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Laboratory Screening of Soybean varieties/genotypes against *Spodoptera litura* (Fabricius)

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ABSTRACT
In the study, laboratory screening of soybean varieties/genotypes against Spodotera litura (Fabricius) during kharif 2014, at the Entomology departmental laboratory and experimental farm, College of Agriculture, Jabalpur, Madhya Pradesh. Findings revealed that during the present investigation higher larval mortality was observed in genotypes JS 97-52, JS 20-114, JS 20-122, JS 20-29, JS 93-05, JS 20-112, JS 20-111, JS 20-108, JS 20-103 and JS 20-116 with mortality ranging between 73.34% and 53.34% that were at par.
Keywords: *Glycine max (Varieties/genotypes), Spodoptera litura.*

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INTRODUCTION

Soybean [*Glycine max* (L.) Merrill] is one of the most important oilseed cash crops of India. Soybean is a major oil seed crop of the world grown in an area of 113.01m ha with production of 283.79 mt and productivity of 2.51 t/ha [1]. The crop is mainly cultivated in USA, China, Brazil, Argentina and India. India contributes more than 90 per cent of the world's acreage [3]. Major soybean growing states in India are Madhya Pradesh, Maharashtra, Rajasthan, Karnataka, Uttar Pradesh, Andhra Pradesh and Gujarat [3]. In the year 2012-13 in India, soybean cultivation reached to 12.03 m/ha recording production of 12.98 mt with an average of 1079 kg/ha. In the year 2012-13 in Madhya Pradesh, soybean is grown over an area of 6.26 m/ha with a production of 5.95 mt and productivity of 950 kg/ha [3].

The defoliator *Spodoptera litura* (fab) are feeding on pods, flower and foliage causing significant yield loss [4]. The *Spodoptera litura* (fab) is a regular and serious pest in Madhya Pradesh. It damages soybean from mid-August to October in *kharif* and from November to March in *rabi* [4].

The luxuriant crop growth with soft and succulent foliage attracts many insects and provides unlimited source of food, space and shelter. About 380 species of insects have been reported on soybean crop from different parts of the world [11]. During the introduction of soybean in India, in the early seventies, only about a dozen minor insect pests were recorded, while in 1997 this number increased to an alarming figure 270, besides 1 mite, 2 millipedes, 10 vertebrates and 1 snail [5]. About 130 insect pests have been reported causing damage to various parts of soybean crop in Madhya Pradesh [6].

Integrated pest management comprises of biological, cultural and bio-rational approaches as major components. Among these, use of resistant/ tolerant varieties is the most promising means of insect pests management and also beneficial to protect the environment from toxic chemical residues.

METHODOLOGY

The experiment was laid out in the laboratory using Completely Randomized Design (CRD) with three replications and fourteen treatments (genotypes/varieties) (Table 1).

Table 1: Treatment details (genotypes/varieties of soybean)

S. No.	Varieties/ Genotypes	S. No.	Varieties/ Genotypes
1	JS-20-29 (V)	8	JS-20-103
2	JS-20-34 (V)	9	JS-20-108
3	JS-95-60 (V)	10	JS-20-111

4	JS-97-52 (V)	11	JS-20-112
5	JS-93-05 (V)	12	JS-20-114
6	JS-20-94	13	JS-20-116
7	JS-20-102	14	JS-20-122

(V) = Variety

Egg masses of *Spodoptera litura* were collected from the field and kept in laboratory for hatching. Two days old larvae were transferred to petriplates containing leaves of different genotypes/ varieties. Ten such larvae were kept in each petriplate and reared till adult emergence. Leaves were changed daily to ensure sufficient food to the larvae. Development of *Spodoptera litura* larvae on different genotypes was observed larval mortality, larval period, rate of pupation, pupal weight; pupal duration and adult emergence were recorded. Varieties and genotypes were compared based on the development of *Spodoptera litura* using analysis of variance at 5% level of significance.

RESULT

Fourteen genotypes including five varieties (JS 20-29), (JS 20-34), (JS 95-60), (JS 97-52) and (JS 93-05) were tested for resistance against *Spodoptera litura*. Influence of genotypes and varieties on larval and pupal survival and mortality is presented below.

(A) Larval mortality

Mortality percentage of *Spodoptera litura* larvae on different soybean genotypes/varieties are presented in table 1. The larval mortality varied from 26.67% (JS 20-102) to 73.34% (JS 97-52) and differences were significant among the varieties. Higher larval mortality was observed in genotypes JS 97-52, JS 20-114, JS 20-122, JS 20-29, JS 93-05, JS 20-112, JS 20-111, JS 20-108, JS 20-103 and JS 20-116 with mortality ranging between 73.34% and 53.34% that were at par. Genotypes/verities JS 20-102 registered significantly less larval mortality (26.67%) followed by JS 95-60, JS 20-34 and JS 20-94 (43.34%, 46.67% and 50.0%, respectively) that were at par (Fig 1).

