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Effect of Racuza as a Chemical Ripener in Sugarcane

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ABSTRACT

Racuza was sprayed at the rate of 1.12 kg a.i./ha on the leaves of five sugarcane varities under field conditions to determine its effectiveness as a chemical ripener. It was found that varieties responded differently to treatments. There were increases in sucrose and fibre contents of the cane when compared with the untreated plots. Varietal differences in sucrose, fibre and reducing sugars were also obtained between days after treatment, but these differences could not account for any significant differences in reducing sugars between the treatments.

It is suggested that Racuza may prove to be effective when juice quality is poor and further work with this chemical is desirable.

INTRODUCTION

Superior cane quality can be obtained from normal rapid growth to prolonged slow growth. Yates (1967) postulated that reduced cane growth is induced by low temperatures which override any effect of moisture availability. Importance of low temperatures in inducing ripening has been reported by Innes and Cowan (1960), Clements (1962) and Glasziou *et.al.* (1965). Clements (1962) suggested that drought stress can be imposed to induce ripening when suitable low temperatures cannot be obtained.

Where weather conditions for ripening are unsuitable, it may be possible to reduce respiration of the cane by the application of suitable growth regulation chemicals (Yates, 1967). Such chemicals should increase sugar storage without permanently depressing photosynthesis, translocation or sucrose storage.

Data published on racuza (Alexander, 1971) suggested that this chemical increased the sucrose content of sugarcane. Unlike most compounds which have been found to increase sugar content, it was reported to act not by reducing growth but by increasing the rate of translocation. It was therefore decided to test the effectiveness of the chemical on sugarcane varieties having different ratios of weights of leaf blade

and joint with the expectation that sucrose content might be enhanced more in varieties with a high ratio of weights of leaf blade and joint than in those with a low ratio of weights of leaf blade and joint. Assimilation rates are generally lower in the former varieties which suggests either that the size of the sink or the rate of translocation might be limiting assimilation in these varieties.

MATERIALS AND METHODS

Five commercial varieties were used in the experiment. From previous data (Oworu, 1976; MacColl, 1977) two of the varieties B59162 and B51129 were known to have a high ratio of weights of leaf blade and joint while the remaining three varieties were known to have low ratio of weights of leaf blade and joint (Table 1.).

The varieties were planted in two blocks with one plot of each variety per block. Each plot consisted of eleven rows, which were 14·6 metres long spaced 1·5 metres apart. The two-bud setts used as planting material were rinsed in an organomercurial compound (Aretan) and planted in the furrow.

A split application of 497·8 kg/ha of 20-0-20 NPK fertilizer was made at the rate of 248 9 kg/ha three and six months after planting. When the cane was $8^1/_2$ months old, racuza (Methyl 3,6-dichloro-o-anisate) was applied to each plot by means of a hand sprayer at a concentration of 16ml racuza to 1500ml water which is equivalent to 1·12kg/ha of active ingredient. A few drops of teepol were added to the spray solution. Three rows in each plot were sprayed as it was intended to repeat the spraying at a later date.

Before spraying one lot of eight canes was harvested at random from each block from the three rows which were to be sprayed and the three adjacent rows which were to act as control. At ten day intervals after spraying, upto 50 days, further lots of eight canes were randomly taken from the sprayed and unsprayed rows of both blocks. The sets of eight canes were ground in a Jeffco cutter-grinder and samples of the resulting brei (ground cane) taken for estimation of total and reducing sugars using the Berlin Institute method (Anon., 1964). Sucrose content was expressed as the percentage difference between total and reducing sugars. The residue remaining after extraction (the fibre) was expressed as a percentage of fresh weight.

RESULTS AND DISCUSSION

Table 2 shows the effect to racuza on sucrose % fresh weight of cane. There were significant differences ($P=0·05$) between varieties, treatments (sprayed and unspryed plots) and between days after treatment. The differences in the values of sucrose % fresh weight 50 days after spraying between sprayed and unsprayed plots were high for the varieties (B59162 and B51129) with high ratio of weights of leaf blade and joint (Tables 1 & 2).

Table 1. Ratio of weights of leaf blade and joint for five sugarcane varieties in plant and ratoon crops.

Variety	Ratio of weights of leaf blade and joint	
	Plant	Ratoon
B 59162	0·50	0·48
B 51129	0·41	0·41
B 5970	0·28	0·33
B 4744	0·29	0·35
B 49198	0·39	0·35

Table 2. Effect of Racuza on sucrose % fresh weight of five sugarcane varieties at different times.

UNSPRAYED

Variety	Days after spraying					
	0	10	20	30	40	50
B59162	6.56	7.54	7.08	9.24	8.68	8.89
B5970	7.65	8.07	7.64	9.56	8.15	9.31
B51129	10.50	13.08	12.88	14.33	12.10	13.95
B4744	7.74	8.94	10.45	11.13	11.03	11.24
B49198	6.78	7.54	7.03	8.01	7.66	7.19
Mean	7.85	9.03	9.70	10.45	9.52	10.12

SPRAYED

B59162	6.56	7.89	8.90	9.92	10.26	11.97
B5970	7.65	7,97	9.16	9.61	9.67	10.91
B51129	10.50	12.72	12.92	13.21	14.01	15.96
B4744	7.74	9.50	9.63	11.03	11.45	13.92
B49198	6.78	8.09	8.72	9.70	9.74	11.81
Mean	7.85	9.23	9.86	10.69	11.02	12.91

Sig. Diff. (P=0.05)
Between varieties=1.42
Sprayed/Unsprayed=1.34
Between days after treatment=1.04

Table 3. Effect of Racuza on reducing sugars % fresh weight of five sugarcane varieties at different times.

