larvae reared on JS 335, PS 1556, PS 1347, SL 955 and NRC 94 had higher pupal weight of 0.21, 0.202, 0.188, 0.174 and 0.182g/pupa, respectively.

The data computed on pupal weight against *S. obliqua* showed that larvae reared on the germplasm JS 20 89 had lowest pupal weight of 0.132 g/pupa whereas the larvae reared on JS 335 had highest pupal weight of 0.21 g/pupa indicating that it was, more susceptible in nature as compared to other tested germplasm [1] tested the effect of fifteen soybean germplasm against Bihar hairy caterpillar *S. obliqua* and reported some variety as resistant and some as susceptible and suggest the cause of this effect as antibiosis

3.1.4 Effect of soybean germplasm on larval period

The larval period was recorded for the third instar larvae of test insects which were reared on 15 germplasm and it was observed that the larval period ranged from 18.32 – 20.78 day. Larvae reared on JS 20 89, VLS 89, JS 20 87, PS 1550 and MACS 1460, Bragg had higher larval period of 20.32, 20.66, 20.78, 20.52, 20.52 and 20.42 d, respectively. On the other hand larvae reared on SL 688, JS 335, NRC 94, PS 1347 and RCS 1046 had lower larval period of 18.8, 18.764, 19.22, 18.32 and 18.76 d, respectively.

Data produced according to the experiment revealed that germplasm JS 20 87 had longest larval period suggesting that it was having resistant characters as compared to other tested germplasm. Highest larval period of the germplasm JS 20 87 indicates that it showed the adverse effect to the larvae, whereas germplasm which had lowest larval period indicates that it was susceptible in nature. According to the findings of [12] germplasm NRC 94 was resistant having a longest larval period. It was a contradiction to the above findings which indicates germplasm NRC 94 as less resistant to the test insects.

3.1.5 Effect of soybean germplasm on Terminal larval mortality

It was recorded after the larvae were in pupation, terminal larval mortality of the 4 germplasm i.e. JS 20 89, JS 20 87, DSB 25 and Bragg was 0.2, 0.2, 0.2 and 0.4per cent and rest of the 11 tested germplasm SL 955, SL 688, NRC 94, PS 1556, PS 1550, PS 1347, RCS 10 46, MACS 1460, SL 1028, JS 335 and VLS 89 had 0per cent terminal larval mortality.

The data on terminal larval mortality indicated that Bragg reduces the larval population significantly indicating that it had resistant characters as compared to other tested germplasm and the cause of larval mortality may be attributed to the antibiosis effect of resistant germplasm on the test insects. [10] also reported non preference mechanism of resistance in soybean germplasm against Bihar hairy caterpillar

3.1.6 Effect of soybean germplasm on adult emergence

During the present investigation adult emergence of the third instar larvae of the test insects were observed and it was found that all the larvae which were in pupation were successfully emerged out after a certain pupal duration so it was concluded that there was 100per cent adult emergence of all the pupae and there was no pupal deformity.

Data generated from the observations which were based on different growth parameters against *S. obliqua* on different days during the experiment revealed that germplasm JS 2089 had lowest larval weight showing that it was resistant among other tested germplasm, whereas JS 335 had highest larval weight suggesting that it was most susceptible among all other tested germplasm.The present finding was in accordance with the finding of **[10]** who reported JS 335 as most susceptible germplasm. Similar antibiosis mechanism of resistance against *Spilarctia obliqua* on different germplasm of soybean [6].

Germplasm Bragg had longest pupal period i.e. 12.8 d showing that it was resistant among other germplasm having the best characters which were not favorable for the larvae, whereas germplasm SL 688 had shortest pupal period indicating that it was most susceptible among other tested germplasm which were fed to the larvae. Similar non-preference mechanism of resistance in soybean germplasm against Bihar hairy caterpillar was reported [8].

The data computed on pupal weight against *S. obliqua* showed that larvae reared on the germplasm JS 20 89 had lowest pupal weight of 0.132 g/pupa whereas the larvae reared on JS 335 had highest pupal weight of 0.21 g/pupa indicating that it was, more susceptible in nature as compared to other tested germplasm [1] tested the effect of fifteen soybean germplasm against Bihar hairy caterpillar *S. obliqua* and reported some variety as resistant and some as susceptible and suggest the cause of this effect as antibiosis.

