RESULTS OF RECENT EXPERIMENTS ON CHEMICAL RIPENING OF SUGARCANE

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Abstract

Of six potential chemical ripeners screened in two field experiments, only Embark (3M Company) and Am74/A382 (Amchem Products Inc.) were sufficiently effective to justify further testing. In two small-scale and three large-scale (mill) replicated experiments, varying rates of these chemicals and the standard ripener, Ethrel, were applied to sugarcane of differing ages, and in different months, at the start of the milling season. Am74/A382 had visible effects on the sugarcane similar to those of Ethrel. It also improved cane quality and gave similar increases in sugar yield, at lower rates of active ingredient per hectare than those of Ethrel. Embark generally had a greater visible effect on the plant than did Ethrel and, on very immature sugarcane, was as effective a ripener giving similar increases in sugar yield at equivalent rates of application. In three experiments in which the effect of greater maturity was investigated either by spraying older sugarcane or by spraying crops of a similar age two months later in the milling season, Embark was not as effective as Ethrel when applied to more mature sugarcane. In one experiment, Embark improved sucrose percent cane fresh mass and juice purity as much as Ethrel did but, because of a lower cane fresh mass per stalk and a lower sucrose content, expressed on a dry matter basis, sugar yield was lower.

The addition of either urea or Orchex N695 oil to aerial applications of Ethrel did not improve the effectiveness of the chemical.

Introduction

Recent chemical ripening experiments have been concerned with screening prospective new chemicals, and evaluating more fully the use of both Ethrel, ((2-chloro-ethyl) phosphonic acid) the only chemical at present registered for use as a chemical ripener on sugarcane, and Embark (N-(2,4 dimethyl-5-(((trifluoromethyl)sulfonyl)amino)phenyl)acetamide), a promising new chemical. Experiments were designed to test the effectiveness of rates of Ethrel and Embark on cane of different ages and on cane of the same age sprayed in either March or May. Attempts were also made to improve the efficiency of Ethrel by applying it either with an oil additive, or with urea.

This paper reports the results of a total of seven experiments; two screening experiments, two small-plot experiments and three large-plot (mill) experiments.

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Materials and Methods

Details of the experiments are given in Table 1 and the chemical treatments applied in Experiments 3-6 are given in Table 2. All treatments were adequately replicated and all experiments were fully irrigated, but drying off prior to harvest was practised only in Experiments 4-7. NCo 376 was the only variety used in Experiments 1, 2, 4, 5, 6 and 7.

Screening experiments

In Experiments 1 and 2, adjacent rows of sugarcane were sprayed with increasing rates of chemical and compared with unsprayed control plots. Ethrel at 1,0 kg ai/ha was applied as a standard ripener treatment.

The chemicals were applied to two rows at a time, using an extended lance with a T piece, attached to a CO_2-operated sprayer. A total spray volume of approximately 300 l/ha was obtained by using two TK 2,5 flood jets, one immediately above each of two cane rows, and spraying the crop twice to improve the uniformity of the application. By spraying "round" every second cane row a range of rates of application was obtained. Although experiments were sprayed only under calm weather conditions, there may have been slight spray drift from one cane row to the next. This was not considered to be serious enough to affect the comparison of relative rates of application.

New chemicals screened in Experiment 1, were as follows: Embark at rates between 0,5 and 2,0 kg ai/ha, PP757 (composition not disclosed) at rates ranging from 1,5 to 5,0 kg ai/ha, and Am74/A382 (composition not disclosed) at rates of 0,5

TABLE 1
Details of the experiments

Experiment site	Date treated	Crop	Crop condition at spraying			Age at harvest (months)
			Age (months)	Estimated tc/ha	Purity (%)	
SCREENING EXPERIMENTS						
1. Chakas Kraal	8 Apr 1975	1R	8	61	69	11
2. Chakas Kraal	14 Apr 1976	2R	7,5	64	67	10,5
SMALL-PLOT EXPERIMENTS						
3. Pongola	(*a*) 25 Feb 1975	1R	7	96*	54*	11,5
	(*b*) 2 Apr 1975	1R	8,2	114*	69*	12,8
4. Chakas Kraal	(*a*) 6 Apr 1976	1R	9	87	58	12,5
	(*b*) 6 Apr 1976	1R	12,5	112	75	16,0
LARGE-PLOT EXPERIMENTS						
5. Tambankulu	25 Mar 1976	1R	10	100	63	12,0
6. Tambankulu	17 May 1976	4R	10	85	80	12,0
7. Ubombo	1 May 1975	3R	10	—	71	13,0

* Variety NCo 376

TABLE 2
Treatments applied in experiments 3, 4, 5 and 6 (kg ai/ha)

