

DETERIORATION LOSSES: BURNT CUT vs. BURNT STANDING CANE

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Abstract

Two trials were conducted to determine comparative changes in weight, juice quality and recoverable sugar in whole stalk sugarcane which was either burnt and cut immediately, or burnt and left standing in the field for a number of days before harvesting. It was concluded that cane which is burnt and left standing shows a more rapid decline in recoverable sugar percentage than does cane which is burnt and cut immediately. The additional loss from burnt standing cane cannot be ascribed only to the increase in weight which follows burning, due to uptake of water from the soil via the undamaged roots of the cane plant. Allowing burnt cane to stand even for a day before cutting can subsequently cause it to deteriorate more rapidly than cane cut immediately after burning. This emphasizes the importance of only burning enough cane to meet the requirements for one day's harvesting.

Introduction

In a series of cane deterioration trials conducted for the South African Sugar Industry, Wood *et al*⁶ reported that recoverable sugar from cane burnt and left standing for a period before cutting, seldom equalled that from cane cut immediately after burning. However, some doubt existed regarding the reliability of this statement because it had not been possible to estimate accurately the changes in weight of burnt standing cane in any of the trials. Too few stalks were harvested and there were wide variations in individual stalk weights. It seemed possible that the rapid decline in sucrose percentage in standing cane was the result of an increase in weight which followed burning, this being caused by uptake of water via the undamaged cane roots as reported by several workers (Egan,¹ Hsia Fuu-Yeu,² Samuels and Cayere,³ Young,⁴ Waddell⁵). In an attempt to clarify this situation two further trials were conducted in which a much larger number of stalks were taken from the burnt standing cane on each day of sampling.

Procedure

Both trials were undertaken with the object of examining comparative changes in weight, juice quality and recoverable sugar in whole stalk cane which was:

- (a) Burnt and all cut immediately on day 0 and analyzed at intervals over a 13 day period.
- (b) Burnt and left standing in the field, and cut and analyzed at intervals over a 13 day period.

Ratoon cane aged 18 months was used, the varieties being NCo 376 in the first trial and NCo 310 in the second. Field sampling was randomised within five replicates.

Trial 1. Treatment A: Sixteen bundles each of 9 stalks were removed from each replicate on day 0, giving a total of 80 bundles and 720 stalks. Two of these bundles from each replicate were used for sucrose analysis on days 0, 1, 2, 3, 4, 6, 8 and 13 after harvest (i.e. 10 bundles of 9 stalks per sampling day).

Treatment B: Seven bundles each of 9 stalks were removed from each replicate on days 1, 2, 3, 4, 6, 8 and 13, giving a total of 35 bundles and 315 stalks on each sampling day. Two of the seven bundles from each replicate were analyzed on the day of cutting. The possible effects that delay in cutting burnt cane might have on its subsequent rate of deterioration were examined by analyzing single bundles from each of the five replicates on the sampling days remaining after cutting.

All cane bundles in treatment A were weighed on day 0. Ten bundles were analyzed immediately and the remainder were returned to stacks in the field. These remaining bundles were subsequently reweighed on the day on which they were due to be analyzed in order to determine changes in weight with time. In treatment B all bundles were weighed on the day on which the cane was cut.

All analyses were carried out on stripped whole stalks which had been topped by hand in the field.

A moderately hot burn was obtained at the start of the trial, and some cane regrowth was noted a week later. During the trial (27.10.72-9.11.72) 39,4 mm of rain was recorded and humidity was generally low, humidity at 2 p.m. reaching 90 on three days only.

Trial 2. In the first trial the estimated increases in weight in the standing cane following burning were somewhat erratic despite the large number of stalks harvested. This may have been due to variable soil moisture conditions which could subsequently have affected uptake of water by the burnt cane. It was therefore decided to conduct a second trial in the wetter summer period, using cane which had been irrigated, and to take an even larger number of stalks from the burnt standing cane on each sampling day.

Apart from the following treatment differences the procedures in the second trial were in every way similar to those in the previous trial.

Treatment A: Fifteen bundles, each of 9 stalks, were removed from each of the five replicates on day 0 giving a total of 75 bundles and 675 stalks. Two or three bundles from each replicate were taken for analysis on days 0, 2, 4, 6, 8 and 13 after harvest.

Treatment B: Ten bundles each of 9 stalks were removed from each replicate on days 2, 4, 6, 8 and 13

giving a total of 50 bundles and 450 stalks on each sampling day. Two of the ten bundles from each replicate were analyzed on the day of cutting.

