



Study On Population Dynamics Of Sugarcane Root Borer In Udham Singh Nagar, Uttarakhand, India

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Abstract: The studies on diversity of insect fauna and population dynamics of root borer in sugarcane were carried out for two crop seasons during 2017-18 and 2018-19 in U.S. Nagar, Uttarakhand, India. Root borer, *Emmalocera depressella* is spread extensively in all sugarcane growing areas of the country including Uttarakhand. The Survey and observation were conducted in sugarcane farmer's fields both seeded and planted crops distributed over at four places of district U.S. Nagar during two consecutive years 2017-18 and 2018-19 with an objective to gather information of insect pest in this area towards developing survey schedule for the farmers to recommend control measures and to determine the population dynamics of sugarcane root borer in the months of March to till harvest of the crop. A total of one hundred canes from each places have been studied for the experimentation. The population reached its maximum in the month of May; however the peak activity recorded during both the first and second seasons, respectively. Thus the study exhibited that the peak activity of root borer was from April-June during 2017-18 and 2018-19 crop seasons, respectively.

Keywords: Sugarcane, Root Borer and Population Dynamics

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 percent 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 (Kumarasinghe, 1999). Economical loss in sugarcane has been estimated to be 20 percent in cane yield and 15 percent in sugar recovery due to the ravages of the insect pests (Avasthy, 1977). Studies from

India reported on varying levels of productivity loss ranging between 1.3-10 percent due to Root borer, *Emmalocera depressella* infestation (Gupta and Avasthy, 1952). Root borer, *Emmalocera depressella* is a wide spread pest in all sugarcane growing areas of the country. This pest attacks the crop at early periods of growth with its peak activity during May-June in places like Punjab, Haryana and Uttar Pradesh (Sardana 1999a and Nair et al., 1971). The larva of root borer starts damage by boring on the lateral side of the plant to make a way to the base of the root through a bored entry hole and inside the plant it bores downwards or upwards killing the growing point. This would sever the central leaf spindle which dries up to form dead heart symptom that can be pulled out effortlessly (Srikanth, 2012). The need for the study on population dynamics of pests of sugarcane is increased considerably during present era is a pre-requisite for control and



forecasting system. Keeping the above points in view the present work conducted on “Study on population dynamics of root borer in sugarcane in U.S. Nagar.

Materials and methods

The experiments conducted in the in the farmer’s field of sugarcane at four places of district U.S. Nagar, i.e., Kashipur, Bazpur, Jaspur, and U.S. Nagar, Uttarakhand, India, during 2017-18 and 2018-19 to study the population dynamics of root borer in sugarcane. The farmers of every experimental site seeded and planted sugarcane in the month of March and also followed agricultural practices given in materials and methods their after. The geographical area of the district is 3055 Km sq. and is located between latitude 28° 53' N and 29° 23' N and laterally extends between longitudes 78° 45' E and 80° 08' E. The sugarcane was planted on 26th March and 02nd March during the year 2017 and 2018 respectively. All recommended package and practices were followed to raise the crop organically. Systematic survey was taken to assess the population dynamics of root borer of Sugarcane in U.S. Nagar. The observations were made at monthly intervals, starting from the month of March, 2017 onwards till harvest of the crop. The root borer infestation was estimated by recording the number of ‘dead-hearts’ in the field and measured in terms of percentage of canes attacked (Pruthi, 1937). Root borer attacks sugarcane in the early stages when the crop is 2-4 months old and causes The pest infested during the early stage of crop growth period. The activity of this pest started from April till July and reaches at peak level during both cropping seasons of 2017-18 and 2018-19 on the basis of data presented in Tables 1, 2, 3 & 4 and Figs 1, 2, 3 & 4. High level of pest incidence was observed during both the years of the survey in all areas. The maximum incidence of 9.33 percent was recorded in Kashipur. However, the minimum average incidence of 8.00 percent was recorded in

damage throughout the year (Isaac, 1939; Anonymous, 1943). Dead hearts are produced in the young crop which, though resemble those produced by shoot borer, cannot be pulled out (Khan and Singh, 1942). The dead heart does not emit any offensive smell and often one or two leaves adjacent to the central leaf whorl also dry up. There is only one entry hole near the base of the shoot (Rahman and Singh, 1942; Cheema, 1948). In early April, the newly hatched larvae crawl down and bore into the base of young plants about 2.5" below ground level resulting in drying of the central spindle and the entire plant. After July, the larvae attack side tillers more frequently than the main or mature side shoots making one to seven holes in the internodes below ground level and sometimes disperse from one shoot to another (Cheema, 1953a). Attack in the later stages of crop leads to yellowing of leaves in the post-monsoon period and this yellowing is due to the obstruction of free flow of nutrients from roots to leaves (Pannu et al., 1990). The percent incidence was obtained by dividing the total number of dead hearts/ bunchy top/ infested plant with total number of plant multiplied by 100. Percent root borer infestation calculated by following formula:

Precent indices of borer

$$= \frac{\text{Number of dead hearts/ bunchy top/ infested canes}}{\text{Total number of plant}} \times 100$$

Results and Discussion

Jaspur during crop season 2017-18. While, during crop season 2018-19 the maximum pest incidence was observed 19.00 percent in Kashipur and the minimum incidence 13.33 percent in Jaspur. 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.



