IMPACT: International Journal of Research in Applied, Natural and Social Sciences (IMPACT: IJRANSS)
ISSN(P): 2347-4580; ISSN(E): 2321-8851
Vol. 5, Issue 9, Sep 2017, 137-142
© Impact Journals

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

B. SUNDAR, R.S. CHOUHAN, N. KHANDWE & J. VENKATESHWAR
R.A.K. College of Agriculture, Sehore, Madhya Pradesh, India

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 25thweek with 52.5 mm rainfall. The crop growth was very good, offered by well- distributed rains up to 39th 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 chlorpyriphos 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 Treated (X)	UN Treated (Y)	Loss (X-Y)	Loss (%)	Relative Yield to Resistant Check	Percent Yield Loss to Susceptible Check	Reaction To Pest & Yield
1	2	3	4	5	6	7	8	9
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

1028,HIMSO 1685, VLS 86, VLS 89, JS 20-34, JS 97-52, PS 1092, JS 335) were Resistant low yielding (R-LY). Twenty two varieties (AMS 1003, DS 3102, DSb 23-02, DSb 28-3, JS 20-53, JS 20-79, JS 20-89, KDS 726, MACS 1370, NRC 99, PS 1556, RVS 2002-4, RCS 10-46, 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).On the basis of maximin-minimax method Singh *et al*. (2007) also categorized and concluded that the ten genotypes were resistance high yielding. Eight were resistant low yielding. Twenty three were susceptible high yielding. Further Using the Maximin-minimax method, Harish *et a*l. (2009) reported that JS 335, DSb-1, PK 1029, JS 93-05, Monetta and Bragg were classified as susceptible but high yielding. Similarly, in present finding JS 335, JS 93-05 were resistant low yield and susceptible low yielding.

CONCLUSIONS

Out of 50 soybean genotypes/varieties screened against tobacco caterpillar, Two varieties HIMSO 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.

REFERENCES

1. Arifin, M. (1989). Yield loss assessment for the common cutworm (Spodoptera litura F.) on soybean under a semi-field condition. Indonesian Center for Agricultural Library and Technology Dissemination, Indonesia.
2. Bhagat, R.B. and Kulkarni, D.K. (2012). Evaluation of larvicidal and antifeedant potential of three jatropha species against Spodoptera litura (Lepidoptera: Noctuidae) and two predators (Coleoptera: Coccinellidae). Annals of Biological Research 3(6): 2911-2916.
3. Dhir, B.C.; Mohapatra, H.K. and Senapati, B.(1992). Assessment of crop loss in groundnut due to tobacco caterpillar, Spodoptera litura (F.).Indian Journal of Plant Protection 20(2):215-217.
4. Harish, G.; Patil, R.H.; Patil, P.V. (2009). Identification of resistant source to major defoliator pests of soybean. Karnataka Journal of Agricultural Science 22(1): 215-217.
5. Konar, A.; SantanuPaul.; Basu, A. and Chettri, M. (2003). Field evaluation of bio- pesticides and insecticides against cut worm in plains of west Bengal. J. Indian Potato Assoc., 30: 155-156
6. Kulkarni, S.A. (1989). Bio ecology and management of Spodoptera litura on groundnut, Ph. D. thesis submitted to University of Agriculture Science Dharwad, India.
7. Odulaja, A. and Nokoe, S. (1993). A maximin-minimax approach for classification of crop varieties into resistance groups based on yield potential and loss. Intl. J. Pest Mgt., 39:15-16.
8. Patel, H.K.; Patel, N.G. and Patel, V.C. (1971). Quantitative estimation of damage to tobacco caused by the leaf-eating caterpillar, Prodenia litura. PANS 17: 202-205.
9. Pillai, K.S. and Palaniswami, M.S.(1983). Annual Assessment Report.(unpublished), CTCRI, Trivendrum.
10. Singh, K.J.; Khandwe Nanda and Hansraj Patidar (2007). Field screening of soybean genotypes for resistance to major insect pest of soybean. Abstract International Congress of Environmental Research 28-30 Dec, 07: pp 140

