INNSPUB

International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print), 2222-5234 (Online)
http://www.innspub.net
Vol. 14, No. 3, p. 396-400, 2019

RESEARCH PAPER OPEN ACCESS

Sustainable management of *Chilo infuscatellus* (Pyralidae, Lepidoptera) by using non-chemical approaches

S. Ahmad[1*], M.W. Alam[1], M. Sarwar[1], A. Rehman[2], T. Shafeeq[1], M. Ashfaq[1]

[1]*Institute of Agricultural Sciences, University of the Punjab, Lahore, Pakistan*

[2]*Department of Plant Pathology, University of Agriculture, Faisalabad, Pakistan*

Key words: Cultural, *Chilo infuscatellus,* Mechanical, Pyralidae, Sugarcane.

http://dx.doi.org/10.12692/ijb/14.3.396-400 Article published on March 27, 2019

Abstract

Chilo infuscatellus (Pyralidae: Lepidopetra) is key pest of sugarcane crop that causes severe damage to cane and reduce the sugarcane recovery. Of several management practices that have been evaluated against *C. infuscatellus*, application of synthetic chemicals was considered the most important control method. During the past decade, chemicals remnants are prevailing in all compartments of agro-ecosystem, decreasing flora and fauna biodiversity. To replace these chemicals, non-chemical approaches are gaining momentum now a days. In present research, cultural and mechanical methods have been adopted to minimize the infestation of the pest. The results revealed that minimum infestation (12.91%) was recorded in treatment T^1 (rash mulching) which significantly different from other treatments. The treatment T^2 (Light traps) showed (14.09%) infestation which was statically at par with those of T^3 (Propping), T^4 (Hand collection of egg masses) and T^5 (Detrashing) with increase of infestation (15.69%), (16.00 %) and (16.84%), respectively. The maximum infestation (25.71%) was recorded in T^6 (control). The infestation was maximum (17.08%) after 20 day intervals while it was minimum (16.84%) after 10 day intervals. It was concluded that trash mulching is the best approach while infestation decreases when we put the application after ten days.

* **Corresponding Author:** S.Ahmad✉Shahbaz.iags@pu.edu.pk

Introduction

Sugarcane (*Saccharum* spp.) is widely cultivated crop in tropical and subtropical countries and used in food stuff as fiber, production of biofuels, etc. However, expansion of the crop in sandy soil areas, previously used for growing coffee and degraded grassland, has aggravated problems with phyto-nematodes. Sugarcane crop are a major raw material source for the production of white sugar, brown sugar, gur and it is also a cash crop. Its share in value addition in agriculture and GDP is 3.6 and 0.8 percent, respectively. Sugarcane was cultivated on an area of 988 thousand hectares, and estimated production was 55.3 million tons during the year 2010-11. Currently, the average yield of sugarcane per hectare is 63.9 million tons which is 16.8 percent higher than that of the past years (Ahmad *et al.,* 2011). The average yield of sugarcane in Pakistan is low as compared to the other sugarcane growing countries of the world. There are many factors of comparatively low yield out of which insect pests are the most important. About 103 insects are associated with Sugarcane (Kumarasinghe, 1999).Sugarcane crop is currently facing a severe crisis in the country. Both, farming community and the industry are striving for its sustainable existence and growth. The major challenges faced by the crop are less average per area production, low sugar recovery and higher cost of production. Regardless of pronounced developments in sugarcane research and expansion in sugar industry, our national average sugarcane yield is 49.00 tons per hectare.

Among insect pest's, sugarcane borers are most damaging one. Stem borer of sugar cane causes losses up to 36.51% (Aheer *et al.,* 1994). Sugarcane stem borer has become a challenging pest of sugarcane crop, due to feeding inner side of the plants where it is too difficult to control. The extensive and injudicious use of insecticides also caused the environmental pollution, health hazards and resistance problem in large number of insect pests. (Mohyuddin *et al.,* 1997; Soerjani, 1998). It is observed that 40% borer infestation reduces 17% sucrose and 40% crop yield (Arian, 1981). Fifteen percent losses by borers in cane weight were determined at the time of harvesting while 6.4% losses were observed in sugar in Sindh, Pakistan (Soomaro, 1981).