Treatment	Experiment			
	3a and 3b	4a and 4b	5	6
1	Control	Control	Control	Control
2	Ethrel 1,0	Ethrel 0,5	Ethrel 0,5	Ethrel 0,5
3	Ethrel 2,0	Ethrel 1,0	Ethrel 0,75	Ethrel 0,74
4	Am 74/A382 0,25	Embark 0,5	Ethrel 1,0	Embark 0,5
5	Am 74/A382 0,5	Embark 1,0	Embark 0,5	Embark 0,71
6	Embark 1,0		Embark 1,0	

0,1% wetting agent added to all Embark treatments.

to 2,0 kg ai/ha. Treatment with Ethrel at 1,0 kg ai/ha plus 15 kg/ha urea (46% N) was included. Similarly in Experiment 2 the following treatments were compared with the control: Ethrel at 1,0 kg ai/ha and Am75/A382 at 0,5 kg ai/ha as standard treatments; Asulox 40 (Methyl 4-amino benzene sulphonylcarbamate), JFE 2129 and ACR 1093 DA (compositions not disclosed) at rates ranging from 1,5 to 6,0 kg ai/ha. Agral 90 at 0,1% v/v was added to the spray solution of Embark, Asulox 40, JFE 2129 and ACR 1093 DA used in the treatments.

Small-plot experiments

In Experiments 3 and 4, plot sizes were 56 m^2 and 92 m^2, respectively (four rows per plot), and the chemicals were applied with a CO_2-operated sprayer. In Experiment 3 there were four replicates of the four varieties NCo 376, NCo 334, N55/805 and L76. Each of these was sub-divided for ripener treatments, and two replicates of each variety were sprayed on 25 February 1975 (Experiment 3a) and two replicates on 2 April (Experiment 3b).

Experiment 4 comprised two separately randomised tests of the same treatments, both of which were sprayed with chemicals on 6 April, 1976. In Experiment 4a the sugarcane was 9,0 months of age when sprayed and in Experiment 4b it was 12,5 months of age.

Large-plot experiments

Experiment 5, in which plots were 0,4 ha in size, was sprayed on 25 March, 1976 and Experiment 6 (0,6 ha plots) on 17 May, 1976. The same Cessna Agwagon aeroplane, fitted with 4 x AU 3 000 micronair atomisers, was used for both experiments and a spray volume of 30 l/ha was applied. There were five replicates in each experiment.

In Experiment 7, which had four replicates, Ethrel at a rate of 0,5 kg ai/ha (0,6 ha plots) was applied either with or without the addition of 5,0 l/ha Orchex N695 oil. The treatments were applied in a spray volume of 25 l/ha, by a Cessna Agwagon aeroplane fitted with 6 x AU 3 000 micronair atomisers.

Sampling and harvesting procedures

Samples of either 16 or 20 stalks per plot were taken from all experiments, before spraying and at various intervals afterwards, in order to determine the pattern of ripening response. Most of the experiments were terminated between 8 and 12 weeks after spraying but Experiments 3a and 3b were terminated at 19 and 18 weeks respectively, and Experiment 4 at 15 weeks.

The stalk samples were topped at the point of attachment of the sixth leaf, counting from the first leaf that was more than half unfurled. The samples were then chaffed and sub-samples taken and completely disintegrated, so that the sucrose and moisture contents could be determined by standard methods.

The amount of sugar that could be recovered from the sugarcane (ers %) was estimated using the following formula:

$$\text{Ers \%} = \text{S \%} - 0{,}485 \text{ non sucrose \%} - 0{,}056 \text{ fibre \%}.$$

Only in Experiments 5-7 was all the sugarcane from each plot harvested, and in these experiments there was sufficient cane for it to be kept separate and weighed at the mill, and for juice samples to be analysed for sucrose content in the mill laboratory. In Experiment 4 the number of stalks at the final sampling was increased to 40, in order to obtain a better estimate of changes in stalk mass.

Results

Screening experiments

Of the chemicals screened, only Embark and Am 74/A382 gave results that were comparable with those of Ethrel, and these chemicals were the only ones worthy of further testing. In Experiment 1 both chemicals gave good and consistent ripening effects 8 and 12 weeks after spraying (Fig. 1) and all rates of application appeared to be equally effective. Embark caused a marked loss of leaf canopy, a paling of leaf colour and a decrease in cane moisture content, which was associated with the development of axillary buds (side-shooting). The loss

