

“ Further Experiments in the Harvesting of Burned Cane ”

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By H. H. Dodds and P. Fowlie

The experiments to be described form largely a repetition and confirmation of the somewhat unlooked-for results described in our paper read last year.

It will be recollected that we then found that burning cane before harvesting delayed any material deterioration in sucrose content and purity for about a week or nine days; while in the case of unburned cane the rate of deterioration was more or less uniform from the time of cutting.

Further, cane left standing after burning also showed no considerable deterioration for nine days, and thereafter gave a gradual decrease in purity and sucrose content, probably associated with renewed growth which became evident at that time.

The first series of experiments was harvested in the month of December, 1927, during a period of very little rain and a mean atmospheric temperature of 72° F.

The experiments now recorded were harvested in October, 1928, with a mean temperature of 69° F. and light rains almost daily.

The procedure was the same as before. Three adjacent portions of a field were taken for the experiment, and in one case the cane was cut in the ordinary way without burning and the cane weighed off into 1,000 lb. weight each, a bundle every alternate day being weighed and analysed and then discarded from the experiment.

The other two portions of the field were burned as the cane stood, the combustion being comparatively cool and slow, owing to the damp weather conditions prevailing.

In one section the cane was divided off into bundles of 1,000 lb. each, and left on the ground for weighing and analysis of a bundle every alternate day as in the case of the unburned cane. In the remaining section the burned cane was left standing.

The average loss in weight of the bundles was, as before, very slightly smaller with the burned cane, but the average daily loss in weight in both cases were much less than in the 1927 experiments, no doubt owing to the different weather conditions.

Average Percentage Loss per Day.

			Unburned Cane.			Burned Cane.
1927	0.96	..		1.05
1928	0.42	..		0.46

The small difference between the burnt and unburnt cane cannot be considered as of any significance, however, in view of the conditions of the experiment.

The changes in sucrose per cent. on keeping were very fluctuating, so that it is difficult to draw any very striking conclusions.

An inspection of the figures given in the accompanying table and graph, however, will indicate that, as in the 1927 experiments, there was a smaller average loss from the burnt than from the unburnt cane. The average loss per day per cent. of original sucrose in the cane was 0.59 in the case of the burnt harvested cane and 0.69 in the unburned cane. The difference, however, is very much less marked than under the conditions of the previous year's experiments, when the relative loss in sucrose of the unburnt cane was very much greater over the first nine days of the experiment.

In the present series there was, as before, a period of four to six days in the case of the unburnt cane before there was a marked falling off in sucrose, and a steady diminution right from the start in the unburnt cane.

The fall in sucrose per cent. cane of the burnt cane left standing was much less than with the harvested cane, whether burnt or standing, as in the 1927 experiments. It is, however, impossible to express this as loss of original sucrose, since the changes in weight of the standing cane cannot be determined.

The changes in purity give rise to some interesting results.

It may be recalled that in the 1927 experiments the purity of the unburnt cane showed a uniform fall in purity from the time of cutting, whereas the burnt harvested cane, after a slight initial rise in purity in the first two days, thereafter showed a slight regular fall until the ninth day, after which rapid deterioration set in.

The burned cane left standing showed no appreciable fall in purity for the first nine days, and thereafter a small regular fall for a further twelve days, after which rapid deterioration of the juice followed, associated with renewed growth of the cane.

The results in the recent experiments gave the same comparative results, except that the unburnt cane in this instance maintained its purity for four days, after which there was a regular fall of 1.29 per cent. per day, compared with 1.53 per cent. under the 1927 conditions.

The burnt harvested cane, as before, showed a temporary rise in purity over the first six days, after which there was a steady fall of 0.70 per cent., compared with 0.87 per cent. per day under the 1927 conditions.

The burned cane left standing maintained its purity with slight fluctuations over 20 days, or as long as the experiment was continued.

In the 1928 series of experiments some of the burnt cane was left standing for six days and for 13 days respectively, and then left lying on the ground and analysed periodically thereafter. These showed no essential differences from the analyses of cane harvested immediately after burning.

In the case of the cane kept for six days before cutting there was no apparent fall in sucrose or purity for a further week, after which time a slow deterioration set in.

Similar results were obtained with the cane kept for 13 days before cutting, marked deterioration also being delayed for about another week.

