

Performance of Canes under Restricted Conditions of Manuring and Irrigation

By

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In sugarcane culture it is well known that about 50% of the cost of cultivation is accounted by two items viz., irrigation and manuring. If an effective economy in either of the two or preferably both could be made without sacrifice of yield or crop quality it will be an achievement of far-reaching economic importance to the cane grower on one hand and the factory owner on the other. To this end experimental work on this crop was started at the Agricultural Research Station, Anakapalli. During the early part of such work the varieties of cane under cultivation were such that they did not lend themselves to any degree of restriction in either manuring or irrigation, to make cane culture a cheap proposition. Later, during the course of testing, at Anakapalli, of the seedling canes bred at the Imperial Sugarcane Breeding Station, Coimbatore, a differential degree of resistance to restriction in these two treatments was exhibited by a few of the cane varieties. Since then it was considered desirable to try the seedling canes under two sets of treatments designated as the "Normal" and "Restricted" for a study of their performance with special reference to growth and quality of juice. The results of such a study are presented in this paper.

Material and Methods :

As seedling canes are received in batches from the Imperial Sugarcane Breeding Station, Coimbatore, they are first multiplied to secure sufficient seed material to plant on a field scale in what are known as "Study Plots", under two sets of conditions of manuring and irrigation, denoted as "Normal" and "Restricted". The area of each plot was one cent under both the conditions of crop growth and Co. 419 was planted as control after every pair of varieties, the planting being done in the X A B X pattern, every year in first week of March. The varieties under this trial during the period 1941—44, reviewed in the paper were as follows :

- 1941—42 Co. 214, Co. 223, Co. 244, Co. 299, Co. 365, Co. 383, Co. 393, Co. 395,
Co. 446 to 465, Co. 502, Co. 534 to 550, Co. 551 to 554. (Total 50 varieties).
1942—43 Co. 365, Co. 394, Co. 395, Co. 457 to 469, Co. 502, Co. 546 to 558.
(Total 30 varieties).
1943—44 Co. 460 to 476, Co. 550 to 558, Co. 560 to 665 and Poj. 2961. (Total 32 varieties).

The crop under "Normal" treatment received five tons of farmyard manure as a basal dressing in addition to which 100 lbs of Nitrogen per acre, $\frac{2}{3}$ as groundnut cake and $\frac{1}{3}$ as Sulphate of Ammonia, were applied. The concentrated manure of 100 lbs of Nitrogen was applied in two equal halves, one at the time of planting in March, and the remainder at the time of trenching and earthing up in June. Irrigations were given to the crop once in a fortnight or whenever the crop needed it. The crop under "Restricted" treatment received only half the number of irrigations given to the normal and 50 lbs of nitrogen in the same form, proportion and instalments as for the normal treatment. Restriction in irrigation was enforced from the time of planting.

Climatology :

An ideal climate for sugarcane culture in these parts seems to be one which is uniformly warm, with a well-distributed rainfall of not less than 40 inches annually. A climate with more of moisture and warmth during the grand period of vegetative growth followed by cool and dry winter to check vegetative development and ripen off the canes is the desideratum. On the whole these conditions are fulfilled over a large part of the Vizagapatam district, and the area under cane cultivation extending over 30,000 acres therefore occasions no surprise. The conditions obtaining at Anakapalli which are fairly representative of the major part of the cane-growing area of the district, are presented below :

*Table I. Climatic Factors at the A. R. S. Anakapalli.
(Average of ten years 1936—45)*

Months	Rainfall inches.	* Rainy days.	Maximum Temp. of	Minimum Temp. of	Humidity at 8 A. M. %	Wind velocity M. P. H.
January	0.28	0.80	85.13	63.25	83	2.10
February	1.27	2.10	87.35	65.84	82	2.35
March	1.24	1.70	92.61	70.67	84	3.50
April	1.43	1.80	95.38	75.95	83	4.99
May	3.09	3.90	98.04	80.24	76	5.05
June	4.02	6.60	95.12	79.83	75	4.44
July	4.32	8.90	90.91	77.71	87	5.12
August	4.76	8.40	91.84	77.38	89	3.97
September	7.28	11.10	90.79	77.03	89	2.11
October	9.27	9.00	88.56	74.11	89	1.56
November	2.81	3.60	85.60	68.08	84	1.55
December	0.32	0.40	83.70	63.88	79	1.83

* Less than ten cents of rain is not counted as a rainy day

@ Average of five years only.

Crop-Performance :

The behavior of the crop under the two sets of treatments is described in detail below.

Germination and tillering:— Germination commences about two weeks after the planting of the cane sets and almost reaches completion by the sixth week. Germination counts are recorded once in a week from the third week to the sixth week and percentage germination is calculated from the number of buds germinated every week, the number of buds planted being known. Active tillering seems to set in by the middle of April and extends till the end of May. Tillering is largely confined to the pre-monsoon period and any factor or factors disturbing this phenomenon is naturally reflected in the final yield. As between the two treatments "Normal" and "Restricted" the former shows a general tendency to quicker germination, but in years of well-distributed rainfall there is hardly any difference between the two treatments. The percentage of germination is significantly higher under "normal" treatment.

Table II. Percentage of germination under Normal and Restricted Irrigations.

Year	Percentage of Germination		N—R	Significance	Rainfall during the period of germination March—April	
	Normal (N)	Restricted (R)			Inches.	Rainy days
1940—41	61.90	59.70	2.20	No.	4.86	7
1941—42	68.46	63.65	4.81	Yes	0.75	2
1942—43	60.02	52.97	7.05	Yes	0.34	1

Growth :

A study of the growth measurements of individual canes recorded at monthly intervals from June to March every year, in the studies of the crop under review, has shown that 72% of the total length of the cane is formed between June-October while only 10.5% of the total growth is made in the subsequent four months. Good growth is therefore dependant on favourable climatic conditions in June-October.

