

NUTRIENT UPTAKE IN MAIZE UNDER VARYING IRRIGATION REGIMES, SOIL, AMENDMENTS AND IRRIGATION LAYOUTS

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ABSTRACT

Effect of 4 levels of irrigation (all furrow, alternate furrow, skip furrow and paired row furrow; 2 levels of IW/CPE ratio (0.6 & 0.75) and 2 levels of amendments (coconut fibre waste, farmyard manure) on the nutrient uptake in maize was investigated. Irrigating maize based on 0.75 irrigation ratio under paired row furrow method of irrigation with coconut fibre waste increased the uptake of nutrients besides water economy.

KEY WORDS : Irrigation layouts, IW/CPE ratio, nutrient uptake

Maize is gaining ground in Tamil Nadu as a component of integrated farming system. Application of amendments to soil, apart from improving the physical properties, also aids the availability of nutrients, organic carbon and provides better soil moisture environment and increase the yield of crops. If the yield and quality of the crops is to be increased, there is a need to generate the information on the fertilizer requirement of the crop. Saving of water by proper water management practices is the most important aspect in irrigated farming as it increases water use efficiency, which is the ultimate goal of irrigated farming. With a view to solve the problems of scarce water situation and coir waste utilisation, an attempt was made in maize crop.

MATERIALS AND METHODS

A field experiment was conducted at the Tamil Nadu Agricultural University, Coimbatore during 1992-93 under irrigated conditions. There were 16 treatment combinations consisting of 2 levels of irrigation regimes, 2 levels of amendments in main plot and 4 levels of irrigation layouts as sub plot treatments. The experiment was laid out in strip plot design with three replications. The fertilizer combinations were:

Raw coir waste (12.5 t ha^{-1}) + 150% NPK

Farmyard manure (12.5 t ha^{-1}) + recommended dose of 100% NPK

The experimental area was deep, moderately well drained sandy clay loam with low available N, medium available P and high available K with a pH of 7.60. The seeds were dibbled (2 seeds per spot)

on one side of the ridge with a spacing of 60 cm between rows and 20 cm between plants in the treatments, all furrow (L1) alternate furrow (L2) and skip furrow (L3) 120 cm between ridges accommodating two rows on both sides accomplishing 60 cm between rows and 20 cm between plants in paired row furrow (double row) (L4). Fertilizer was applied in two splits viz., basal and 45 days after sowing DAS, N P and K were applied in the form of urea, single super phosphate and muriate of potash respectively. Entire P, K and 50 per cent N were applied as basal dose. Another 50 per cent of N was applied at 45 days after sowing DAS. In the case of treatments receiving Coconut fibre (coir) waste 150 per cent (207.5 : 93.75 : 75.75g/ha) of recommended dose of NPK were applied to compensate the nutrients expected out of FYM. Pre-emergence herbicide, atrazine 50 wp @ 500 g ha^{-1} was applied 3 DAS as spray on the soil surface using a high volume sprayer. Thinning and gap filling were done 7 DAS. The depth of irrigation water was fixed as 5 cm. Five randomly selected plants in each treatment at 30, 60 DAS and at harvest were oven dried to a constant weight. Then dried plants were powdered in a Willey Mill and analysed for N, P and K by standard methods.

RESULTS AND DISCUSSION

Nitrogen uptake

On 30, 60 DAS and at harvest, irrigation regime of 0.75 IW/CPE, coconut fibre waste and paired row furrow increased the N uptake significantly (Table 1). At harvest stage, irrigation level of 0.75 IW/CPE (I2) recorded significantly

Table 1. Effect of irrigation levels, soil amendments and irrigation layouts on N uptake (kg h^{-1}) at 30, 60 DAS and at harvest

	30 DAS					60 DAS					Harvest				
	C	F	I ₁	I ₂	Mean	C	F	I ₁	I ₂	Mean	C	F	I ₁	I ₂	Mean
L ₁	34.64	32.53	31.62	35.54	33.58	123.25	120.03	116.61	126.68	121.64	199.57	200.31	194.69	205.19	199.94
L ₂	29.23	26.29	25.64	29.89	27.76	115.14	115.91	111.96	119.10	115.53	196.84	193.59	189.19	201.24	195.22
L ₃	26.00	25.02	24.27	26.75	25.51	114.46	112.42	109.02	117.85	113.44	190.73	187.36	186.42	191.67	189.05
L ₄	37.97	36.12	35.49	38.60	37.05	122.94	123.38	120.43	125.89	123.16	205.15	200.59	195.96	209.79	202.87
I ₁	29.99	28.52	-	-	-	113	87	115.14	-	-	-	191.61	191.51	-	-
I ₂	33.93	31.46	-	-	-	124.03	120.73	-	-	-	204.53	199.42	-	-	-
Mean	31.96	29.99	29.23	32.70	-	118.95	117.93	114.50	122.38	-	198.07	195.47	191.56	201.97	-
	SEc		CD			SEd		CD			SEd		CD		
I-Irrigation	0.73		1.8			0.41		0.99			0.90		2.2		
M-Amendments	0.73		1.8			0.41		0.99			0.90		2.2		
L-Layouts	2.0		2.9			0.5		1.23			1.50		3.6		