The Brix of the harvested cane showed a tendency to rise in the unburnt cane, while remaining more or less constant in the burnt cane; the Brix of the burnt cane left standing, however, showed a steady fall until the cane was cut, after which it also remained constant. These also are in general agreement with the results obtained in the 1927 series.

The fibre content of the cane in these experiments in general showed a tendency to increase, with certain fluctuations, which serve perhaps only to illustrate the difficulties in getting representative samples and analyses in cane tests.

Mr. Moberly: We are sorry that time has not permitted us to go more deeply into this paper, but I feel sure that it is a very interesting subject. It is a subject which has been followed from year to year and should continue to be studied to get some finally conclusive evidence on this very puzzling problem, about which the information has been so conflicting in the past.

Mr. B. E. D. Pearce proposed a hearty vote of thanks to Mr. Dodds for so ably presiding as Chairman during the Congress. He felt sure he was expressing the feelings of all of them when he said

The content of reducing substances and the reducing substance ratio, in general follow the changes in purity of juice, but are apparently considerably less in unburnt than in burnt cane until marked deterioration has set in.

The same may be said of the hydrogen ion concentration of the juice; in general there is a slow gradual increase in the pH of the unburned cane and a much more rapid increase in the burnt harvested cane.

General Conclusions.

To sum up, it may be said that similar relative differences in the keeping qualities of burned and unburned cane are shown as last year, but that the rate of deterioration in each case is much slower, probably because of the earlier date of the experiment and consequently cooler weather.

The unburned cane deteriorates much more rapidly than the burned cane, especially where the latter is left standing.

The ultimate results of burning cane we believe to be injurious from the agronomical standpoint, owing to the rapid destruction of humus involved in our already depleted soils.

These experiments indicate, however, that where cane is not burned, it is necessary to get it to the factory as rapidly as possible after cutting, especially when harvested late in the season with warm weather prevailing. A little more latitude is available for burned cane, since there is an initial period of four days or more over which there appears to be little or no loss or deterioration.

When a larger quantity of cane is burned, accidentally or otherwise, than can be got to the factory within four days, it is better to leave the cane standing in the field until transport is available, since it will keep much better before being cut.

These experiments apply only to the Uba cane, which is a variety reputed to have very good keeping qualities. It is our intention, when opportunity occurs, to do similar experiments with other varieties such as P.O.J. 213, which is generally stated to deteriorate rapidly after harvesting.

The authors have pleasure in acknowledging the valuable assistance of Mr. Donald McRae in the many chemical analyses involved.

that he was very pleased that Mr. Dodds had reconsidered his decision, and would continue as Chairman for another year. (Loud applause.)

Mr. Dodds thanked the members for the kind remarks made by Mr. Pearce and the way in which they had been endorsed by the meeting, and stated that a vote of thanks was due to the energetic and thoughtful secretary, Mr. D. M. Eadie, and assistant secretary, Mr. Donald McRae, for the way in which they had kept things moving and well organised behind the scenes.—(Loud applause.)

The Congress terminated at 5.15 p.m.

**BURNING vs. TRASHING EXPERIMENT—SUGAR EXPERIMENT STATION.
OCTOBER, 1928.**

A.—HAND-TRASHED CANE.

Days after cutting.. . . .	0	2	4	6	8	11	13	15	18	20
Weight of original 1,000 lb. heaps	1000	997	987	963	963	930	906	866	—	—
Loss in weight (lbs.)	—	3	13	37	37	70	94	134	—	—
Percentage loss in weight	—	0.3%	1.3	3.7	3.7	7.0	9.4	13.4	—	—
Sucrose % cane	16.2	16.1	16.0	15.6	15.3	14.8	13.8	13.9	13.5	12.4
Sucrose % original weight	16.2	16.1	15.8	15.0	14.7	13.8	12.5	12.0	—	—
Fall in sucrose % of original	—	0.6	2.5	7.4	9.3	14.8	21.6	25.9	—	—
Fibre % cane.. . . .	13.0	13.6	14.6	13.6	13.8	14.6	13.1	13.2	13.5	15.2
Java Ratio (calculated)	81.6	81.0	79.3	81.4	80.6	78.0	78.2	80.5	78.0	79.0
Juice : Brix	21.8	21.7	22.1	21.8	22.0	22.6	22.1	22.2	22.6	22.3
„ Purity.. . . .	90.8	91.3	91.3	87.8	86.4	84.0	79.8	77.8	76.3	70.6
Reducing sugars	0.21	0.16	0.31	0.69	0.69	1.24	1.74	1.78	2.30	3.28
Reducing sugar ratio	1.06	0.81	1.54	3.60	3.63	6.53	9.87	10.31	13.33	20.8
pH	5.35	—	—	5.30	5.18	5.10	5.03	5.05	5.0	—
pH of 50 c.c.'s juice + 5 c.c.'s N/10NaOH	—	—	—	7.13	6.70	6.50	6.43	6.22	6.42	—
Difference in pH	—	—	—	1.83	1.52	1.40	1.40	1.18	1.42	—
Hours sunshine since preceding test	—	6.5	16.8	7.8	6.4	24.8	10.6	17.1	16.4	19.1
Mean temperature since preceding test	—	65°	72°	72°	69°	65°	65	70°	72°	73°
Mean humidity since preceding test	—	78	61	70	79	58	74	77	79	68
Rainfall in inches since preceding test	—	0.02	0.06	Nil	0.155	0.025	0.04	0.45	0.205	0.245

