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Influence of potassium and irrigation regimes on sheath moisture, physiological parameters and cane yield

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Abstract: Experiments were conducted at Tamil Nadu Agricultural University, Coimbatore to study the effect of potassium and moisture regimes on sheath moisture, physiological parameters and cane yield. Four irrigation regimes and six levels of K application were accommodated in split plot design, replicated thrice. Results revealed that sheath moisture content was optimum with irrigation scheduled at 0.75 IW/CPE ratio during tillering and grand growth phase (I1). Even with restricted irrigation regimes, there was optimum sheath moisture index of 80 to 82 per cent at early growth phase, 80 per cent at grand growth phase and 77 to 78 per cent at ripening and maturity phases. Further reduction in irrigation level (I3), caused a reduction in sheath moisture content and cane yield. The results on physiological parameters of sugarcane revealed that irrigation scheduled at 0.75 IW/CPE ratio during tillering and grand growth phase (I1) recorded higher DMP and LAI. Under early drought conditions, application of 168 Kg K_2O / ha or application of 112 Kg K_2O ha^{-1} + 2.5 per cent foliar spray of KCl at 45, 75 and 105 DP recorded more dry matter production (DMP) and leaf area index (LAI).
(Key words : Sugarcane, Irrigation regimes, K application, Sheath moisture, Dry matter production, Leaf area index, Cane yield).

Sugarcane is an important cash crop in Tamil Nadu. The total consumptive use of water varies from 2000 to 2500 mm. Moisture variation during the crop period, adversely affected the growth and yield of sugarcane. Failure of monsoon and non- availability of water with increased atmospheric temperature aggravate the situation worse especially during hot summer. The degree of reduction in cane yield depends on the magnitude of drought and the stage at which the crop experience drought. According to Parthasarathy and Perumal (1976), the moisture index in the leaf sheath falls gradually from 85% to 80% when the crop is 6 to 8 months old. Sinha (1978) indicated the favourable effects of potassium application on leaf area and leaf sheath moisture under moisture stress conditions, which induced stomatal adjustments resulted in improvement in growth and yield. It has been estimated that about 250 t of water is required to produce one ton of dry matter (ICAR, 1987). Investigations carried out by a number of workers (Mohan Naidu *et al.* 1983) showed that moisture variation adversely affected the growth and yield of sugarcane. With limited scope for further exploitation and need for diversion of presently utilized irrigation water to the expanding industries and exploding population, there is greater urgency for its efficient use. Efficient water management has a decisive effect on the yield attributing characters like germination, tillering, cane height, leaf area, number of internodes as well as cane and sugar yields. (Chavan *et al.* 1980). The role of K in water relation is well recognized and late K application is being advocated to minimize the effect of moisture stress (Hunsigi, 1993). Sinha (1978) indicated the favourable effects of potash application on leaf area under moisture stress conditions, which induced stomatal adjustments, resulted in improvement in growth and yield. Hence the present study was undertaken to study the effect of K application and irrigation regimes on sheath moisture, physiological parameters like dry matter production and leaf area index and cane yield under early drought conditions.

Materials and Methods

Field experiments were conducted with early maturing short duration CV. Co. 8021 during 1993 (first plant cane) and 1993-94 (ratoon cane and second plant cane) at Tamil Nadu Agricultural University, Coimbatore to investigate the effect of K application and irrigation regimes on sheath moisture, physiological parameters and cane yield. The soil of the (first) experimental field was clay loam in texture, classified as fine,

Table 1. Sheath moisture (per cent) at 90, 135 DP and 180 DP

Treatments	90 DP			135 DP			180 DP		
	First plant cane	Ratoon crop	Second plant cane	First plant cane	Ratoon crop	Secon plant cane	First plant cane	Ratoon crop	Second plant cane
Irrigation regimes									
I1	84.55	85.72	85.30	84.44	86.32	84.31	84.61	86.75	86.15
I2	80.46	83.52	83.20	80.69	83.65	80.82	81.37	86.34	85.36
I3	77.77	83.78	83.37	76.78	83.40	80.56	77.47	84.71	84.73
I4	82.46	85.72	85.22	80.34	86.27	84.61	83.03	84.52	84.71
SE_d	0.023	0.680	0.683	0.152	0.560	0.443	0.070	0.492	0.643
CD	0.056	1.663	1.671	0.371	1.369	1.085	0.171	1.203	NS
K Application									
K1	81.54	84.70	84.21	80.18	84.95	82.85	82.06	85.54	85.22
K2	81.45	84.70	84.46	80.79	84.96	82.89	81.88	85.54	85.25
K3	81.26	84.69	84.22	81.08	84.96	82.69	81.18	85.99	85.32
K4	81.3 3	84.69	84.22	81.78	85.39	82.44	80.83	85.64	85.28
K5	81.51	85.03	84.23	81.78	84.86	82164	81.98	85.63	85.28
K6	80.76	84.30	84.30	77.79	84.33	81.93	81.78	88.16	85.04
SEd	0.726	0.644	0.664	0.76")	0.762	0.817	0.728	0.666	0.639
CD	NS	NS	NS	1.542	NS	NS	NS	NS	NS