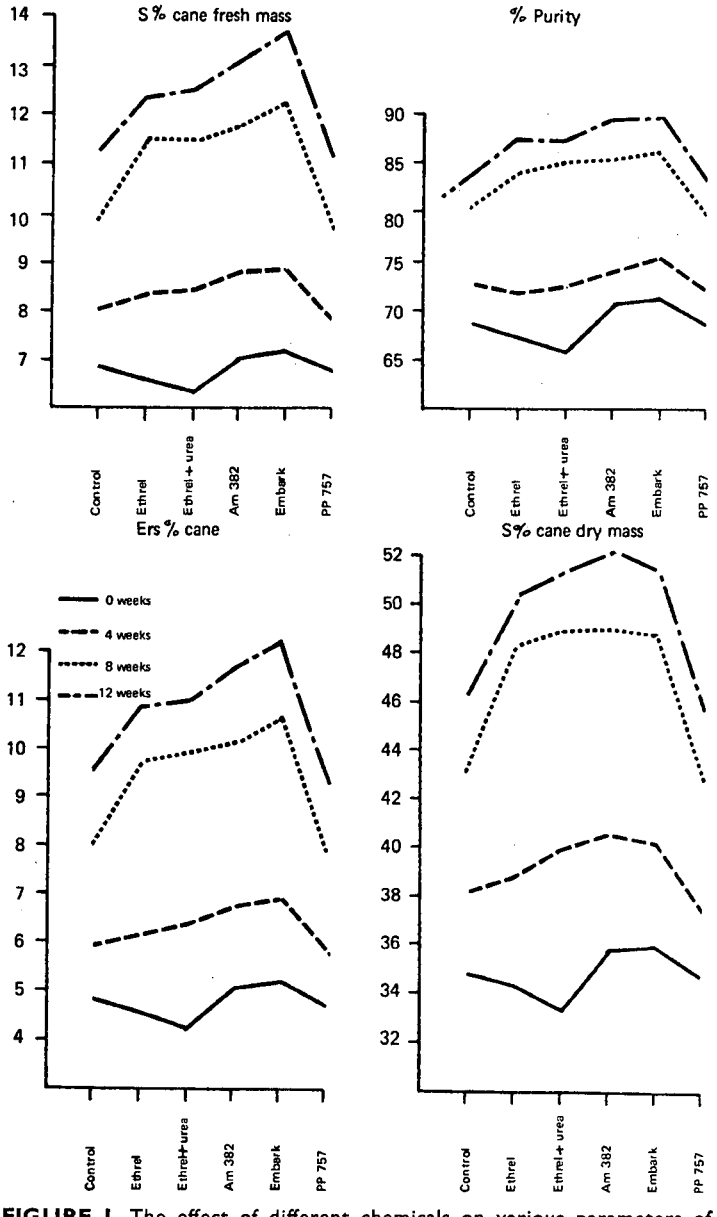

FIGURE 1 The effect of different chemicals on various parameters of sugarcane quality in Experiment 1. Mean of all rates of application.

of moisture resulted in Embark causing a higher sucrose percent cane fresh mass than other treatments. There was little difference between Embark, Am 74/A382 and Ethrel + urea treatments, on the basis of either sucrose percent cane dry mass or mass of ers, but Ethrel without the addition of urea did not seem to be quite as effective (Fig. 1). Possibly this was because the rate of Ethrel was lower than the average rate of the other chemical applied. Am 74/A382 was more active than Ethrel in Experiments 2 and 3 (Table 3). In Experiments 3, 4a and 5 Embark and Ethrel gave similar results at similar rates of application.

Am 74/A382 appeared to be more effective than Ethrel in Experiment 2, a rate of 0,5 kg ai/ha producing a 10% increase in mass of estimated recoverable sugar (ers) between 5 and 11 weeks after spraying, by comparison with a 14% increase following treatment with 1,0 kg ai/ha Ethrel. The only other chemical that appeared to have a slight but statistically non-significant ripening activity was JFE 2129 at rates of 4,5 to 6,0 kg ai/ha.

Small-plot experiments

Experiment 3

Spraying with Ethrel and Embark in February had more marked visible effects and improved the quality of the cane of all varieties more than spraying in April, when the crops were older and relatively more mature. Ethrel at 1,0 kg ai/ha and Am 74/A382 at 0,5 kg ai/ha produced a similar visible effect on the cane, reducing the length of the lamina and sheath of upper leaves and the length of between one and two upper internodes per stalk. Ethrel at 2,0 kg ai/ha had a greater effect than other treatments. Ethrel and Am 74/A382 affected variety NCo 376 most and varieties N55/805 and L76 least.