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C.—BURNT CANE LEFT STANDING.

Days after burning	1	4	6	8	11	13	15	18	20
Sucrose % cane.. . . .	14.11	14.0	14.3	13.5	13.0	13.1	12.5	12.3	12.4
Fall in sucrose % of original	—	—	—	—	—	—	—	—	—
Fibre % cane	13.3	13.3	12.0	13.6	13.4	13.0	13.2	13.9	13.9
Java Ratio.. . . .	80.4	80.9	82.1	80.6	79.6	80.0	84.0	79.1	78.9
Juice : Brix	20.0	19.6	19.5	19.1	18.7	18.5	18.2	17.8	17.9
Purity	87.7	88.4	89.0	87.9	87.0	88.5	85.7	87.5	88.1
Reducing sugars	0.42	0.34	0.35	0.42	0.48	0.45	0.63	0.54	0.47
Reducing sugar ratio	2.39	1.96	2.02	2.50	2.95	2.75	4.04	3.46	2.98
pH	5.28	—	5.38	5.37	5.20	5.10	5.28	5.35	—
pH of 50 c.c.'s juice + 5 c.c. N/10NaOH	—	—	6.98	7.20	7.37	7.28	7.68	7.97	—
Difference in pH	—	—	1.60	1.83	2.17	2.18	2.40	2.62	—
Hours sunshine since preceding test	—	23.3	7.8	6.4	24.8	10.6	17.1	16.4	19.1
Mean temperature since preceding test	—	70°	72°	69°	65°	65°	70°	72°	73°
Mean humidity since preceding test	—	64	70	79	58	74	77	79	68
Rainfall in inches since preceding test	—	0.06	Nil	0.155	0.025	0.04	0.45	0.205	0.245

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OCTOBER, 1928.

B.—BURNT CANE.

Days after cutting.. . . .	0	2	4	6	8	11	13	15	18	20
Weight of original 1,000 lb. heaps	1,000	1,000	990	962	964	932	931	931	—	—
Loss in weight (lbs.)	—	Nil	10	38	36	68	69	69	—	—
Percentage loss in weight	—	Nil	1.0	3.8	3.6	6.8	6.9	6.9	—	—
Sucrose % Cane	15.7	15.1	16.4	15.7	15.3	14.7	14.8	13.9	13.5	13.8
Sucrose % original weight	15.7	15.1	16.2	15.1	14.7	13.7	13.8	12.9	—	—
Fall in sucrose % of original	—	3.8	3.2	3.8	6.4	12.7	12.1	17.8	—	—
Fibre % cane.. . . .	14.2	13.6	14.2	15.5	14.6	13.4	15.5	15.6	15.9	15.6
Java Ratio (calculated)	81.1	81.2	8.12	79.2	79.2	78.2	77.6	76.8	76.2	77.8
Juice : Brix	21.7	21.2	22.1	21.9	21.7	22.0	22.0	21.7	22.0	21.7
„ Purity.. . . .	88.9	87.9	90.2	90.2	89.0	85.6	86.5	83.1	80.6	81.8
Reducing sugars	0.46	0.54	0.31	0.31	0.38	0.90	0.77	1.24	1.52	1.44
Reducing sugar ratio	2.33	2.90	1.55	1.57	1.97	4.78	4.05	6.87	8.57	8.11
pH	5.32	—	—	5.32	5.18	4.90	4.87	4.70	4.77	—
pH of 50 c.c.'s juice + 5 c.c.'s N/10NaOH	—	—	—	6.95	6.77	6.43	6.41	6.30	6.15	—
Difference in pH	—	—	—	1.63	1.59	1.53	1.54	1.60	1.38	—
Hours sunshine since preceding test	—	6.5	16.8	7.8	6.4	24.8	10.6	17.1	16.4	19.1
Mean temperature since preceding test	—	65°	72°	72°	69°	65°	65°	70°	72°	73°
Mean humidity since preceding test	—	78	61	70	79	58	74	77	79	68
Rainfall in inches since preceding test	—	0.02	0.06	Nil	0.155	0.025	0.04	0.45	0.205	0.245

