



(RESEARCH ARTICLE)



## Infestation of early shoot borer, top borer and root borer in sugarcane varieties in Shahjahanpur, Uttar Pradesh

Sejal Gupta <sup>1</sup> and Newton Paul <sup>2,\*</sup>

<sup>1</sup> Master of Science in Zoology, Isabella Thoburn College, Lucknow, India.

<sup>2</sup> Department of Zoology, Isabella Thoburn College, Lucknow, India.

International Journal of Science and Research Archive, 2023, 09(02), 447–451

Publication history: Received on 16 June 2023; revised on 25 July 2023; accepted on 28 July 2023

Article DOI: <https://doi.org/10.30574/ijrsra.2023.9.2.0589>

### Abstract

Sugarcane is the most important crops in Uttar Pradesh. The largest producing and growing state of sugarcane in the nation is Uttar Pradesh. In UP, sugarcane was grown on 27.40 lakh hectares in 2020–21. The state claimed that 22,32 crore tons of sugarcane were produced during the most recent sugar season (October 2020–September 2021). Top shoot borer can result in a 20–30% production loss for farmers. Shoot borer (*Chilo infuscatellus snellen*), top borer (*Scirpophaga excerptalis*), root borer (*Polyocha depressella swinhoe*) is major pest of Sugarcane during summer season in almost all the cane growing tracts in India. Damage occurs at the initial stage of crop growth resulting in killing young shoot up to 26–65 percent. Although a large number of insecticides have been recommended for its control, yet besides causing several adverse effects on the environment, the application of insecticides in grown up stage of sugarcane becomes real serious problem.

**Keywords:** Pest; Insecticides; Sugarcane; Damage

### 1. Introduction

Sugarcane is an important cash crop of India. Numerous elements, including soil fertility, climate, variety, and cultural practices, the frequency of pests and diseases, as well as environmental stress, have a significant impact on sugarcane output. Among these, pests are known to cause a considerable loss in sugar production as well as cane yield. Due to its extended growing season (between 10 and 18 months), sugarcane is susceptible to a variety of insect pests and illnesses. According to an estimate, sugarcane production declines by 20.0 and 19.0% by insect pests and diseases, respectively. In addition to other variables, the prevalence of insect pests is a major contributor to low yield and sugar recovery. The crop of sugarcane was related with about 103 insects [2]. Studies from India reported on varying levels of productivity loss ranging between 1.3–10% due to infestation with *E. depressella* [4]. Due to the ravages of insect pests, economic loss in sugarcane has been estimated to reach 20% in cane yield and 15% in sugar recovery [5]. The Bihar State Planning Board of India identified north Bihar to be an endemic area for *Chilo infuscatellus* due to widespread infestations with this pest [6]. When sugarcane is first growing in India, primarily in the summer, one of these borers, *Chilo infuscatellus*, causes significant losses [8]. In several regions of India, *Scirpophaga excerptalis* is regarded as a serious sugarcane pest that can cause yield and sugar levels to drop by up to 51% and 2.0 units, respectively [7, 9]. *Chilo auricilius* is also a major pest of sugarcane in western as Uttar Pradesh India its appearance in 1954 [1, 10]. It has been noted that the insect infests plant cane and ratoon crops, and these may act as a source of infestation for the plant crop that follows. Researcher found that canes with infection levels of 5, 10, 15, 40, 50, and 80% had sugar recovery percentages of 9.85%, 9.78, 9.35, 9.30, 6.26, 3.94, and 2.39%, respectively [12]. The current study was therefore started with the aim of analyzing the state of insect pests and losses incurred by the sugarcane crop due to infestation by sugarcane borer through surveys and surveillance in various sugarcane varieties.

\* Corresponding author: Newton Paul

## 2. Material and methods

Infestation of early shoot borer, top borer, root borer recorded during months of March-April (2023) from different variety of sugarcane. Infestation was recorded in the farmer's fields to gather information of borer in this area. The farmer's fields were selected in the adjoining areas distributed. The infestation was recorded in terms of percentage incidence.

Early shoot borer, top borer, root borer percent incidences based on dead heart, and infested plant for 400 plants in every variety of sugarcane randomly selected at 6 different areas. In every area, randomly selected 4 rows of 100 plants of particular variety and surveyed the infestation of early shoot borer, top borer and root borer percentage.

By dividing the total number of infested plants by the total number of plants multiplied by 100, the percent infestation was calculated.

Field surveys were conducted in sugarcane fields both in plant and ratoon crops in certain city Shahjahanpur, Sugarcane research Institute's field during April-May 2023. To learn more about the insect pests of sugarcane in this region, surveys and surveillance were conducted on a monthly basis in the fields of the farmers. The farmer's fields were selected in the adjoining areas distributed over the field where different varieties of sugarcane available for regular visit and recording of insect pests of sugarcane. The incidence of insect pests was recorded on the basis of nature of the damage caused by each pest and the symptoms expressed by the plants in response to the pest attack. Both the percentage incidence of tissue borers and the quantity of sucking pests per leaf/plant were used to quantify the damage.