Spraying with Embark in February, in Experiment 3, produced the severest symptoms in varieties NCo 376 and L76 and had least effect on variety N55/805. Spraying in April caused only a small reduction in leaf length and slight leaf tip scorch. In February, the tips of leaves of NCo 376 became pale in colour and there was a marked red/orange discoloration of the body of the laminae, associated with an increased amount of leaf spot disease caused by *Cercospora longipes*. Leaf emergence was reduced, upper internodes were very short, and in all plots, there was severe side-shooting in some stalks. Side-shooting and a reduction in both internode and lamina size was also severe in variety L76, but there was less leaf discoloration and less disease than in NCo 376. The laminae of both NCo 334 and N55/805 were slightly reduced and there was some tip scorch, but only in variety NCo 334 was there slight side-shooting.

All three chemicals, when applied in February, produced large and consistent improvements in juice purity, sucrose percentage and sucrose yield, the highest rates of application resulting in average increases of between 22,5 and 32,5% in mass of ers (Table 3). The ripening effects were smaller, particularly with Embark, when the chemicals were applied in April, and increases ranged from 7,8 to 17,2% in mass of ers. The ripeners were still effective up to 18 or 19 weeks after spraying, but the response was then smaller than on previous sampling occasions. The average increases for the 7-15 or 6-14 week samples (Table 3) therefore provide the best estimate of the ripening response. Varieties L76 and N55/805 responded less than did varieties NCo 376 and NCo 334 when they were sprayed in February, but there was little difference among the varieties when they were sprayed in April.

Experiment 4

Visible symptoms were more marked on the older sugarcane (Experiment 4b), particularly after treatment with Embark and side-shooting was very pronounced from 8 weeks after applying Embark at the higher rate. This treatment resulted in a marked tapering of the diameter at the top of the stalk, apparently caused by the sudden cessation of elongation. In addition, young leaves were very stunted. In contrast, in the younger sugarcane in Experiment 4a, there was normal stalk elongation, with only slight side-shooting and a slight reduction in leaf length, even at the high rate of application.

TABLE 3

Average percentage increase in mass of estimated recoverable sugar for weeks 7-15 (A) or 6-14 (B) in Experiment 3

Treatment (kg ai/ha)	Variety				Mean
	NCo 376	NCo 334	N55/805	L76	
Part A					
Control (actual g/stalk)	80,9	78,6	87,6	162,6	102,4
Am 74/A382 0,25	26	29	6	−4	14,2
Am 74/A382 0,5	29	34	11	16	22,5
Ethrel 1,0	29	34	13	8	21,0
Ethrel 2,0	42	45	23	19	32,2
Embark 1,0	49	51	14	16	32,5
Part B					
Control (actual g/stalk)	114,5	123,0	103,3	184,7	131,4
Am 74/A382 0,25	12	9	6	6	8,2
Am 74/A382 0,5	6	11	19	10	11,5
Ethrel 1,0	22	13	9	18	15,5
Ethrel 2,0	13	16	25	15	17,2
Embark 1,0	8	5	11	7	7,8

TABLE 4

Cane fresh mass (g/stalk) and sucrose percent cane dry mass in Experiment 4b

Treatment (kg ai/ha)	Cane fresh mass (g/stalk)					Mean 8–12 weeks
	Weeks					
	0	4	8	10	12	
Control . .	937	991	992	1 142	1 131	1 088
Ethrel 0,5	914	875	1 084	1 055	1 022	1 054
Ethrel 1,0	948	833	905	1 159	1 128	1 064
Embark 0,5	927	856	958	1 030	1 075	1 021
Embark 1,0	952	906	983	948	980	970
Mean . .	936	892	984	1 067	1 067	1 039
CV (%) .	—	9,7	8,4	10,4	9,9	—
LSD (0,05)	—	134,0	128,0	170,2	162,6	—
(0,01)	—	187,9	179,4	238,6	228,0	—

Treatment (kg ai/ha)	S% Cane dry mass					Mean 8–12 weeks
	Weeks					
	0	4	8	10	12	
Control . .	39,9	44,2	49,0	48,2	50,8	49,3
Ethrel 0,5	40,5	42,8	51,6	52,1	52,5	52,1
Ethrel 1,0	40,0	43,5	51,6	51,4	53,8	52,2
Embark 0,5	39,3	39,6	48,0	50,0	51,9	50,0
Embark 1,0	40,8	42,2	50,2	50,5	52,0	50,9
Mean . .	40,1	42,4	50,1	50,4	52,2	50,9
CV (%) .	—	5,2	6,2	3,2	2,8	—
LSD (0,05)	—	3,4	4,79	2,52	2,28	—
(0,01)	—	4,8	6,71	3,53	3,20	—

In both experiments Ethrel caused a reduction in leaf length and swelling of the upper buds on the stalk, but only slight side-shooting, and the higher the rate of application, the more severe