BURNING v. TRASHING EXPERIMENT—SUGAR EXPERIMENT STATION
OCTOBER, 1928.

D.—BURNT CANE LEFT STANDING FOR 6 DAYS AND THEN HARVESTED.

E.—BURNT CANE LEFT STANDING FOR 13 DAYS AND THEN HARVESTED.

	D						E		
Days after burning	1	6	8	11	13	15	16	19	21
Days after cutting	—	0	2	5	7	9	3	6	8
Sucrose % cane	14.1	14.3	14.5	14.3	13.7	13.5	13.0	13.1	12.1
Fall in sucrose % of original	—	—	—	—	—	—	—	—	—
Fibre % cane	13.3	12.0	12.2	14.3	14.7	15.1	14.4	13.4	14.2
Java Ratio	80.4	82.1	82.4	79.9	78.9	76.6	78.2	78.9	76.8
Juice : Brix	20.0	19.5	19.7	20.4	19.9	20.4	19.1	19.2	18.7
Purity	87.7	89.0	89.0	87.9	87.4	86.6	87.2	86.5	84.5
Reducing sugars	0.42	0.35	0.34	0.38	0.63	0.84	0.56	0.72	0.93
Reducing sugar ratio	2.39	2.02	1.94	2.12	3.62	4.75	3.36	4.33	5.88
pH	5.28	5.38	5.27	5.10	5.06	4.92	—	—	—
pH of 50 c.c.'s juice + 5 c.c. N/10NaOH	—	6.98	7.35	6.65	6.87	6.78	—	—	—
Difference in pH	—	1.60	2.08	1.55	1.81	1.86	—	—	—
Hours sunshine since pre- ceding test	—	31.1	6.4	24.8	10.6	17.1	—	21.9	16.0
Mean temperature since pre- ceding test	—	71°	69°	65°	65°	70°	—	70°	78°
Mean humidity since pre- ceding test	—	66	79	58	74	77	—	81	56
Rainfall in inches since pre- ceding test	—	0.08	0.155	0.025	0.04	0.45	—	0.14	0.485

