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## Survey and surveillance of sugarcane insect pests under Terai zone of Northern West Bengal

**Anil Kumar and Suprakash Pal**

**Abstract**

Surveys and surveillance were conducted in sugarcane fields both in plant and ratoon crops distributed over certain villages Under the Terai zone of northern West Bengal during two consecutive years 2017-18 and 2018-19 with an objective to gather information of insect pests in this area towards developing survey schedule for the farmers to recommend control measures and to determine the spatial and temporal pattern and intensity of different sugarcane pests in northern West Bengal. Among the various insect and non-insect pests, early shoot borer, root borer, stem borer, woolly aphid and derbid plant hopper can be considered as major pests, while pyrilla, yellow mite, and grasshoppers as minor pests. The surveys and surveillance were conducted in the months of March to June for early shoot borer and root borer, in March to October for top borer; in July to February for stem borer, pyrilla, woolly aphid, grass hopper and mite. The results revealed that the maximum incidence of shoot, root, top and stem borer were recorded as 9.5, 6.75, 12.25 and 9%, respectively. While, incidence of sucking pests: pyrilla, derbid plant hopper, woolly aphid and mite were recorded as 0.92 per leaf, 4.2 per plant, 7.17 per leaf and 11.25%, respectively. However the maximum incidence i.e., 9.75% of grasshopper was recorded during crop season 2017-18. Similar trend was also observed during 2018-19.

**Keywords:** Insect pests, survey, surveillance, sugarcane, northern West Bengal

**1. Introduction**

Sugarcane is an important cash crop of India. Sugarcane yield is markedly influenced by many factors like soil fertility, climate, variety, and cultural practices, prevalence of pests and diseases as well as environmental stress. Among them, pests are known to inflict considerable loss in cane yield as well as sugar output. Sugarcane is a long duration crop of 10-18 months and therefore is liable to be attacked by a number of insect pests and diseases. According to an estimate, sugarcane production declines by 20.0 and 19.0% by insect pests and diseases, respectively. Among the various factors, incidence of insect pests plays a vital role for low productivity and sugar recovery. About 103 insects were associated with sugarcane crop [1]. Economical loss in sugarcane has been estimated to be 20 per cent in cane yield and 15 per cent in sugar recovery due to the ravages of the insect pests [2]. Among these; borers, *Chilo infuscatellu* causes considerable losses during the early periods of sugarcane growth in India, mainly during the summer months [3]. Due to heavy infestations with this pest, the Bihar State Planning Board of India declared north Bihar to be an endemic area for *C. infuscatellus* [4]. Studies from India reported on varying levels of productivity loss ranging between 1.3-10% due to *E. depressella* infestation [5]. *Scirpophaga excerptalis* is considered to be a major pest of sugarcane in many parts of India reducing the yield and sugar contents of up to 51% and 2.0 units, respectively, as recorded in Indian cane fields [6, 7]. *Chilo auricilius* also a major pest of sugarcane in western Uttar Pradesh in India since its appearance in 1954 [8, 9]. The pest is recorded as infesting plant cane and ratoon crops and these may serve as a source of infestation of the following plant crop. Shennhmar *et.al.* recorded sugar recovery percentage of 9.85% in uninfested compared to 9.78, 9.35, 9.30, 6.26, 3.94 and 2.39% in canes showing 5, 10, 15, 40, 50 and 80% infestation levels, respectively [10]. Hence, the present study was undertaken with an objective to analyze the status of insect pests and losses caused to the sugarcane crop under Terai agro climatic conditions by conducting surveys and surveillance in different villages of Cooch Behar for helping the farmers to fix the management schedules for getting sustainable yields and better returns.

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## 2. Materials and Methods

Field surveys were conducted in sugarcane fields both in plant and ratoon crops in certain villages under Terai zone of northern West Bengal during two consecutive years 20017-18 and 2018-19 as PhD research project. Survey and surveillance was recorded at monthly interval in the farmer's fields with an objective to gather information of insect pests of sugarcane in this area. The farmer's fields were selected in the adjoining areas distributed over four villages, i.e. Salmara, Barorangras, Kathalguri and Dawaguri all within Cooch Behar district of West Bengal for regular visit and recording of insect pests of sugarcane. The insects were collected by hand picking and sweep netting and were preserved dry or in 70% alcohol. Similarly, the plant parts infected were also collected and brought to the laboratory for their further study. 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. The damage was recorded in terms of per cent incidence for tissue borers and in terms of number of sucking pests per leaf/plant.

