

## DETERMINATION OF YIELD LOSSES OF SOYBEAN ENTRIES/VARIETIES CAUSED BY *SPODOPTERA LITURA*

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### ABSTRACT

The experimental work was conducted in the field No. 11 at the Research Farm of R.A.K. College of Agriculture, Sehore, Madhya Pradesh under, All India Coordinated Research Project on soybean financed by ICAR, New Delhi. Four replications (2treated + 2 untreated), treatments 50 Soybean genotypes/varieties. The grain yield range from 456.25 to 2375.00 kg/ha and 437.50 to 2263.00 kg/ha, in treated and untreated varieties, respectively. The grain yield loss % ranged from 0.67 to 17.71 percent in different varieties. These varieties were further grouped in four categories, based on the maximum - minimax method. Ten varieties were resistant, high yielding (R-HY), sixteen were resistant, low yielding (R-LY), Twenty three varieties were susceptible low yielding (S-LY) and one variety was susceptible high yielding (S-HY).

**KEYWORDS:** Maximin-Minimax Method, Grain Yield Loss %

### INTRODUCTION

*Spodoptera litura* (Fab.) Is an economically important poly phagous insect, which is widely distributed throughout Asia, causing considerable economic loss to many fields, vegetables and fruit crops. Crop loss due to insect varies between 10 to 30 percent of major crops. It has a broad range of hosts, feeding on 112 species worldwide, of which 40 species are known from India. In recent years, the use of synthetic organic insecticides in crop pest control programs around the world has resulted in damage to the environment, pest resurgence and toxic effects on non-target organisms. Traditionally, farmers have been using synthetic pesticides to control *Spodoptera* and hence, it has developed resistance against almost all the commonly used insecticides. Extensive use of chemical insecticides has made strains of the target insects resistant to them, e.g. Malathion. Realizing the adverse effects of chemical insecticides, attention has now been diverted in favor of non-chemical methods for pest management. Plant derived insecticides encompasses an array of chemical compounds, which act concertedly on both behavioral and physiological processes. Thus, the chances of pests developing resistance to such insecticides are less. More than 2,000 species of plants are known to possess some insecticidal properties. Recently, some of the researchers reported the bioactivity of extracts/essential oils from various plants against agricultural pests. (Bhagat and Kulkarni 2012).

### MATERIAL AND METHODS

The yield of plots was recorded after the harvest of the crop and converted in to kg/ha. Further, entries were categorized into resistant and susceptible groups with high and low yielding against pests and according to the maximum-minimax method (Odulaja and Nokoi, 1993).

R-HY = Resistant -high yielding

R-LY = Resistant-low yielding

S-HY = Susceptible-high yielding (Tolerant)

S-LY = Susceptible-low yielding.

## RESULTS

During the kharif, 2015 the onset of monsoon was well in time i.e. During 25<sup>th</sup> week with 52.5 mm rainfall. The crop growth was very good, offered by well- distributed rains up to 39<sup>th</sup> week of September. The overall weather data were suitable for normal growth and productivity of crop.

All entries were grown in two sets, one with complete plant protection measures and others with no plant protection measures. One spray of chlorpyrifos 20 EC @ 1.5 l/ha, variably increased grain yield in all the varieties (Table). The grain yield ranged from 475.00 to 2375.00 kg/ha in treated and 450.00 to 2263.00 kg/ha in untreated varieties, respectively. The grain yield loss ranged from 0.67 to 17.71 percent in different varieties. These varieties further grouped in four categories based on Maximin- Minimax method. Eleven varieties (AMS 1002, JS 20-96, KDS 753, KDS 780, MACS 1410, MACS 1460, MAUS 706, RVS 2007-6, VLS 63, SL 983, PS 1347) were resistant, high yielding (R-HY), where as seventeen varieties (DS 3101, DSb 25, JS 20-87, JS 20-98, KDS-869, PS 1550, RKS113, RVS 2008-24, RVS 2008-8, SL 1028, HIMSO 1685, VLS 86, VLS 89, JS 20-34, JS 97-52, PS 1092, JS 335) were Resistant low yielding (R-LY). And Twenty two varieties (AMS 1003, DS 3102, DB 23-02, DB 28-3, JS 20-53, JS 20-79, JS 20-89, KDS 726, MACS 1370, NRC 99, PS 1556, RVS 2002-4, RCS 1046, SL 955, NRC 86, DSb 21, SL 688, VLS 59, JS 93-05, MACS 1442, JS 20-69, NRC 94) were susceptible low yielding (S-LY). (Fig.4, 5, 6)

