

EFFECT OF IRRIGATION SCHEDULING, METHODS OF IRRIGATION AND NITROGEN LEVELS ON GROWTH ANALYSIS PARAMETERS OF MAIZE

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ABSTRACT

The results of the field experiments conducted during Kharif and Rabi 1989-1990 on Co₁ maize revealed that irrigation based on 0.75 IW/CPE ratio with all furrow method of 'irrigation' and application of 175 Kg/ha recorded the highest LAI, CGR, NAR and yield of maize.

INTRODUCTION

Maize responds relatively better to management factors especially irrigation and nitrogen (Prasad et.al., 1987). Most of the work on irrigation is based on either critical growth stages (or) soil moisture depletion without incorporating climatic parameters. The IW/CPE ratio approach for scheduling irrigation takes these parameters into consideration. The role of different irrigation methods and N levels with varying moisture regimes in crop production needs to be studied and with this background, the present experiment was planned to determine the irrigation scheduling, method of irrigation and N requirement of maize on growth analysis parameters and yield.

MATERIALS AND METHODS

Field experiments were conducted at Tamil Nadu Agricultural University, Coimbatore in Kharif 1989 and rabi 1989-90. The soil was sandy clay loam with pH 7.9 and contained 198, 18, 535

kg/ha of available N, P₂O₅ and K₂O respectively. The field capacity, permanent wilting point, bulk density were 23%, 12.5% and 1.32 g/cc respectively. The treatments comprised of two levels of irrigation (0.50 (I₁) and 0.75 (I₂) IW/CPE ratio) three methods of irrigation (All furrow (S₁), alternate furrow (S₂) and paired skip furrow (S₃) methods) and three levels of N (75(N₁), 125 (N₂) and 175 kg N/ha (N₃)) laid out in a split plot design with three replications. A uniform basal dose of 62.5 kg P₂O₅ and 50 kg K₂O ha was applied at sowing. Maize variety Co₁ was sown on 1-7-1989 and 2-12-1989 and was harvested on 23-10-1989 and 27-3-1990 in Kharif 1989 and rabi 1989-1990 respectively. CGR was calculated based on the formula suggested by Buttery (1970) and RGR and NAR were calculated as suggested by Enyi (1962).

RESULTS AND DISCUSSION

Influence of treatments on growth analysis parameters and yield were presented in Table 1 and 2 for Kharif and Rabi seasons. The crop growth rate (CGR), relative growth rate (RGR), net assimilation rate (NAR) and leaf area index (LAI) were increased upto 60 days after sowing thereafter these components tend to decrease marginally. There was significant increase in growth analysis with the increase in the level of irrigation and N. Maximum values were recorded when irrigation was scheduled at Table 1.

Influence of treatments on CGR and RGR of maize
IW/CPE ratio of 0.75. Among the methods of irrigation the values were maximum at all furrow method. Higher CGR, RGR, NAR and LAI might be due to the higher values of all growth components under 0.75 IW/CPE ratio (I₂). Adequate moisture supply increased the growth characters of maize in both the Kharif and rabi seasons (Subramanian, 1977; and Thiagarajan, 1981). Among the N levels the values were maximum at 175 kg N ha⁻¹. The increase in growth analysis components in presence of adequate moisture and N

