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EFFECT OF IRRIGATION SCHEDULING AND NITROGEN LEVELS ON WATER USE, YIELD AND QUALITY OF SUGARCANE RATOON

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ABSTRACT

The field studies on the effect of irrigation scheduling and N levels on water use, yield and quality of sugarcane ratoon during 1982-1983 and 1983-1984 revealed that irrigation scheduling and N fertilization significantly influenced the yield of ratoon. Maximum ratoon yield was obtained when the crop was applied irrigation at IW/CPE of 1.25 (CPE 60 mm) and fertilized with 200 kg.ha^{-1} of N. Increase in N application and frequency of irrigation increased consumptive use but decreased water use efficiency. Irrigation scheduling did not influence the juice quality but beyound 120 kg.ha^{-1} N the juice quality deteriorated.

KEY WORDS : Sugarcane, Ratoon, Irrigcation schedulling, N levels.

Ratooning of sugarcane is a general practice in almost all sugarcane growing States of the country. The ratoon crops have now come to occupy about 30 to 40 per cent of the total cane acreage in different states. But strangely enough this practice has so far not received the attention it deserved at the hands of growers and ratoon crops have been cultivated mostly as 'gift' crops without being provided with proper manurial and irrigational operations. The sugarcane is a long duration crop and required huge quantity of nutrient for optimum yield (chakravarti, 1970). Bhoj (1991) reviewd the improvement in practice for ratooning and reported that at Jullundhar there was marked increase in yield of ratoon over control when N dose was increased. Rattan and Singh (1955) reported interaction between doses of manure and levels of irrigation and noted the ill effects of higher N on juice quality could be largely reduced by controlled irrigation . Light and frequent irrigations (at an interval of 7to12 days) had been reported to be superior in comparison to delayed and heavy ones (Raheja, 1951, Singh *et al.* 1960). The present investigation was undertaken to study the effect of irrigation and N levels on water use, yield and quality of sugarcane ratoon.

MATERIALS AND METHODS

The experiment was conducted on ratoon sugarcane (Variety CO 1253) at agricultural Research Station, Sriganganagar. The soil of experimental field was sandy loamy in texture, pH 8.1, EC 0.20 d.s.m^{-1}, O.C.0.22 per cent, field capacity 16.2 per cent, wilting coefficient 4.7 percent and 115, 42 and 352 kg.ha^{-1} of available N,P and K respectively. The experiment was laid out in a split plot design with four replications. Treatments comprised four levels of irrigations (IW/CPE ratio of 0.5, 0.75, 1.0 and 1.25) and three levels of N (100, 150 and 200 kg.ha^{-1}). First ratoon of sugarcane was under taken by applying the above treatments. Ratoon was started in mid February of 1982 and harvested at the end of December 1982 and during 1983-1984 the ratoon was started in mid February 1983 but harvested in second week of March 1984. Initially two irrigations of 7.5 cm depth were applied for establishment of the crop. Subsequent irrigations were applied as per treatments. Irrigation water was measured at field with the help of parshall flume. One third of N, full dose of P_2O_5 and K_2O (each @ 60 kg.ha^{-1}) was applied at first irrigation and second 1/3rd N dose was given at tillering while remaining 1/3rd N dose was given at grand growth stage. Recommended package of practices were followed. Data on milliable cane, height of cane, cane yield and juice sucrose were recorded and subjected to statistical analysis. Number of irrigations and total quantity of

Ta ble 1. No. of irrigations and total water applied to the sugarcane ratoon.

Treatments	No.of irrigations		Total depth of water applied (cm)*	
	1982-1983	1983-1984	1982-1983	1983-1984
Irrigation regimes				
I - IW/CPE 0.50	11	9	112.0	123.8
I - IW/CPE 0.75	17	13	157.0	153.8
I - IW/CPE 1.00	21	18	187.0	191.3
I - IW/CPE 1.25	26	23	224.5	228.0

* Including rainfall of 29.5 cm during 1982-1983 and 56.3 cm during 1983-1984.

water applied to the ratoon crop are given in Table 1.

RESULTS AND DISCUSSIONS

The main effects of treatments on yield and yield contributing characters are summerized in Table 2. Data indicated that there was significant difference in cane yield due to various irrigation regimes and N levels in both the years. Irrigation scheduling at IW/CPE ratio of 1.25 (CPE 60 mm) produced significantly highest cane yields of 915.6 and 1068.8 q.ha^{-1} during 1982-1983 and 1983-1984 respectively. Average depth of water applied was 226.7 cm Chaturvedi (1946) reported that total delta of 181.25 cm was required for maximum yield in Barabanki, while Kulkarni and Gokhle (1963) reported that under field trials at Hadapsar (Maharashtra) the total water requirement was about 254 cm.

Khan and Nathuram (1947) recommended 198.12 cm of total delta, including rains in Punjab. Tthe total requirement of water for sugarcane was 291.52 cm of which 231.20 cm water was applied through 28 irrigations of 7.9 cm depth each in Mysore (Anon. 1963). Data (Table 2) further showed that cane yields increased with increase in N levels from 100 to 200 kg.ha^{-1}.

