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RATOON MANAGEMENT OF DIFFERENT SUGARCANE (*SACCHRUM OFFICINARUM* L.) GENOTYPES UNDER VARIABLE WATER REGIMES

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Ratooning is an age old method of propagation in sugarcane in which subterranean buds on stubble-the part of cane left under ground after harvesting plant cane, gives rise to succeeding crop stand. Since more than 50 percent cane area in the country is covered under ratoons, even a small jump in productivity can make perceptible difference in the country's sugarcane production (Shahi, 2001). Earlier studies done in India indicated that varieties differed in their ratooning ability, medium and thin canes rationed relatively well as compared to thick soft canes and rations have better compensatory ability due to its larger numbers of tillers produced. The varieties, which require less water in the summer months, are most suitable under moisture stress conditions. The application of water on desired phase of growth is much important as farmers applying irrigation in the sugarcane on availability of irrigations from the source. The water requirement of sugarcane is very high and it accounts for nearly 30 per cent of the cane production cost. It is expected that by now nearly 80-85 per cent area of sugarcane to be irrigated but only 35 per cent area is under irrigation and remaining 65 per cent area is either unirrigated or grown under restricted supply of water. Singh and Kanwar (1964) observed that early variety could grow under restricted water supply but mid late needs more water. Majority of workers have concentrated mainly on scheduling irrigation either through day interval, available soil moisture or plant growth stages. Only limited information is available on scheduling irrigation in this crop based on IW/PAN-E approach that integrates soil-plant-atmospheric continues in a better way. Therefore, this experiment on ratoon management of sugarcane genotypes under variable water regimes was initiated during pre-monsoon period of spring planted sugarcane.

A field experiment was conducted during spring season of 1998-99 as can crop and allowed for ratoon in the month of February during 1999-2000 at the Indian Institute of Sugarcane Research, Lucknow in split plot design with three replications. The treatment comprised of three irrigation regimes (irrigation at IW/PAN-E-0.4 0.8 and 1.2) in main plot and eight genotypes (early group Cos 687, CoLk 9412, CoLk 9414 and LG 94184 and mid-late group CoS 767, CoLk 9606, CoLk 9618 and LG 94204) in sub-plot. The crop was fertilized with 200 kg N, 60 kg P_2O_5 and 60 kg K_2O/ha, respectively. Half dose of nitrogen, full dose of phosphorus and potash were applied as basal dressing and remaining ¼th was applied at tillering and ¼th at maximum grand growth period. Irrigation was based upon IW/PAN-E ratio, where IW refers to depth or irrigation water and PAN-E is the Cumulative Pan Evaporation minus rainfall since previous irrigation. The depth of irrigation was 8 cm. Gravimetric soil moisture content was determined at planting, before and after each irrigation and at harvest. All the agronomic and plant protection operations were carried out uniformly as and when required. The soil of experimental field was sandy loam having 7.45 pH, 266.0 kg/ha available nitrogen, 417.0 kg/ha available phosphorus and 334.0 kg/ha available potassium. The standard procedures were followed for soil chemical analysis. The bulk density of the soil was determined by core sampler method and constant infiltration rate by double ring infiltrometer. The moisture content of top layer (0-30 cm) soil at field capacity and permanent wilting point was 14.17 and 9.79 percent, bulk density at different depths were 1.47 gm/cc (0.15 cm) and 1.55 gm/cc (15-30 cm) and infiltration rate was 0.3 cm/hr, respectively. Five sugarcane plants were taken from each plot for juice analysis. The juice was analyzed for brix (soluble solids) using a Bausch and Lomb refractometer. After clarifying the juice, using lead sub acetate, the pol (juice sucrose concentration) was determined using polarimeter. The per cent sucrose in juice was computed using formula developed from sucrose tables and temperature brix correction tables.

Among genotypes, all the growth and developmental characters such as height of the plant, number of tillers, number of millable canes and commercial cane sugar were higher in mid late group as compared to early group of genotypes. Among mid late group of genotypes higher yield attributes were recorded in CoLk 9606 and found significantly superior over CoLk 9606, LG 94204 and CoS 767, where as among early groups of genotypes, maximum yield attributing characters were recorded in LG 94184 followed by CoLk 9412, CoLk 9414 and found significantly superior over CoS 687. Singh *et al.* (1998) also reported variation in cane yield in different genotypes of sugarcane due to yield attributing characters. Quality parameter such as brix (%), pol (%), purity (%) and sugar recovery (%) was higther in early group as compared to mid late groups of genotype and found significantly superior over each other (Tables 1 & 2).

It was evident from the result that there was significant variation among levels of irrigation and different genotypes on cane yield. Maximum cane yield was obtained at IW/PAN-E (1.2) followed by 0.8 and 0.4 and found significantly superior among each other (Table 1). The increase in cane yield in both the treatment over IW/PAN-E (0.4) was to the tune of 23 and 14%, respectively. The results are in the conformity with that of Singh and Kanwar, 1964. There was significant variation among genotypes at different levels of irrigation. Among the mid late group of genotypes, maximum cane yield was recorded CoLk 9618 followed by CoLk 9606 and found significantly superior over LG 94204 and CoS 767. The increase in cane yield over CoS 767 was to the tune of 43.0 and 39.0 and 14.0%, where as among the early group, maximum cane yield was recorded in LG 94184 and found significantly superior over CoLk 9412, CoLk 9414 and Cos 687, respectively. The increase in cane yield over check variety (CoS 687) was to the tune of 147.0, 79.0 and 30.0%, respectively. The interaction effects of levels of irrigation and genotypes were also significant.

