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VARIATION IN JUICE QUALITY IN TOP BORER *SCIRPOPHAGA NIVELLA* (FABR.) INFESTED CANE

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Five sugarcane varieties two each from Barbados and Tando Jam and one from Lyallpur (BL-19, BL-4, Triton, PR-1000 and L-113) were planted in six replicated Randomized Complete Block Design during 1986-87 and 1987-88. TSS, sucrose, CCS, glucose and fibre content percentages were affected significantly by top borer infestation. Variety L-113 was significantly more susceptible to top borer, followed by BL-19 and BL-4 respectively. It was further estimated that top borer infested cane reduced 6.46% TSS, 5.05% sucrose, 6.63%CCS, 15.19% glucose but significantly increased the fibre content percent (8.72). It is suggested that sugarcane crop may be sprayed with suitable insecticide for obtaining better juice quality and quantity. Furthermore variety L-113 is recommended for commercial planting.

Key words: Sugarcane, Juice quality, Top borer, Infestation.

Introduction

Sugarcane *Saccharum officinarum* L., is an important cash crop of Pakistan growing on an area of 854.3 million hectares with a production of 35.5 million tonnes [1]. This crop is infested by a number of pests, among these top borer is the most important pest of sugarcane in the province of Sindh, where this crop is grown on an area of 250.7 million hectares having a production of 12.3 million tonnes [1,2]. Resistance to insect pest is governed by amount of heritable qualities possessed by the plant which influences the ultimate degree of damage done by insect [3]. Plant characteristics (narrow leaves, high fibre content, high stalk density, high stalk colour, heavy coating, leaf shedding fall, thin stalk, long leaf spendles, hard stalk rind, erect leaves and high vigour) have all been reported to be the responsible for resistance [4-10]. Reported by [8, 11, 12] that top borer infestation reduced the sucrose by 1 - 12% in the cane. However, Fuller *et al.* [13] reported that stalk weight and commercial cane sugar were negatively correlated with *Diteria saccharalis* (F.) damage they further estimated that increased fibre content, resulting in less juice, was positively correlated to percent bored internodes.

Keeping in view the above facts an experiment was carried out to assess the top borer resistant sugar-cane variety and to estimate the losses occur in sugar quality and quantity due to the attack of this pest.

Materials and Methods

A field experiment was conducted to determine the variation in juice quality in top borer affected cane during 1986-87 and repeated in 1987-88 at Sugarcane Experimental Field Agricultural Research Institute, Tando Jam. Five varieties each two from Barbados and Tando Jam and one from Lyallpur (Faisalabad) *viz.* BL-19, BL-4, Triton, PR-1000 and L-113 were planted in six replicated completely Randomized Block Design in each year, at a rate of 80,000 sets/ha, having a net plot size of 14 x 14 metre. A basal fertilizer dose of 250 + 150 + 250 kg NPK/ha, was applied prior to sowing. Insecticide was not applied during the growing period in order to allow the plants to be exploited by the pest.

For recording top borer infestation 10 randomly selected plants in each plot were tagged at maturity stage. Infested and healthy canes were separated and brought to the laboratory and crushed for juice. The juice was separately analysed (healthy and infested) for total soluble salt (TSS), sucrose, commercial cane sugar (CCS), glucose and fibre content percentages according to Queensland Lab. Manual, Anonymous [14]. All the collected data were subjected to pooled analysis of variance to discriminate the superiority of treatment mean L.S.D. test was applied following Gomez and Gomez [15].

Results and Discussion

Variation in total soluble salts (TSS), sucrose, commercial cane sugar (CCS), glucose and fibre content percentages were significant (P 0.01) due to top borer infestation (Table 1). It was observed that top borer affected cane reduced total soluble salt (6.46%), sucrose content (5.05%), commercial cane sugar (6.63%), glucose content (15.19%), but increased in the fibre content (8.72%) over healthy canes. These results are supported by the findings of Clear [5], Pruthi and Naryana [11] who reported an average infestation reduced sucrose content from 1 to 12% in infestated cane, whereas Fuller *et al.* [13] also reported that stalk weight and commercial cane sugar (CCS) were negatively correlated with *Diteria saccharalis* (F.) damage, they further reported that increased fibre content

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resulting in less juice was positively correlated with percent bored internodes (Table 2).

Varieties had significantly different trends (P 0.01) for TSS, sucrose, CCS, glucose and fibre content percent respectively (Table 1). Variety L-113 was more susceptible against top borer and caused significantly maximum total soluble salt content (16.97%), sucrose content (13.98%), commercial cane sugar content (10.20%), whereas glucose content was superior in variety BL-19 (1.78%). It was apparent that the fibre content was greater in varieties BL-4. Triton and L-113, than BL-19 and PR-1000 respectively. It might be due to change in phenotypic parameters brought from parental material used. These results are in accordance with those obtained by Painter [3], he reported that insect resistance is the relative amount of heritable qualities which influenced the ultimate degree of damage done by the insect. Plant characteristics have been reported to be responsible for pest resistance [4-10] Table 2.