Appreciable differences were observed in consumptive (CU) use and water use efficiency (WUE) due to different levels of irrigation and N application during 1983-1984 (Table 3). Minimum CU of water was recorded when irrigation was scheduled at IW/ CPE ratio of 0.5 (CPE 150 mm) and increased propressively with successive increase in IW/CPE ratio from 0.5 to 1.25, whereas, WUE showed a reverse trend with increased irrigation regimes. The CU and WUE increased with increase in N levels from 100 to 200 kg.ha^{-1}.

Cane height and millable cane number were not significantly affected either by irrigation regimes or N levels (Table 2). Data on juice quality (Table 4) revealed that there was no significant difference in sucrose content due to 0.75 and 1.0 IW/CPE irrigation regimes whereas at 0.5 and 1.25 IW/CPE, surcose content of juice got significantly reduced in comparison to other irrigation. Sucrose content and purity per cent of cane juice at harvesting stage was significantly reduced at 200 kg.ha^{-1} N. Baver (1963), Miwra and Mehta (1985) also reported that higher application of N had adverse effect on juice quality.

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Table 2 : Effect of levels of irrigation and nitrogen on cane yield and yield determining attributes of Sugarcane.

Treatments	Cane yieled (q.ha^{-1})			Plant height (cm)			Millable cane (in thousand.ha^{-1})		
	1982-1983	1983-1984	Mean	1982-1983	1983-1984	Mean	1982-1983	1983-1984	Mean
Irrigation regimes									
IW/CPE 0.50	592.6	930.5	761.5	191.0	207.6	199.3	103.7	115.3	109.5
IW/CPE 1.75	807.1	979.9	893.5	200.3	210.9	205.6	111.7	116.9	114.3
IW/CPE 1.00	867.2	1024.0	945.6	209.4	219.2	214.3	113.9	118.7	116.3
IW/CPE 1.25	915.6	1068.8	992.2	224.3	233.1	228.7	114.3	124.1	119.2
SE	16.57	11.01		11.7	6.15		4.16	12.79	
CD (5%)	47.83	32.3		NS	NS		NS	NS	
Nitrogen levels									
100 kg.ha^{-1} N	731.0	923.8	927.4	198.4	212.9	205.7	108.0	113.0	110.5
150 kg.ha^{-1} N	800.8	998.1	899.5	205.3	217.6	211.5	110.9	119.1	115.0
200 kg.ha^{-1} N	882.1	1080.4	981.3	215.1	222.6	218.9	113.8	124.2	119.0
SE	14.38	9.54		10.13	5.32		3.60	11.07	—
CD (5%)	41.51	27.97		NS	NS		NS	NS	—

N.S. - Not significant

Table 3 : **Consumptive use and water use efficiency of sugarcane ratoon as influenced by different levels of irrigation and nitrogen application.**

Treatments	Consumptive water use (cm) 1982-1983	1983-1984	Mean	Water use efficiency (kg.ha mm) 1982-1984	1983-1984	Mean
Irrigation regimes						
IW/CPE 0.50	102.2	100.3	101.3	57.9	92.7	75.3
IW/CPE 0.75	148.6	132.7	140.7	54.3	73.8	64.1
IW/CPE 1.00	179.8	168.8	174.3	48.2	60.6	54.4
IW/CPE 1.25	210.6	200.9	205.8	43.5	53.1	48.3
Nitrogen levels						
100 kg.ha-1 N	151.2	140.3	145.8	48.3	65.8	57.1
150 kg.ha-1 N	158.3	149.2	153.8	50.6	66.4	58.5
200 kg.ha-1 N	171.4	162.6	167.0	51.05	66.8	59.2

Table 4. Juice quality characters of sugarcane ratoon as influenced by irrigation and nitrogen levels.

Treatments	Brix			Sucrose			Purity per cent		
	1982-1983	1983-1984	Mean	1982-1983	1983-1984	Mean	1982-1983	1983-1984	Mean
Irrigation regimes									
IW/CPE 0.50	18.4	19.2	18.8	15.28	15.76	15.72	82.5	82.3	82.5
IW/CPE 1.75	18.5	19.2	18.9	15.65	16.02	15.88	84.5	83.6	84.1
IW/CPE 1.00	18.4	19.5	18.9	15.40	16.07	15.74	83.4	82.5	83.0
IW/CPE 1.25	18.2	18.8	18.5	15.17	15.13	15.15	83.3	80.7	82.0
SE	0.24	0.19		0.27	0.15		0.98	0.81	
CD (5%)	N.S.	N.S.		N.S.	0.44		N.S.	N.S.	
Nitrogen levels									
100 kg.ha^{-1} N	18.7	19.3	19.0	15.72	16.19	15.96	84.0	84.1	84.1
150 kg.ha^{-1} N	18.6	19.4	19.0	15.67	15.95	15.81	84.2	82.4	83.3
200 kg.ha^{-1} N	17.8	18.8	18.3	14.73	15.09	14.91	82.2	80.3	81.3
SE	0.21	0.16		0.24	0.13		0.85	0.71	
CD (5%)	0.59	0.47		0.68	0.38		N.S.	2.08	