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Field studies on the nature of damage caused by sugarcane plassey borer *Chilo tumidicostalis* Hampson (Lepidoptera: Pyralidae)

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ABSTRACT

Field experiment was conducted to investigate the nature of damage caused by sugarcane plassey borer *C. tumidicostalis*. Generally, there are two phases of infestation of the pests known as primary and secondary infestation. From the investigation, it was observed that the mean number of internodes damaged was more or less similar (1 to 3 internodes) in both the primary and secondary infestation. The mean number of damaged internode was 1.88, 2.06 and 2.42 which was slightly more in the secondary infested canes with 1.78, 2.56 and 2.74 in August, September and October, respectively. However, there was a great variation in the length of spindle damaged by the larvae in primary and secondary infested cane. Similarly, the mean length of internode damaged was more in primary infested canes than secondary infested canes. The mean proportion damaged length caused by the larvae in primary infested cane was 0.46, 0.45 and 0.41 during August, September and October as against 0.18, 0.13 and 0.16 in secondary infested cane, respectively.

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INTRODUCTION

Sugarcane *Saccharum officinarum* L. is an important food cum cash crop grown extensively throughout India. In Assam, sugarcane is the important commercial crop grown in all the districts next to tea and jute with an area and production of 0.30 lakh ha and 10.76 lakh metric tons tons, respectively (Anonymous, 2014). The low yield of sugarcane in the state may be attributed to the various attacks of pests and diseases. The number of insect pests associated with sugarcane crop in India had been listed by many workers. About 125 insect species are reported to attack sugarcane in India (Box, 1953). Phukan (1978) mentioned about 6

insect species which are major importance of sugarcane crop in Assam.

Among the different internode borers associated with sugarcane, the plassey broer, *C. tumidicostalis* has assumed the status of a very serious endemic pest in recent years. In India, the pest caused 8.2 to 12.6 per cent loss in cane yield and 1.25 to 7.85 per cent loss in sucrose output in endemic areas (Butani, 1961). Generally, there are two phases of infestation of the pests known as primary and secondary infestation. The primary infestation phase starts after near about 60 DAP and the secondary infestation phase has been noticed in the crop ecosystem after migration of the pests from infested to nearby plants. In primary infestation phase, the larvae of this species bore into the young tender stem in such a way that whole peripheral tissue below the rind is eaten up in the form of a ring. The entire leaves of the crown dry up and produce dry crown symptom. The portion above the ring gets easily broken off by wind. Several entry and exit holes are made by the larvae due to congregation and red coloured frass is oozing out through the holes. On mature cane stalk, grown up larvae bore and cause damage, but do not produce 'dry crown' symptom which is seen in primary infestation phase (Khanna *et al*., 1957). In Assam, the intensity of damage by this pest ranged from 1 to 8 internodes/cane (Rajmedhi, 1992).

In view of the above factors, the present study is undertaken to investigate the nature of damage caused by sugarcane plassey borer.

MATERIAL AND METHODS

The present investigation on field studies on the nature of damage caused by sugarcane plassey borer *C. tumidicostalis* Hampson (Lepidoptera: Pyralidae) were carried out during 2015-16. For assessment of primary and secondary infestation of cane, fifty randomly selected canes were selected from different plots. The damaged canes was brought to the laboratory and observations were made on the length of the cane, total number of internodes, length of spindle, number of internodes bored, internode number damaged starting from top to the base of the cane. Length of the damaged internodes was also recorded.

In case of secondary infested canes, to observe the larval damage from the tip of the spindle as well as the length of the damage inflicted on the spindle was also observed. Only holes on infested cane were recorded for secondary infested canes.

To estimate the proportion of damaged length in primary and secondary infested cane, the damage intensity was calculated and analysis was done with 't'-test and paired 't' test, respectively.

RESULTS AND DISCUSSION

The data on nature of larval damage in the primary and secondary infested canes are presented in Table 1

Table 1 : Mean primary infestation of *C. tumidicostalis* on different parts of cane with length (2014-15)

Months	Damaged internode number	Damaged spindle length (cm)	Internode damaged length (cm)
August	1.88±0.32 (1-3)	32.46±8.10 (13-60)	19.38±5.69 (3-40)
September	2.06±0.60 (1-3)	42.26±5.28 (30-60)	22.24±4.81 (3-40)
October	2.42±0.49 (2-3)	43.02 ±3.35 (35-49)	30.58±4.10 (18-40)

Figures in parenthesis is range Number of sample (n=50)

Table 2 : Mean secondary infestation of *C. tumidicostalis* on different parts of cane with length (2014-15)

