Madras Agric. J. 88(7-9): 367-370 July-September 2001
https://doi.org/10.29321/MAJ.10.A00345

Effect of irrigation regimes and nitrogen levels on growth, yield and quality of baby corn

S.D. SUNDAR SINGH
Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore - 641 003, Tamil Nadu.

Abstract : Field experiments were conducted at Tamil Nadu Agricultural University during summer and *kharif*, 1997 to study the effect of irrigation regimes nitrogen levels and their interaction on baby corn. Three levels of irrigation regime *viz.* irrigation at 0.50, 0.75 and 1.00 IW/CPE ratio were assigned to main plots and five levels of N *viz.* 60, 90, 120, 150 and 180 Kg ha^{-1} were allotted to sub-plots. All the treatments were replicated thrice. Different irrigation regimes and N levels exerted favorable influence on plant height and dry matter production. These parameters were increased with higher soil moisture regime of 1.00 IW/CPE ratio coupled with application of 150 Kg N ha^{-1}. The yield attributes *viz.* number of cobs per plant and young cob yield were higher with irrigation scheduled at 1.00 IW/CPE ratio along with N at 150 Kg ha^{-1}. Similar trend was also observed in the case of stover yield and crude protein. However no significant effect was recorded on Vitamin C content. The total water used was higher under irrigation at 1.00 IW/CPE ratio whereas the water use efficiency was higher at 0.50 IW/CPE ratio. The interaction effect between irrigation regimes and N levels was significant for all the growth and yield parameters. *(Key words : Baby corn, Irrigation regime, Nitrogen levels, Water requirement, Water use efficiency).*

Maize is the most widely cultivated cereal crop in the world after wheat and rice. A recent development in maize is of harvesting maize as young and tender cobs for vegetable purpose. Already this crop has been developed into a multi dolor business in foreign countries because of its potential as a value added product for export and a good food substitute. In India it is gaining importance under commercial agriculture. Adequate experiments have been conducted on water requirement and quality aspects on grain maize; however, only a few have been attempted on baby corn. Hence, the present investigation was carried out to study the effect of irrigation regimes and nitrogen levels on yield and quality of baby corn.

Materials and Methods

Field experiments were carried out for two seasons *viz.* summer and *kharif* in 1997. The soil of the experimental field was well drained, sandy clay loam in texture with a bulk density of 1.15 cm. The field capacity and permanent wilting point were 24 and 10 percent respectively; the pH was 7.6 and EC remained at 0.75 ds/m. The soil was low in available nitrogen (210 Kg ha^{-1}), medium in available phosphorous (15 Kg ha^{-1}) and high in available potassium (410 Kg ha^{-1}).

The experiments were laid out in split plot design with three replications. The main plot treatments comprised of three irrigation regimes *viz.*, 0.50, 0.75 and 1.00 IW/CPE ratio (11, 12, 13 respectively) with 5.0 cm depth of water. Five levels of nitrogen (60, 90, 120, 150, 180 Kg ha^{-1}) were assigned to the sub-plots. Nitrogen was applied at 50% as basal and the remaining 50% was applied at 20 days after sowing (DAS). The phosphorous and potassium were applied in full dose at 62.5 and 50.0 Kg ha^{-1} respectively as basal at sowing. Baby corn seeds were sown on 02.01.1997 and 04.08.1997 for summer and *kharif* seasons respectively. Irrigation was scheduled when the cumulative pan evaporation (CPE) reached the level of 50, 67 and 100 mm in the case of IW/CPE ratio of 1.00, 0.75 and 0.50 respectively. The irrigation water was measured through 7.5 cm size Parshall flume. The young cob was harvested on 60, 62 and 64 DAS and thus there were three harvests in summer and *kharif* seasons.

Results and Discussion

Plant height

Plant height recorded at harvest, revealed that there was significant difference between irrigation regimes and N levels during both summer and *kharif* seasons. Irrigation scheduled at 1.0 IW/CPE ratio produced taller plants than that at 0.75 and 0.50 ratios. With regard to N levels in summer season, there was a significant increase in plant height to every increment dose of N upto 150 Kg ha^{-1}. Through higher plant height was observed under N at 180 Kg ha^{-1}; it was

comparable with N at 150 Kg ha^{-1}. However, in *kharif* season, the significant difference in plant height was observed only upto 120 Kg ha^{-1}, since the plant height at 120 Kg ha^{-1} was on par with 150 and 180 Kg ha^{-1} (Table 1). It may be attributed that due to increased frequency of irrigation and increase in water supply under 1.0 IW/CPE ratio might have led to the effective uptake of nutrients particularly the nitrogen and resulted in higher plant height. The interaction between irrigation and N was significant during both the seasons. Irrigation scheduled at 1.0 IW/CPE ratio along with N at 180 Kg ha^{-1} increased the plant height to the maximum level but was comparable with I_3N_4 in summer and I_3 N_3 and I_3N_4 in *kharif*.