(Interaction effect was not significant except in second plant cane at 45 DP; and in first plant cane at 90 and 135 DP)

Table 2. Sheath moisture (per cent) at 225 and 270 DP

Treatments	225 DP			270 DP		
	First plant cane	Ratoon crop	Second plant cane	First plant cane	Ratoon crop	Second plant cane
Irrigation regimes						
I1	82.48	81.74	81.46	78.32	78.82	76.39
I2	81.93	81.33	81.25	77.38	77.69	75.86
I3	78.16	81.46	81.31	76.29	77.48	75.97
I4	82.34	81.89	81.23	77.00	77.57	75.80
SE_d	0.078	0.351	0.051	0.308	0.384	0.414
CD	0.190	NS	0.124	0.754	0.940	NS
K Application						
K1	80.99	81.41	81.35	77.51	78.12	76.29
K2	81.49	82.00	81.31	77.42	78.17	76.36
K3	81.24	81.54	81.39	77.36	78.17	76.34
K4	81.31	81.54	81.36	76.77	78.18	76.22
K5	81.40	81.60	81.33	77.30	78.19	76.01
K6	80.94	81.54	81.14	77.13	76.52	74.81
SEd	0.473	0.681	0.040	0.412	0.890	0.698
CD	NS	NS	0.081	0.834	1.799	NS

(Interaction effect was not significant except in second plant cane at 225 DP; second plant cane)

Table 3. Dry matter production (t/ha) at 45, 90 and 135 DP

Treatments	45 DP			90 DP			135 DP		
	First plant cane	Ratoon crop	Second plant cane	First plant cane	Ratoon crop	Second plant cane	First plant cane	Ratoon crop	Second plant cane
Irrigation regimes									
I1	1.15	1.23	1.12	2.55	2.78	2.74	8.16	8.69	8.78
I2	1.07	1.21	1.04	2.41	2.70	2.62	8.05	8.52	8.38
I3	0.93	1.24	1.01	2.20	2.70	2.62	7.85	8.52	8.")9
I4	1.15	1.22	1.03	2.44	2.79	6.75	8.24	8.60	8.82
SE_d	0.006	1.005	0.006	0.011	0.014	0.019	0.020	0.045	0.013
CD	0.016	0.012	0.015	0.027	0.0')5	0.047	0.049	0.010	0.051
K application									
K1	1.04	1.23	1.03	2.35	2.76	2.69	7.96	8.65	8.53
K2	1.05	1.24	1.05	4.33	2.76	2.68	8.00	8.59	8.60
K3	1.10	1.24	1.05	2.44	2.76	2.69	8.10	8.58	8.60
K4	1.18	1.25	1.06	2.48	2.77	2.69	8.20	8.58	8.62
K5	1.12	1125	1.05	2.44	2.77	2.68	8.33	8.61	8.65
K6	0.96	1.12	1.05	2.32	2.63	2.66	7.86	8.48	8.57
SEd	0.006	0.011	0.012	0.012	0.021	0.023	0.023	0.077	0.075
CD	0.014	0.022	0.024	0.024	0.042	N S	0.047	N S	N S