(B) Larval period

Larval period of *Spodoptera litura* varied on different soybean genotypes/varieties. Significantly lower larval period (12 days) was recorded on variety JS 20-122 followed by varieties JS 20-102, JS 20-34 and JS 97-52 (14.1, 14.0 and 13.5 days, respectively) that were at par with larval periods. Larval periods in other varieties/genotypes were at par and ranged between 14.2 and 15.0 days (Fig 2).

(C) Pupal mortality

There was significant variation in pupal mortality of *Spodoptera litura* on different soybean genotypes/varieties (table 4). Pupal mortality varied from 12.50% (JS 20-114) to 100% (JS 20-122) and differences were significant among varieties. Pupal mortality on variety JS 20-122 was recorded to be highest (100%) and it differed significantly from all the other varieties. Next better varieties in term of pupal mortality were JS 20-112, JS 20-116 and JS 97-52 that were at par and registered significantly higher pupal mortality (71.2%, 66.97% and 64.0%, respectively) over other varieties. Pupal mortality in all other genotypes was significantly lower and varied between 44.7% and 12.5% (Fig 1).

Pupal period

Pupal period of *Spodoptera litura* varied significantly on different soybean genotypes. Significantly lower pupal period (6.74 days) was observed on variety JS 97-52. Highest pupal period was observed in genotypes JS 20-29 (9.3 days), JS 93-05 (8.24 days) and JS 20-116 (8.24 days) followed by genotypes JS 20-94, JS 20-112, JS 20-102, JS 20-103, JS 20-111, JS 20-114, JS 95-60 and JS 20-108 that were at par with pupal period range of 7.8 to 7.2 days (Fig 2).

Table 2: Larval and pupal mortality (%), larval and pupal period (days) of *Spodoptera litura* on different soybean genotypes/varieties

Genotypes/ varieties	Larval mortality (%)	Mean larval period (days)	Pupal mortality (%)	Mean pupal period (days)	Mean Pupal weight (gms)
JS 97-52	73.34 (59.01)*	13.57 (3.75)**	64.00 (53.30)*	6.74 (2.69)**	0.72
JS 20-29	66.67 (53.37)	14.70 (3.90)	44.70 (42.58)	9.30 (3.11)	0.21
JS 20-34	46.67 (43.08)	14.00 (3.81)	32.44 (33.98)	8.00 (2.91)	0.73

JS 20-94	50.00 (45.00)	14.80 (3.92)	22.40 (28.03)	7.80 (2.88)	0.66
JS 20-102	26.67 (30.78)	14.10 (3.82)	20.00 (27.52)	7.64 (2.85)	0.72
JS 20-103	56.67 (48.85)	14.20 (3.84)	29.73 (32.76)	7.57 (2.84)	0.73
JS 20-108	56.67 (49.22)	14.90 (3.93)	32.60 (33.71)	7.27 (2.79)	0.71
JS 20-111	60.00 (50.85)	14.70 (3.90)	19.50 (25.07)	7.54 (2.83	0.72
JS 20-112	60.00 (51.15)	14.30 (3.86)	71.20 (58.03)	7.77 (2.87)	0.74
JS 20-114	73.34 (59.22)	14.50 (3.87)	12.50 (20.64)	7.50 (2.83)	0.72
JS 20-116	53.34 (46.92)	14.50 (3.88)	66.97 (55.60)	8.24 (2.95)	0.76
JS 20-122	70.00 (57.00)	12.00 (3.53)	100.00 (90.00)	0.00 (0.71)	0.00
JS 95-60	43.34 (41.15)	15.00 (3.94)	30.81 (33.35)	7.54 (2.83)	0.78
JS 93-05	63.34 (53.15)	14.70 (3.90)	16.37 (19.39)	8.24 (2.96)	0.72
SEm±	4.486	0.034	5.371	0.063	-
C.D. at 5%	12.43	0.1	14.89	0.17	-

