

Response of Sugarcane to Irrigation at different Growth Stages

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ABSTRACT

An experiment was conducted to study the response of sugarcane to Irrigation at different growth stages at TSM, STSM, NBSM and SRTI Experimental farms. The results of the experiment revealed that sugarcane responds positively to irrigation. Significant increase in germination, tillering, millable cane production and yield were recorded in all locations. Response of sugarcane to irrigation was positively correlated. Application of irrigation after planting enhanced germination compared to no irrigation. However, irrigation has no positive impact on sucrose accumulation in sugarcane.

INTRODUCTION

In Bangladesh Sugarcane is grown in around 0.18 million hectares mostly under rainfed condition and hardly any irrigation is applied to the crop. Although sugarcane is considered as drought tolerant crop but for proper growth and development at early growth phase irrigation is reported to be essential. The formative phase (180 DAP) is the critical water demand period (Reddi, 1976). Moisture requirement of sugarcane varies at different growth stages. According to Kingston the moisture content of sugarcane plant varies from 78% during the active growth stage to 67% at the maturity. Response of sugarcane to irrigation has been reported all over the world. In South Africa sugarcane yield were proportionate to the amount of water applied. In Mauritius the average response was 0.21 tones of cane per cm of water applied (Lakshmikantham, 1973). Yield Improvement due to application of Irrigation water were also reported from other cane growing countries like Puerto Rico, Taiwan, Australia, Hawaii and India. Since sugarcane is considered as drought tolerant rainfed crop no systematic research efforts have so far been made to study the irrigation requirement of the crop. Therefore the present experiment was undertaken to study the effects of Irrigation on yield contributing parameters of the crop.

MATERIALS AND METHODS

The experiment was conducted at Protap Farm of Shetabgonj Sugar Mills (STSM) and Muladuli Farm of North Bengal Sugar Mills (NBSM) in 1984-1985 cropping season and at Patuadangi Farm of Thakurgaon Sugar Mills (TSM) and SRTI Farm in 1985-86 cropping season under the Old Himalayan Piedmont plain (STSM & TSM) and the Ganges River Flood plain (SRTI & NBSM). The experiment

was carried out following RCB design with four replications. The treatments were as follows:

T_0 = No Irrigation (check).

T_1 = One Irrigation at planting.

T_2 = T_1 + One Irrigation at 60 d after planting.

T_3 = T_2 + One Irrigation at 120 d after planting.

The plot size used 10m x 10m. Setts were planted in trenches following end to end method of sett placement. Variety Isd 2/54 was used as test crop and planted in November. Normal Cultural practices appropriate for the crop was done. The Crop was harvested in January. Soil moisture was monitored at depths 0-15 cm, 15-30 cm and 30-45cm before and after each irrigation. Moisture content was determined by gravimetric method. Special care was taken during irrigation to avoid lateral seepage. Polythene sheets were inserted vertically between plots to control lateral seepage of irrigation water. Data on germination, tillering, millable cane and yield were recorded and statistical analysis was done.

RESULTS AND DISCUSSION

The two year results of the experiment showed that germination percentage of cane under different treatments ranged between 32.3 (SRTI) to 49.7 (TSM). The significantly higher percentage was obtained in treatment where three irrigations were applied compared to check. Differences in emergence of shoots among the irrigated plots were statistically insignificant. This indicates that application of irrigation after planting is beneficial for obtaining initial establishment of crop stand.

While considering the influence of irrigation on the tiller production it appears that the tiller production varies with the number of irrigation applied upto 120 DAP where the higher number of Irrigation produced significantly higher number of tillers (Tables 1 & 2). Although the increasing trend of tiller production was same with the increasing number of irrigation upto 3 rounds in both the years at all locations, the total number of tillers per unit area under different treatments varied with the location. The highest number of tillers was obtained at Ganges river flood plain (NBSM) Soil while the lowest was at old Himalayan piedmont plain soil.

Regarding the plant height as influenced by Irrigation during the formative stage (Feb.-April) it appeared that one irrigation induced plant height by 25.4% whereas two irrigations increased elongation upto 38.9% over the control (Table 3). Production of millable cane and yield under different treatments showed the similar trend as tiller production. Lowest number was obtained in control while the highest millable cane was obtained where three irrigations were applied. Under nonirrigated condition germination and tillering were low resulting lower number of millable cane production.

Table 1. Germination, tillers, millable cane, yield and recovery (%) in experiment conducted at STSM and NBSM during cropping season 1984-85.

