

Variations in juice quality in top-borer affected canes

by

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Introduction: The top-borer *Scirpophaga nivella* Fabr. is a major pest of sugarcane which has assumed a serious form in the sugarcane areas in Madras state. Of late this pest has increased in alarming proportions in the Pugalur Factory Zone and is also increasing in intensity of attack in the South Arcot District. The very young canes affected by this pest die out and do not survive till harvest. The canes affected at later stages survive but give juice of varying quality. This varies according to the variety and the period of harvest.

In this tract (South Arcot District) there are three popular varieties of sugarcane - namely Co. 419, Co. 449 and Co. 527. The three varieties mature at different stages in the crushing period. The varieties Co. 449 and 527 mature early in the season while the variety Co. 419 matures late in the season. It has been observed that in the grown up canes the top-borer attack induces early maturing since the vegetative growth is arrested. This results in variations in the quality of the juice of the affected canes, depending on the time of attack of the borer.

Materials and Methods: To study the extent of variation in juice quality, the analysis of the juice of the affected and healthy canes was taken up in the different promising varieties prior to harvest in successive years at the Central Sugarcane Research Station, Cuddalore. In the first three years of this study, the affected and healthy canes were separated, crushed and the juice analysed separately. In the first year the juice analysis was taken up in the month of March at the age of ten months of the crop. In the second year the analysis was taken up in the month of January at the age of twelve months. In the third year the analysis was taken up in the month of March at the age of twelve months.

In the fourth year the analysis was conducted in the months of December and January at the age of eleven and twelve months respectively.

Results and Discussion: The juice analysis data obtained during the years 1955-56 showed that the healthy canes yielded juice of slightly lower quality in Co. 419 and Co. 449 while it was slightly higher in Co. 527. In the years 1956-57, 1957-58 and 1958-59 the quality was low in the affected canes in all the varieties examined at the time of harvest. The analysis of juice taken up during the month of December 1958 revealed that there was considerable decrease in quality in the early affected than the healthy canes while there was slight increase in quality in the late affected canes.

In the first year of the trial (1955-'56 season) the canes were harvested at the age of ten months. The harvest was taken up two months earlier. There was no significant decrease in the quality of the juice between the healthy and affected canes. This is probably due to the affected canes maturing early as consequence of the arrest of the vegetative growth. The healthy canes recorded slightly lower juice quality because of the early harvest of the canes. (The crop generally matures in eleven to twelve months in this tract.) The juice analysis data are given in Table No. I.

In the 1956-'57 and 1957-'58 season the canes were harvested at the age of twelve months when all the canes have become mature. The top-borer affected canes in these cases yielded juice of lower quality than the healthy canes. The difference was statistically significant in both the years. This lowering in quality is the direct result of the early maturing of the top-borer affected canes, which become overmature at the time of harvest when the healthy canes are just fully mature. The juice analysis data are furnished in Table No. II and III.

To find out the cause of variation in the results so far obtained, in the 1958-'59 season the juice analysis was taken up at the age of eleven months in the three standard varieties. The top-borer affected canes were separated as early affected (before 9 months) and late affected (after 9 months). The healthy canes were also analysed. The data are furnished in Table No. V. The figures reveal that there is significant lowering of quality in the early affected canes, while in the late affected canes, there is no lowering of juice quality. In the varieties Co. 419 and Co. 527 a slightly higher C. C. S % was recorded in the late affected canes, though not significantly, than the healthy canes. In Co. 449 there was little difference in the quality between the healthy and affected canes.

In the month of January 1959 regular juice analysis as in previous years was taken up in all the varieties when the crop was twelve months old. It was noticed that there was no significant lowering of juice quality in all the varieties examined in the top-borer affected canes. This fully conforms with the results obtained, in previous years. The data are given in Table No. IV.

Variation in quality in the different varieties: It is seen from the figures in the different years that the variation in juice quality due to top-borer attack bears no relationship to the susceptibility of the varieties. Among the varieties examined, the varieties Co. 419, Co. 740 and Co. 785 have been found to be more susceptible to top-borer attack than the other varieties. Co. 449 is fairly resistant. But the variation, as it occurs in different periods, between the quality of juice in the healthy and top-borer affected canes, is uniform in all the varieties irrespective of the susceptibility of the variety to top-borer incidence (Gupta 1954). The

variations in the difference in juice quality between the healthy and affected canes among the different varieties was not statistically significant. The results are furnished in Table No. VI.

Conclusions: (1) The results indicate that the top-borer attack in sugarcane induces early maturity in grown up canes.