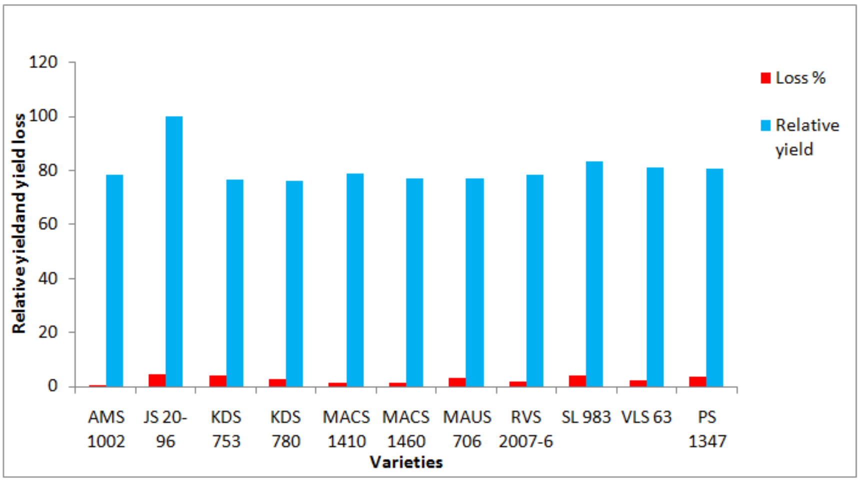

Figure 1: Soybean Varieties Resistant high Yielding Categories

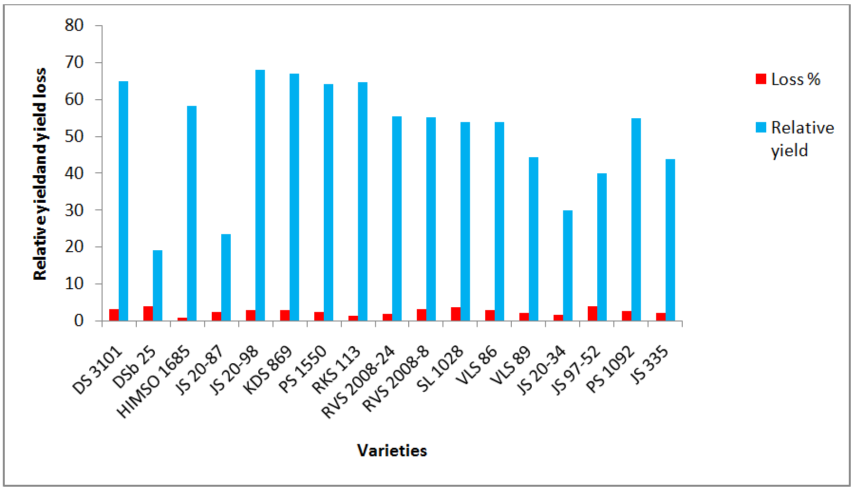

Figure 2: Soybean Varieties Resistant low Yielding Categories

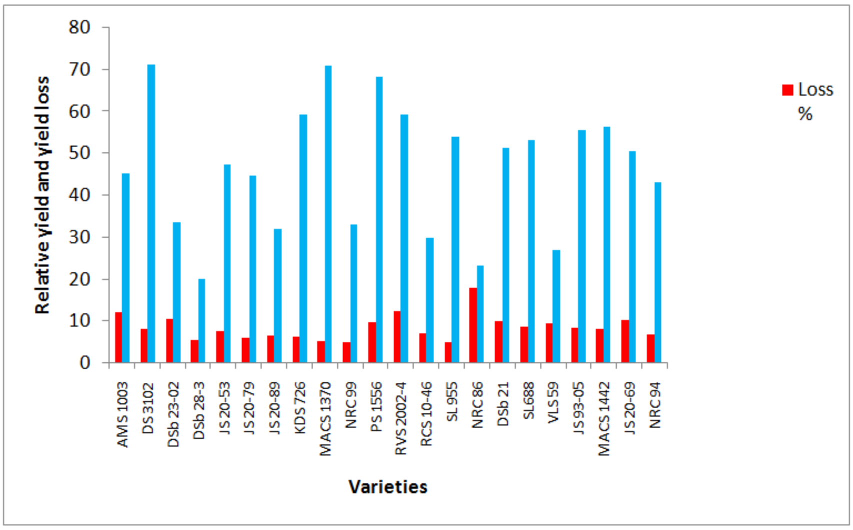

Figure 3: Soybean Varieties Susceptible low Yielding Categories