Environment and Ecology 42 (2A) : 670—672, April—June 2024
Article DOI: https://doi.org/10.60151/envec/FJPU6231
ISSN 0970-0420

Non-Target Organisms Captured in the Sex Pheromone Traps of Yellow Stem Borer of Rice

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Received 3 September 2023, Accepted 18 February 2024, Published on 6 May 2024

ABSTRACT

Scirpophaga incertulas (Walker) the yellow stem borer (YSB) is an important pest of rice. Besides, chemical control female sex pheromone traps are used to monitor YSB population and mating disruption. A study was undertaken to enumerate non-target organisms in the traps. Traps with sex pheromone lure and traps without any lure were fixed in the farmers' fields and samples were examined for different organisms. A maximum of 21 species of organisms including three unidentified lepidopterans were collected from the traps where no lure was available where as 46 species of organisms including 5 species of unidentified Lepidoptera were recovered from the traps with lure. Spiders appeared in almost equal numbers in both baited and control traps. Natural enemies of different rice pests were also trapped.

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Keywords Rice, Yellow stem borer, Sex pheromone trap, Non-target organisms.

INTRODUCTION

Insect pests causing significant yield loss over the years are yellow stem borer (YSB) *Scirpophaga incertulas* (Walker), plant hoppers, both brown plant hopper (BPH), *Nilaparvata lugens* (Stål) and white backed plant hopper (WBPH), *Sogatella furcifera* (Horvath) (Seni 2021). *Scirpophaga incertulas* (Walker) is the most important pest of rice causing severe yield loss. When heavily infested with more than 5 panicles destroyed, rice hills can have as much as 80% yield loss (Pallavi *et al.* 2018). Among the different methods employed for its management, use of traps with synthetic sex pheromone mixture for monitoring and mating disruption is of recent origin and gaining popularity among farmers (Raut *et al.* 2017). It has been tested to be effective in controlling yellow stem borer damage in farmer's field and increasing yield (Cork *et al.*1988). Apart from YSB males several other organisms were also recovered from pheromone traps. A study was undertaken in the farmers field, Balangir, Odisha, India to enumerate the non-target organisms captured in the female sex pheromone traps set up for the capture of YSB males.

MATERIALS AND METHODS

Long sleeve traps baited with (Z)-9-hexadecenal and (Z)-11-hexadecenal in the ratio of 1:3 in plastic lures were used for the study. The lures were replaced with fresh ones every fortnight. Nine such traps with lures

impregnated with the synthetic pheromone blend were randomly fixed to place the lure at 1 meter height in the field plots. Nine more traps without any lure were also fixed randomly as controls. Organisms captured in the traps were collected once in a week and examined in the laboratory and sorted out. The study was undertaken from July 2020 to January 2021 and samples were collected for 21 weeks.

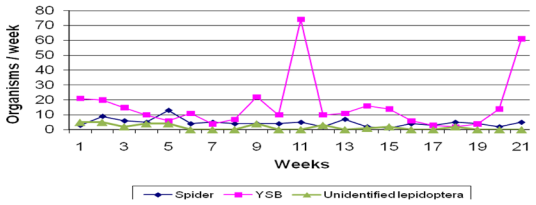

Fig. 1. Spiders, YSB male and unidentified lepidoptera in pheromone traps with lure (21sampled weeks), 30 - 04 SMW.

RESULTS AND DISCUSSION

Males of YSB started appearing in the traps from beginning of the study in 30th standard meteorological week (SMW) and reached the peak in the 45th SMW. Besides YSB several other organisms were also captured in the traps (Fig. 1). A maximum of 21 species of organisms including three unidentified lepidopterans were collected from the traps where no lure was available where as 46 species of organisms including 5 species of unidentified Lepidoptera were recovered from the traps with lure. Spiders appeared in almost equal numbers in both baited and control traps from July to January. Among spiders *Clubiona* sp., *Lycosa pseudoannulata, Salticus* sp., *Phidippus* sp., *Oxyopes pandae* Tikader, *Tetragnatha mandibulata* Walck and two unidentified species were recorded from the traps with the preponderance of *Clubiona* sp. and *L. pseudoannulata*. Although more lepidopterans were trapped in the traps with lure than in the traps without lure statistically it was not significant. There was no statistical significance between the treated and control traps as regards capture of other insects like leaf and plant hoppers, blue beetle and hymenopterans were concerned (Table 1). However, not a single YSB male or female was recovered from the traps without any lure whereas; besides male YSB two moths of female YSB were captured from the traps with lure. Apart from moths of YSB a few moths of the white stem borer *Scirpophaga innotata* (Walker), the striped borer *Chilo suppressalis* (Walker), the cut worm *Mythimna separata* (Walker), the rice green semi-looper *Naranga diffusa* (Walker) and the swarming caterpillar *Spodoptera mauritia* (Guenee) were also recovered from the traps. Several lepidopteran species share the same pheromone blend consisting

Table 1. Common organisms captured both in pheromone traps baited with lures of synthetic sex pheromone of YSB and without lures in rice fields.