Treatments	CGR g m ⁻² day ⁻¹				RGR g g ⁻¹ day ⁻¹			
	Kharif		Rabi		Kharif		Rabi	
	30-60 DAS	60-Harvest	30-60 DAS	60-Harvest	30-60 DAS	60-Harvest	30-60 DAS	60-Harvest
Irrigation								
I ₁	22.50	11.72	22.72	13.85	0.0357	0.0045	0.0383	0.0052
I ₂	24.15	11.79	24.61	13.90	0.0364	0.0055	0.0394	0.0065
SE	0.02	0.02	0.05	0.01	0.0001	0.0001	0.0001	0.0001
CD	0.60	0.06	0.17	0.04	0.0002	0.0001	0.0002	0.0002
Method of irrigation								
S ₁	23.65	11.81	24.00	13.97	0.0362	0.0052	0.0392	0.0061
S ₂	23.63	11.80	23.89	13.96	0.0361	0.0051	0.0390	0.0060
S ₃	22.71	11.74	23.10	13.70	0.0357	0.0047	0.0385	0.0057
SE	0.02	0.01	0.07	0.01	0.0001	0.0001	0.0002	0.0001
CD	0.07	0.05	0.21	0.04	0.0003	0.0002	0.0003	0.0003
N levels								
N ₁	22.77	11.73	23.06	13.81	0.0356	0.0044	0.0385	0.0055
N ₂	23.50	11.78	23.78	13.87	0.0362	0.0051	0.0390	0.0058
N ₃	23.72	11.78	24.16	13.93	0.0365	0.0056	0.0392	0.0063
SE	0.03	0.01	0.09	0.01	0.0001	0.0001	0.0001	0.0001
CD	0.08	0.04	0.26	0.04	0.0002	0.0003	0.0002	0.0003

Table 2 Influence of treatments and NAR, LAI and yield of maize

Treatments	NAR g cm ⁻² day ⁻¹				LAI		Yield (Kg/ha ⁻¹)	
	Kharif		Rabi		Kharif	Rabi	Kharif	Rabi
	30-60	60-Harvest	30-60	60-Harvest				
Irrigation:								
I ₁	0.770	0.166	0.627	0.141	3.89	4.79	3898	3922
I ₂	0.875	0.195	0.701	0.189	4.77	5.62	4680	4792
SE	0.004	0.001	0.011	0.001	0.01	0.02	12	18
CD	0.013	0.004	0.035	0.004	0.03	0.06	38	54
Method of Irrigation:								
S ₁	0.861	0.194	0.703	0.185	4.56	5.38	4428	4553
S ₂	0.821	0.176	0.656	0.157	4.40	5.37	4396	4448
S ₃	0.787	0.171	0.633	0.154	4.02	4.86	4044	4070
SE	0.005	0.002	0.014	0.001	0.01	0.01	12	21
CD	0.021	0.005	0.043	0.004	0.03	0.08	36	62
N levels:								
N ₁	0.781	0.169	0.631	0.160	3.95	4.91	3960	4054
N ₂	0.813	0.175	0.665	0.163	4.39	5.25	4348	4389
N ₃	0.874	0.197	0.702	0.173	4.65	5.44	4560	4627
SE	0.004	0.001	0.013	0.001	0.02	0.01	22	41
CD	0.010	0.004	0.038	0.002	0.07	0.04	68	124

may be due to rapid cell-division and elongation (Danmead and Shaw, 1960). Highest grain yield was recorded at 0.75 IW/CPE ratio (I₂) with all furrow method of irrigation (S₁) and with 175 kg N ha⁻¹ (N₃). The rate of increase under 0.75 IW/CPE ratio (I₂) over 0.50 IW/CPE ratio (I₁) was 20.06 and 22.18 per cent during Kharif and rabi seasons respectively. Increased yield under 0.75 IW/CPE ratio (I₂) may be due to proper allocation of assimilates to satisfy the potential sink capacity resulting from

more amount of moisture. Similar results have been obtained by Harold (1984) and Karlen and Camp (1985). Application of less amount of water which led to competition between plants resulted in lowest yield attributes under skip furrow method of irrigation (Balaswamy et.al., 1986). Application of 75 kg N/ha recorded lowest yield due to less availability of nutrients to the crop plants. N deficiencies can alter the physiological response of maize crop (Radin et.al., 1985).

Total water used under I₂S₁N₃ combination was highest for both Kharif and Rabi seasons (553.6 and 529.2 mm for Kharif and Rabi respectively). Average water requirement under all furrow method is 495 mm and 464 mm for Kharif and Rabi respectively, whereas it is only 368 mm and 317 mm

under alternate furrow method of irrigation. Here it is evident that there is not much difference between all furrow and alternate furrow method of irrigation even though the water requirement for alternate furrow method of irrigation is 60-70 per cent of the all furrow method of irrigation.

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