Table 1. Survey for population dynamics of root borer *Emmalocera depressella* and their parasites on sugar cane at Kashipur

Months	% plant Infestation	Population of <i>E. Depressella</i>	Population of <i>T. japonicum</i>
March	0.00	0.00	0.00
April	3.33	8.00	7.00
May	8.67	14.67	16.33
June	9.33	19.00	27.33
July	4.33	7.33	9.33
August	0.00	0.00	0.00
September	0.00	0.00	0.00
October	0.00	0.00	0.00
November	0.00	0.00	0.00
December	0.00	0.00	0.00
January	0.00	0.00	0.00
February	0.00	0.00	0.00

Table 2. Survey for population dynamics of root borer *Emmalocera depressella* and their parasites on sugarcane at U.S. Nagar

Months	% plant Infestation	Population of <i>E. Depressella</i>	Population of <i>T. Japonicum</i>
March	0.00	0.00	0.00
April	3.67	7.33	6.33
May	7.33	12.33	13.67
June	9.00	17.67	24.33
July	4.67	6.33	8.33
August	0.00	0.00	0.00
September	0.00	0.00	0.00
October	0.00	0.00	0.00
November	0.00	0.00	0.00
December	0.00	0.00	0.00
January	0.00	0.00	0.00
February	0.00	0.00	0.00



Perusal of data revealed that the percent infestation by root borer varied from 3.33 to 19.00 percent during the course of investigation. The pest marked its first appearance by an average of 3.33 percent dead heart symptoms in month of May. The population gradually increased and the

maximum infestation of root borer was observed in the month of May; however the peak activity recorded (19.00 percent), respectively. Thereafter, the root borer population gradually decreased in population till month of July.

Table 3. Survey for population dynamics of root borer *Emmalocera depressella* and their parasites on sugarcane at Bazpur

Months	% plant Infestation	Population of <i>E. depressella</i>	Population of <i>T. Japonicum</i>
March	0.00	0.00	0.00
April	3.00	7.00	6.67
May	7.00	11.67	11.33
June	8.33	15.33	21.67
July	4.00	6.00	7.33
August	0.00	0.00	0.00
September	0.00	0.00	0.00
October	0.00	0.00	0.00
November	0.00	0.00	0.00
December	0.00	0.00	0.00
January	0.00	0.00	0.00
February	0.00	0.00	0.00

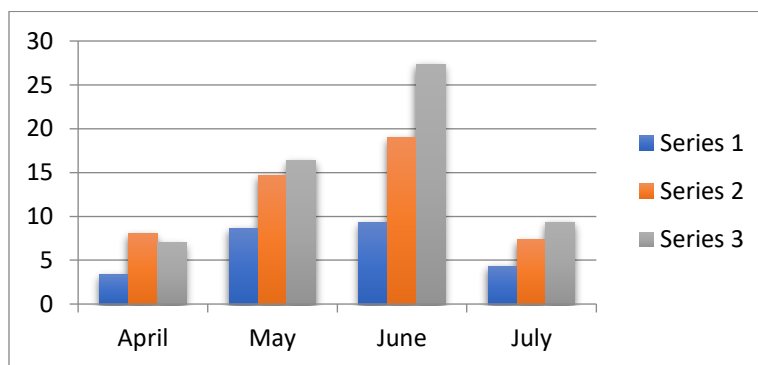


Fig. 1. Population dynamics of root borer *Emmalocera depressella* and their parasites on sugarcane at Kashipur



Table 4. Survey for population dynamics of root borer *Emmalocera depressella* and their parasites on sugarcane at Jaspur

Months	% plant Infestation	Population of <i>E. depressella</i>	Population of <i>T. japonicum</i>
March	0.00	0.00	0.00
April	2.33	6.67	5.00
May	6.33	10.33	11.00
June	8.00	13.33	18.33
July	3.33	5.67	7.00
August	0.00	0.00	0.00
September	0.00	0.00	0.00
October	0.00	0.00	0.00
November	0.00	0.00	0.00
December	0.00	0.00	0.00
January	0.00	0.00	0.00
February	0.00	0.00	0.00

The population/ infestation of the root borer on sugarcane during subsequent year, 2017-18 and 2018-19 crop season, was observed from April to July respectively.