UNSPRAYED

Variety	Days after spraying					
	0	10	20	30	40	50
B 59162	3·80	3·73	4·00	3·43	3·30	3·62
B 5970	3·54	3·42	3·55	3·21	3·00	3·05
B 51129	2·83	2·52	2·66	2·52	2·26	2·13
B 4744	3.30	2·96	2·92	2·67	2·41	2·39
B 49198	3·91	4·03	4·09	4·25	3·74	3·64
Mean	3·48	3·33	2·63	3·22	2·94	2·97

SPRAYED

B 59162	3·80	3·88	4·01	3·58	3·55	3·32
B 5970	3·54	3·54	3·31	3·60	3·08	2·92
B 51129	2·83	2·60	2·73	2·53	2·24	2·26
B 4744	3·30	2·93	3·19	2·98	2·68	2·36
B 49198	3·91	3·71	3·96	3·73	3·57	3·51
Mean	3·48	3·33	3·44	3·26	3·00	2·87

Sig. Diff. (P=0·05)
Between varieties=0·69
Sprayed/Unsprayed=NS
Between days after treatment=0·25
NS=Not significant

As for reducing sugars, there were significant differences between varieties and between days after treatment. However, no significant differences was demonstrated between treatments (Table 3). Table 4 shows the effect of racuza on fibre % fresh weight. There were significant differences between the treatments, varieties and

Table 4. Effect of Racuza on % fresh fibre weight of five sugarcane varieties at different times

UNSPRAYED

Variety	Days after planting					
	0	10	20	30	40	50
B 59162	12·5	12·7	12·4	13·6	13·1	15·5
B 5970	9·9	10·3	10·8	10·7	10·8	11·6
B 51129	9·5	10·2	10·0	10·4	10·7	11·7
B 4744	10·0	10·9	11·1	10·7	11·1	11·5
B 49198	10·4	10·1	10·5	10·6	11·2	11·5
Mean	10·5	10·8	11·0	11·2	11·4	12·4

SPRAYED

B 59162	12·5	13·8	13·9	14·5	15·1	16·6
B 5970	9·9	10·3	10·6	11·0	11·2	13·1
B 51129	9·5	10·2	10·9	11·0	11·8	12·9
B 4744	10·0	10·4	10·5	11·0	11·1	12·7
B 49198	10·4	10·4	11·8	10·8	12·2	13·8
Mean	10·5	11·0	11·5	11·9	12·4	13·8

Sig. Diff. (P=0·050
Between varieties=1·41
Sprayed/Unsprayed=0·82
Between days after treatment=0.70

between days after treatment (P=0·05). The differences in the values of fibre % fresh weight 50 days after spraying between sprayed and unsprayed plots were, however, low for the varieties (B59162 and B51129) with high ratio of weights of leaf blade and joint (1·1% and 1·2%) respectively, while the varieties (B5970 and B49198) with low ratio of weights of leaf blade and joint had high values (1·5% and 2·3%) respectively.

The increase in sugar content, though minimal, obtained in this experiment showed that racuza could possibly be a promising chemical ripener and future work with this chemical is desirable. However, some of the results obtained are not unusual in chemical ripening trials where chemicals previously shown to have some effect on components of dry matter are used. Thus 2,4-D, MH, Pesco, 1815, TBA, and Dalapon have all been shown to give positive ripening results (Naylor and Davis, 1950 ; Chacravarti *et.al.* 1955 ; Yates, 1964 ; Vlitos and Lawrie, 1965) while other workers obtained either inconclusive or negative results with the same chemicals (Lugo-Lopez and Grant, 1952 ; Lugo-Lopez *et.al.* 1953 ; Yates and Bates, 1957 ; Evans and Bates, 1963 ; Yates, 1964 ; Vlitos and Lawrie, 1965 ; Alexander, 1973).

Data collected from various countries on the effect of racuza as a ripening agent showed in most cases no significant response to racuza ; although Alexander (1971) quoted Nickell as having obtained favourable response from initial test in Hawaii, suggesting that racuza could be a promising chemical ripener. Sugar accumulation in sugarcane is a complex process and little is known of the mechanism of the action of any chemical ripener except those which stop growth, although Nickell and Maretzki (1970) showed in some basic biochemical studies of some chemical ripeners that growth repression is only one of a series of active ripening features. It seems likely that some chemical ripeners may prove to be effective in stimulating sucrose accumulation when juice quality is poor but may be ineffective when juice quality is already high. Differences in cultural practices between cane growing areas, climatic conditions and varieties may be such that a ripener which gave response in one location may be ineffective in another, thus limiting the adoption of any one particular ripener.

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