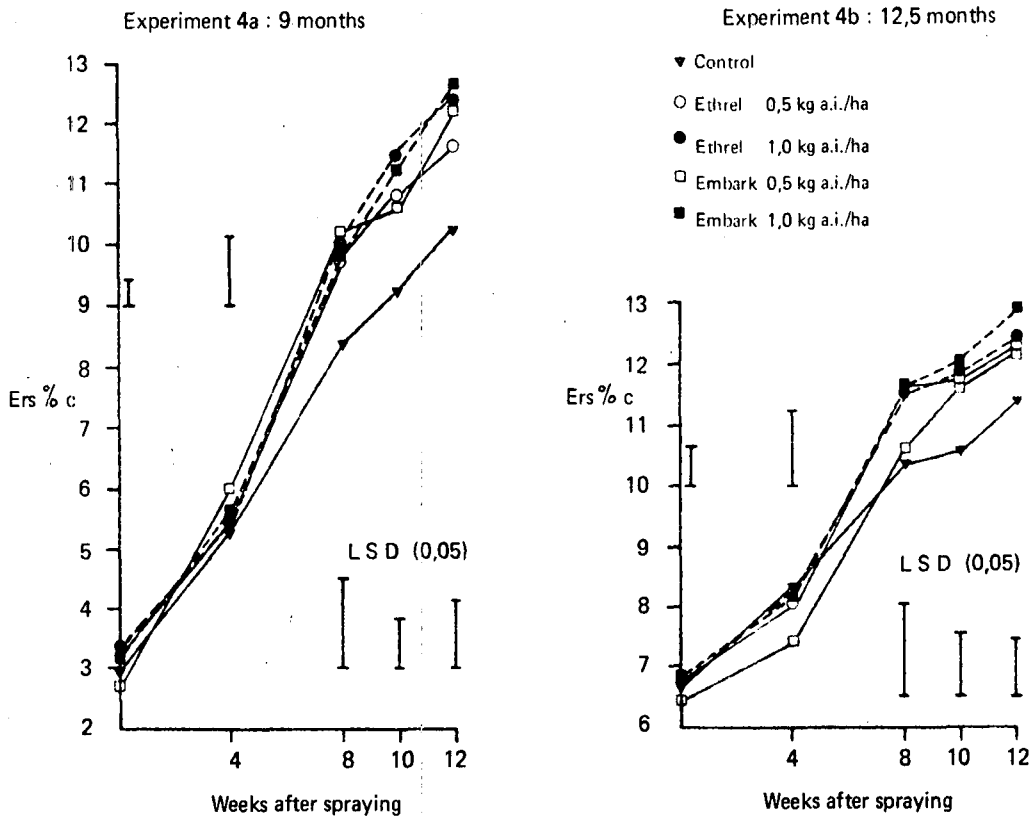

FIGURE 2 The effect of Ethrel and Embark on percentage estimated recoverable sugar (ers% c) of sugarcane of two ages in Experiment 4.

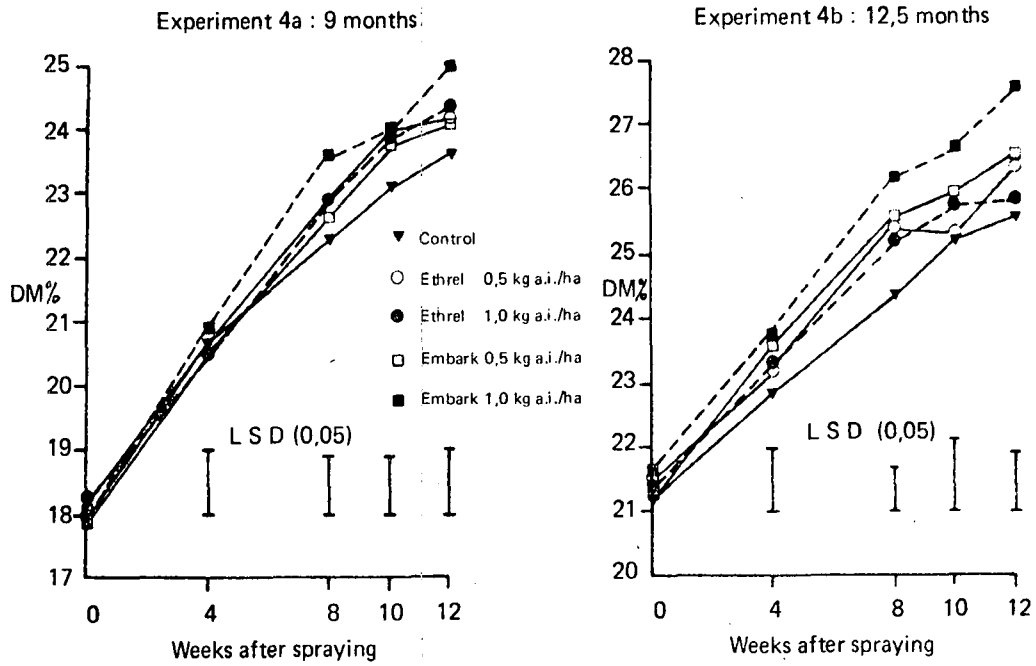

FIGURE 3 The effect of Ethrel and Embark on dry matter percentage (dm%) of sugarcane of two ages in Experiment 4.

were the effects. In Experiment 4b there was also a marked reduction in the length of the upper internodes but this was not as severe as that caused by Embark. In Experiment 4a, only one or two upper internodes were shortened, younger ones being of normal length, or possibly slightly longer than normal.