(Interaction effect was not significant except in second plant cane at 45 DP; and in first plant cane at 90 and 135 DP)

montmorillonitic, isohyperthermic Ustropept. The soil was low in available N and high in available P and K. The same field was maintained for the ratoon cane without disturbing the layout. The second experimental field (second plant cane) soil was deep and sandy clay loam classified as Calcareous Vertic Ustropepts . It was low in available N, medium in available P and high in available K. Experiments were laid out in a split plot design, replicated thrice. Four irrigation regimes were accommodated in the main plots (0.75 IW/CPE ratio during tillering and grand growth period (I_1); 0.30 IW/CPE ratio during tillering and 0.75 IW/CPE ratio during grand growth period (I_2); 0.30 IW/CPE ratio during tillering and grand growth period (I_3); 0.75 IW/CPE ratio during tillering and 0.30 IW/CPE ratio during grand growth period (I_4). These main plot treatments were super imposed with six levels of K application (112 kg K_2O/ha in three equal splits at 30,60, and 90 DP (Days after Planting) (K_1); 56 kg K_2O/ha at 30 DP and 56 kg K_2O/ha around 60,90 and 120 DP(K_2); 56 kg K_2O /ha at 30 DP and 84 kg K_2O /ha around 60,90 and 120 DP (K_3); 56 kg K_2O/ha at 30 DP and 112 kg K_2O / ha around 60,90 and 120 DP (K_4); K_1 + 2.5 per cent KCl spray given at 45,75 and 105 DP (K_5) and no K application (K_6). Healthy two budded setts were prepared using sharp knife. The cut ends were treated with 0.05 per cent carbendazim for 15 minutes. A seed rate of 75,000 two budded setts ha^{-1} was used for planting. Ratoon cane was maintained after harvesting of first plant cane, without disturbing the layout used for first plant cane, in the subsequent season, after removing the cane trashes from the field. Nitrogen as urea and phosphorus as single super phosphate were applied at the rate of 225: 62.5 kg /ha respectively. Full dose of P was applied basally by placement at the time of planting along the furrows. N was applied in three equal splits around 30, 60 and 90 days after planting, followed by irrigation. K as Muriate of Potash was applied as per the treatment schedule. Totally 21 irrigation for first plant cane, 24 irrigation for ratoon and 23 irrigation for second plant cane were given. The sheath moisture content was recorded from 90 to 270 DP at 55 days interval. Leaf sheath samples from the third to sixth visible dewlap were removed from three plants at random from each treatment at different stages of crop growth and their total fresh weight were recorded immediately using chemical balance. Then they were dried to a constant weight at 60°C ± 5°C in an air oven and dry weight was recorded. The loss of moisture was reported as percent leaf sheath moisture on the basis of fresh weight. Destructive plant samples were separated into stem, sheath and leaf, and fresh weight was recorded. Samples were chopped into small pieces separately and air-dried first and then oven dried at 60°C till constant weight was obtained. Oven dry weight of each sample was determined and total DMP (t/ha) was calculated. The leaf area of the third leaf from the top was taken as the index leaf in the main stem. Leaf length and maximum width were measured and leaf area was calculated using the method:

Leaf area = Length x maximum width x 0.6274.

LAI was worked out using the formula,

LAI = Total leaf area (cm^2) / Unit land area (cm^2)

Results and Discussion

Sheath moisture

Sheath moisture index is the moisture content of leaf sheath expressed as percentage of green weight. An understanding of the moisture relations of the cane is essential to crop control, since water is the dominant component of the plant and of the control system (Clements and Kubata, 1942). In this experiment, sheath moisture content was optimum with irrigation scheduled at 0.75 IW/CPE ratio during tillering and grand growth phase (I1) (Table 1 and 2). Even with restricted irrigation regimes, there was optimum sheath moisture index of 80 to 82 per cent at early growth phase, 80 per cent at grand growth phase and 77 to 78 per cent at ripening and maturity phases. Thus adequate supply of moisture to meet the demand of water by cane

Table 4. Dry matter production (t ha^{-1})) at 180 DAP

Treatments	K1	K2	K3	K4	K5	K6	Mean
First plant cane (1993)							
I1	5.53	5.60	5.06	5.62	5.82	5.61	5.64
I2	15.45	15.56	15.62	15.61	15.62	15.28	15.52
I3	13.46	13.25	13.51	13.56	13.48	13.48	13.46
I4	13.71	13.59	13.79	13.88	13.96	13.71	13.77
Mean	14.54	14.50	14.65	14.67	14.72	14.52	
Ratoon crop (1993-94)							
I1	16.09	16.07	16.06	16.10	16.08	5.72	16.02
I2	16.03	16.05	16.06	16.06	16.07	15.74	16.00
I3	15.87	15.86	15.87	15.89	15.88	15.34	15.79
I4	15.98	15.98	16.03	16.04	16.04	15.68	15.96
Mean	15.99	15.99	16.01	16.02	16.02	15.62	
Second plant cane (1993-94)							
I1	16.40	16.43	16.45	16.35	16.42	5.09	16.19
I2	15.66	15.65	15.67	15.75	15.71	15.18	15.60
I3	15.55.	15.55	15.35	15.55	15.58	14.73	15.39
I4	16.26	16.32	16.30	16.32	16.35	15.32	16.14
Mean	15.97	15.99	15.94	15.99	16.02	15.08	