Treatment	Germination (%)		Tillers (10^3 ha^{-1})		Millable cane (10^3 ha^{-1})		Yield (TCH)		Recovery (%)	
	STSM	NBSM	STSM	NBSM	STSM	NBSM	STSM	NBSM	STSM	NBSM
T ₀ (Control)	32.7b	34.9b	63.4	85.7	55.7c	76.9	30.5b	40.7c	8.8a	12.3
T ₁ (1-Irrigation)	42.3a (29.9)	40.3a (15.3)	80.1c (26.2)	100.4c (17.2)	63.98b (14.9)	89.9c (16.9)	39.1c (28.1)	55.1b (35.3)	9.6b	12.3
T ₂ (2-Irrigations)	40.8a (24.8)	42.8a (22.5)	106.8b (68.6)	139.8b (63.7)	66.7b (19.8)	100.8b (31.1)	43.2b (42.3)	56.4b (38.5)	9.97a	12.3
T ₃ (3-Irrigations)	43.11a (31.71)	41.4a (18.5)	123.6a (95.1)	176.6a (106)	75.7a (36.0)	114.1a (48.4)	49.3a (61.4)	67.7a (66.3)	8.8a	12.2

Table 2. Germination, tillers, millable cane, yield and recovery (%) in experiment conducted at TSM and SRTI during cropping season 1985-86.

Treatment	Germination (%)		Tillers (10^3 ha^{-1})		Millable cane (10^3 ha^{-1})		Yield (TCH)		Recovery (%)	
	TSM	SRTI	TSM	SRTI	TSM	SRTI	TSM	SRTI	TSM	SRTI
T ₀ (Control)	32.6b	32.3b	66b	63.21b	59.53b	54.8ac	36.54b	33.43b	8.76a	10.4
T ₁ (1-Irrigation)	40.3c (19.1)	34.6b (7.1)	98.4c (49.0)	52.5c (30.6)	74.8c (25.6)	71.3 (30.1)	50.93c (39.38)	49.51c (48.2)	8.9a	10.0a
T ₂ (2-Irrigations)	47.3b (45.3)	38.0a (17.6)	113.3b (71.6)	107.9b (70.7)	84.5b (42.0)	88.9a (62.2)	54.6b (49.5)	57.1b (70.9)	8.9a	9.2a
T ₃ (3-Irrigations)	49.7a (52.69)	38.14a (18.19)	122.89a (86.2)	118.56a (87.57)	94.28a (58.37)	91.4a (63.7)	58.8a (60.9)	63.7a (90.6)	8.8a	10.3a

* Means followed by same letter (5) do not differ significantly at 5% level of DNMR test.
 ** Figures within bracket show % increase over control.

Table 3. Plant height as Influenced by Irrigation at Muladuli farm during 1984-85 cropping season.

Treatments	Mean plant height in cm	% increased over control
T ₀ -Control	21.2	—
T ₁ (1-Irrigation)	26.6	25.4
T ₂ (2- Irrigation)	29.4	38.4
T ₃ (3-Irrigation)	29.2	37.5

It appears from the experiment that application of irrigation water at tillering and initial growth period of the crop helped to produce higher number of tillers, millable cane and maintained an uniform growth rate and increased unit stalk weight of cane which in turn gave higher yield per unit area. The highest yield was obtained in three irrigation conditions and the lowest under rainfed condition. Statistical analysis for recovery percentage indicates that irrigation did not significantly influence sucrose accumulation. Significant Yield increase was found with increased number of irrigations. In all the locations the highest response of all yield contributing factors were recorded with 3-round irrigation. The results reflect that irrigation is one of the most significant variable factors for the higher yield of sugarcane.

REFERENCES

- Anonymous, 1984-85. Annual Report : Co-ordinated Irrigation and Water Management Studies. BARC, Dhaka.
- Anonymous, 1980. Statistical Year Book of Bangladesh. Bangladesh Bureau of Statistics. p. 143.
- Humbert, R. P. 1968. The Growing of Sugarcane (Revised edition). Elsevier Publishing Company, Amsterdam. pp. 311-323.
- Kingston, G. 1980. Irrigation Research More Important Than Ever. pp. 6-8.
- Lakshmikantham, M. 1973. Technology in Sugarcane Growing (Second edition). Oxford & IBM Publishing Co., New Delhi. pp. 121-122.
- Reddi, G. H. S. 1976. Management of Irrigation Water. Andhra Pradesh Agril. Univ. Press. p. 22.