Indian Journal of Entomology 84(3): 634-636 (2022) DoI No.: 10.55446/IJE.2021.58

ASSESSMENT OF YIELD LOSSES DUE TO WHITE STEM BORER *SCIRPOPHAGA FUSCIFLUA* (HAMPSON) IN RICE

Vikas Tandon* and Ajai Srivastava[1]

Department of Entomology, CSK Himachal Pradesh Krishi Vishvavidyalaya,
Palampur 176062, Himachal Pradesh, India
[1]CSK HPKV Rice and Wheat Research Centre, Malan 176047, Himachal Pradesh, India
*Email: tandonvikas8763@gmail.com (corresponding author)

ABSTRACT

Field experiments were conducted to assess the extent of losses occurring in rice crop due to the white stem borer (WSB) *Scirpophaga fusciflua* (Hampson) at different stages of crop growth. Results revealed that maximum infestation in terms of deadhearts and white ears was 11.6% at maximum release level (6 larvae/ hill) and the least (6.2%) at 2 larvae/ hill. The avoidable losses varied from 7.5 to 32.3%. The infestation % of released larvae was lowest to the economic threshold level.

Key words: *Scirpophaga fusciflua*, rice, deadhearts, white ears, losses, infestation, release of larvae, artificial infestation, economic threshold level, crop stages

Rice is one of the leading staple food crops in the world. In India, rice crop is attacked by approximately 100 insect pests and out of which 20 are considered to be major pests causing up to 30% yield loss from seedling to dough stage (Atwal and Dhaliwal, 2005; Dhaliwal et al., 2010). Amongst these, which, rice stem borers are a key group of insect pests damaging rice (Dhaliwal and Arora, 1996). White stem borer (WSB) *Scirpophaga fusciflua* (Hampson) is of increasing significance in rice though its dominance has not been consistent and widespread. But, in certain pockets such as the state of Kerala in southern India and Himachal Pradesh in the northern hills, it is continuously present (Katti et al., 2011). *Scirpophaga fusciflua* infestation has been found in most of the areas of Himachal Pradesh (Srivastava et al., 2012). Rice is major cereal crop and grown in 70 % of the total cultivated area of Himachal Pradesh. Yield loss estimate across India varied from 11.2 to 40.1% due to deadhearts and 27.6 to 71.7% due to white ears, respectively (Krishnaiah and Varma, 2012). In Himachal Pradesh, work on assessment of yield losses in rice due to WSB has not been done, and hence the present study.

MATERIALS AND METHODS

The field experiments were conducted in randomized block design at the Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya Rice and Wheat Research Centre, Malan (32°07.180 N, 76° 25.065 E, 961 masl), during kharif 2016 and 2017. The area represents the mid hills sub-humid zone of Himachal Pradesh. Varying levels of pest damage were created through the artificial release of larvae. The whole experimental area (400 m^2) was divided into four equal plots (100 m^2) marked as T_1, T_2, T_3 and control (T4). Four rice hills were selected and marked by bamboo sticks and these served as one replication, like these there were nine replications. These hills were covered with nylon net supported with four bamboo sticks at the corners. Pretreatment observations were made on the total and infested number of tillers. The treatments with artificially infestation were made at tillering stage by releasing 2, 4 and 6 larvae/ hill and thereafter observations made on 42 and 72 days after transplanting (DAT). The panicles from these were harvested at maturity for recording yield data. These panicles were threshed, cleaned and weighed. The avoidable yield losses were calculated using the formula given by Atwal and Singh (1990). The data on % infestation and yield losses were subjected to analysis with factorial randomized block design using the software CPCS-1 as per procedure suggested by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

The data revealed that deadhearts and white ears incidence varied significantly amongst all release levels during both the cropping seasons. During 2016, the deadhearts and white ears incidence varied from 6.7 to 12.1% and 5.8 to 10.8%, respectively. Similar results were observed during 2017. The pooled means indicate that the maximum incidence was 11.6% at the release

Table 1. Infestation, yield and % avoidable losses with various release levels of *S. fusciflua* larvae in rice

No. of larvae released/ hill	Infestation (%) 2016 42 DAT	2016 72 DAT	2016 Mean	2017 42 DAT	2017 72 DAT	2017 Mean	Over all mean	2016 Yield (g/ hill)	2016 Avoidable losses (%)	2017 Yield (g/ hill)	2017 Avoidable losses (%)
0	0.0 (1.00)	0.0 (1.00)	0.0 (1.00)	0.0 (1.00)	0.0 (1.00)	0.0 (1.00)	0.0 (1.00)	16.7 (4.15)	-	16.5 (4.13)	-
2	6.7 (2.68)	5.8 (2.50)	6.3 (2.60)	6.4 (2.62)	5.9 (2.54)	6.2 (2.58)	6.2 (2.59)	15.5 (4.00)	7.5	15.3 (3.97)	7.8
4	9.6 (3.17)	8.0 (2.92)	8.8 (3.05)	9.8 (3.20)	8.2 (2.94)	8.9 (3.07)	8.8 (3.06)	13.5 (3.75)	19.0	13.4 (3.72)	19.3
6	12.1 (3.55)	10.7 (3.35)	11.5 (3.45)	12.4 (3.58)	11.2 (3.43)	11.8 (3.50)	11.6 (3.48)	11.3 (3.44)	32.3	11.5 (3.46)	30.5
Mean	7.1 (2.75)	6.1 (2.57)	6.6 (2.66)	7.1 (2.76)	6.3 (2.61)	6.7 (2.69)		14.3 (3.84)	-	14.2 (3.83)	-