Dry matter production

Baby corn exhibited significant response to irrigation regimes in the total biomass production. Because the DMP is the cumulative effect of all other growth and yield parameters which responded to the treatment effect appreciably. Therefore, irrigation at higher regime (1.0 IW/CPE ratio) has produced distinctly higher DMP than at other lower moisture regimes *viz.*, 0.75 and 0.50 ratios. This trend was observed in both summer and *kharif* seasons. The N levels recorded significant increase in DMP upto 150 Kg ha^{-1} but it was comparable with 180 Kg ha^{-1}. The same trend was observed in both the seasons. Improvement in DMP at increased N level might have improved the metabolic activities contributing to the higher DMP. The above results on plant height and DMP were agreeable with the findings of Banga *et al* (1994).

Number of cobs per plant

The number of young cobs per plant as influenced by irrigation regimes and N levels showed that the higher moisture regime of 1.0 IW/CPE ratio has proved its supremacy to produce the maximum number of young cobs per plant *viz.*, 3.78 and 3.69 in summer and *kharif* season respectively. With regard to N levels the response during summer was significant upto 150 Kg ha^{-1} whereas it was only upto 120 Kg ha^{-1} in kharif as evidenced in Table 1.

Yield of young cob and stover

The yield of young cob and stover were favourably increased under higher irrigation regime of 1.0 IW/CPE ratio, recording 5074 and 4855 kg of young cob and 27967 and 25865 kg of stover per hectare (Table 2) during summer and *kharif* respectively. The favourable moist environment in the root zone and the positive contribution by the yield attributes under higher moisture regime have resulted in higher yield. With respect to nitrogen levels, significant yield increase of both young cob and stover was recorded upto 150 Kg N ha^{-1} and it was found comparable with 180 Kg N ha^{-1} and thereby indicating the sufficiency of 150 Kg N ha^{-1}. Similar results were reported by Thakur *et al.* (1995). The interaction between irrigation and N levels exhibited marked influence on young cob yield in both the seasons. Irrigation at 1.0 IW/CPE ratio coupled with 180 Kg N ha^{-1} recorded the highest yield which in turn was found to be comparable with I_3 N_4 treatment in both the seasons.

Quality of baby corn

Crude protein content

The crude protein content of the young cob was significantly influenced by the irrigation regimes tried during both the seasons (Table 2). Irrigation scheduled at 1.0 IW/CPE ratio recorded significantly higher level of protein than at 0.75 and 0.50 ratios. The higher crude protein content under 1.0 IW/CPE ratio might be due to more production and translocation of assimilates to the sink. With respect to N levels, application of both 150 and 180 Kg N ha^{-1} were found to yield comparable amount of crude protein and thus indicated the sufficiency of 150 Kg N ha^{-1}. The other N levels tried resulted significantly lower crude protein. This might be attributed to the maximum total N content accumulated and extended benefit with congenial biochemical relations at higher N levels as reported by Kamalakumari and Singaram (1996).

Vitamin C Content

Both irrigation and N levels had no significant effect on Vitamin C content of baby corn during both the seasons (Table 2). Vitamin C content is a genetic factor; but in most cases excess N and water increased the concentration of NO_3 in plants, leading to decrease the ascorbic acid content in plants. This is confirmative with Mozafar (1993).

Water requirement and water use efficiency

During summer season, there was a rainfall of 2 mm only whereas that during kharif season was 33 mm. The number of irrigation given under 0.50, 0.75 and 1.0 IW/CPE ratios were 4, 5 and 7 during summer and 4, 7 and 8 during

kharif respectively. Irrigation data on different treatments revealed that the total water used under the irrigation schedule of 1.0 IW/CPE ratio was 352 and 433 mm during summer and *kharif* respectively, which was higher than 0.50 and 0.75 ratios. The interval between two successive irrigations was in the order of 18, 12 and 9 days for summer and 15, 11 and 8 days for

Table 1. Effect of irrigation regimes and N levels on growth and yield attributes of baby corn