* Angular transformed values
** √X+0.5 transformed values

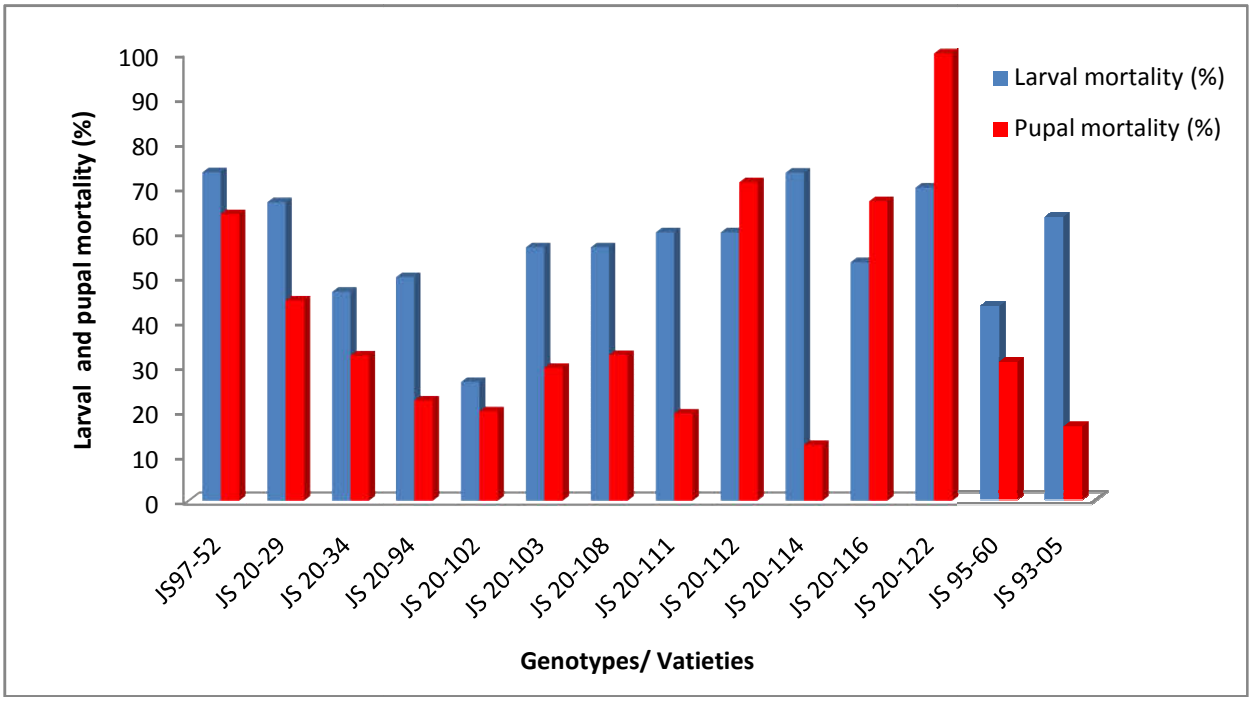

Fig. 1: Larval and pupal mortality of *Spodoptera litura* on different soybean varieties / genotypes