CD (p=0.05)					
Years (A)	: NS	A×B	: NS	Release levels (A)	: 0.68
Days after transplanting (B)	: 0.03	A×C	: 0.07	Years (B)	: 0.48
Released levels (C)	: 0.05	B×C	: NS	A×B	: 0.96
		A×B×C	: NS		

Figures in parentheses square root transformed values; DAT: Days after transplanting

level of 6 larvae/ hill as against 6.2% as the least at 2 larvae/ hill; infestation was non-significant during 2016-2017. The interaction between release levels of white stem borer larvae and cropping seasons revealed that no infestation was observed at pest free level. Table 1 reveals that grain yield showed decreasing trend with increasing release levels during 2016; being the least with level of 6 larvae/ hill (11.3 g hill^{-1}) where plant infestation was 11.5% followed by 4 and 2 larvae/ hill, respectively; maximum yield (16.7 g hill^{-1}) was obtained in the treatment with no incidence. During 2017, similar trend was observed with maximum (16.5 g hill^{-1}) and least (11.5 g hill^{-1}) being at release levels 0 and 6 larvae/ hill, respectively, and the infestations were 11.8% at 6 larvae/ hill. Grain yield decreased gradually with increasing white stem borer infestation but a drastic decrease in yield was observed with increase in release levels > 2 larvae/ hill. The linear regression equation worked out between grain yield and release levels of larvae presented in Fig. 1 (pooled data) reveal that a unit increase in resulted in reduction in yield to the extent of 0.985, 0.993 and 0.99 g hill^{-1}. These results agree with those of Daryaei (2005) who revealed that at 5, 15, 30 and 60 % infestation the grain yield resulted with 5287, 4953, 4656 and 4440 kg ha^{-1} at vegetative stage and 5095, 4628, 3643 and 3155 kg ha^{-1} at panicle initiation stage. Muralidharan and Pasalu (2005) also observed that 1% deadheart or white ears infestation leads to 2.5, 4.0 and 6.4% yield loss, respectively. Islam and Karim (1997) revealed that grain yield at 1-10, 11-15, 16-20,

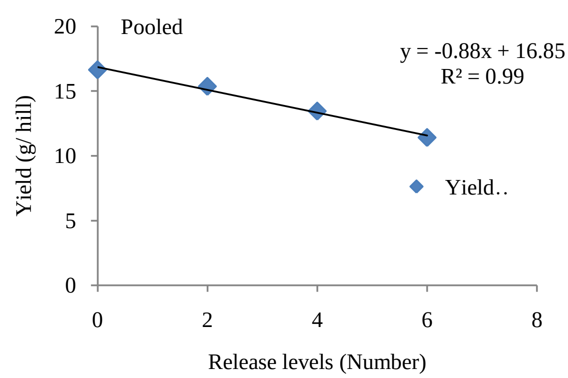

Fig. 1. Linear regression- yield vs. release levels of *S. fusciflua*

21-30 and 30% white ears infestation recorded 15.9, 16.2, 12.9, 10.5 and 5.2 g hill^{-1}, respectively.

REFERENCES

Atwal A S, Dhaliwal G S. 2005. Agricultural pests of South Asia and their management, Kalyani Publishers, New Delhi. 181-182 pp.

Atwal A S, Singh B. 1990. Pest population and assessment of crop losses. Indian Agricultural Research Institute, New Delhi. 107 pp.

Daryaei M G. 2005. Assessment of yield loss in rice due to yellow stem borer, *Scirpophaga incertulas*, using simulation models. Caspian Journal of Environmental Sciences 3(1): 59-62.

Dhaliwal G S, Arora R. 1996. An estimate of yield losses due to insect pests in Indian Agriculture. Indian Journal of Ecology 23: 70-73.

Dhaliwal G S, Jindal V, Dhawan A K. 2010. Insect pest problems and yield losses: Changing trends. Indian Journal of Ecology 37: 1-7.

Islam Z, Karim A N M R. 1997. Whiteheads associated with stem borer infestation in modern rice varieties: an attempt to resolve the dilemma of yield losses. Crop Protection 16(4): 303-311.

Katti G, Shanker C, Padmakumari A P, Pasalu I C. 2011. Rice stem borers in India- species composition and distribution. Technical Bulletin No. 59, Directorate of Rice Research, Rajendranagar, Hyderabad, India. pp.1-27.

Krishnaiah K, Varma N R G. 2012. Changing insect pest scenario in the rice ecosystem- a national perspective. Directorate of Rice Research Rajendranagar, Hyderabad. pp.2-8.

Muralidharan K, Pasalu I C. 2005. Assessments of crop losses in rice ecosystems due to stem borer damage (Lepidoptera: Pyralidae). Crop Protection 25: 409-417.

Samanta A, Chakraborti K, Alam S K F, Das B C, Patra S. 2014. Pest surveillance in lcc and non-lcc rice plots by participatory rural folk appraisal. The Ecoscan 8: 211-213.

Srivastava A, Singh P S, Ram L, Salaia R, Singh A. 2012. New record of *Scirpophaga fusciflua* Hampson from North India. Journal of Rice Research 5(1&2): 61-62.

(Manuscript Received: February, 2021; Revised: June, 2021;
Accepted: July, 2021; Online Published: October, 2021)
Online published (Preview) in www.entosocindia.org Ref. No. e21028