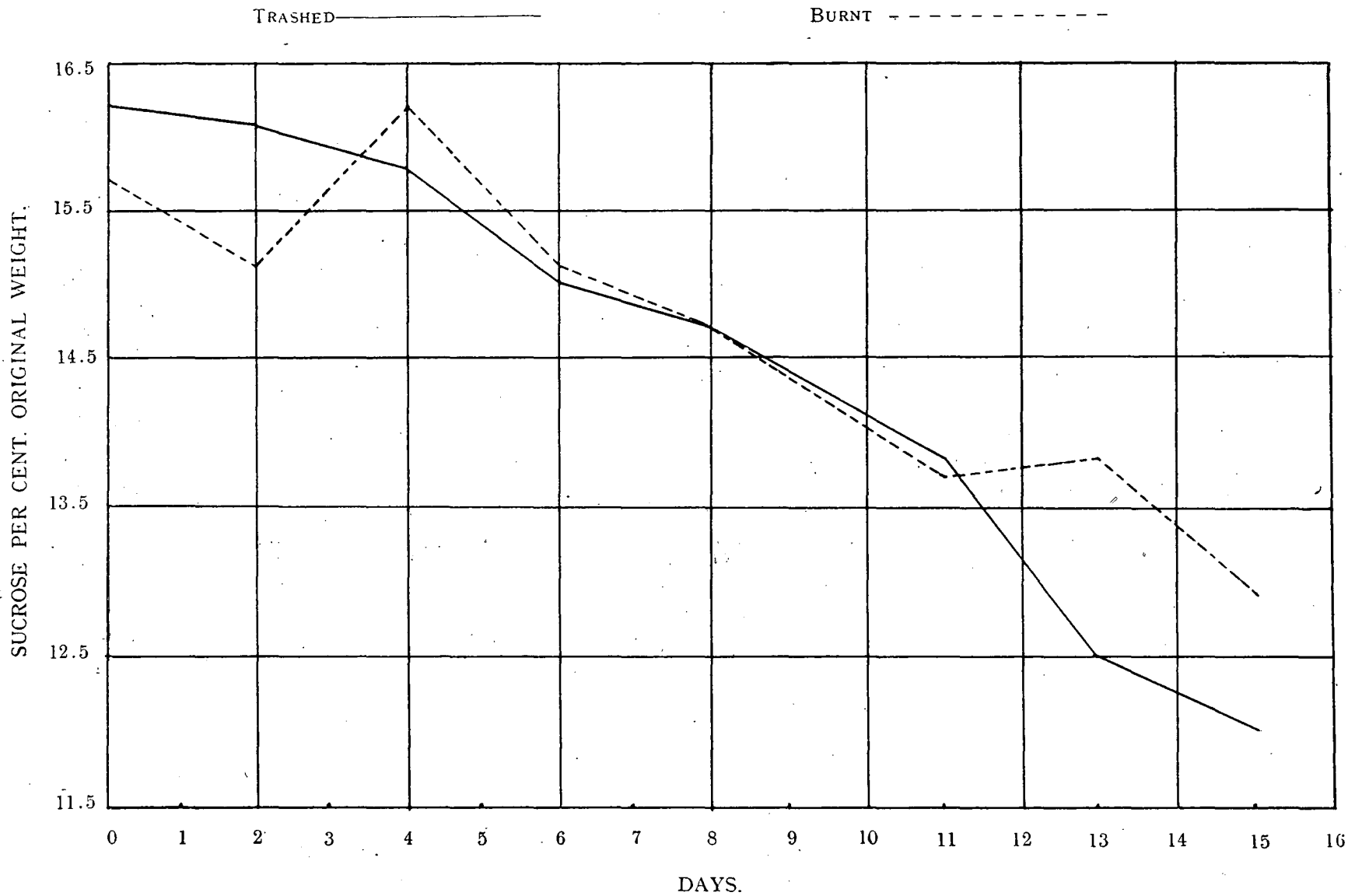
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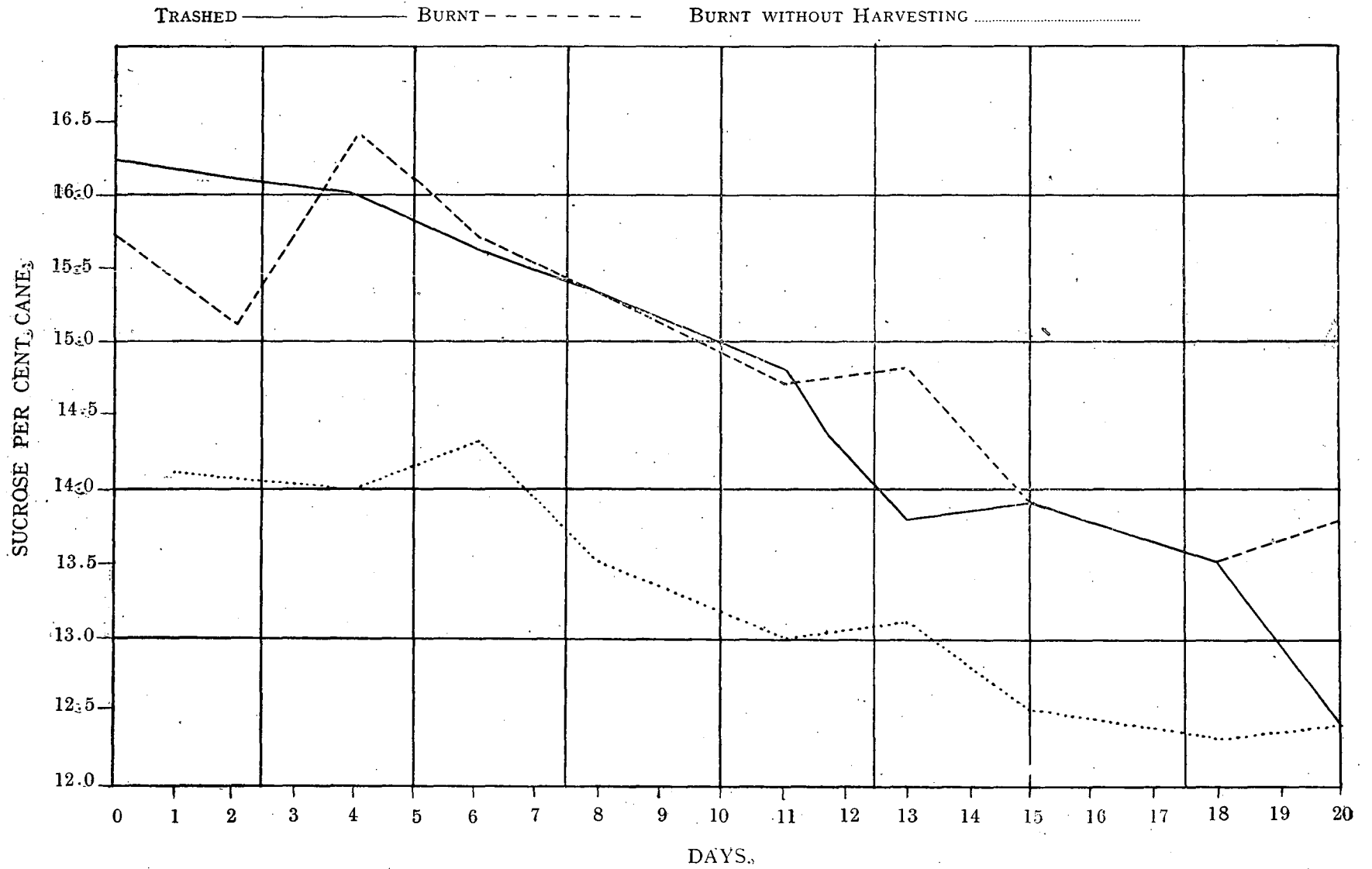
WEATHER RECORDS.