Total water use and amount of irrigation during the year of experimentation (171.0 cm) was higher in case of IW/PAN-E ratio (1.2) followed by preceding levels of irrigation (IW/PAN-E ratio. 0.8 and 0.4). The results were in the conformity of results of Singh *et al.* 2001. It might be due to greater leaf area and higher dry matter production. Higher rate of water use per day was recorded in IW/PAN-E ratio (1.2), while the lowest rate was observed in IW/PAN-E ratio 0.8 & 0.4), respectively. WUE was influenced by the seasonal rainfall and number of irrigation

Table 1. Effect of levels of irrigation on Sugarcane genotype during 1999-2000

Treatments (m)	Height tillers	No. of Millable cane	No. of use (cm)	Water Yield (t/ha)	Cane (t/cm/ha)	WUE
Irrigation						
I_1 - IW/PAN-E (0.4)	2.01	366.63	99.81	131	51.75	0.39
I_2 - (IW/PAN-E (0.8)	2.08	377.21	99.30	155	59.43	0.38
I_3 - IW/PAN-E (1.2)	2.09	395.25	102.80	171	63.88	0.37
Genotypes (Early)						
CoS 687	1.21	143.00	67.31	158	27.57	0.17
Colk 9412	2.03	323.56	82.81	158	49.30	0.31
Colk 9414	1.57	291.89	76.21	158	35.97	0.22
LG 94184	2.26	556.89	130.72	158	68.29	0.43
Genotypes (Mid-late)						
CoS 767	1.99	423.00	97.06	158	57.42	0.36
Coll 9606	2.66	445.11	124.13	158	80.30	0.50
Coll 9618	2.40	472.00	118.33	158	82.20	0.52
LG 94204	2.40	386.00	107.80	158	65.79	0.41
C.D. for Interaction 5% (I)	N.S.	21.54	2.74	-	1.24	-
C.D. for Genotype 5% (G)	0.18	23.88		6.26	-	3.29
C.D. for Interaction 5% (I x G)	N.S.	N.S.	10.87	-	5.71	-

Table 2. Effect of levels of irrigation on quality characteristics of Sugarcane genotypes during 1999-2000

Treatments (m)	CCS (t/ha)	Brix (%)	Pol (%)	Purity (%)	Sugar Rec (%)
Irrigation					
I_1 - IW/PAN-E (0.4)	4.68	18.95	15.78	80.83	9.21
I_2 - (IW/PAN-E (0.8)	5.37	19.92	15.92	79.63	9.15
I_3 - IW/PAN-E (1.2)	5.99	19.45	16.22	81.25	9.41
Genotypes (Early)					
CoS 687	2.67	18.90	16.30	81.22	9.34
Colk 9412	4.61	20.02	16.33	79.56	9.49
Colk 9414	3.35	19.45	16.15	81.56	9.35
LG 94184	6.44	20.03	16.52	81.11	9.73
Genotypes (Mid-late)					
CoS 767	5.35	19.80	14.56	80.78	8.57
Colk 9606	7.25	18.94	15.96	80.33	9.13
Colk 9618	7.07	18.73	16.29	79.56	9.37
LG 94204	6.02	19.66	15.66	80.44	9.04
C.D. for Irrigation 5% (I)	0.83	0.44	N.S.	N.S.	N.S.
C.D. for Genotype 5% (G)	0.52	1.11	1.11	N.S.	3.09
5% (G) C.D. for Interaction 5% (I x G)	0.90	N.S.	N.S.	5.35	N.S.

applied. Water use efficiency was lower in higher irrigation regimes (IW/PAN-E-1.2). Highest WUE was observed in IW/PAN-E ratio 0.4 and 0.8 treatments in which lesser number of irrigations was applied. Similar results are reported by Singh *et al.*, 1997. It is interesting to note that WUE was more in mid-late group of genotype as compared to early groups. Among mid late groups. maximum WUE was recorded in CoLk 9606 and CoLk 9618, where as among early groups, WUE was more in LG 94184 and CoLk 9412, respectively (Table 1). There was significant variation among levels of irrigation and different genotypes on brix (%). Maximum brix was recorded at higher level (IW/PAN-E-1.2) of irrigation followed by preceding levels of irrigation. Pol (%) in juice, purity (%) and sugar recovery (%) were not affected due to different levels of irrigation. However, all the quality parameters responded to higher level of irrigation. maximum sugar yield was obtained at IW/PAN-E ratio of 1.2 and minimum at preceding lower levels bul could not reach to the level of significance. Singh *et al.* 2001 also observed the similar results. Among genotypes, sugar recovery was maximum in early groups as compared to mid-late and found significantly superior over each other. Among early groups, maximum sugar recovery was recorded in LG 94184 followed by CoLk 9414, CoLk 9412 and CoS 687, respectively. However, among mid-late groups, maximum sugar recovery was recorded in CoLk 9618 followed by CoLk 9606, LG 94204 and CoS 767, respectively (Table 2).

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