Table III. Mean Height of canes in inches 1938—39 and 42—43.

Month	Mean height		Difference N-R	Significance	Mean rate of growth		Rainfall in inches	Rainy days
	Normal (N)	Restricted (R)			N.	R.		
1938—39								
Up to June 38	27.34	28.58	1.24	Yes	—	—	8.44	17
July	49.79	50.74	0.95	No	22.45	22.16	3.53	17
August	75.53	76.64	1.11	..	25.74	25.90	7.16	20
September	102.10	101.53	0.57	..	26.57	24.89	15.16	20
October	118.59	117.52	1.07	..	16.49	15.99	4.43	13
November	130.17	130.15	0.02	..	11.58	12.63	8.16	5
December	135.59	135.12	0.47	..	5.42	4.97
January 1939	138.23	136.83	1.40	..	2.64	1.71	0.15	2
February	140.29	138.96	1.33	..	2.06	2.13
March	142.37	140.48	1.89	..	2.08	1.52	1.48	3

1942-43								
Up to June 42.	29'60	18'70	10'90	Yes	20'65	14'38	3'36	6
July	52'50	41'30	11'20	..	15'98	17'39	2'30	13
August	75'70	60'50	15'20	..	16'19	14'77	6'07	10
September	97'50	82'20	15'30	..	15'22	16'69	4'69	15
October	115'10	101'40	13'70	..	12'28	15'77	7'15	12
November	130'10	116'80	13'30	..	10'47	11'85	3'35	6
December	135'50	123'00	12'50	..	3'77	4'77	0'38	1
January 43	139'20	125'90	13'30	..	2'58	2'23	0'98	3
February	141'30	128'50	12'80	..	1'47	2'00	0'20	2
March	143'30	130'00	13'30	..	1'40	1'15

Data recorded over fairly long period showed that the crop under "Normal" conditions registered a better vegetative growth during the pre-monsoon period and this initial advantage was maintained throughout the period of growth. The rates of growth between the treatments "Normal" and the "Restricted" did not reveal any wide variations during seasons of well distributed rainfall, but in years of deficient or unevenly distributed rainfall, the differences were more marked and the "Restricted" treatment showed a much lower growth-rate than the "Normal".

Quality of Cane Juice :

A picture of the progressive variations in the quality of cane juice under the two treatments was obtained by periodical chemical analysis of the cane juices. This study commenced from October and was carried on till the end of May. Its object was to assess the different periods of ripening of the cane varieties, with a view to classify them under three groups viz., early, mid and late season maturing types. The chemical analysis data given in tables IV, V and VI (appended) show that :

- (i) Juices obtained from "Normal" treatment tended to record lower values than those of the "Restricted" in respect of both sucrose and purity.
- (ii) Varieties under the "Restricted" treatment matured earlier.

Summary :

The performance of a number of seedling canes under two conditions of manuring and irrigation was studied for a period of three years. During the period of study the crop growth and the seasonal conditions prevailing during each growth phase were recorded. The data showed that at every growth phase of the crop, differences were noticeable between the two treatments,

1942—43								
Normal treatment	9.39	12.11	13.77	15.75	16.59	16.70	15.74	14.56
Restricted treatment	9.30	12.39	14.05	15.67	16.61	17.16	16.08	14.75
Difference (N-R)	0.09	0.28	0.28	0.80	0.02	0.46	0.34	0.19
S. E. of Mean diffce.	0.167	0.189	0.150	0.239	0.201	0.225	0.191	0.284
Significance	No	No	No	No	No	Yes	Yes	No
1943—44								
Normal treatment	9.43	12.40	14.25	16.22	17.12	16.51	15.19	14.18
Restricted treatment	10.37	13.08	14.99	17.01	17.72	17.76	16.22	14.97
Difference (N-R)	0.24	0.68	0.74	0.79	0.60	1.25	1.03	0.79
S. E. of mean diffce.	0.261	0.311	0.315	0.709	0.248	0.266	0.438	0.584
Significance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No

Table VI. Purity %.

1941—42								
Normal treatment	66.73	78.32	83.32	85.71	86.80	88.13	86.97	84.46
Restricted treatment	72.28	81.36	85.68	87.79	88.59	88.93	87.66	85.43
Difference (N-R)	5.50	3.04	2.36	2.08	1.79	0.80	0.60	0.97
S. E. of mean diffce.	0.624	0.733	0.454	0.359	0.388	0.391	0.302	0.673
Significance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1942—43								
Normal treatment	71.60	80.55	82.91	88.10	87.83	88.10	87.45	85.04
Restricted treatment	69.99	80.64	83.71	86.97	87.70	88.44	88.09	85.09
Difference (N-R)	1.61	0.09	0.90	1.13	1.13	0.36	0.64	0.05
S. E. of mean diffce.	0.813	0.636	0.341	0.684	0.442	0.299	0.415	0.674
Significance	No	No	Yes	Yes	No	No	Yes	No
1943—44								
Normal treatment	59.95	79.54	84.29	87.88	90.60	91.60	86.72	83.92
Restricted treatment	74.17	81.26	86.11	89.44	91.03	93.10	88.66	84.78
Difference (N-R)	4.22	1.72	1.82	1.56	0.43	1.50	1.94	0.86
S. E. of mean diffce.	1.330	0.708	0.794	0.493	0.479	0.456	0.656	1.369
Significance	Yes	Yes	Yes	Yes	No	Yes	Yes	No