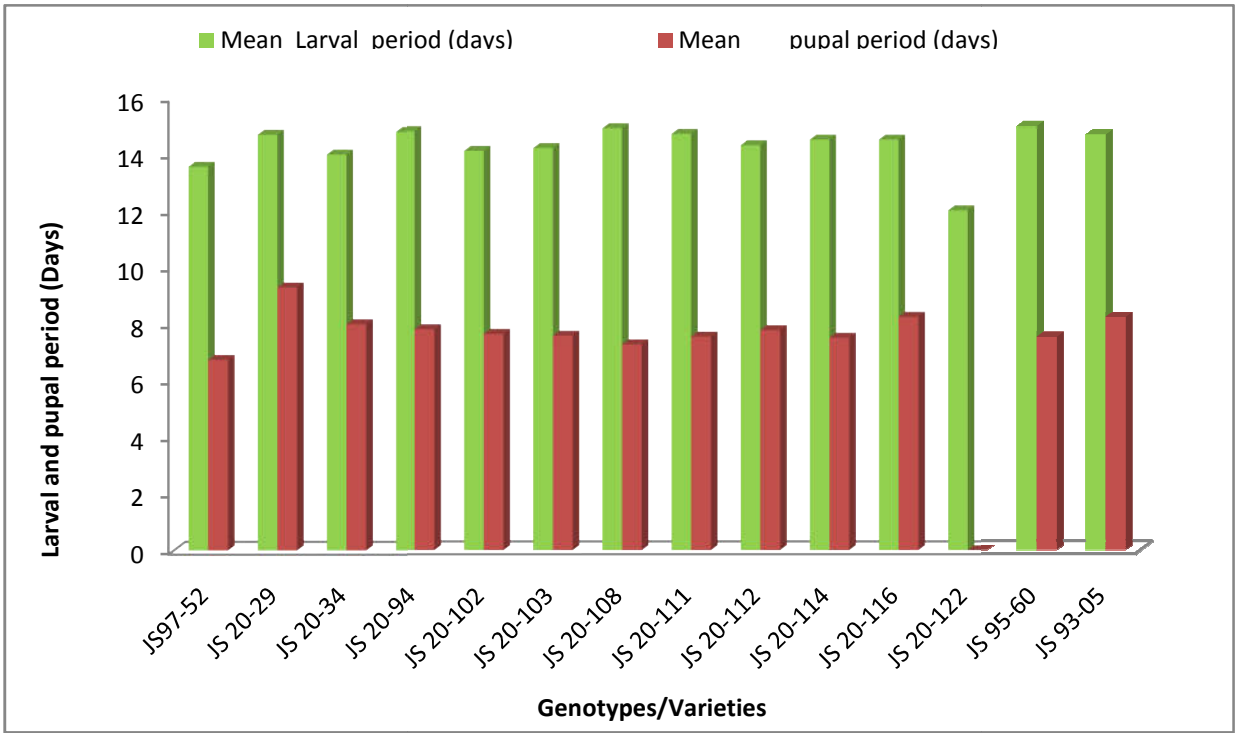

Fig. 2: Larval and pupal period (days) of *Spodoptera litura* on different soybean varieties / genotypes

DISCUSSION

During the present investigation higher larval mortality was observed in genotypes JS 97-52, JS 20-114, JS 20-122, JS 20-29, JS 93-05, JS 20-112, JS 20-111, JS 20-108, JS 20-103 and JS 20-116 with mortality ranging between 73.34% and 53.34% that were at par. Farahani et al. [13] also reported higher larval mortality of *Spodoptera exiqua* (39.35%) on variety L17.

Highest larval period (15 days) was recorded in variety 95-60. Whereas larvae developed faster on genotype JS 20-122 recording less larval period (12 days) followed by varieties JS 20-102, JS 20-34 and JS 97-52 (14.1, 14 and 13.5 days, respectively) that were at par. Seema et al. [15] reported that the larval development of *Spodoptera litura* varied greatly depending on host plants and temperature, and the development prolonged under low or high temperatures.

Pupal mortality on variety JS 20-122 was recorded to be highest (100%) and it differed significantly from all the other varieties. Genotype 20-114 registered minimum pupal mortality (12.5%).

Pupal period among varieties differed, however there are no references available to compare with. According to Patel *et al*. [14] pupal development was not affected by host plants on which their larvae fed. However, our results show that pupae developed faster on preferred varieties/genotypes than non preferred ones.

Lara *et al.*[12], Shu Yun *et al.* [7] and Vieira *et al.* [9] also evaluated soybean varieties against *Diabrotica speciosa* and *Cerotoma* sp; Soybean aphids and soybean whiteflies, respectively and reported resistant types.

Work on identification of resistant lines & varieties has also been conducted by scientists like Harish [10] and Trimohan *et al.,* [8] against different insect pests and various genotypes / varieties have been identified as resistant or tolerant.

CONCLUSION

The genotypes/varieties tested under laboratory condition included JS 20-29, JS 20-34, JS 95-60, JS 97-52, JS 93-05, JS 20-94, JS 20-102, JS 20-103, JS 20-108, JS 20-111, JS 20-112, JS 20-114, JS 20-116 and JS 20-122.

Under laboratory condition higher larval mortality was observed in genotypes JS 97-52, JS 20-114, JS 20-122, JS 20-29, JS 93-05, JS 20-112, JS 20-111, JS 20-108, JS 20-103 and JS 20-116 with mortality ranging between 73.34% and 53.34% that were at par, followed by JS 20-94 (50.00%), JS 20-34 (46.67%) and JS 95-60 (43.34%) that were intermediate in this respect.

Lower larval period (12 days) was recorded on variety JS 20-122 followed by varieties JS 20-102, JS 20-34 and JS 97-52 (14.1, 14.0 and 13.5 days, respectively) that were at par.

There was significant variation in pupal mortality of *Spodoptera litura* on different soybean genotypes/varieties. Pre-pupal mortality was observed to be highest (100%) on variety JS 20-122 that differed significantly from all the other varieties. Next better varieties in term of pupal mortality were JS 20-112, JS 20-116 and JS 97-52 that were at par and registered significantly higher pupal mortality (71.2%, 66.97% and 64%, respectively) over other varieties. Pupal mortality in all other genotypes was significantly lower and varied between 44.7% and 12.5%.

Lower pupal period (6.74 days) was observed on variety JS 97-52. Highest pupal period was observed in genotypes JS 20-29 (9.3 days), JS 93-05 (8.24 days) and JS 20-116 (8.24 days) followed by genotypes JS 20-94, JS 20-112, JS 20-102, JS 20-103, JS 20-111, JS 20-114, JS 95-60 and JS 20-108 that were at par with pupal period range of 7.8 to 7.2 days.

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