Data produced according to the experiment revealed that germplasm JS 20 87 had longest larval period suggesting that it was having resistant characters as compared to other tested germplasm. Highest larval period of the germplasm JS 20 87 indicates that it showed the adverse effect to the larvae, whereas germplasm which had lowest larval period indicates that it was susceptible in nature. According to the findings of [10] germplasm NRC 94 was resistant having a longest larval period. It was a contradiction to the above findings which indicates germplasm NRC 94 as less resistant to the test insects.

The data on terminal larval mortality indicated that Bragg reduces the larval population significantly indicating that it had resistant characters as compared to other tested germplasm and the cause of larval mortality may be attributed to the antibiosis effect of resistant germplasm on the test insects. [8] also reported non preference mechanism of resistance in soybean germplasm against Bihar hairy caterpillar.

(3.2) Antixenotic effect of different soybean germplasm against Bihar hairy caterpillar (*Spilarctia obliqua)*

The antixenotic effect of fifteen germplasm against third instar larvae of *S. oblique* (mean larval weight= 0.11g/larvae) was assessed on the basis of efficiency of consumption index (ECI), efficiency of conversion of digested food (ECD) and approximate digestibility (AD) following gravimetric method. The detailed methodology has been presented in below. The result has been presented in the Table 2.

3.2.1 Effect of soybean germplasm on efficiency of conversion index (ECI)

The present investigation was carried against third instar larvae of *S. obliqua* on 15 soybean germplasm. It was observed that the (ECI) value of *S. obliqua* ranged from 3.20 - 6.17. The larvae reared on germplasm SL 1028, JS 335, PS 1556 and RCS 1046 had higher ECI value of 6.17, 5.36, 5.36 and 5.03, respectively. On the other hand larvae reared on germplasm SL 955, Bragg, PS 1550 and JS 2089 had lower ECI value of about 5.03, 3.20, 3.23 and 3.30, respectively.

The data computed on the efficiency of consumption index against *S. obliqua* showed a significant influence of different germplasm on consumption ability of soybean leaves. According to the value of ECI, Bragg (3.20) is least suitable for the growth and development of *S. obliqua* as it was least preferred by the test insects. In contradiction to the above findings according to [12] it was revealed that Bragg was susceptible having ECI value of 13.72 indicating that it was more preferred by the test insects as compared to the tested germplasm.

3.2.2 Effect of soybean germplasm on efficiency of conversion of digested food (ECD)

Measure of the efficiency of conversion of digested food into growth and any change in ECD value indicates the overall increase or decrease of the proportion of digested food metabolized for energy [5]. Therefore, no change in ECI and ECD values indicates that the ingested secondary biochemical do not exhibit any chronic toxicity **[4]**. Data presented in the table 4.3 indicated that the ECD value of third instar larvae of *S. obliqua* fed on 15 different soybean germplasm ranged from 3.28 - 6.56. It was evident that SL 1028 had the highest ECD value of 6.56 followed by JS 335(5.82), RCS 10 46(5.57) and PS 1556 (4.82) whereas Bragg, PS 1347, SL955, PS 1550 and JS 2089 had lower ECD value of 3.28, 3.63, 3.44, 3.35 and 3.38 respectively.

3.2.3 Effect of soybean germplasm on approximate digestibility (AD)

Approximate digestibility is the measure of the approximate percentage of food consumed that is utilized by the larvae. The data presented in Table 2 suggests that the value of AD ranged from 74.29 – 99.32 and the highest AD value was recorded for SL 688 (99.32) followed by RCS 1046 (98.68), PS 1550 (98.57), VLS 89(97.95) and DSB 25(98.55). Whereas it was lowest for JS 20 87(59.02) followed by JS 335(74.29), PS 1556(91.41), SL 1028(91.67), Bragg 59.02(93.50).

The data generated for approximate digestibility (AD) value revealed that JS 20 87 and JS 335 had lowest AD value suggesting them as susceptible germplasm, whereas germplasm SL 688 and RCS 1046 had highest AD value indicating that these were less preferred by the test insects or resistant as compared to other tested germplasm. The present findings were in accordance with the findings of [12].