Treatments	Plant height at harvest (cm)		DMP (Kg ha^{-1})		No. of cobs per plant	
	Summer	*Kharif*	Summer	*Kharif*	Summer	*Kharif*
Irrigation regime (IW/CPE ratio)						
0.50	213.0	206.6	11,101	10,364	2.99	2.91
0.75	226.0	222.3	12,404	12,144	3.67	3.54
1.00	231.0	227.9	13,500	12,716	3.78	3.69
CD = (P=0.05)	4.9	4.8	283	168	0.03	0.04
Nitrogen levels (Kg ha^{-1})						
60	211.0	223.2	10,260	10,883	2.97	3.06
90	220.0	230.0	11,738	11,796	3.37	3.48
120	225.1	236.7	12,550	12,607	3.63	3.69
150	229.6	237.9	13,070	13,118	3.72	3.70
180	231.2	239.7	13,224	13,279	3.74	3.69
CD = (P=0.05)	2.1	6.2	317	255	0.09	0.10

Table 2. Effect of irrigation regimes and N levels on yield and quality of baby corn

Treatments	Young cob yield (Kg ha^{-1})		Stover yield (Kg ha^{-1})		Crude protein (%)		Vitamin C (mg/100 g)	
	Summer	*Kharif*	Summer	*Kharif*	Summer	*Kharif*	Summer	*Kharif*
Irrigation regimes (IW/CPE ratio)								
0.50	4180	4049	21,846	20,591	12.11	12.16	12.44	12.57
0.75	4697	4508	26,035	24,138	12.78	12.81	12.57	12.64
1.00	5074	4855	27,967	25,865	13.23	13.17	12.65	12.61
CD = (P=0.05)	62	180	583	1,030	0.06	0.04	NS	NS
Nitrogen levels (Kg ha^{-1})								
60	4021	4125	17,555	18,236	11.88	12.10	12.43	12.53
90	4467	4578	23,021	23,848	12.56	12.77	12.58	12.91
120	4766	4885	27,061	27,986	12.94	13.18	12.58	12.60
150	4968	5097	29,021	30,042	13.10	13.30	12.58	12.60
180	5031	5153	29,755	30,553	13.10	13.36	12.58	12.58
CD = (P=0.05)	102	107	616	1256	0.09	0.07	NS	NS

NS : Non significant

Table 3. Water use and WUE* as influenced by irrigation regimes and N levels on baby corn.

Treatments	Summer 1	Summer 2	Summer 3	Summer 4	*Kharif* 1	*Kharif* 2	*Kharif* 3	*Kharif* 4	Cob Yield ($Kg\ ha^{-1}$) Summer	Cob Yield ($Kg\ ha^{-1}$) *Kharif*	WUE ($Kg\ ha\ cm^{-1}$) Summer	WUE ($Kg\ ha\ cm^{-1}$) *Kharif*
Irrigation regimes (IW/CPE ratio)												
0.50	4	200	2	202	4	200	33	233	4180	4049	20.7	17.4
0.75	5	250	2	252	7	350	33	383	4697	4508	18.6	11.8
1.00	7	350	2	352	8	400	33	433	5074	4855	14.4	11.2
Nitrogen levels ($Kg\ ha^{-1}$)												
60	–	–	–	268	–	–	–	349	4021	4125	15.0	11.8
90	–	–	–	268	–	–	–	349	4467	4578	16.7	13.1
120	–	–	–	268	–	–	–	349	4766	4885	17.1	14.0
150	–	–	–	268	–	–	–	349	4968	5097	18.5	14.6
180	–	–	–	268	–	–	–	349	5031	5153	18.8	14.8

1 : No. of irrigation 2 : Water use by irrigation (mm) 3 : Effective rainfall (mm) 4 : Total water used (mm) * Statistically not analyzed

kharif respectively for 0.50, 0.75 and 1.0 IW/CPE ratio.

The WUE (Table 3) was the lowest under higher irrigation regime whereas it was reverse with limited irrigation schedules of 0.75 and 0.50 IW/CPE ratio in which case the applied water might have been utilized more effectively. The WUE was higher under the N level of 180 Kg ha^{-1} and was comparable with 150 Kg N ha^{-1}, since the difference was negligible (less than 1%) in both the seasons. Increase in N levels resulted in higher WUE which is attributed to the increased yield under higher N levels with a constant rate of applied water.

References

Banga, R.S., Tej Singh and Singh, D.P. (1994). Response of winter maize to irrigation as fertility levels under shallow water table conditions. *Haryana J. Agron.* **10**: 177-181.

Kamalakumari, K. and Singaram, P. (1996). Quality parameter of maize as influenced by application of fertilizer and manures, *Madras Agric. J.* **83**: 32-33.

Mozafafr, A. (1993). Nitrogen fertilizers and the amount of vitamins in plants : *A review J. Plant Nutrition* **16**: 2479-2506.

Thakur, D.R., Kharwa, P.C. and Om Prakash (1995). Effect of nitrogen and plant spacing on growth, development and yield of baby corn (*Zea mays*). *Him. J. Agric. Res.* **21**: 5-10.

(Received: September 2000; Revised: June 2001).