Based on dead hearts, bunchy tops, and infested plants for 400 plants randomly selected at four different corners, borers, mites, and grasshopper incidence is calculated as a percentage. The percentage incidence was calculated by multiplying the total number of infected plants, dead hearts, and bunchy tops by 100.

---

## 3. Results and discussion

Data presented in (Table 1) reveals that early shoot borer, top borer and root borer occupied the key position in sugarcane growing areas of the Shahjahanpur of northern side (Uttar Pradesh) followed by shoot borer, top borer and root borer. Graph-1 shows percent infestation of pests in sugarcane variety.

### 3.1. Shoot borer

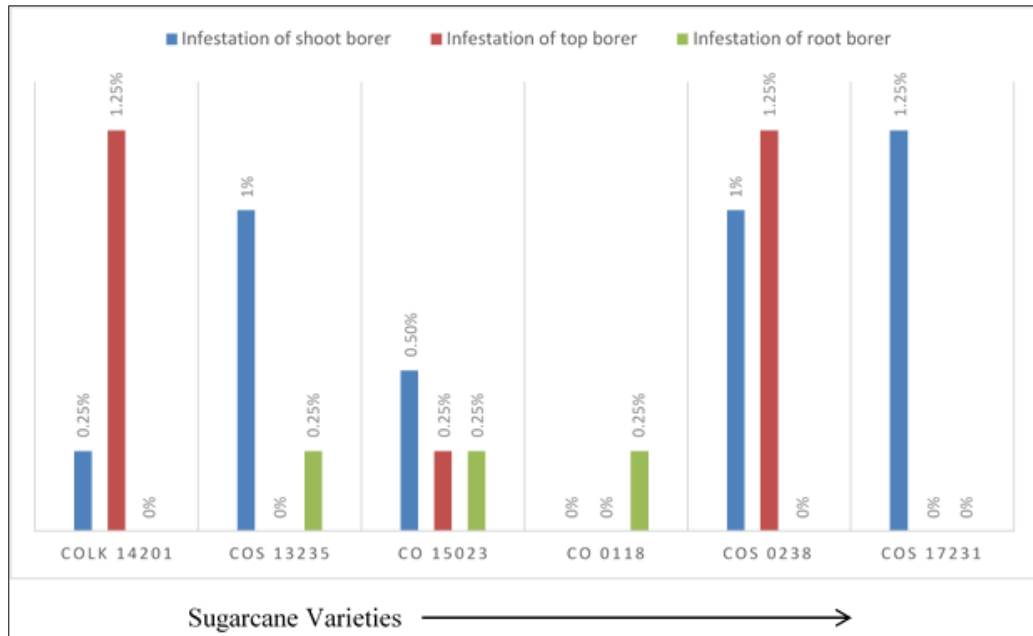
High level of pest incidence was observed during march and April months of the survey in all the field. The maximum incidence of 1.25 per cent was recorded in *COS 17231* variety of sugarcane. However, the minimum average incidence of 0.25 per cent was recorded in *COLK 14201* during crop season presented in table 1 and graph 1. The pest first appeared in March and persisted through the end of July, with May being thought of as the month with the highest level of activity. The findings are in keeping with Singh & Varma's study that the Nizamabad district of Andhra Pradesh, India, experiences a major population buildup in April and a peak in May [11].

### 3.2. Root borer

Early in the crop growing period, the pest infected. The activity of this pest started from March till July and reaches at peak level during both cropping seasons of March and April on the basis of data presented in table 1. High level of pest incidence was observed during both months of the survey in field. The maximum incidence of 1.25 per cent was recorded in *COLK 14201* and *CO 0238* as shown as graph 1. However, the minimum average incidence of 0.25 per cent was recorded in *CO 15023* Sugarcane variety. The same outcome was also observed by Fletcher in 1932, who noted that the root borer was extremely active in Pusa from early May to mid-June, when other borers were practically completely dormant due to the hot weather [3].

### 3.3. Top borer

The top borer typically infests the crop in the early growth phases and after internode formation. The per cent incidence of top borer was more or less uniform in both the months and in all the variety of sugarcane. The data presented table 1 revealed that the average maximum per cent incidence of 0.25 per cent was recorded in *COS 13235* and *CO 0118* variety of sugarcane the minimum 0.0 per cent during crop season March- April and also shown in graph1. The pest activity started from March and continued till October and reaches the peak level during June. The result similar with Shenhmar & Brar in 1996 also recorded *S. excerptalis* to be active from March to October, with most of the damage inflicted during July-August. [13]



**Figure 1** Infestation on sugarcane varieties

**Table 1** Survey and Surveillance of sugarcane incidence of insect pests shoot borer, Top borer and Root borer under Northern Shahjahanpur of Uttar Pradesh during hot weather (March-April 2023)