3.2.4 Preference index

To analyze the antixenotic level of test insects against 15 soybean germplasm preference index was evaluated. It was found that larvae reared on 13 germplasm viz. SL 955, SL 688, JS 2089. JS 20 87, NRC 94, PS 1550, PS 1347, PS 1556, SL 1028, MACS 1460, RCS 10 46, VLS 89 and Bragg showed slight antixenotic response with the value ranging from 0.91-0.96 against third instar larvae of *S. obliqua* whereas larvae reared on rest of the two germplasm DSB 25 and JS 335 showed preferred host response having C value ranged from 1.03 and 1.00.

The data computed on the efficiency of consumption index against *S. obliqua* showed a significant influence of different germplasm on consumption ability of soybean leaves. According to the value of ECI, Bragg (3.20) is least suitable for the growth and development of *S. obliqua* as it was least preferred by the test insects. In contradiction to the above findings according to **[10]**, it was revealed that Bragg was susceptible having ECI value of 13.72 indicating that it was more preferred by the test insects as compared to the tested germplasm. This may be due to the difference in biotype, the difference in the laboratory conditions. In the present study, SL1028 has the highest value of ECI value of 6.17. The higher ECI values may also be due to some nutritional insufficiency due to which *S. obliqua* has to ingest more food to full fill the nutritional requirement. It is also possible that the food may be nutritionally unstable which consequently increased the ECI value.

The data computed on the efficiency of conversion of digested food (ECD) of different soybean germplasm revealed that larvae reared on germplasm PS 1347 had lowest ECD value suggesting that these larvae were not efficient in turning digested food into biomass. Whereas germplasm SL1028 had highest ECD value indicating that these more preferred by the test insects. And the reason of this resistance may be antixenosis.

The data generated for approximate digestibility (AD) value revealed that JS 20 87 and JS 335 had lowest AD value suggesting them as susceptible germplasm, whereas germplasm SL 688 and RCS 1046 had highest AD value indicating that these were less preferred by the test insects or resistant as compared to other tested germplasm [10].

Table 1: Effect of soybean germplasm on growth and development *of* Bihar hairy caterpillar *Spilarctia obliqua* (Walker)

S. No	Germplasm	Mean weight (g/larva) 3DAF	Mean weight(g) 6DAF	Mean weight(g) 9DAF	Mean larval period (d)	Mean pupal weight (g/pupa)	Mean pupal period (d)	Adult emergence (per cent)	Terminal larval mortality (per cent)
1.	SL 955	0.14 (0.799)	0.238 (0.858)	0.27 (0.877)	19.54 (4.47)	0.174 (0.820)	16.92 (3.142)	100	0 (0.512)
2.	SL 688	0.134 (0.795)	0.236 (0.857)	0.266 (0.875)	18.84 (4.39)	0.17 (0.818)	16.68 (3.130)	100	0 (0.000)
3.	JS 20 89	0.112 (0.782)	0.184 (0.826)	0.23 (0.854)	20.32 (4.56)	0.132 (0.794)	18.4 (3.273)	100	0.2 (1.23)
4.	VLS 89	0.116 (0.784)	0.186 (0.828)	0.236 (0.857)	20.66 (4.60)	0.138 (0.798)	18.56 (3.288)	100	0 (0 .512)
5.	NRC 94	0.14 (0.799)	0.214 (0.844)	0.274 (0.879)	19.22 (4.44)	0.182 (0.825)	16.74 (3.123)	100	0 (0.512)
6.	JS 20 87	0.118 (0.786)	0.188 (0.829)	0.24 (0.860)	20.78 (4.61)	0.144 (0.802)	18.62 (3.289)	100	0.2 (1.025)
7.	PS 1550	0.13 (0.793)	0.192 (0.831)	0.248 (0.864)	20.52 (4.58)	0.152 (0.807)	18.76 (3.301)	100	0 (1.237)
8.	MACS 1460	0.134 (0.796)	0.196 (0.834)	0.252 (0.867)	20.52 (4.58)	0.16 (0.812)	18.46 (3.270)	100	0 (0.000)
9.	DSB 25	0.128 (0.792)	0.202 (0.83)	0.258 (0.870)	20 (4.52)	0.162 (0.813)	18.82 (3.304)	100	0.2 (1.537)
10.	RCS 10 46	0.148	0.218	0.278	18.76	0.184	16.88	100	0