	First plant cane		Ratoon crop		Second plant cane	
	SE_d	CD	SE_d	CD	SE_d	CD
Source	0.049	0.120	0.018	0.044	0.088	0.216
	0.128	0.258	0.010	0.021	0.114	0.230
I at K	0.238	0.485	0.026	0.058	0.226	NS
K at I	0.255	0.515	0.020	0.041	0.228	NS

Table 5. Dry matter production (t ha^{-1})) at 225 and 270 DP and harvest

Treatments	225 DP			270 DP			Harvest		
	First plant cane	Ratoon crop	Second plant cane	First plant cane	Ratoon crop	Second plant cane	First plant cane	Ratoon crop	Second plant cane
Irrigation regimes									
I1	24.59	24.32	22.53	31.81	30.53	29.22	32.82	33.18	32.68
I2	24.06	24.25	21.86	31.42	30.70	29.19	30.61	32.13	31.67
I3	22.25	22.15	20.63	29.51	28.06	27.17	28.65	31.19	30.07
I4	21.99	22.11	21.85	29.46	29.25	28.89	31.11	32.00	32.32
SEd	0.148	0.238	0.122	0.063	0.140	0.221	0.444	0.216	0.204
CD	0.363	0.582	0.298	0.154	0.342	0.541	1.086	0.530	0.499
K Application									
K1	23.19	23.21	21.72	30.58	29.82	28.78	30.92	32.34	31.51
K2	23.23	23.32	21.70	30.59	29.82	28.76	30.73	32.15	31.52
K3	23.53	23.22	21.67	30.50	29.98	28.89	31.05	32.35	31.58
K4	23.53	23.23	21.72	30.82	29.85	28.69	30.97	32.36	31.86
K5	23.43	23.15	21.72	30.80	29.70	28.73	31.58	32.38	31.70
K6	22.41	23.20	21.76	29.99	28.64	27.85	29.54	31.72	30.')0
SEd	0.314	0.176	0.201	0.423	0.243	0.271	0.444	0.249	0.272
CD	0.634	NS	NS	NS	0.491	0.549	0.898	NS	0.549

(Interaction effect was not significant)

Table 6. Leaf area index at 45, 90, 135 and 180 DP

Treat-ments	45 DP			90 DP			135 DP			180 DP		
	First plant cane	Ratoon crop	Second plant cane	First plant cane	Ratoon crop	Second plant cane	First plant cane	Ratoon crop	Second plant cane	First plant cane	Ratoon crop	Second plant cane
Irrigaion regimes												
I1	1.35	1.32	1.15	1.80	1.83	1.76	2.51	2.63	3.11	3.30	3.74	3.81
I2	1.28	1.32	1.13	1.75	1.75	1.71	2.45	2.52	3.08	3.29	3.70	3.75
I3	1.26	1.31	1.09	1.70	1.74	1.69	2.42	2.52	3.08	3.15	3.67	3.70
I4	1.33	1.32	1.13	1.77	1.82	1.74	2.49	2.61	3.11	3.25	3.70	3.82
SEd	0.004	0.005	0.114	0.007	0.010	0.014	0.001	0.012	0.016	0.015	0.034	0.030
CD	0.010	NS	NS	0.016	0.025	0.035	0.004	0.029	NS	0.036	NS	0.073
K Application												
K1	1.28	1.33	1.14		1.79	1.73	2.44	2.58	3.10	3.25	3.71	3.79
K2	1.30	1.31	1.14	1.73	1.79	1.73	2.46	2.57	3.10	3.27	3.72	3.78
K3	1.31	1.32	1.14	1.76	1.79	1.73	2.48	2.58	3.10	3.25	3.71	3.78
K4	1.34	1.32	1.15	1.80	1.79	1.72	2.50	2.59	3.10	3.26	3.71	3.77
K5	1.33	1.33	1.12	1.79	1.80	1.74	2.49	2.59	3.11	3.26	3.72	3.78
K6	1.26	1.30	1.06	1.70	1.76	1.70	2.42	2.52	3.08	3.21	3.66	3.74
SEd	0.004	0,013	0.137	0.017	0.011	0.014	0.022	0.020	0.022	0.026	0.036	0.031
CD	0.008	N S	N S	0.035	N S	N S	0.044	0.040	N S	N S	N S	N S

(Interaction effect was not significant except at 45 DP in first plant cane)

Table 7. Leaf area index at 225, 270 DP and harvest.