Integrated techniques like cultural, mechanical, biological and chemical control methods individually and in combination are effective to control the insect pests. Use of pesticides against borers creates resistance. To overcome resistance problem, meet the demand of international market, for producing good quality agro products, now more stress is on non-chemical approaches. It is imperative to utilize mechanical and cultural control program for sugarcane (Khan and Khan, 2006). The methods like chemical, cultural, mechanical and biological and their combinations give significant control of borers and increase the sugarcane yield (Gul and Saeed, 2006). Various techniques like use of light traps, application of insecticides and release of biological control agent like *Trichogramma chilonis,* effectively control the sugarcane borers (Sardana, 2000). The use of IPM approach was very effective against sugarcane borers (Zubir *et al.,* 2007; Jena *et al.,* 1997; Hashmi and Rehman, 1985). Therefore, the objective of present study was to find the suitable and sustainable tactics to control the sugarcane stem borers.

Materials and methods

In order to assess the mechanical and cultural control of sugarcane stem borer *(Chilo infuscatellus)* on sugarcane crop, an experiment was conducted in the southern Punjab (Rahim Yar Khan) which was severely infested with sugarcane borers (*Chilo infuscatellus*). Homogeneous set of a standard commercial sugarcane variety US-718 was planted in rows at a 2.5 feet R×R and one foot P×P distance between the sets. The experiment was laid out in RCBD and replicated thrice with a plot size of 5×10 m^2 with five treatments in each block. Six treatments including Trash Mulching, Detrashing, Propping, Eggs Collecting, Light Traps and control were applied with a check for comparison. Three dressing were made at one month interval. One variety US-718

showing resistance responses was selected from the previous studies and grown in three sets.

Mechanical control plants infested by stem and root borers (dead hearts) and gurdaspur borer (dry tops) were rouged from April to September during first week of each month. Infested plants along with borer's larvae and egg clusters of all borers along with leaves were collected from April to September during first week of each month and fed to the livestock. Cultural control, balanced application of fertilizers as DAP and SOP in plant crop (2.0 bags each/acre at sowing time), Urea in both crops (1.5 bags during hoeing and earthing-up) was applied. Irrigation with ten days interval during March to June and twenty days interval during July to September was done. Strong earthing-up during May was maintained. 15 shoots were selected randomly from each treatment in each replication. Damaged canes were separated; holes were counted and % infestation was calculated according to the following formula.

Percent infestation= $\frac{\text{Numb}}{\text{Tot}}$

The pre-treatment observations were recorded one day before application of insecticide, while the post treatment observations were recorded 10, 20 and 30 days after each dressing of the insecticide. All the data were analyzed statistically by Tukey HSD test. The treatments were as followed:

T_1 = Trash mulching
T_2 = Light traps
T_3 = Propping
T_4 = Hand collection of egg masses
T_5 = Detrashing
T_6 = Control

Results and discussion

The results showed a significant difference among the treatments. The minimum infestation (12.91%) in treatment T1 significantly differs from other treatment. The maximum infestation (25.71%) was recorded in control (T6.) The treatment T2 showed 14.09% infestation followed by T3, T4 and T5 with 15.69, 16.00 and 16.84%, respectively. The infestation was maximum (17.08%) after 20 days intervals while it was minimum (16.84%) after 10 days intervals.

It is evident from the results that minimum infestation 12.91% was recorded by using trash mulching while the maximum infestation 25.71% was recorded in control treatment. The results showed that detrashing showed 14.09% infestation followed bypropping, Egg collecting and light traps with 15.69%, 16% and 16.84% respectively.