Date.	Hours Sunshine.	Temperature.		Humidity.		Rainfall, inches.	Days from beginning of experiment.
		Max.	Min.	8.30 a.m.	1 p.m.		
Thursday, 18/10/28.. ..	0.00	69	56	94	85	0.02	
Friday, 19/10/28.. ..	6.5	77	57	64	72	—	2
Saturday, 20/10/28.. ..	10.0	83	60	60	53	—	
Sunday, 21/10/28.. ..	6.8	77	66	69	63	0.06	4
Monday, 22/10/28.. ..	1.2	83	67	95	52	—	
Tuesday, 23/10/28.. ..	6.6	75	64	68	66	—	6
Wednesday, 24/10/28.. ..	5.2	77	61	74	78	0.045	
Thursday, 25/10/28.. ..	1.2	72	67	81	83	0.22	8
Friday, 26/10/28.. ..	4.5	72	60	67	68	0.025	
Saturday, 27/10/28.. ..	8.3	72	55	40	59	—	
Sunday, 28/10/28.. ..	12.0	74	55	53	59	—	11
Monday, 29/10/28.. ..	10.6	75	54	57	65	—	
Tuesday, 30/10/28.. ..	0.0	71	61	100	74	0.04	13
Wednesday, 31/10/28.. ..	10.2	75	58	73	74	0.015	
Thursday, 1/11/28.. ..	6.9	81	64	86	74	0.435	15
Friday, 2/11/28.. ..	6.2	85	65	74	64	0.065	
Saturday, 3/11/28.. ..	10.2	81	68	79	64	0.04	
Sunday, 4/11/28.. ..	0.0	71	62	92	100	0.10	18
Monday, 5/11/28.. ..	11.7	77	60	79	71	—	
Tuesday, 6/11/28.. ..	7.4	90	63	71	51	0.245	20
Wednesday, 7/11/28.. ..	8.6	89	69	49	54	0.24	
Thursday, 8/11/28.. ..	—	—	—	—	—	—	22
Friday, 9/11/28.. ..	—	—	—	—	—	—	—