Both Ethrel and Embark produced statistically significant increases in s % c, purity and ers % c from five weeks after spraying (Fig. 2) and the response to the chemicals was smaller in the older crop. On a fresh weight basis Embark appeared to improve s % c and ers % c slightly more than did Ethrel, but this was because it increased dry matter percentage to a greater extent (Fig. 3). On a dry matter basis, both chemicals had a similar effect on s % dm and ers % dm in the younger cane, although Embark was not as effective as Ethrel on the older cane.

In the younger cane, increases in the yield of estimated recoverable sugar over the 8-12 week priod (calculated from the actual sample data) were similar for both chemicals and both rates of application, and ranged from 10,9 to 14,9% (Fig. 4). In the older cane, however, Embark appeared to have no

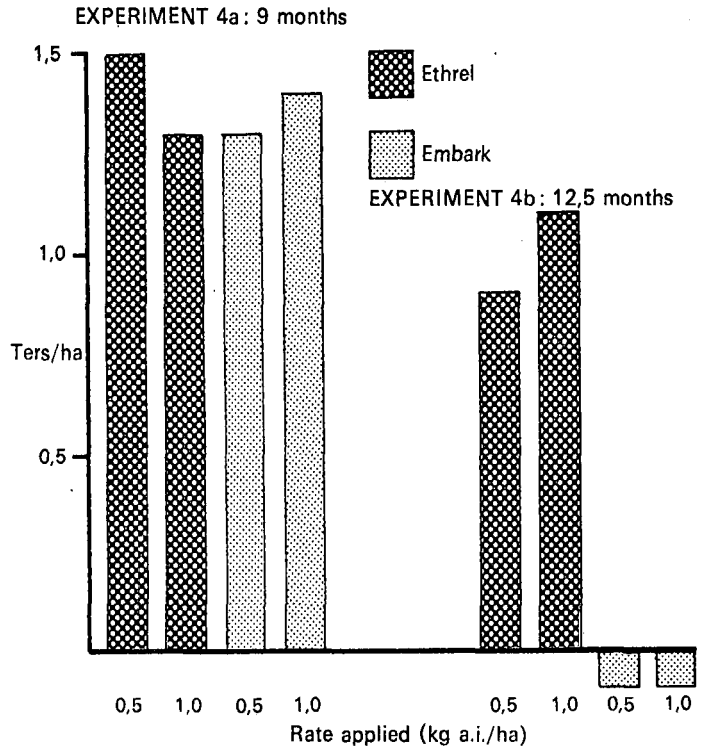

FIGURE 4 Actual response in terms of estimated recoverable sugar per hectare (ters/ha) for sugarcane of two ages in Experiment 4.

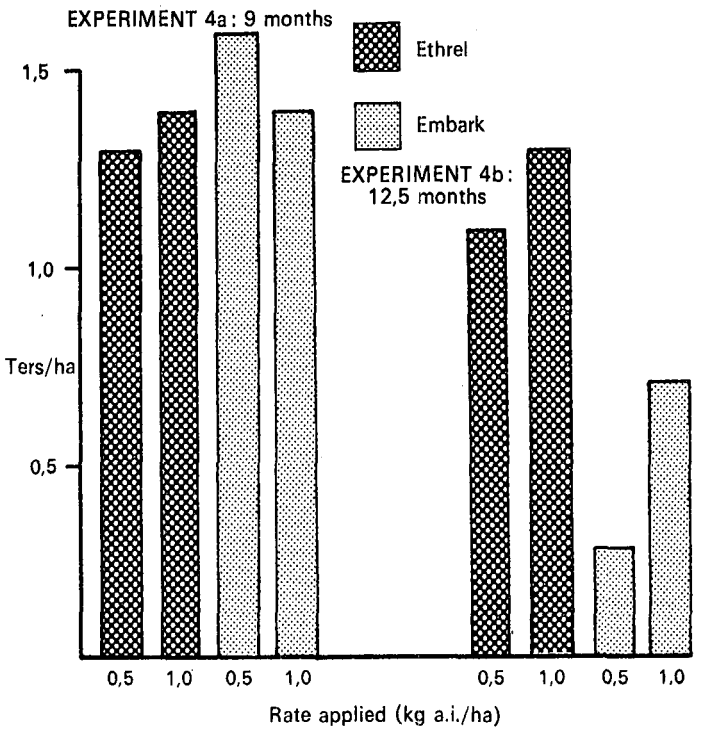

FIGURE 5 Estimated response in terms of estimated recoverable sugar per hectare (ters/ha) for sugarcane of two ages in Experiment 4, based on ers % cane dry mass and assuming no effect of treatments on cane dry mass.