Varieties of Sugarcane (Early maturing)	No. of plants examined	Shoot borer (No. affected plants)	% incidence of shoot borer	Top borer (No. affected plants)	% incidence of top borer	Root borer (No. affected plants)	% incidence of root borer
COLK 14201	100	00	00	01	01	00	00
	100	00	00	00	00	00	00
	100	01	01	01	01	00	00
	100	00	00	03	03	00	00
Total	400	01	0.25%	05	1.25%	---	---
COS 13235	100	00	00	00	00	00	00
	100	00	00	00	00	00	00
	100	03	03	00	00	00	00
	100	01	01	00	00	01	01
Total	400	04	01%	00	---	01	0.25%
CO 15023	100	02	02	00	00	00	00
	100	00	00	01	01	00	00
	100	00	00	00	00	01	01
	100	00	00	00	00	00	00
Total	400	02	0.50%	01	0.25%	01	0.25%
CO 0118	100	00	00	00	00	01	01

	100	00	00	00	00	00	00
	100	00	00	00	00	00	00
	100	00	00	00	00	00	00
Total	400	00	---	00	---	01	0.25%
CO 0238	100	01	01	01	01	00	00
	100	01	01	02	02	00	00
	100	01	01	01	01	00	00
	100	01	01	01	01	00	00
Total	400	04	01%	05	1.25%	---	---
COS 17231	100	01	01	00	00	00	00
	100	01	01	00	00	00	00
	100	01	01	00	00	00	00
	100	02	02	00	00	00	00
Total	400	05	1.25%	00	---	00	---

#### 4. Conclusion

An essential method for learning about local insect pests and creating a survey plan for farmers to prescribe control actions is surveillance and surveys. Thus, it can be concluded on the basis of the survey was conducted on major insect pest's incidence of the different variety that Among the various insect and non-insect pests, early shoot borer, root borer and top borer, can be considered as major pests, while *Pyrrilla*, yellow mite, and grasshoppers as minor pests. However, IPM should be developed on the basis of an infestation history of the pest in the field where the problem recorded. However, the grower must be very careful to proper pest occurrence in the field, economic threshold level and timing of application of insecticides.

#### Compliance with ethical standards

##### Acknowledgments

Author thanks to Head of Pesticide Department of Entomology (Sugarcane Research Institute, Shahjahanpur) Mr. Arun Kumar Singh and the Principal Dr. (Mrs.) V. Prakash, Isabella Thoburn College, Lucknow University, Uttar Pradesh, India for suitable suggestion time to time and guidance during field visit. Author is also greatly thankful to local farmers for help and their cooperation.

##### Disclosure of conflict of interest

No conflict of interest to be disclosed.

#### References

- [1] Atwal AS. Appearance of stalk borer, *Chilo auricilius* Dudg. (Crambidae Lep.) In Punjab, Indian Journal of Sugar Cane Research and development 1962: 7:57.
- [2] Avasthy PN. Integrated control of sugarcane pests and diseases. Sugar News, 1977: 9:72-74
- [3] Fletcher TB. Report of the Imperial Entomologist. Sci. Rep Imp Inst Agric Res, Pusa, 1932, 87-92.5.
- [4] Gupta BD. Avasthy PN. Biology of sugarcane borer, *Emmalocera depressella* a UP. Journal of Agriculture and Animal Husbandry, UP. 1952, 2:19-25.1.
- [5] Kumarasinghe NC. Insect fauna associated with sugarcane plantations in Sri Lanka Division of Pest Management, Sugarcane Research Institute, Uda Walawe, Sri Lanka 70190; 1999.

- [6] Kumar K. Gupta SC, Mishra GP, Dwivedi GP, Sharma NN. Sugarcane pests in Bihar: Retrospect and prospect- A review. *Agricultural Review*, 1987; 8:59-66.
- [7] Madan YP, Singh D, Singh M. Extent of damage, losses and control of sugarcane top borer, *Scirpophaga excerptalis* Walker. (Pyralidae: Lepidoptera). *Indian Sugar*, 1999, 48(11):915-920
- [8] Nagalakshmi KV. Balaja S, Gowrishanker S. Evaluation of insecticides in the management of sugarcane early shoot borer *Chile infuscatellus* Snellen, Proceedings of the 61st Annual Convention of the Sugar Technologists' Association of India, New Delhi, India, 1999, a142-147.
- [9] Pandey KP, Sharma BL, Singh RG. Effect of different density of egg mass of top borer (*Scirpophaga excerptalis* Walker) on growth, yield and quality of sugarcane. *Entomon* 1997, 22(3, 4):247-249.
- [10] Rai AK, Khan MA, Kaur S. Biological control of stalk borer, *Chilo auricilius* Dudg in sugarcane belt of UP. *Shashpe*. 1999, 1(6):59-62.
- [11] Singh PB. Verma A. Population dynamics of the sugarcane shoot borer, *Chile infuscatellus* Snellen in Andhra Pradesh, India. *Annals of Plant Protection Sciences*. 1995; 3:23-26
- [12] Shenhmar M. Verma GC, Duhra MS, Doomra S. Assessment of loses caused by *Chilo auricilius* Dudgeon (Lepidoptera. Crambidae), *Indian Sugar*: 1998; 48:39-41
- [13] Shenhmar M, Brar KS. Evaluation of parasitoids for the management of *Chile infuscatellus* (Snellen) and *Scirpophaga excerptalis* (Fabricius) on sugarcane in Panjab. *Indian Sugar*, 1996, 121-123