Treatments	225 DP			270 DP			Harvest		
	First plant cane	Ratoon crop	Second plant cane	First plant cane	Ratoon crop	Second plant cane	First plant cane	Ratoon crop	Second plant cane
Irrigation regimes									
I1	3.83	4.00	3.77	3.50	3.45	3.35	3.21	3.12	3.17
I2	3.80	3.70	3.95	3.51	3.40	3.38	3.16	3.09	3.11
I3	3.62	3.71	3.74	3.32	3.34	3.29	3.16	3.10	3.08
I4	3.70	3.71	3.76	3.42	3.40	3.33	3.20	3.10	3.11
SEd	0.023	0.204	0.020	0.006	0.020	0.012	0.004	0.012	0.018
CD	0.056	0.499	NS	0.014	0.048	0.030	0.010	NS	0.044
K Application									
K1	3.75	4.13	3.77	3.45	3.42	3.34	.18	3.09	3.12
K2	3.77	.3.71	3.76	3.47	3.41	3.35	3.18	3.09	3.12
K3	3.75	3.72	3.76	3.43	3.40	3.35	3.19	3.12	3.12
K4	3.76	3.72	3.76	3.47	3.40	3.35	3.19	3.10	3.13
K5	3.75	3.71	3.75	3.44	3.41	3.36	3.20	3.10	3.14
K6	3.64	3.70	3.74	3.37	3.36	3.27	3.16	3.08	3.07
SEd	0.030	0.243	0.031	0.009	0.024	0.029	0.003	0.030	0.020
CD	0.061	0.491	NS	0.018	NS	NS	0.005	NS	0.041

(Interaction effect was not significant except at 270 DP and at harvest in first plant)

was ensured even at these levels. Halias (1951) considered leaf sheath moisture index of 85 per cent for the first six months with gradual fall to 73 per cent at harvest was ideal. Adequate irrigation provided in I_1 would have resulted in increasing the uptake of moisture and thus maintaining the required leaf sheath moisture at all the growth phases. Maintaining the leaf sheath moisture at 80 to 86 percent in the formative phase in I_2 and I_4 probably resulted in better cane growth as reflected in increased cane elongation; at 80 to 82 percent at grand growth phase leading to higher cane thickness and internode elongation and at 76 to 78 percent at maturity phase resulting in higher cane yield and better sugar accumulation. Srinivasan and Mariakulandai (1972) stated that the sheath moisture content of 74 to 76 per cent was optimum, obtainable by irrigation at wilting point during maturity phase.

Dry matter production

Cane dry matter production was influenced by irrigation levels at all stages of observations. Dry matter production increased rapidly in the early period and the rate of increase decreased at later growth periods. Irrigation scheduled at 0.75 IW/CPE ratio during tillering and grand growth period (I_1) had a favourable influence on DMP at all stages, in all the three canes, compared to other irrigation levels (Table 3-5). There was a reduction in DMP in I3 irrigation regime (0.30 IW/CPE ratio during tillering and grand growth period). Soil moisture stress during the early growth phase retarded the growth and reduced the DMP. The water consumption by cane in relation to DMP varied greatly with levels of moisture maintained at different growth stages (Prasad, 1976). Levels and mode of K application influenced DMP only in same stages of the crop growth over no K application. The interaction effect between irrigation regimes and K application was significant only on 90, 135 and 180 DP in the first plant cane, 180 DP in ratoon and 45 DP in second plant cane. Among the K levels, application of 168 Kg K_2O ha^{-1} or 112 Kg K_2O ha^{-1} + 2.5% KCl spray recorded more DMP than other levels. The plant under water stress condition, when sprayed with

Table 8. Cane yield (t ha^{-1})