TABLE 5

A Sprayed 25 March, harvested 16–18 May — **Harvest data for Experiments 5 and 6**

Treatment (kg ai/ha)	Tc/ha	Purity	S% c	Ers% c	Actual ters/ha	Ters/ha at 143 tc/ha	Ters/ha response
Control	147	74,1	8,5	6,2	9,1	8,9	
Ethrel 0,5	140	76,9	9,5	7,3	10,2	10,4	+ 1,5
Ethrel 0,75	132	79,2	10,0	7,9	10,3	11,3	+ 2,4
Ethrel 1,0	146	77,9	9,8	7,6	11,1	10,9	+ 2,0
Embark 0,5	149	76,8	9,3	7,1	10,5	10,2	+ 1,3
Embark 1,0	142	78,3	10,0	7,8	11,2	11,2	+ 2,3
Mean	143	77,2	9,5	7,3	10,4	—	
LSD (0,05)	11,7	2,1	0,5	0,6	0,8	—	
(0,01)	15,9	2,9	0,7	0,8	1,1	—	
C of V (%)	6,2	2,1	4,1	6,1	5,7	—	

B Sprayed 17 May, harvested 12-13 July

Treatment (kg ai/ha)	Tc/ha	Purity	S% c	Ers% c*	Actual ters/ha	Ters/ha at 113 tc/ha	Ters/ha response
Control	114	82,3	11,8	9,8	11,0	11,1	
Ethrel 0,5	112	84,0	12,4	10,2	11,6	11,5	+ 0,4
Ethrel 0,75	114	84,7	12,5	10,5	11,9	11,9	+ 0,8
Embark 0,5	110	83,4	12,2	10,1	11,2	11,4	+ 0,3
Embark 0,75	116	82,6	11,9	9,9	11,4	11,2	+ 0,1
Mean	113	83,4	12,2	10,1	11,4	—	
LSD (0,05)	10,2	1,7	0,6	0,6	1,1	—	
C of V (%)	6,7	1,5	3,9	4,7	7,0	—	

* Adjusted for variation present at 0 weeks

effect on sugar yield (Fig. 4) despite the appreciable improvements in cane quality (Fig. 2). This might have been due to a slight reduction in cane fresh mass (Table 4). It was difficult to determine the correct height at which to top the older, Embark treated cane and, in order to ensure that any possible differences in topping height did not bias the results, the yield response was calculated on the basis of changes in ers % dry mass, assuming that cane dry mass had not been affected by any of the treatments. This confirmed the observation that Embark was not as effective as Ethrel on the older sugarcane (Fig. 5).

Large plot (mill) experiments

Experiments 5 and 6

The results of these semi-commercial experiments confirmed those already reported for the screening and small-plot experiments. Ripening effects of both Ethrel and Embark were apparent from 4 and 5 weeks after spraying and resulted in increases in sugar yield in Experiment 5, of between 2,0 and 2,4 ters/ha at the highest rates of application (Table 5). In this experiment a rate of 1,0 kg ai/ha for both products was significantly better in a statistical sense, than a rate of 0,5 kg

ai/ha. There was, however, no difference between Ethrel treatments of 0,75 and 1,0 kg ai/ha. The reduction in cane yield apparently caused by Ethrel at the 0,75 kg ai/ha rate (Table 5a) is thought to have been due either to chance variation or to error, because it was not evident at the highest rate of application, and no other experiment has ever given an indication that Ethrel reduces cane yield.

Ripening effects were smaller in Experiment 6 (Table 5b) than in Experiment 5 and only Ethrel gave statistically significant increases in s % c and juice purity, which resulted in yield increases of 0,4 ters/ha at 0,5 kg ai/ha and 0,8 ters/ha at a rate of 0,75 kg ai/ha. Embark had no statistically significant effect on either sugar yield or cane quality, but there was an indication of some ripening response at a rate of 0,5 kg ai/ha. This was greater at the 5 week than at the 8 week sampling. Embark had no effect at a rate of 0,75 kg ai/ha.