Traps	Spiders	For micids	Chironomids	Lepid opterans	Plant hoppers	Swarming caterpillar	Beetles	Vespids
With lure	4.52 (2.16)	0.76 (1.01)	2.71 (1.30)	1.52 (1.27)	0.42 (0.89)	0.23 (0.81)	0.85 (1.07)	0.76 (1.03)
Without lure	4.09 (2.10)	1.8 (1.27)	1.42 (1.13)	0.66 (0.99)	0.57 (0.93)	0.19 (0.77)	0.61 (0.94)	0.47 (0.91)
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Table 1. Continued.

Traps	Hymen opterans	Leaf folder	Cutworm	*Menida histro*	Green leaf hopper	Blue beetle	*Micraspis discolor*
With lure	0.66 (0.85)	0.09 (0.76)	0.71 (1.00)	0.23 (0.84)	0.47 (0.92)	9.33 (2.09)	2.28 (1.31)
Without lure	0.23 (0.82)	0.04 (0.73)	0.28 (0.84)	0.23 (0.84)	0.71 (1.00)	8.19 (1.97)	1.71 (1.19)

* Square root transformed values are given within parentheses.

of (Z)-11-hexadecenal and (Z)-9-hexadecenal at different ratios and active doses. These components frequently trapped other lepidopteran species, such as rice pests *Chilo suppressalis, Scirpophaga incertulas* and *Mythimna separata* (Chen *et al.* 2018).

Some of the rice pest predators e.g. *Menochilus sexmaculatus* (Fabr.), *Casnoidea indica* (Thunb.), *Paedarus fuscipes* (Curtis), *Pseudogonatopus hospes* (Perkins), *Verania discolor* (Fabr.), *Limnogonus nitidus* (Meyer), *Andrallus spinidens* (Fabr.) and parasitoids like *Charops bicolor* (Szepl.), *Ceraphron* sp. and *Brachymeria albotibialis* (Ashm.) were also recovered from the traps. Other insects caught in the traps were blue beetle, grasshopper, *Menida histrio* Fab., grasshopper, carabid beetles, preying mantis, collembolans, hymenopterans, ephemeropterans, *Forcipula* sp. and *Eucophylla* sp. Among these insects only blue beetles and certain hymenopterans occurred in appreciable number whereas others were just stray cases. It seems possible that only the males of YSB and to some extent certain lepidopterans were actively attracted to the sex pheromone lures of YSB and captured in the baited traps whereas other insects were trapped as a matter of chance. Spiders, especially hunting ones might have been attracted while foraging by the fluttering of freshly caught insects in the traps or selected the traps as a place of shelter. Among all the organisms spiders were trapped during all the weeks under study in both type of traps where as YSB males were captured in the baited trap only.

Kairomonal response of predacious wolf spider *Lycosa pseudoannulata* Boesenberg and Strand to the sex pheromone of yellow stem borer, *S. incertulas* (Walker) was reported by Sinha and Kumar (1998). They used only baited pheromone traps and concluded that presence of the wolf spider in traps was the indication of YSB female pheromone acting as a kairomone for the wolf spider. They observed the spider in traps for three weeks during last week of September to second week of October, whereas in the present investigation several species of spiders were caught in the traps right from July to January during all the weeks.

CONCLUSION

The present study indicated that several non-target arthropod species are attracted actively or passively to the sex pheromone traps of YSB although a few species were also trapped in the traps without pheromone lure.

REFERENCES

Chen QH, Zhu F, Tian Z, Zhang WM, Guo R, Liu W, Pan L, Du Y (2018) Minor components play important role in inter specific recognition of insects: A basis to pheromone based electronic monitoring tools for rice pests. *Insects* 9(4):192. DOI: 10.3390/insects9040192

Cork A, De Souza K, Krishnaiah K, Reddy A, Zainullabuddin S (1988) Season-long control of yellow stem borer, *Scirpophaga incertulas* (Lepidoptera: Pyralidae) by mating disruption with the natural ratio of pheromone components. *Bulletin of Entomological Research* 88 (1) 2: In press

Pallavi D, Basappa S, Megaladevi P (2018) Seasonal Fluctuation of Yellow Stem Borer *Scirpophaga incertulas* (walker) on Paddy and Its Relationship between Trap Catches with Weather Parameters. *International Journal of Current Microbiology and Applied Sciences* 7(09) : 3575-3584. https://doi.org/10.20546/ijcmas.2018.709.443

Raut A, Satpathi CR, Krishnaiya K (2017) Management of rice yellow stem borer *Scirpophaga incertulas* (Walker) using different formulations of insect sex pheromone in West Bengal. *Journal of Pure and Applied Microbiology* 11(1): 549-558. http://dx.doi.org/10.22207/JPAM.11.1.72

Seni A (2021) Frontier insect pest management technologies for sustainable rice production. *Journal of Cereal Research* 13 (2): 136-148. http://doi.org/10.25174/2582-2675/2021/113113

Sinha RBP, Kumar K (1998) Studies on the sex pheromone of yellow stem borer, *Scirpophaga incertulas* (Walker). *Oryza* 35(1): 93-94.