In case of borers, mite and grasshopper per cent incidence based on dead hearts, bunchy top and infested plant for 400 plants randomly selected at four different corners. The per cent incidence was obtained by dividing the total number of dead hearts/bunchy top/infested plant with total number of plant multiplied by 100.

$$\text{Per cent incidences of borer} = \frac{\text{No of dead heart/bunchy top/ infested canes}}{\text{Total no of plant}} \times 100$$

$$\text{Per cent incidences of grasshopper/mite} = \frac{\text{No of infested canes}}{\text{Total no of plant}} \times 100$$

For sucking pests like *Pyrilla purpusilla* and *Ceratovacuna lanigera* populations of nymphs and adults per leaf was recorded on three leaves (Upper, middle, lower) from 40 leaves randomly selected at four different corners. While, in case of derbid plant hopper 40 plants randomly selected at four different corners and number of hoppers per plant was noted.

## 3. Results and Discussion

Data presented in (Table 1&2) reveals that shoot borer, root borer, top borer and sugarcane wooly aphid occupied the key position in sugarcane growing areas of the Terai zone of West Bengal followed by stem borer, pyrilla, derbid plant hopper, mite and grasshopper.

### 3.1 Shoot borer

High level of pest incidence was observed during both the years of the survey in all the village areas. The maximum incidence of 9.5 per cent was recorded in Dawaguri and Samlara village area. However the minimum average incidence of 4.65 per cent was recorded in Kathalbari during crop season 2017-18 presented in table 1. While, during crop season 2018-19 (table 2) the maximum pest incidence was observed 14 per cent in the village area of Kathalbari and the minimum average incidence 3.85 percent in Dawaguri. The pest started appearing in the month of March and continued up to the end of July while May is considered to be the peak period of its activity in the Terai zone of West Bengal. The result agreement with Singh & Varma reported that in the Nizamabad district of Andhra Pradesh, India, the main build up of the population takes place in April and reaches a peak in May [11].

### 3.2 Root borer

The pest infested during the early stage of crop growth period. The activity of this pest started from March till July and reaches at peak level during both cropping seasons of 2017-18 and 2018-19 on the basis of data presented in table 1&2. High level of pest incidence was observed during both the years of the survey in all the village areas. The maximum incidence of 6.75 per cent was recorded in Kathalbari. However, the minimum average incidence of 3 per cent was recorded in Samlara during crop season 2017-18. While, during crop season 2018-19 the maximum pest incidence was observed 9.5 per cent in Kathalbari and the minimum incidence 2.45 percent in Samlara. The similar result was also recorded by Fletcher in 1932 that root borer to be very active from the beginning of May to mid-June at Pusa, a period when other borers were rendered almost inactive by the hot weather [12].

### 3.3 Top borer

The top borer usually infests the crop in early stages of crop growth and after formation of internodes. The per cent incidence of top borer was more or less uniform in both the years and in all the village areas. The data presented table 1&2 revealed that The average minimum per cent incidence of 4.43 per cent was recorded in village Kathalbari and the maximum 12.25 per cent in Dawaguri during crop season 2017-18. During the crop season of 2018-19 the maximum incidence of 17.25 percent in Kathalbari and the minimum average 5.37 per cent in Salmara were recorded. 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].

### 3.4 Stem borer

The infestation of stem borer started from July till December that is after cane formation and its peak period was recorded in the month of August during both of seasons. The Average minimum per cent incidence of 3.12 per cent was recorded in village Kathalbari and the maximum 9 per cent in Dawaguri during crop season 2017-18 data showed in table 1. During the crop season of 2018-19 (table 2) the maximum incidence of 6.75 percent in Dawaguri and the minimum average of 2.08 per cent in Salmara. In Nayagarh, Orissa, India, the pest is active from late June to November when the maximum temperature is 32.5°C to 36.1°C and relative humidity is between 71.3 and 79.5%. High temperature, high relative humidity and rainfall favour multiplication, with high relative humidity being very conducive to borer survival. Four distinct generations were recorded from mid June to late January [14-17]. In Gujarat, *C. auricilius* occurs simultaneously with *C. sacchariphagus* from June to December in cane fields [18].