Experiment 7

Ethrel applied at a rate of 0,5 kg ai/ha produced a marked ripening effect and increased sugar yield by an average of 1,4 ters/ha (Table 6). The addition of Orchex oil had no effect on this ripening response.

TABLE 6
Harvest data for Experiment 7 (Sprayed 1 May, harvested 18 July)

Treatment (kg ai/ha)	Tc/ha	S % c	Purity	Ers % c	Ters/ha*
Control	118	13,1	85,4	11,2	13,8
Ethrel 0,5	127	14,3	87,6	12,5	15,4
Ethrel 0,5 + oil	125	14,1	87,6	12,3	15,1
Mean	123	13,9	86,8	12,0	14,8
LSD (0,05)	17,0	0,8	1,8	0,9	—
(0,01)	25,8	1,2	2,7	1,4	—
C of V (%)	8,0	3,4	1,2	4,4	—

* Based on mean cane mass

Discussion

From the screening experiments it was evident that Embark and Am 74/A382 were the only chemicals that ripened sugarcane and gave increases in sugar yield equivalent to those obtained with Ethrel, the standard chemical ripener in South Africa. In the two experiments in which it was tested, Am 74/A382 was more effective than Ethrel at an equivalent rate of active ingredient per hectare, which confirms the results of earlier work (Rostron, Durandt and Lang[3]).

When sugarcane was young and growing rapidly, as in Experiments 1, 3a, 4a, and 5, all three chemicals produced similar substantial increases in yield of estimated recoverable sugar per hectare (ters/ha). In Experiments 1 and 4a, Embark also improved ers % c slightly more than did Ethrel because it reduced the moisture content of the cane stalk to a greater extent. However, in sugarcane that was either older (Experiment 3b and 4b), or lower yielding and sprayed in May rather than March (Experiment 6) Embark was either not effective or was less effective than Ethrel.

The poorer response of maturer sugarcane to Embark in Experiments 4 and 6 was associated with a marked cessation of stalk growth and increased development of axillary shoots. This may indicate an increased sensitivity of the crop to the chemical, implying that the rate of application may have been too high for the condition of the sugarcane at that time. Sideshooting and other visible symptoms in the more mature sugarcane were less marked at a rate of 0,5 kg ai/ha Embark than at a rate of 1,0 kg ai/ha but there was no indication of a difference in the ripening response between the two rates.

In Experiment 4b, adjusted yield data (Fig. 5) indicated that the higher rate of Embark (1,0 kg ai/ha) gave a better response than the lower rate, but in Experiment 6 (Table 5b), the lower rate appeared to give the best yield. None of these effects was statistically significant and further work will be necessary to define more closely the conditions under which good ripening responses to Embark occur, and to determine whether fairly mature sugarcane should receive lower rates of application.

All varieties tested in Experiment 3 were ripened by Ethrel, Embark and Am 74/A382 but, in Part A, which was sprayed in February, the naturally higher sucrose varieties N55/805 and L76 did not respond as well as varieties NCo 376 and NCo 334. This confirms the results obtained in a plant crop experiment on the same site with the same varieties (Rostron[2]). Spraying in April was less effective than spraying in February and, at this time, there was no difference between the varieties in their response to any of the chemicals. In this experiment, a delay of one month in the spraying of all varieties reduced their response to Ethrel and Am 74/A382 by about 50% and to Embark by 75% (Table 3). These results re-emphasise the importance of the physiological state of the crop at the time of spraying, which has been discussed in previous papers (Rostron [1, 2]) and there can be little doubt that biochemical tests on crops at the time of spraying would lead to a better understanding of the chemical ripening process.

In the large-plot experiments with variety NCo 376, the best ripening response of up to 2,4 ters/ha was obtained in Experiment 5, which was sprayed in March, when juice purity was 63%, and the lowest response of 0,8 ters/ha was from sugarcane sprayed on 17 May, when juice purity was 80% (Experiment 6). In Experiment 7, which was sprayed on 1 May at a purity of 71%, the response averaged 1,4 ters/ha. These results confirm the inverse relationship between juice purity at the time of spraying and the yield response to Ethrel (Rostron[2]). They also confirm that it is the condition of the crop at the time of spraying, rather than the month of the year at which it is sprayed, that is of over-riding importance in determining the size of the ripening response.

The duration of the positive response to a chemical ripener is important because it determines the area of crop that can be sprayed on one occasion, and it permits flexibility in the harvesting of chemically ripened sugarcane. The sample data from Experiment 3 showed that there was a response to Ethrel, Embark and Am 74/A382 up to at least 18 or 19 weeks after spraying, although the response was beginning to disappear after 14 weeks.

The addition of oil or urea to Ethrel applications did not improve the response to the chemical, and this confirmed previous results obtained with urea (Rostron, Durandt and Lang[3]).

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