INCIDENCE AND INTENSITY OF BORER COMPLEX INFESTATION ON DIFFERENT SUGARCANE GENOTYPES UNDER AGRO-CLIMATIC CONDITIONS OF THATTA

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ABSTRACT: CA field trial was conducted to investigate the incidence and intensity of borer complex infestation on different sugarcane genotypes at National Sugar Crops Research Institute, farm Thatta during the year 2005-06. Total forty six sugarcane genotypes were evaluated in 3rd cycle to find out the incidence and intensity of borer infestation. It was observed that the top borer appeared in the month of March and caused maximum damage of 14.46% in July. The stem borer appeared during April and infestation increased gradually up to 21.44% in September. The root borer appeared in the month of April and caused maximum damage of 10.21% in August and the gurdaspur borer appeared in the month of June and caused maximum damage 2.63% in July. The sugarcane genotypes were categorized according to the infestation percent. Out of forty six genotypes screened, twenty seven were resistance, six were less susceptible, one was moderately susceptible, three were susceptible and nine were highly susceptible.

Key word: *sugarcane; borer incidence; borer infestation %.*

INTRODUCTION

Sugarcane (*Saccharum sp*) is one of the major crops of Pakistan grown on about 1.0 million hectares. The average yield 46 and 48-tons/ha and sugar recovery of 8.7% being achieved in Pakistan is lowest as compared with other major sugarcane growing countries having about 60 tones per hectare and also lower than the neighboring country, India. (Junejo, 2002 and Keerio, 2005). One of the important factors responsible for low yield and sugar recovery is the attack of various borers. A loss of 30-80% in yield and 0.25-1.25% in sugar recovery has been reported by various researchers (Ishtiaq, 2005).

Sugarcane is attacked during its growth by a number of insect pests namely borers, white grub, scale insect, mealy bugs etc. and rats as a non insect pest (Bashir *et al.*, 2007). Insects feeding on sugarcane are diverse, numerous and characteristically of limited geographically distributed, at the global 1300 insect species attacked sugarcane, while in Pakistan 61 species are on record (Hashmi, 1994). The sugarcane borer are major devantors, those consequently reduce the quality and quantity of cane and cane sugar. Khanzada (2002) reported that the sugarcane top borer, *Scripophaga excerptalus* Walk and *S. novella* Fab. Sugarcane stem borer, *Chillo infuscatellus* sn and *C. auricilius* and sugarcane root borer *Emmalocera depressela* swinh, are responsible for damaging sugarcane crop by boring and chewing through out the season. Afghan e*t al.*, (2006) reported that cane yield of 70 tones per hectare was harvested from healthy crop, while loss of cane yield was 9, 19 and 31% with borer infestation of 25, 50 and 75% respectively. They further reported that sugar recovery % in case of healthy crop was 8.56% decline in sugar recovery was 22, 34 and 52% with borer infestation of 25, 50 and 75% respectively. Bashir *et al.*, (2007) mentioned that root borer feed on underground portion of plants resulting in the drawing up of the central whorl of leaves. This pest primarily destructive to the young plants and attack a particularly sever from April to June. Plants attacked after the formation of the canes are not killed although their weight and sugar contents are reduced.

A sugarcane pest subjected to diverse ecological, seasonal and biological stresses in its distribution, poses an intricate problem in its management. It was therefore stressed that sugarcane borers need a detailed study in respect of their biology, attack and damage in agro-ecological condition of Thatta.