2. The canes affected by top-borer till about the ninth month show much lower quality in juice while the canes affected in the later stages do not show significant difference in juice quality.

3: The variation in quality depends on the age and maturity of the cane crop at the time of harvest.

4. The variation in quality of juice in top-borer affected canes is uniform in all varieties. There is no relationship between the susceptibility or resistance of the variety and the loss in quality of the juice due to top-borer infestation.

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REFERENCES

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TABLE I.

The results of top-borer studies 1955-'56.

Variety	C. C. S %		Statistical results
	Healthy canes	Affected canes	
Co. 419	9.55	9.62	Main Effects (Healthy x Affected) Z test not satisfied.
Co. 449	11.58	11.77	S. E. 0.7186.
Co. 527	11.66	11.49	Minor effects (Varieties) Z test satisfied. Significant at P = 0.05 S. E. 0.3228. Interactions: Z test not satisfied. S. E. 0.4565.

TABLE II.

The results of top-borer studies 1956-'57.

Variety	C. C. S %		Statistical results
	Healthy canes	Affected canes	
Co. 419	7.74	4.97	Main effects (Healthy and Affected) Z test satisfied: significant at 0.05 S. E. 0.4244.
Co. 449	8.34	6.06	Minor effects (Varieties) Z test satisfied, significant at P = 0.05 S. E. 0.3942 C. D. 0.8590.
Co. 527	10.59	8.81	Interactions Z test not satisfied S. E. 0.5575.

TABLE III.

The results of top-borer studies 1957—'58.

Variety	C. C. S%		Statistical results
	Healthy canes	Affected canes	
Co. 419	10.98	10.13	Main effects (Healthy & Affected)
Co. 449	13.48	12.17	Z test satisfied, significant at P = 0.05.
Co. 527	12.36	11.90	C. D. 0.5738.
Co. 658	14.19	13.15	
Co. 719	14.32	11.88	Minor effects (varieties)
Co. 758	13.84	12.04	Z test satisfied S. E. 0.3722
Co. 785	13.73	13.29	C. D. 0.7457. Significant at P = 0.05.
Co. 799	12.83	11.73	Interactions Z test not satisfied S. E. 0.7442.

TABLE IV.

The results of top-borer studies 1958—'59.

Variety	C. C. S%		Statistical results
	Healthy	Affected	
Co. 449	10.83	6.78	Main effects (Healthy & Affected)
Co. 527	11.42	9.83	Z test satisfied. Significant at P = 0.05.
Co. 658	13.03	11.72	S. E. 0.6040 C. D. 1.48.
Co. 726	9.30	6.51	Minor effects (Varieties)
Co. 740	9.91	8.00	Z test satisfied. Significant at P = 0.05.
Co. 785	11.57	8.19	S. E. 0.9968 C. D. 1.9936.
Co. 997	13.79	13.31	Interactions.
Co. 1001	11.02	8.90	Z test not satisfied S. E. 1.727.

TABLE V.

Top-borer studies - with references to the time of top-borer affection.

Age at harvest 11 months.

December 1958.

Variety	C. C. S%		
	Healthy Canes	Late affected Canes	Early affected Canes
Co. 419	9.10 ± 0.3614	9.79 ± 0.2619	8.00 ± 0.5016
Co. 449	9.41 ± 0.6436	9.40 ± 0.3889	5.29 ± 0.3283
Co. 527	11.04 ± 0.4015	11.45 ± 0.2226	7.08 ± 0.2639

Statistical analysis — Significance.

	Co. 419	Co. 449	Co. 527
Healthy X Late affected canes	No	No	No
Healthy X early affected	Yes. P=0.05	Yes. P=0.05	Yes. P=0.05
Late affected X early affected	Yes. P=0.05	Yes. P=0.05	Yes. P=0.05

TABLE VI.

Difference in C. C. S. of healthy and affected canes.

	Average of four Replications 1955—'56	Average of four Replications 1956—'57	Average of four Replications 1957—'58
Co. 419	+ 0.08	— 2.87	— 0.85
Co. 449	+ 0.19	— 2.28	— 1.31
Co. 527	— 0.18	— 1.78	— 0.46
Co. 658	—	—	— 1.04
Co. 719	—	—	— 2.43
Co. 758	—	—	— 1.80
Co. 785	—	—	— 0.44
Co. 799	—	—	— 1.10
	Z test not satisfied S. E. 0.6078	Z test not satisfied S. E. 0.74	Z test not satisfied S. E. 0.6403