Months	Damaged internode number	Damaged spindle length (cm)	Internode damaged length (cm)
August	1.78±0.70 (1-3)	4.38±1.24 (3-6)	16.46±9.65 (4-37)
September	2.56±0.54 (2-3)	0.58±0.67 (2-6)	17.58±4.25 (10-33)
October	2.74±0.53 (2-3)	0.44 ±0.50 (3-10)	22.84±6.93 (12-27)

Figures in parenthesis is range Number of sample (n=50)

Table 3 : Comparison of mean damaged cane length in primary and secondary infestation (2014-15)

Months	Primary infested cane ($\overline{X}$)	Secondary infested cane ($\overline{Y}$)	t-value
August	0.46 (n=12)	0.18 (n=26)	3.23*
September	0.45 (n=20)	0.13 (n=37)	4.56*
October	0.41 (n=26)	0.16 (n=52)	7.72*

* indicate significance of value at P=0.05 n= Total number of sample

and 2. The data indicate that the mean number of internodes damaged was more or less similar in both the primary and secondary infestation and it was observed that only 1 to 3 internodes were damaged by the larvae during the cropping season 2015-16. The mean number of damaged internode was 1.88, 2.06 and 2.42, respectively, in August, September and October. It was slightly more in the secondary infested canes with 1.78, 2.56 and 2.74, respectively in August, September and October, respectively. This showed that the migrating larvae (*i.e.* 3rd instar) entered the spindle of the neighbouring canes only from the base of the spindle in the secondary infested canes and never from top as observed in the primary infested canes. However, there was a great variation in the length of spindle damaged by the larvae in primary and secondary infested cane. The mean spindle length damaged in primary infested cane was 32.46, 42.26 and 43.02 cm, respectively in August, September and October in comparison to 4.38, 0.58 and 0.44 cm in secondary infested canes. In secondary infested canes, the spindle was damaged at the base only. This indicated that the migrating larvae never entered the neighbouring canes from top but slightly above the base of spindle. Similarly, the mean length of internode damaged was more in primary infested canes than secondary infested canes. It was 19.38, 22.24 and 30.58 cm in primary infested canes and 16.46, 17.58 and 22.84 cm in secondary infested canes, respectively in August, September and October.

The data on the proportion of damaged length in the primary and secondary infested cane in different months are presented in Table 3. The mean proportion damaged length caused by the larvae in primary infested cane was 0.46, 0.45 and 0.41 during August, September and October as against 0.18, 0.13 and 0.16 in secondary infested cane, respectively.

The statistical analysis of the data indicated that the proportion of damaged length was significantly high in primary infested canes than secondary infested cane in 5 per cent probability level. There were mainly two types of damage in the primary infested cane. Majority of the primary infested cane showed continuity of the larval tunneling and feeding in the cane. In the other types of damage there was break in the continuity of the larval tunneling and feeding. This showed that in the second type of damage, larvae from the primary infested cane migrated and bored the healthy lower internodes of the same damaged cane.

Damage caused by plassey borer to the canes in the field was either primary or secondary (Khanna *et al.*, 1957; Gupta and Avasthy, 1959 and Rajmedhi, 1992). Khanna *et al.* (1957) reported that the insect after hatching enters inside the top of the canes which includes spindle and few top internodes and the larvae feeds on the internal tissues gregariously leading to drying up of central spindle and few other crown leaves. Such infested canes are referred to as primary infested canes. After completion of third instar, the larvae migrates to neighbouring canes or the healthy internodes. Such infested canes are referred to as secondary infested canes. However, these canes do not show drying up of crown leaves. Since the larval instars responsible for primary and secondary damage is different, therefore there may be difference in the larval behaviour in causing damage in respect of internodes, spindle and the length of tunnel in the internodes. The variation in the number of internode damaged by the larvae may be correlated with the size of the egg mass. Since all the larvae hatched from the same egg mass enters into the same spindle, therefore in some canes there is overcrowding and as such some larvae were also found to damage second or third internodes.

Khanna *et al.* (1957) also reported that the crown leaf is dried only in case of primary infested canes which supported the present findings. The proportion of the damaged length caused by the larvae in the primary infested cane was significantly more in comparison to secondary infested canes (Table 3). The present findings is supported by Khanna *et al.* (1957) who reported migration of third instar larvae and cause damage to healthy lower internodes. Bhuyan (1999) also reported that the insect cause primary damage resulting in drying up of crown leaves and top few internodes. Secondary damage to the cane was caused by migrating larvae leading to tunneling and feeding of internodes without drying up of the crown leaves. The insect entered through the top of the spindle in primary infested canes while it bored little above at the base of spindle in secondary infested canes. Proportion of damaged length was significantly more in primary infested cane than secondary infested canes.

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