### 3.5 Sugarcane Pyrilla

It is a minor pest but sometime, it is an important sporadic insect of sugarcane in the entire northern and central India occurring at a periodicity of 5-8 years (Mann *et al.*, 2006). In Cooch Behar, West Bengal the pest appeared in the month of August and continued till harvest of sugarcane during 20017-2018. Its average incidence ranged from 0.24 to 0.52 hoppers per leaf and the maximum incidence of 0.92 hoppers per leaf was observed at village Dawaguri during 20017-18. However during 20018-19, the maximum incidence of 0.83 hoppers per leaf was recorded at Kathalbari and average incidence ranged from 0.32 to 0.53 hoppers per leaf. Chaudhary and Sharma

reported that the *Pyrilla* population was the maximum at 12.1 adults per plant during 2<sup>nd</sup> half of August, falling to 1.8 adults per plant in the 2<sup>nd</sup> week of September<sup>[19]</sup>.

### 3.6 Derbid plant hopper

It is a minor pest but its incidence was recorded huge especially during late crop growth stage. However, the maximum incidence up to 4.52 hoppers per plant was recorded at village Salmara and average incidence ranged from 1.37 to 2.47 hoppers per plant during 2017-18. However during 2018-19, its average incidence ranged from 1.31 to 5.35 hoppers per plant and the maximum incidence of 11.95 hoppers per plant at village Salmara. The incidence started in June and continued up to February and reached the maximum during September to November. Bhavani reported that under AICRP on sugarcane during 2013-14 the incidence of leafhoppers, *Pyrilla perpusilla* (4-11 adults & nymphs/leaf) and *Proutista moesta* (3-10/leaf) were observed from June to September<sup>[20]</sup>.

### 3.7 Sugarcane woolly aphid

The incidence of woolly aphid was reported from most of Indian states like Assam, Nagaland, Maharashtra, Uttar Pradesh and pockets of Andhra Pradesh. It was a sporadic pest of different cane growing areas in India. In India, Basu and Banerjee in 1958 reported it for the first time from West Bengal<sup>[21]</sup>. In Cooch Behar Sugarcane woolly aphids emerged as a serious pest. However, in recent years, its incidence was reported in Salmara, Barorangras, Dawaguri and Kathalbari of Cooch Behar, West Bengal. There was a sharp rise in the incidence during 20018-19 as compare to 2017-18. Maximum the incidence up to 7.12 aphids per leaf was recorded at village Salmara and the average incidence ranged from 1.86 to 3.51 woolly aphids per leaf during 2017-18. During 2018-19, its average incidence ranged from 1.77 to 4.96 per leaf

and the maximum incidence of 12.27 woolly aphids per leaf at village Salmara. The incidence started from August and continued up to February and reached the maximum during October till December. Rabintra *et al.* reported that serious infestation by the sugarcane woolly aphid, *C. lanigera*, on the leaves of 4 to 9 month old sugarcane plants was observed in Kolhapur and Pune districts of Maharashtra in September-October 2002<sup>[22]</sup>.

### 3.8 Grasshopper

The incidence of grasshopper was observed all-round the year. The maximum incidence of 9.75 per cent was recorded in village Dawaguri area and the average incidence ranged from 2.25 to 5.15 during season 2017-18. However during 2018-19, the maximum incidence of 6.75 per cent was recorded at Dawaguri and the average per cent incidence ranged from 1.81 to 5.07. Vastrad<sup>[23]</sup>. (1986) and Akhtar *et al* reported that short horned grasshoppers were more abundant during the month of September<sup>[24]</sup>.