An extremely even and hot burn was obtained at the start of the trial, and under the hot humid conditions that prevailed, cane regrowth was noted as early as four days after burning, and stalks were heavily infected with *Neurospora*. During the trial (13.2.73-26.2.73), 60,3 mm of rain was recorded, and humidity was generally high, the humidity during the first week averaging well over 100.

Results and Discussion

The data in Table 1 show the changes which occurred in dry matter, purity, sucrose, estimated recoverable sugar (ERS) and units of recoverable sugar over a period of 13 days in treatments A and B, in both trials. The figures have been adjusted for changes in weight which occurred as the trials progressed.

In treatment A (burnt cane) no loss in sucrose or recoverable sugar % cane was observed in either trial until 4 days after harvest. In the first trial the rate of deterioration was rapid only after 8 days, whereas in the second trial deterioration losses increased rapidly after 4 days in the hot humid conditions that prevailed. Decline in purity followed a similar pattern.

In treatment B (burnt, standing cane) a marked decline in sucrose and recoverable sugar % cane was already apparent after 2 days in both trials, despite a gain in weight of 3,3% by the cane in the second trial on this day. In trial 1 further deterioration losses between days 2 and 4 were negligible but subsequently the decline in quality was rapid. The rate of deterioration after 2 days in the second trial continued rapidly despite further gains in weight, and by day 6 about 12% of the recoverable sugar had been lost in treatment B compared with only 7% in treatment A.

Figures 1A-D, show the differences between treatments A and B in terms of ERS% in both trials, for the cane as analyzed, and then adjusted for changes in weight with time.

Figures 2A and B show changes in weight with time in both trials, expressed as a percentage of the weight on day 0, for burnt cut and burnt standing cane. In the first trial there was apparently an initial gain in weight of about 1,5% in the standing cane following burning, which was maintained during the first 4 days of the trial. Thereafter weight changes were erratic. Increase in weight in the second trial averaged 3,4% during the first 8 days following burning, and in spite of subsequent transpiration losses following regrowth of the top leaves, after 13 days it was still 1,3% above the day 0 weight of the burnt cane cut immediately.

Results from both trials indicate that even allowing burnt cane to stand for a relatively short period (1-2 days) before cutting, causes it to deteriorate more rapidly than it would do if cut immediately after burning (see Figs. 1C and 1D). Similar patterns of deterioration were obtained from burnt standing cane which was kept for analysis on the sampling days which remained after cutting, but these have been omitted from Figs. 1C and 1D to avoid confusion.

Conclusions

1. Compared with cane which is burnt and cut immediately, that which is burnt and left standing shows a more rapid decline in recoverable sugar percentage, and this cannot be ascribed only to the increase in weight which normally follows burning.
2. Allowing burnt cane to stand even for a short period before cutting (1-2 days), subsequently causes it to deteriorate more rapidly than cane

TABLE 1
 Summary of the results from the deterioration trials
 (Means of five replicates adjusted for change in weight from day 0)
 Trial 1 Oct.-Nov. 1972 (Mean temp. 20,2°C — Rainfall 39,4 mm) NCo 376

Treatment A. Burnt cut immediately							Treatment B. Burnt left standing					
Day	DM %	Pur. %	Suc. %	ERS %	Units recov. sugar	Wt. loss/gain %	DM %	Pur. %	Suc. %	ERS %	Units recov. sugar	Wt. loss/gain %
0	30,2	90,6	15,77	14,28	100	—	30,2	90,6	15,77	14,28	100	—
1	30,5	91,1	15,99	14,50	102	-2,0	30,5	90,8	15,86	14,34	100	+1,3
2	30,5	91,4	15,92	14,44	101	-1,0	28,8	90,7	14,76	13,32	93	-0,7
3	30,2	90,5	15,80	14,28	100	-2,7	29,5	90,0	15,12	13,58	95	+1,8
4	30,2	91,2	15,62	14,15	99	-3,8	29,4	90,6	14,98	13,49	94	+1,4
6	30,0	89,6	15,62	14,02	98	-6,2	28,6	90,1	14,41	12,92	90	-0,1
8	29,6	89,6	15,28	13,67	96	-6,7	27,1	89,0	13,47	11,97	84	-4,5
13	28,8	84,4	13,90	11,96	84	-7,3	27,8	86,4	13,16	11,50	81	+0,2
Trial 2 February 1973 (Mean temp. 23,8°C — Rainfall 60,3 mm) NCo 310												
0	29,5	89,8	13,93	12,36	100	—	29,5	89,8	13,93	12,36	100	—
2	29,9	89,6	14,33	12,74	103	-4,2	29,3	88,9	13,39	11,78	95	+3,3
4	29,0	87,5	13,76	12,05	97	-6,6	29,0	88,9	12,97	11,37	92	+2,8
6	28,5	86,8	13,18	11,46	93	-11,2	28,9	85,7	12,69	10,86	88	+4,2
8	28,5	83,7	12,66	10,70	87	-11,2	28,5	85,9	12,49	10,69	87	+3,2
13	27,7	79,5	11,87	9,66	78	-17,8	27,5	82,4	11,44	9,48	77	+1,3