These findings are in accordance with Srikanth et al. (2014), who observed the incidence of root borer at reached its peak infestation during

month of May. Jayanthi and David, 1990 also observed that the pest activity was higher during the period of April to July. The pest reached its peak activity during May and June months and the population declined in the month July whilst, whereas, the pest seemed to be completely inactive during the period of October-December.

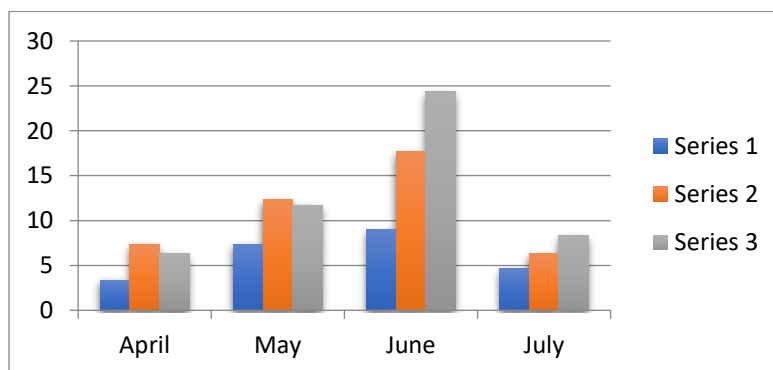


Fig. 2. Population dynamics of root borer *Emmalocera depressella* and their parasites on sugarcane at U.S. Nagar

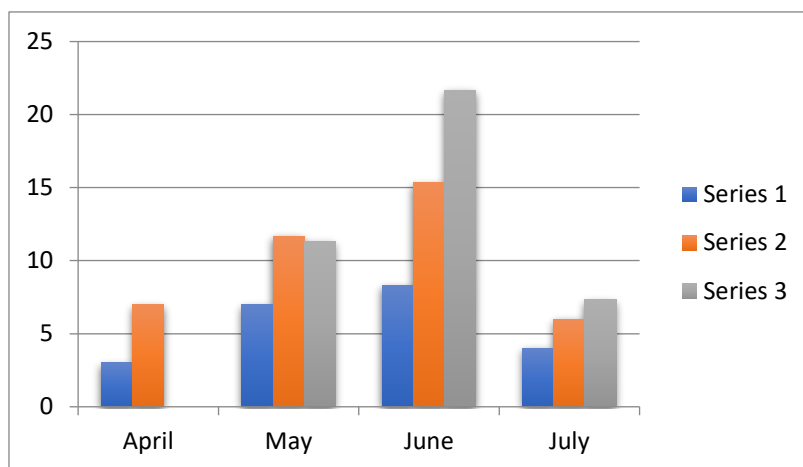


Fig. 3. Population dynamics of root borer *Emmalocera depressella* and their parasites on sugarcane at Bazpur

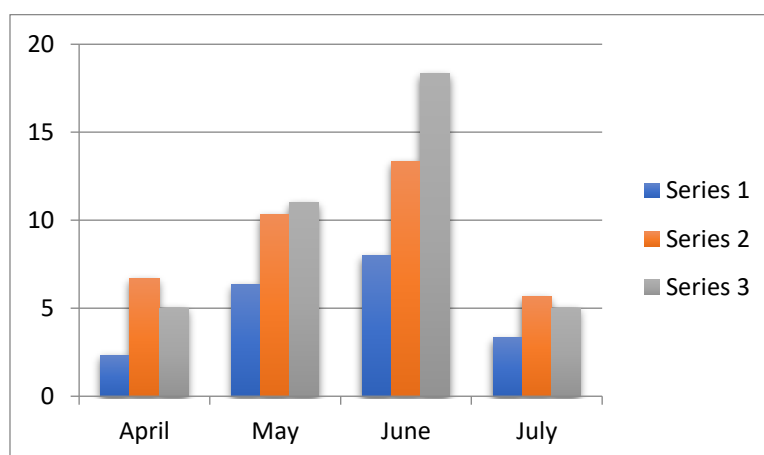


Fig. 4. Population dynamics of root borer *Emmalocera depressella* and their parasites on sugarcane at Jaspur

Conclusion

Statistical tools help to conduct an appropriately well-designed study leading to valid and reliable results. Surveys and observation 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 root borer, *Emmalocera depressella* incidence of the different places.

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