It was infered that out of five commercial sugarcane varieties grown for their susceptibility against top borer. Variety L-113 was found to be the most resistant against this pest, followed by BL-19 and BL-4 respectively. It was noted that juice quality performance was not linear in all the varieties. It might be due to genetical makeup of the material. Total

TABLE 1. ANALYSIS OF VARIANCE OF DATA FROM SUGARCANE INFESTED WITH TOP BORER.

Source of variance	DF	TSS content%	Sucrose content%	CCS content%	Glucose content%	Fibre content
Replications with in year	11	0.003^{NS}	0.0007^{NS}	0.0003^{NS}	0.0004^{NS}	0.0008^{NS}
Year (Y)	1	0.04^{NS}	0.02^{NS}	0.002^{NS}	0.005^{NS}	0.007^{NS}
Condition (C)	1	28.61**	11.93**	10.79**	0.88**	48.07**
Varieties (V)	4	41.18**	21.96**	8.41**	4.82**	27.05**
Y x C	1	0.03^{NS}	0.002^{NS}	0.0001^{NS}	0.023^{NS}	0.002^{NS}
Y x V	4	0.03^{NS}	0.002^{NS}	0.002^{NS}	0.007^{NS}	0.001^{NS}
C x V	4	1.23^{NS}	0.94^{NS}	0.43^{NS}	0.47^{NS}	1.55^{NS}
Y x C x V	4	1.29^{NS}	0.94^{NS}	0.44^{NS}	0.055^{NS}	1.55^{NS}
Pooled Error	90	2.86	0.49	0.50	0.02	2.28
Total	119	–	–	–	–	–

* = Significant at 0.05% probability level., ** = Significant at 0.01% probability level., N. S. = Non significant., DF = Degree of Freedom., TSS = Total soluble salt., CCS = Commercial cane sugar.

TABLE 2. AVERAGE SUGAR QUALITY CONTENT PERCENTAGE OF DIFFERENT SUGARCANE VARIETIES AS AFFECTED BY TOP BORER POPULATION AND YEARS.

Treatment	TSS content %	% + or - over healthy	Sucrose content %	% + or - over healthy	CCS content %	% + or - over healthy	Glucose content %	% + or - over healthy	Fibre content %	% + or - over healthy
YEARS										
1986-87	15.63a		-12.76a		-9.34a		-1.22a		13.89a	
1987-88	15.50a		-15.60a		-9.34a		-1.21a		13.89a	
S. E. ±	0.31		-0.13		-0.13		-0.03		-0.28	
CONDITIONS										
Healthy	16.10a		13.60a		9.64a		1.40a		13.26b	
Infested	15.12b	-6.46	12.43b	-5.05	9.04b	-6.63	1.14b	15.17	14.52	+8.72
S. E. ±	0.31		0.13		0.13		0.03		0.28	
CD at P = 0.05	0.61		0.26		0.25		0.05		0.55	
CD at P = 0.01	0.81		0.34		0.34		0.07		0.73	
VARIETIES										
BL - 19	16.39ab		13.24b		9.69b		1.78a		12.29b	
BL - 4	15.54b		12.67c		9..07bc		1.29c		14.87a	
TRITON	13.64c		11.40d		8.80c		1.16d		14.78a	
P. R. -1000	15.64b		12.44c		8.92c		1.30c		13.49b	
L-113	16.97a		13.98a		10.21a		1.53b		14.02ab	
S. E. ±	0.69		0.20		0.20		0.04		0.44	
CD at P =	1.37		0.40		0.41		0.08		0.87	
CD at P= 0.01	1.82		0.53		0.54		0.11		1.15	

TSS = Total soluble salt., CCS = Commercial cane sugar, Value followed by similar letters are not significantly different at 5% level Probability.

soluble salt (TSS), sucrose, commercial cane sugar (CCS), contents were superior in variety L-113, whereas glucose content was high in BL-19 but the fibre content was so pronounded in variety BL-4 and Triton respectively. It was further observed that differences in juice quality within years due to top borer attack was non significant, explains that all the varieties were affected significantly by the top borer in both the years. It was suggested that for obtaining better juice quality and quantity crop may be protected against this pest by spraying suitable insecticide. Among the varieties tested L-113 proved to be more resistant against top borer as compared to rest of the varieties and could be used for commercial growing.

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