MATERIALS AND METHODS

The experiment was conducted to study the incidence and infestation percentage of borer complex on different sugarcane genotypes under agro-climatic condition of Thatta. For this purpose a total of forty six sugarcane genotypes were evaluated in 3rd cycle along with BL-4 as local check at National Sugar Crops Research Institute, Farm Thatta. The crop was planted in autumn season of 2005-2006. The experiment was conducted under randomized complete block design. Each sugarcane genotype was replicated two times, with 6 meter long two rows at one meter row to row space. All recommended agronomic practices were carried out simultaneously. For recording monthly observation on borer population twenty five canes of each genotype were selected. The healthy and infested canes were counted separately and infestation % was worked out. The observation on top borer, stem borer, root borer and gurdaspur borer were recorded from March to October. The infestation was caused by top borer was computed on the basis of the infested canes and top were removed every month after taking observation. So damage of top borer reflected the activity of top borer in respective month. Pre-harvesting data was collected on whole selected lines at the time of harvesting. One line was selected from each treatment from both the replications. The genotypic behavior for borer infestation percentage was classified according to Khanzada (2002). The percent infestation was calculated according to method as Khan *et al.* (2006).

$$\text{Percent infestation} = \frac{\text{No. Infested cane}}{\text{Total No. canes}} \times 100$$

RESULTS AND DISCUSSION

The result regarding borer complex activity, infestation and genotypic susceptibility is presented as under:

TOP BORER (*Scirpophaga novella* Fabricicus): The month wise recorded observation(fig -1) shows that top borer appeared in March (for the 1st times) and gradually increased in July. The rain in July/August was favorable for its population. Fig -1 further reveals that maximum average damage of 14.46% was caused during July when borer was comparatively more active, followed by in August, October, September, June, May, April and March with average damage of 11.40, 10.97, 10.29, 9.70, 6.12, 4.51 and 3.48% respectively. The results are in line with the findings of Jabbar *et al.* (1986) who reported that maximum average damage of top borer (10.30%) was caused during July when the borer were comparatively more active. According to Bashir *et al* . (2007) the young plants attacked by this pest show reddish streak on the midrib and a number short holes in the leaves ultimately causing dead-heart, which cane be easily pulled out. the 1st two brood of this pest attack young plants before formation of cane. These plants are killed and cause a total loss.

STEM BORER (*Chilo infuscatellus* Snellen): The observation recorded for the infestation in fig-1 indicates that the stem borer appeared during April and maximum average damage of 21.44% was caused during month of September when borer was comparatively more active, followed by in October, August, July, June. May and April with average damage of 17.10, 16.93, 14.12, 11.23. 8.68 and 6.04% respectively and ultimately it passed winter as a hibernating. Jabber *et al.*, (1986) observed that stem borer infestation was 4.0, 8.5, 22.0 and 28.8% during July, August, September and October respectively. Khanzada (2002) reported that the stem borer is the severe pest, which destroys young canes, shoots during April-June annually. According to Chaudhry (1978) this pest is distributed through out Pakistan. There are five generation in a year, 1st two generation cause dead heart, while last three makes the attacked internodes hard and juice less which adversely affected the yield and recovery. Over wintering pupae start emerging as adult in March.

ROOT BORER (*Emmalocera depressella* Swin): The result in fig-1 reveals that the root borer appeared during the month of the April and maximum infestation of 10.21% was caused during August, followed by in September, June, July, October, May and April with average damage of 8.25, 7.91, 7.74, 6.38, 3.82 and 1.36% respectively. Hashmi (1994) reported that root borer larvae bore in to stem below the soil surface. The central leave of attacked plant dry up "dead heart" before the cane forming stage. The "dead heart" are not easily pulled out. It is the major pest of the sugarcane infestation can exceed 10-20%.

GURDASPUR BORER (*Ascigona steniellus* Hampson): This pest is newly reported in Sindh but population of pest is lowest. The results fig-1 reveals that the pest appeared in the month of June resuming of activity was ussally linked with on set of moonson rain. Hashmi (1994) reported that the

Gurdaspur passes winter and early part of summer (November to June) in sugarcane stubble. Masih *et al.*, (1988) reported that Gurdaspur borer did not affect the purity of product.