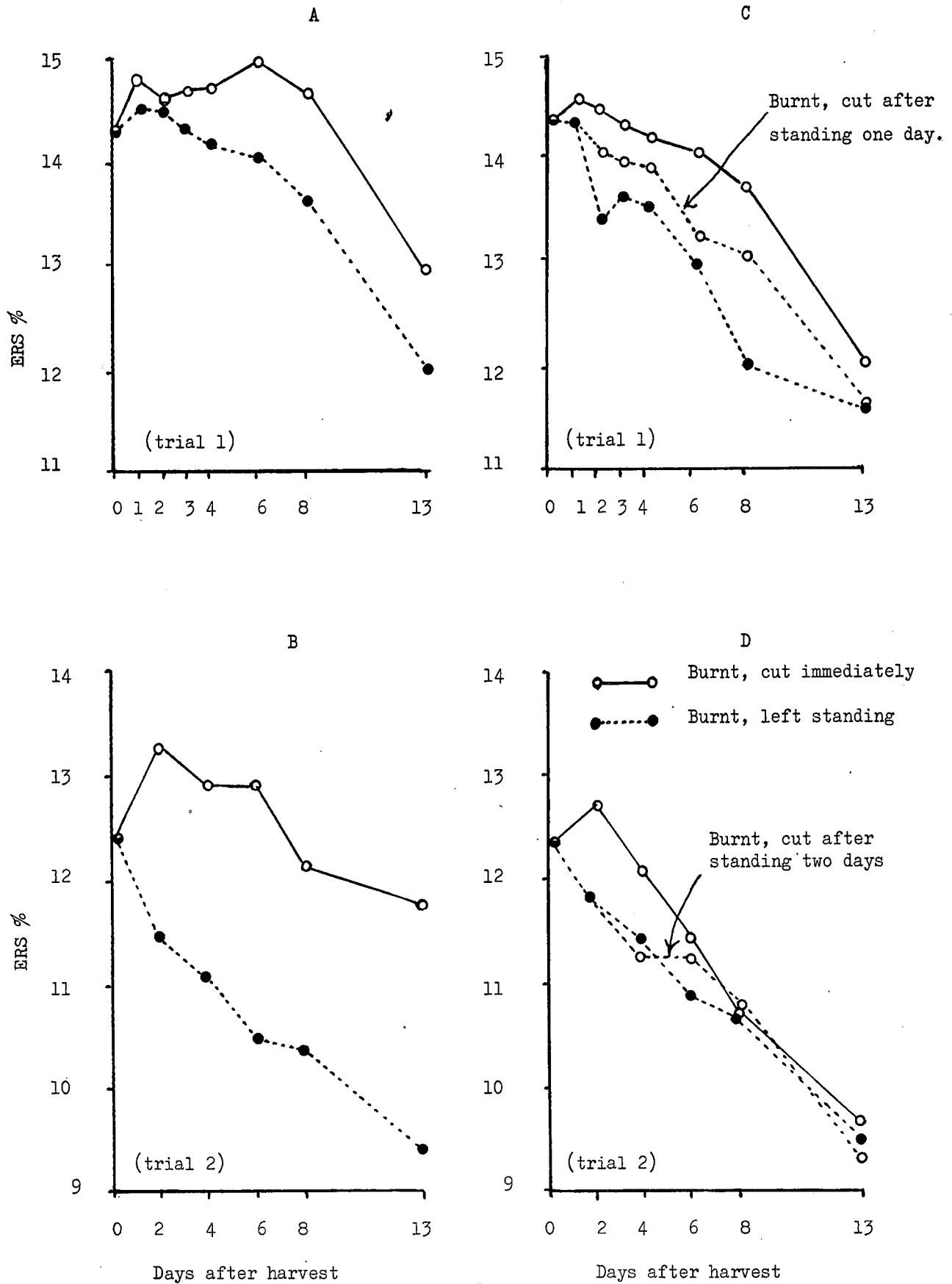


FIGURE 1: Changes in estimated recoverable sugar with time in two deterioration trials. (A, B as analyzed, C, D, adjusted for changes in weight as the trials progressed).