		(0.804)	(0.847)	(0.882)	(4.38)	(0.826)	(3.146)		(0.725)
11.	PS 1556	0.186 (0.827)	0.244 (0.862)	0.292 (0.889)	19.48 (4.46)	0.202 (0.837)	7.878 (3.215)	100	0 (0.000)
12.	SL 1028	0.156 (0.809)	0.24 (0.860)	0.286 (0.886)	19.2 (4.43)	0.152 (0.807)	17.46 (3.190)	100	0 (0.000)
13.	JS 335	0.158 (0.810)	0.248 (0.864)	0.296 (0.892)	18.76 (4.38)	0.21 (0.842)	17.22 (3.164)	100	0 (0.000)
14.	Bragg	0.13 (0.793)	0.204 (0.838)	0.262 (0.872)	20.42 (4.57)	0.166 (0.815)	18.48 (3.283)	100	0.4 (0.725)
	SEm ±	0.0070	0.0054	0.0068	0.037	0.0073	0.020	-	0.50
	CD at 5(%)	0.019	0.015	0.019	0.010	0.020	0.058	--	1.43
	F value	**	**	**	**	**	**		N.S

*D – Days, DAF – Days after feeding, SEM – The Standard error of the mean, CD – Critical difference, N.S. – Non significant

Table 2: Effect of soybean germplasm on Nutritional indices of Bihar hairy caterpillar *Spilarctia oblique*

S. No	Germplasm	AD	ECI	ECD	C value
1	SL 955	96.52 (80.82)	3.33 (10.24)	3.44 (10.39)	0.91
2	SL 688	99.32 (79.34)	4.05 (11.24)	4.16 (11.39)	0.88
3	RCS 10-46	98.68 (76.36)	5.03 (12.55)	5.18 (12.78)	0.94
4	NRC 94	87.88 (79.75)	3.85 (11.11)	3.93 (11.22)	0.88
5	JS 20 87	59.02 (74.54)	3.53 (10.71)	3.63 (10.86)	0.91
6	PS 1347	96.43 (81.51)	3.24 (10.04)	3.31 (10.14)	0.86
7	DSb 25	98.55 (81.00)	4.04 (11.13)	4.10 (11.22)	0.96
8	VLS 89	97.95 (79.88)	3.62 (10.93)	3.71 (11.07)	0.91
9	MACS 1460	96.83 (78.22)	5.35 (13.06)	5.57 (13.34)	1.03
10	PS 1550	98.57 (79.74)	3.23 (10.28)	3.35 (10.47)	0.94
11	JS 20 89	95.41 (79.80)	3.30 (10.40)	3.38 (10.52)	0.90
12	PS 1556	91.41 (75.78)	4.56 (12.23)	4.82 (12.57)	0.96
13	SL 1028	91.67 (76.06)	6.17 (14.11)	6.56 (14.52)	0.99
14	JS 335	74.29 (75.18)	5.36 (12.74)	5.82 (13.18)	1.00
15	Bragg	93.50 (79.16)	3.20 (10.25)	3.28 (10.38)	0.93
	SEm±	2.58	1.24	1.30	-
	CD at 5 (%)	7.29	3.52	3.70	-
	F value	N.S	N.S	N.S	-

AD–Approximate digestibility. ECD – Efficiency 0f conversion of digested food, ECI – Efficiency of conversion index, N.S – Non significant, SEm – Standard error mean, CD – Critical difference

4. Conclusion

The result of above two studies, i.e. **(**larval weight, larval period, pupal period, pupal weight, terminal larval mortality and adult emergence) and antixenosis (efficiency of consumption index, efficiency of conversion of digested food and approximate digestibility) showed that the following germplasm exhibited favourable results in different parameters. The antibiosis study showed JS 2089, JS 2087, VLS 89, MACS 1460, DSB 25 and Bragg showed resistance exhibiting lower larval weight, pupal weight, higher pupal period, larval period and terminal larval mortality as compared to others. While in antixenotic studies SL 688, VLS 89, PS 1556, RCS 1046, JS 2089 and PS 1347 exhibited lower ECI, ECD value; VLS 89, SL 688, RCS 1046, NRC 94, PS 1550 and JS 2087 showed higher AD value. Thus above mentioned germplasms are preferred more over other germplasms while considering *Spilarctia oblique* (Walker) on soybean.

5. References

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