VARIETAL SUSCEPTIBILITY: A pre-harvest data of forty six sugarcane genotypes regarding classified genotypic behavior according to borer infestation is presented in table-1 which indicates that genotype HoTh-644 was severely attacked due to 15.07% infestation, followed by HoTh-636, HoTh-625, HoTh-633, HoTh-632, HoTh-634, HoTh-639, HoTh-631 and HoTh-635 which were highly susceptible to borer attack with mean infestation of 14.84, 14.70, 12.73, 12.49, 12.49, 12.49, 11.33 and 11.27% respectively. In contrast, the genotypes HoTh-637, HoTh-645 and HoTh-614 remained susceptible with mean infestation of 10.65, 10.62 and 10.36% respectively. However HoTh-623, HoTh-617, HoTh-630, HoTh-624, HoTh-629 and HoTh-601 remained less susceptible with mean infestation of 8.96, 8.92, 8.87, 8.84, 8.43 and 8.13% respectively. Moreover, the rest other genotypes and check variety BL-4 were found resistant with cane damage ranging from 1.92 to 7.75%. Ashraf *et al.*, (1986) reported that the varieties CP-67-412 and AEARC mutants 1002 and 2001 were found less susceptible to borer attack as compared to BL-4, PR-1000 and CO-547. Khanzada (2002) reported highly signification variation due to borer damage for different sugarcane cultivars under agro-climatic condition of Tando Jam, Sindh. He reported that among the 50 varieties under test, 10 were less susceptible, 27 moderate susceptible, 6 susceptible and 7 highly susceptible to borer infestation.

CONCLUTIONS: The biology of sugarcane borer is well synchronized to that of sugarcane ecology. The weather condition favorable for rapid growth of sugarcane plant (warm temperature and abundant of rain fall) invariably result in rapid increase in population of sugarcane borer. Borer infestation was observed more in July and August than the March and April. The population of gurdaspur borer was very low in Thatta climatic condition. Gurdaspur borer caused more damage in rainy season. The preceding observation indicated that borers constitute a serious threat even at NSCRI and that to overcome their infestation a continuous monitoring and change in cropping pattern need to be looked into.

RECOMONDATION: It is suggested that for the control of borer population, integrated pest management practices should be followed from the sowing time up to harvesting.

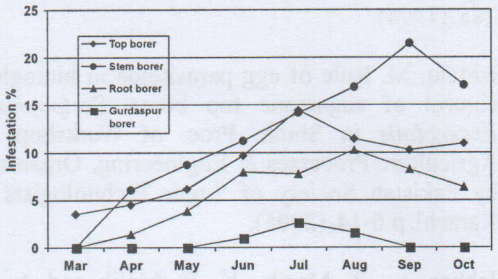

Fig-1. Month wise average infestation% caused by borer complex in 3rd cycle at NSCRI, farm Thatta.

Appendix-1 Summary of meteorological data recorded at Meteorological Station of National Sugar Crops Research Institute, Thatta during 2005-06.

Meteorological data for the year 2005							
Month	Temperature °C		Wet °F	Dry °F	Humidity %	Evaporation rate (mm)	Rainfall (mm)
	Minimum	Maximum					
October	21.54	34.90	71.16	77.93	73.32	10.70	-
November	17.98	32.16	65.24	76.40	53.92	9.00	18
December	10.69	26.37	52.80	65.61	29.88	8.22	-
Meteorological data for the year 2006							
Month	Temperature °C		Wet °F	Dry °F	Humidity %	Evaporation rate (mm)	Rainfall (mm)
	Minimum	Maximum					
January	12.12	24.48	51.3	59.6	92.62	11.60	-
February	16.20	29.30	60.10	59.50	58.44	10.70	-
March	18.00	32.10	65.10	76.00	54.51	11.30	-
April	21.51	35.60	54.93	85.73	74.46	15.73	-
May	26.30	34.90	81.10	87.60	74.80	20.40	-
June	28.20	36.30	81.60	91.30	72.23	19.50	-
July	28.30	32.90	81.00	85.70	81.38	15.00	111
August	25.70	30.50	79.10	83.20	71.80	11.70	109
September	25.70	33.20	78.30	84.60	76.00	11.00	145
October	24.10	33.90	78.50	83.80	70.94	8.90	-
November	18.60	31.40	65.60	76.40	54.40	7.90	3
December	12.90	24.60	56.10	65.40	52.00	7.80	8

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Table-1: Pre-harvest infestation percentage of different sugarcane genotypes by borer complex at NSCRI, farm Thatta during 2006.