### 3.9 Mite

The infestation of mite started from August till December and its peak period was recorded in the month of October during both the seasons. The average minimum per cent incidence of 3.29 per cent was recorded in village Barorangras and the maximum 11.25 per cent in Dawaguri during crop season of 2017-18. During the crop season of 2018-19 the maximum incidence of 9 percent at Kathalbari and the minimum average of 3.91 per cent in Salmara. Amin Nikpay and François-Régis Goebel reported that sugarcane yellow mite, *Oligonychus sacchari* (McGregor) (Prostigmata: Tetranychidae), is an occasional pest of sugarcane in Iranian sugarcane fields. Infestations generally occur during late May-early August, and the lower leaves of sugarcane are usually colonized first<sup>[25]</sup>.

**Table 1:** Survey and surveillance of sugarcane insect pests under Terai zone of West Bengal during 2017-18

Insect pest	Salmara		Barorangras		Kathalbari		Dawaguri		Peak period	Pest activity
	Av.	Max.	Av.	Max.	Av.	Max.	Av.	Max.		
Shoot borer (% Dead Hearts)	5.1	9.5	4.9	8.75	4.65	8.25	4.95	9.5	May	March –July
Root borer (% Dead Hearts)	3.0	5.75	3.1	4.0	3.55	6.75	3.1	5.25	May	March –July
Top borer (% Dead Hearts/bunchy top)	5.18	13.0	5.19	10.50	4.43	9.25	6.78	12.25	June	March –October
Stem borer (% infested plant)	3.62	8.50	3.65	4.25	3.12	5.25	5.29	9.0	September	July -December
<i>Pyrilla</i> (No./leaf)	0.24	0.55	0.41	.72	.32	.52	.50	.92	October	August-February
Derbid plant hopper(No./plant)	2.47	4.52	1.86	3.4	1.37	2.77	1.43	2.57	November	June -February
Woolly aphid (No./leaf)	3.15	7.17	2.54	3.65	1.86	3.90	1.51	2.75	December	August -February
Grasshoppers(% infested plant)	2.75	8.5	2.25	4.25	1.91	4.75	5.15	9.75	December	March -February
Mite (% infested plant)	5.78	10.0	3.29	4.75	3.58	4.75	6.95	11.25	October	August -February

**Table 2:** Survey and surveillance of sugarcane insect pests under Terai zone of West Bengal during 2018-19

Insect pest	Salmara		Barorangras		Kathalbari		Dawaguri		Peak period	Pest activity
	Av.	Max.	Av.	Max.	Av.	Max.	Av.	Max.		
Shoot borer (% Dead Hearts)	5.15	9.0	6.8	11.25	7.3	14.0	3.85	7.25	May	March –July
Root borer (% Dead Hearts)	2.45	4.75	4.2	6.75	4.95	9.50	2.80	6.0	May	March –July
Top borer (% Dead Hearts/bunchy top)	5.37	9.75	6.62	12.0	9.86	17.25	6.65	11.75	June	March –October
Stem borer (% infested plant)	2.08	3.75	2.70	4.75	3.33	5.25	4.29	6.75	September	July -December
<i>Pyrilla</i> (No./leaf)	0.32	0.52	0.38	0.67	0.53	0.83	0.43	0.67	September- November	August -February
Derbid plant hopper(No./plant)	5.35	11.95	1.31	2.31	2.04	3.27	1.97	3.40	September- November	June -February
Woolly aphid (No./leaf)	4.96	12.27	1.77	3.0	3.0	5.27	2.71	3.90	October - December	August -February
Grasshoppers(% infested plant)	2.46	4.75	5.07	5.75	1.81	3.0	3.31	6.75	September - December	March -February
Mite (% infested plant)	3.91	6.5	6.40	4.75	5.25	9.0	5.60	7.75	October	August -February

## 4. Conclusion

Surveys and surveillance is an important tool to gather information of insect pests in the area towards developing

survey schedule for the farmers to recommend control measures. Thus it can be concluded on the basis of the survey was conducted on major insect pests incidence of the different

village that Among the various insect and non-insect pests, early shoot borer, root borer, stem borer, woolly aphid and derbid plant hopper can be considered as major pests, while pyrilla, 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.

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