**Table 1: Yield and Yield Losses in Soybean Varieties due to Tobacco Caterpillar (2015)**

S. No	Varieties	Yield Kg/ha		Loss	Loss	Relative Yield to Resistant Check	Percent Yield Loss to Susceptible Check	Reaction To Pest & Yield
		Treated	UN Treated					
		(X)	(Y)	(X-Y)	(%)			
1	AMS 1002	1787.00	1775.00	12.00	0.67	78.10	39.48	R-HY
2	AMS 1003	1162.50	1025.00	137.50	11.83	45.20	66.73	S-LY
3	DS 3101	1525.00	1475.00	50.00	3.28	65.04	18.46	R-LY
4	DS 3102	1750.00	1612.50	137.50	7.86	71.11	44.32	S-LY
5	DSb 23-02	850.00	762.50	87.50	10.29	33.55	58.09	S-LY
6	DSb 28-3	475.00	450.00	25.00	5.26	19.84	29.69	S-LY
7	DSb 25	456.25	437.50	18.75	4.11	19.25	23.14	R-LY
8	HIMSO 1685	1343.75	1330.50	13.25	0.99	58.45	5.58	R-LY
9	JS 20-53	1162.50	1075.00	87.50	7.53	47.30	42.45	S-LY
10	JS 20-79	1075.00	1012.00	63.00	5.86	44.55	32.80	S-LY
11	JS 20-87	550.50	537.00	13.50	2.45	23.62	13.83	R-LY
12	JS 20-89	775.00	725.00	50.00	6.45	31.90	36.41	S-LY
13	JS 20-98	1600.00	1550.00	50.00	3.13	68.20	17.61	R-LY
14	JS 20-96	2375.00	2263.00	112.00	4.72	99.57	24.56	R-HY
15	KDS 726	1437.50	1350.00	87.50	6.09	59.40	32.32	S-LY
16	KDS 753	1825.00	1750.00	75.00	4.11	76.45	23.20	R-HY
17	KDS 780	1775.00	1725.00	50.00	2.82	75.90	15.86	R-HY
18	KDS 869	1575.00	1525.00	50.00	3.17	67.10	17.89	R-LY
19	MACS 1370	1700.00	1612.50	87.50	5.15	70.92	29.02	S-LY