Treatments	K_1	K_2	K_3	K_4	K_5	K_6	Mean
Plant cane (1993)							
I_1	120.6	122.7	125.2	128.1	120.9	114.3	121.9
I_2	114.9	115.5	116.8	116.2	118.3	109.6	115.3
I_3	109.8	110.3	110.5	111.1	114.8	101.6	109.7
I_4	119.4	119.5	120.8	121.3	123.5	110.6	119.2
Mean	116.2	117.0	118.3	119.2	119.5	109.1	
Ratoon cane (1993-94)							
I_1	116.3	115.4	117.1	115.8	116.7	112.1	115.6
I_2	111.0	110.7	111.8	111.2	110.9	108.0	110.6
I_3	108.9	109.0	109.3	110.1	110.4	104.8	108.8
I_4	113.1	114.1	112.8	114.0	114.3	108.7	112.8
Mean	112.3	112.3	112.8	112.8	113.1	108.4	
Plant cane (1993-94)							
I_1	107.8	106.8	106.3	109.6	107.2	101.8	106.6
I_2	101.4	100.0	99.7	101.8	101.8	97.2	100.3
I_3	97.9	99.3	99.3	00.0	101.5	95.1	98.9
I_4	101.8	101.9	100.8	102.1	102.0	98.1	101.1
Mean	102.2	102.0	101.5	103.4	103.1	98.1	

Source	Plant cane (1993)		Ratoon		Plant cane (1993-94)	
	SEd	CD	SEd	CD	SEd	CD
I	0.258	0.630	0.698	1.709	0.303	0.741
K	0.911	1.841	0.870	1.757	0.554	1.120
I at K	1.683	3.478	1.734	NS	1.056	NS
K at I	1.822	3.682	1.739	NS	1.108	NS

KCl, recovered their turgidity as well as nitrate reductase activity with in one hour thereby indicating that K might have an indirect effect on plant metabolic processes (Rajagopal *et.al.*, 1977).

Leaf area index

The leaf area index recorded on 90,180, 270 DP and at harvest was conspicuously influenced by irrigation regimes in all the three canes. Irrigation scheduled at 0.75 IW/CPE ratio during tillering and grand growth phase (I_1) recorded higher leaf area (Table 6 & 7). The increase in leaf area was due to adequate availability of soil moisture in I_1 regime that helped the crop to take up higher quantity of nutrients needed for growth. This resulted in greater leaf area under adequate irrigation. Similar result was reported by Barnes (1964). Increase in leaf area was brought about by increase in length and breadth of the cane leaves as a result of higher moisture levels (Singh 1972 and Singh, 1977). The leaf area index enhanced with crop growth under normal irrigation, while drought caused reduction in leaf area.

Cane yield

Cane yield was greatly influenced by irrigation levels and mode of K application in all the three canes. Highest cane yield was recorded with irrigation scheduled at 0.75 IW/CPE ratio during tillering and grand growth period (I_1). Desirable plant water relations maintained in the irrigation regime I_1 contributed to increased cane yield. Reduction in irrigation level (I_3), caused a reduction in sheath moisture content and cane yield. Sheath moisture at all stages had very strong positive correlation with cane yield. Reduction in cane yield recorded with restricted irrigation regime of I3 was probably due to five percent reduction in sheath moisture content at formative and grand growth phases resulting in poor tillering and reduced NMC with lighter canes. (Table 8). Among the K levels, K5 (112 kg K_2O ha^{-1} + 2.5 per cent KCl spray given at 45, 75 and 105 DP recorded higher cane yield than other treatments. This might be due to the fact that the foliar KCl spray reduced the transpiration loss and obtained the turgidity of plant cells, even when K supply from the soil, and through fertilizer and irrigation water was adequate.

From this experiment, it is suggested that sheath moisture content was optimum with irrigation scheduled at 0.75 IW/CPE ratio during tillering and grand growth phase (I_1). Even with restricted irrigation regimes, there was optimum sheath moisture index of 80 to 82 per cent at early growth phase, 80 per cent at grand growth phase and 77 to 78 per cent at ripening and maturity phases. Further reduction in irrigation level (I3), caused a reduction in sheath moisture content and cane yield. The results on physiological parameters of sugarcane revealed that irrigation scheduled at 0.75 IW/CPE ratio during tillering and grand growth phase (I1) recorded higher DMP and LAI. Under early drought conditions, application of 168 Kg K_2O / ha or application of 112 Kg K_2O ha^{-1} + 2.5 per cent foliar spray of KCl at 45, 75 and 105 DP recorded more dry matter production (DMP), leaf area index (LAI) and cane yield.

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