The infestation was maximum (17.08%) after 20 days' intervals while it was minimum (16.84%) after 10 days intervals.

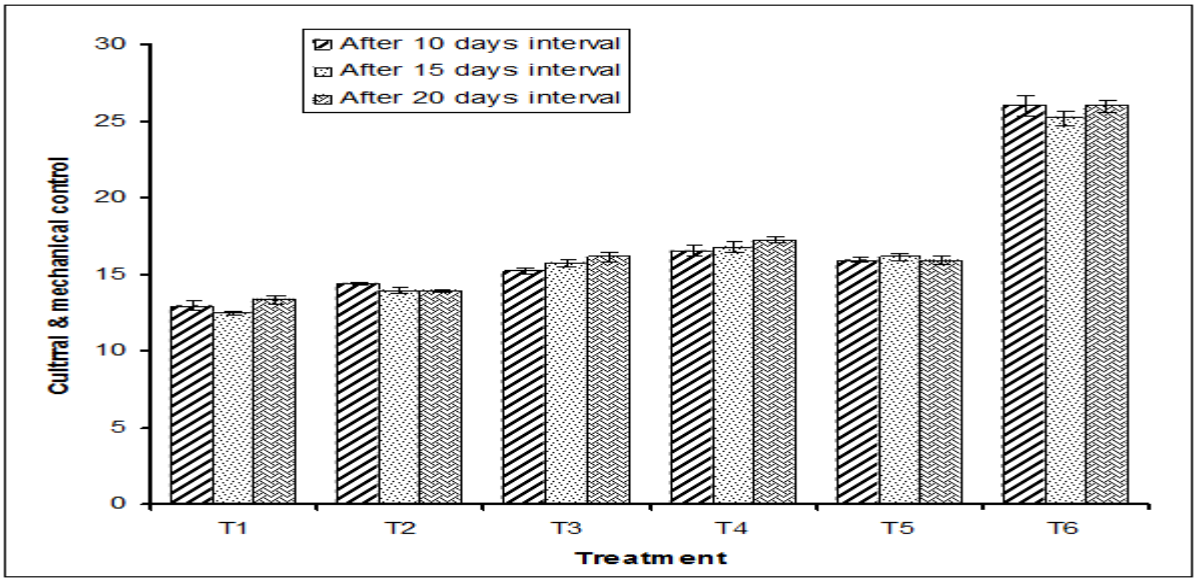

Fig. 1. Graph between cultural & mechanical control and infestation.

The present findings are comparable with those of Jalali *et al.,* (2000), Makhdom *et al.,* (2001) who reported that effect of trash mulching on sugarcane crop against the stem borer (*Chilo infuscatellus*) was very effective. The borer population was significantly suppressed in plots treated as trash mulching compared with trash burnt plots. This was because of the parasitoid activities in trash mulching plots. They reported that sugarcane yield was significantly increased in trash mulching plots. Present findings are also comparable with those Subramanian and Lyer (1921), Flecher (1990), Gupta and Avasthy (1954), and Athwale (1953) who reported that hand collection of egg masses and their destruction before the formation of node reduce the pest population. The present findings are comparable with those of Jena *et al.,* (1997) who reported that cultural control practices i.e. burning of trash, removing plants residue and removing water shoots reduce the pest population 8.23%. The present findings are comparable with those of Hashmi (1994) who reported that sugarcane infested parts should be cut and fed to cattle and strong earthing-up is very effective against the borer control in sugarcane.

Conclusion

It was concluded that non-chemical approaches could be a great idea for effective management of *Chilo infuscatellus* and to enhance the production of sugarcane crop in Pakistan.

Acknowledgements

The authors are thankful to Mr. Rashid Rasool Khan and Shahbaz TalibSahi for their technical support in improving the experiment protocols. The authors are grateful to DG Etihad Sugar Mills Limited on conducting trails and their valuable support.

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