Table 1 Condti

20	MACS 1410	1812.00	1787.00	25.00	1.38	78.65	7.73	R-HY
21	MACS 1460	1782.00	1750.00	32.00	1.80	77.00	10.10	R-HY
22	MAUS 706	1812.50	1750.00	62.50	3.45	77.00	19.42	R-HY
23	NRC 99	787.50	750.00	37.50	4.76	33.00	26.87	S-LY
24	PS 1550	1500.00	1463.00	37.00	2.47	64.37	13.88	R-LY
25	PS 1556	1713.00	1550.00	163.00	9.52	68.20	53.69	S-LY
26	RKS 113	1500.00	1475.00	25.00	1.67	64.90	9.37	R-LY
27	RVS 2002-4	1538.00	1350.00	188.00	12.22	59.40	68.99	S-LY
28	RVS 2007-6	1813.00	1775.00	38.00	2.10	78.10	11.80	R-HY
29	RVS 2008-24	1288.00	1263.00	25.00	1.94	55.57	10.95	R-LY
30	RCS 10-46	725.00	675.00	50.00	6.90	29.70	38.90	S-LY
31	RVS 2008-8	1306.25	1263.00	43.25	3.31	55.37	18.68	R-LY
32	SL 955	1288.00	1225.00	63.00	4.89	53.90	27.60	S-LY
33	SL 983	1975.00	1888.00	87.00	4.41	83.07	24.82	R-HY
34	SL 1028	1275.00	1225.00	50.00	3.92	53.90	22.13	R-LY
35	VLS 86	1263.00	1225.00	38.00	3.01	53.90	16.93	R-LY
36	VLS 89	1037.00	1012.25	24.75	2.39	44.53	13.71	R-LY
37	JS 20-34	700.00	687.50	12.50	1.79	30.22	10.04	R-LY
38	NRC 86	638.00	525.00	113.00	17.71	23.10	99.99	S-LY
39	VLS 63	1888.00	1837.50	50.50	2.67	80.85	15.24	R-HY
40	DSb 21	1288.00	1163.00	125.00	9.70	51.17	54.76	S-LY
41	SL688	1318.75	1206.25	112.50	8.53	53.07	18.16	S-LY
42	JS 97-52	975.00	935.00	40.00	4.10	40.15	22.40	R-LY
43	VLS 59	675.00	612.50	62.50	9.26	26.95	52.67	S-LY
44	PS 1092	1288.00	1250.00	38.00	2.95	55.00	16.65	R-LY
45	PS 1347	2000.00	1925.00	075.00	3.94	80.30	22.24	R-HY
46	JS 335	1025.00	1000.00	25.00	2.44	44.00	13.71	R-LY
47	JS 93-05	1375.00	1263.00	112.00	8.15	55.57	45.95	S-LY
48	MACS 1442	1390.00	1280.00	110.00	7.91	56.32	42.40	S-LY
49	JS 20-69	1280.00	1150.00	130.00	10.16	50.60	57.29	S-LY
50	NRC 94	1050.00	980.00	70.00	6.67	43.12	37.60	S-LY

## DISCUSSION

The grain yield of 2375.00 kg/ha in treated and 2263.00 kg/ha in untreated varieties. The grain yield loss ranged from 0.67 to 17.71 percent in different varieties. Patel *et al.* (1971) reported that two, four and eight larvae of *Spodoptera* per plant reduced 23-24, 44.2 and 50.4% yield, respectively. Pillai and Palaniswami (1983) reported that, *Spodoptera litura* to be the pest of economic importance and the extent of damage from 16 to 18 percent, when the population was as high as 63 caterpillars per leaf. Arifin (1989) stated that Leaf damage caused by 0.5 larvae/stem, at any plant stage did not significantly reduce the yield components and yield of soybean. Kulkarni (1989) reported that in flowering stage 20 per cent and in severe outbreak cause 30 to 40 per cent yield loss in groundnut due to *S. litura*. Dhir *et al.* (1992) reported that one larvae per plant of *Spodoptera litura* at seedling, flowering and at pegging stage reduced the pod yield 25.8%,19% and 5.7% respectively in groundnut crop. Konar *et al.* (2003) reported that, the yield loss of potato due to without plant protections were 7.94 and 3.75 per cent in different regions of West Bengal.

In the present investigation 50 soybean varieties were further grouped in to four categories based on Maximin-minimax method (odulaja and Nokoe 1993). Eleven varieties (AMS 1002, JS 20-96, KDS 753, KDS 780, MACS 1410, MACS 1460, MAUS 706, RVS 2007-6, VLS 63, SL 983 and PS 1347) were Resistant high yielding (R-HY). Whereas seventeen varieties (DS 3101, DSb 25, JS 20-87, JS 20-98, KDS-869, PS 1550, RKS113, RVS 2008-24, RVS 2008-8, SL

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## CONCLUSIONS

Out of 50 soybean genotypes/varieties screened against tobacco caterpillar, Two varieties HIMS0 1685, PS 1347 were found highly resistant, Five varieties namely RVS 2007-6, RVS 2008-24, SL-955, NRC-86 and SL-688 were found to be resistant against tobacco caterpillar. The information obtained in the study could be helpful in soybean breeding programs, aimed at developing the varieties resistant against defoliators.