Genotype	Infestation percentage					
	Top borer	Stem borer	Root borer	Gurdaspur borer	Mean infest. %	Remarks
HoTh-601	8.13	18.60	3.48	2.32	8.13	LS
HoTh-602	5.66	6.91	1.88	1.25	3.92	R
HoTh-603	6.53	9.80	4.54	00	5.22	R
HoTh-604	3.04	5.48	2.38	00	2.72	R
HoTh-605	3.79	4.21	1.26	1.68	2.73	R
HoTh-606	7.63	4.86	4.86	00	4.33	R
HoTh-607	3.42	7.12	1.71	00	3.13	R
HoTh-608	13.79	6.89	2.87	00	5.88	R
HoTh-609	6.66	12.38	8.57	00	6.90	R
HoTh-610	3.30	6.98	2.20	00	3.12	R
HoTh-611	10.34	12.93	7.75	00	7.75	R
HoTh-612	3.70	5.18	2.96	00	2.96	R
HoTh-613	6.14	11.40	9.64	00	6.79	R
HoTh-614	22.34	11.70	5.31	2.12	10.36	S
HoTh-615	7.26	13.40	4.46	00	6.28	R
HoTh-616	7.75	17.24	3.44	00	7.10	R
HoTh-617	11.60	18.75	5.35	00	8.92	LS
HoTh-618	4.84	3.08	0.88	00	2.20	R
HoTh-619	16.03	6.60	4.71	00	6.83	R
HoTh-620	6.76	12.78	5.25	00	6.20	R
HoTh-621	4.14	11.24	8.87	00	6.06	R
HoTh-622	7.62	11.86	5.08	0.84	6.35	R
HoTh-623	6.89	14.48	14.48	00	8.96	LS
HoTh-624	9.23	13.84	12.30	00	8.84	LS
HoTh-625	14.77	19.31	25.00	00	14.70	HS
HoTh-626	5.45	7.27	4.54	00	4.31	R
HoTh-627	7.40	14.07	5.92	00	6.84	R
HoTh-628	11.30	19.13	7.82	00	9.56	MS
HoTh-629	10.00	16.25	7.50	00	8.43	LS
HoTh-630	11.84	13.15	10.52	00	8.87	LS
HoTh-631	14.66	21.33	9.33	00	11.33	HS
HoTh-632	30.43	16.66	16.66	00	12.49	HS
HoTh-633	24.52	16.98	9.43	00	12.73	HS
HoTh-634	11.36	6.81	6.06	00	6.05	R
HoTh-635	21.56	13.72	9.80	3.92	11.27	HS
HoTh-636	25.00	15.62	18.75	00	14.84	HS
HoTh-637	21.31	13.11	8.19	00	10.65	S
HoTh-638	6.66	12.59	4.44	2.22	6.47	R
HoTh-639	7.54	16.03	8.49	00	12.49	HS
HoTh-640	6.06	7.07	4.04	00	4.29	R
HoTh-641	6.01	9.77	4.51	00	5.07	R
HoTh-642	5.92	5.26	3.28	00	3.81	R
HoTh-643	22.22	16.66	11.11	00	12.49	HS
HoTh-644	16.17	25.00	19.11	00	15.07	HS
HoTh-645	12.50	22.50	7.50	00	10.62	S
HoTh-646	4.27	3.41	00	00	1.92	R
BL-4	7.28	9.93	3.31	00	5.13	R

R = Resistant (0-8.00%) , **LS**= Less susceptible (Above 8.01-9.00%), **MS**= Moderately susceptible (above 9.01-10.00%), **S** = Susceptible (Above 10.01-11.00%), **HS**= Highly susceptible (above 11.00%).