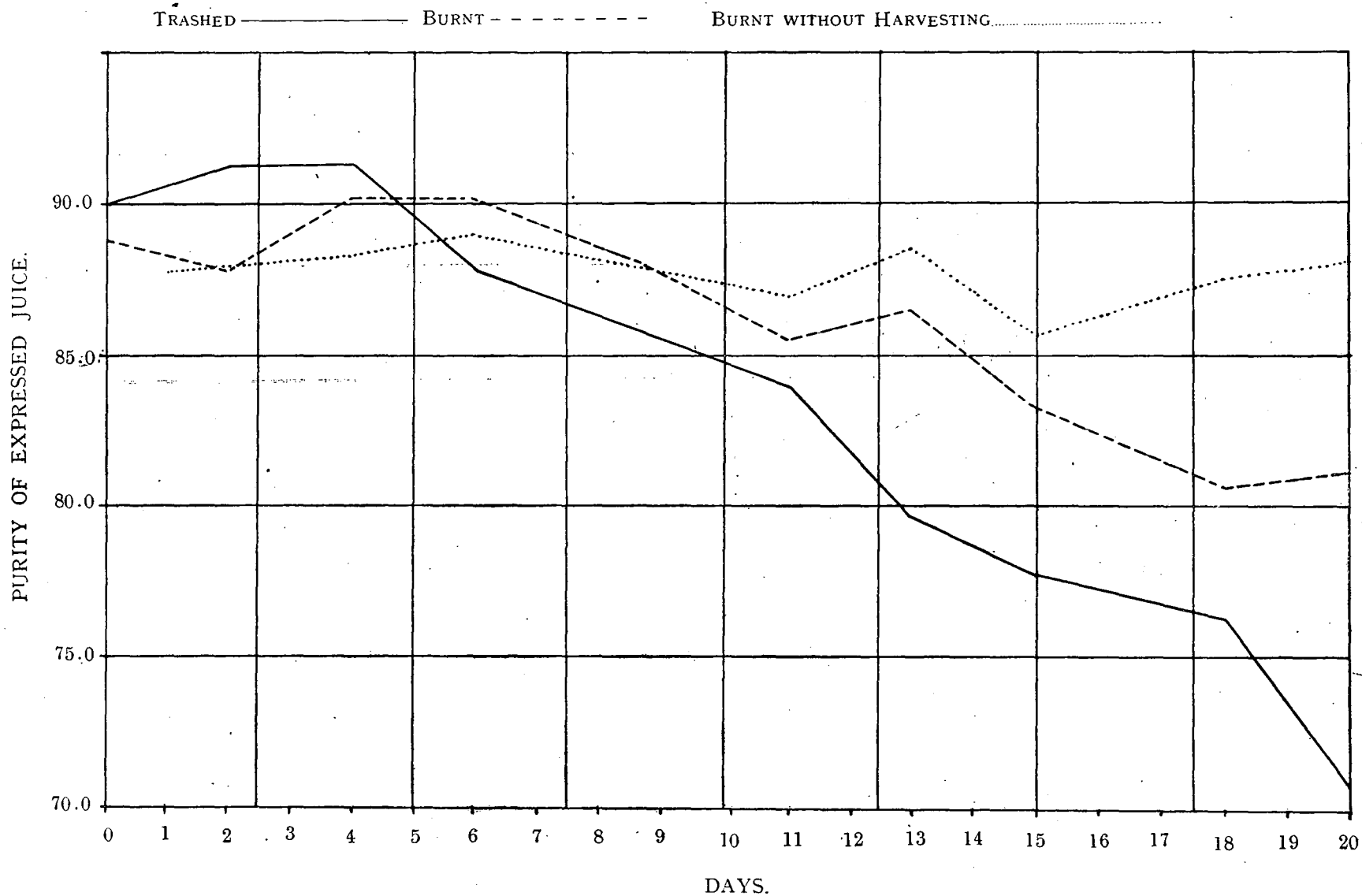
SUCROSE PER CENT. ORIGINAL WEIGHT OF TRASHED CANE COMPARED WITH BURNT CANE.



SUCROSE CONTENT OF TRASHED CANE COMPARED WITH BURNT CANE.



PURITY OF EXPRESSED JUICE FROM TRASHED CANE COMPARED WITH BURNT CANE.



LOSS OF WEIGHT OF TRASHED CANE COMPARED WITH BURNT CANE.