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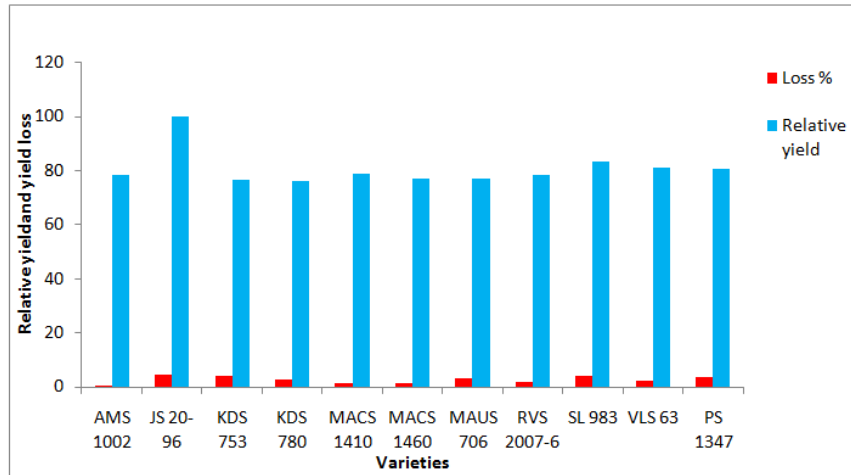


Figure 1: Soybean Varieties Resistant high Yielding Categories

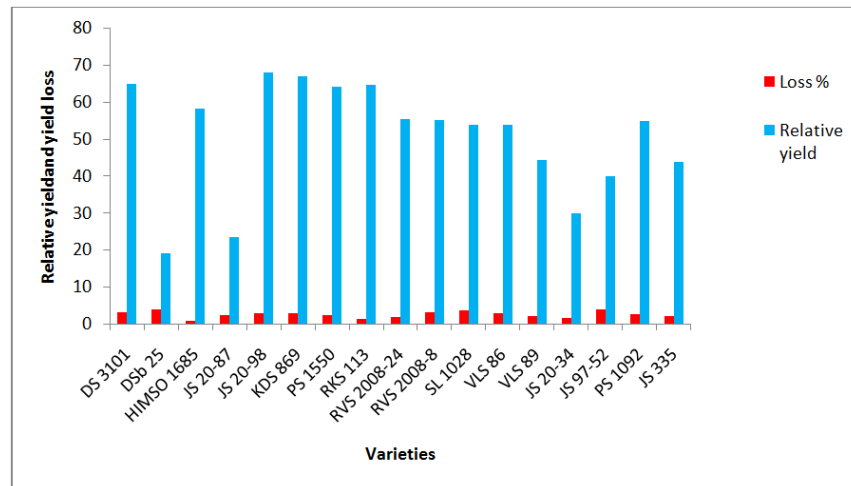


Figure 2: Soybean Varieties Resistant low Yielding Categories

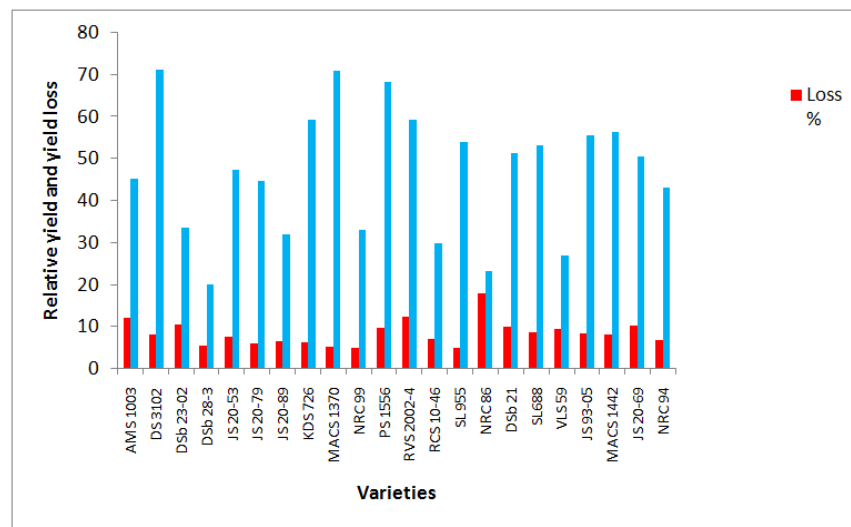


Figure 3: Soybean Varieties Susceptible low Yielding Categories