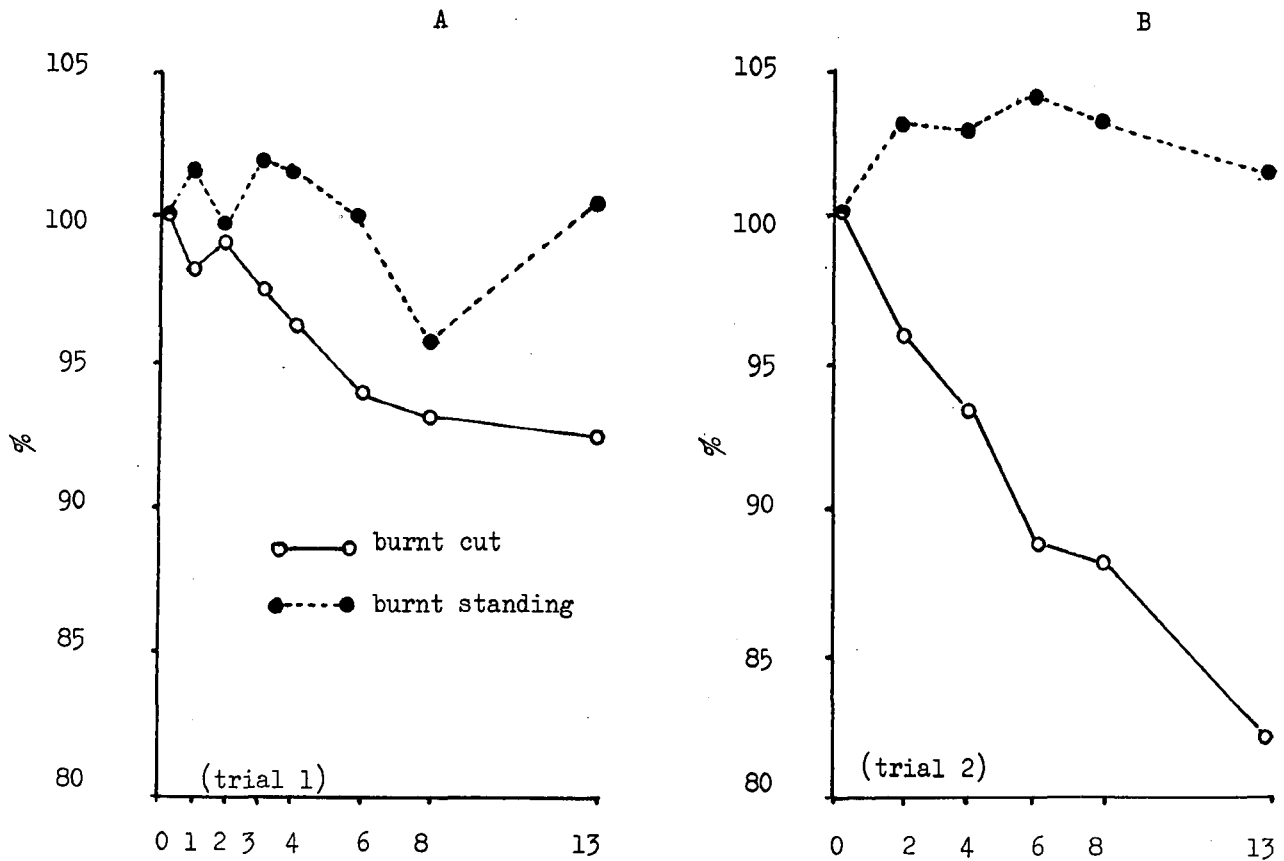


FIGURE 2: Change in weight with time expressed as a percentage of day 0 weight.

cut immediately after burning. This merely serves to emphasize the importance of only burning enough cane to meet the requirements of one day's harvesting.

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