Interaction effect absents

higher N uptake accounting for 201.97 kg followed by 0.6 IW/CPE (II) with 191.56 kg ha^{-1} . The coconut fibre waste (c) recorded significantly higher uptake of N (198.07 kg) as compared to farmyard manure (195.47 kg). Regarding the irrigation layouts, paired row furrow (double row) recorded higher uptake of N (202.87 kg) whereas the skip furrow recorded 189.05 kg of N. Helkiah *et al.* (1981) reported the uptake of nutrients by the crop was found increased due to the addition of organic manures with fertilizers as compared to control and inorganic fertilizers alone.

Phosphorus uptake

The data on the P uptake on 30, 60 DAS and at harvest are furnished in Table 2. On 30 DAS, irrigation at 0.75 IW/CPE recorded significantly higher uptake of P of 12.46 kg as compared to 0.6 IW/CPE accounting for 12.01 kg ha^{-1} . Similarly at 60 DAS and at harvest stage also, same trend was noticed. Irrigation level of 0.75 IW/CPE (I₂) increased the P uptake as compared to 0.6 IW/CPE

(I₁) at all stages of crop growth. This indicated that higher irrigation frequencies might have increased the solubility of phosphorus resulting in higher 'P' uptake.

Regarding amendments, on 30 DAS there was no significant variation was found among the different treatments. On 60 DAS, coconut fibre waste recorded 23.98 kg followed by farmyard manure accounting for 23.63 kg. At harvest stage, coconut fibre waste recorded significantly higher uptake of P (19.07 kg) followed by farmyard manure with 18.76 kg ha^{-1} .

Among the irrigation layouts on 30 DAS paired row furrow (double row) recorded the highest uptake of P (13.17 kg ha^{-1}) and on 60 DAS, 25.08 kg ha^{-1} and at harvest 20.58 kg ha^{-1} of 'P' uptake was recorded. Lower uptake of P was noticed in the skip furrow methods. The high P uptake was noticed in paired row furrow might be due to higher dry matter production.

Table 2. Effect of irrigation levels, soil amendments and irrigation layouts on N uptake (kg h^{-1}) at 30, 60 DAS and at harvest

	30 DAS					60 DAS					Harvest				
	C	F	I ₁	I ₂	Mean	C	F	I ₁	I ₂	Mean	C	F	I ₁	I ₂	Mean
L ₁	12.85	12.76	12.70	12.91	12.80	24.50	24.09	24.07	24.53	24.30	19.45	19.14	18.94	19.64	19.29
L ₂	11.83	11.53	11.31	12.04	11.68	23.61	23.55	23.46	23.70	23.58	18.58	18.40	18.28	18.70	18.49
L ₃	11.20	11.39	10.92	11.66	11.29	22.58	21.96	21.87	22.67	22.27	17.55	17.06	16.96	17.66	17.31
L ₄	13.23	13.12	13.10	13.24	13.17	25.23	24.93	24.74	25.42	25.08	20.70	20.46	20.70	20.46	20.58
I ₁	11.99	12.03	-	-	-	23.80	23.27	-	-	-	18.81	18.47	-	-	-
I ₂	12.56	12.37	-	-	-	24.16	23.10	-	-	-	19.33	19.05	-	-	-
Mean	12.27	12.20	12.01	12.46	-	23.98	23.63	23.53	24.08	-	19.07	18.76	18.64	19.19	-
	SEd		CD			SEd		CD			SEd		CD		
I-Irrigation	0.12		0.30			0.059		0.145			0.038		0.095		
M-Amendments	0.12		NS			0.059		0.145			0.038		0.095		
L-Layouts	0.24		0.60			0.059		0.145			0.050		0.123		

No Interaction effect

Table 3. Effect of irrigation levels, soil amendments and irrigation on K uptake (kg ha^{-1}) as 30 60 DAS harvest

	30 DAS					60 DAS					Harvest				
	C	F	I ₁	I ₂	Mean	C	F	I ₁	I ₂	Mean	C	F	I ₁	I ₂	Mean
L ₁	69.80	69.60	69.56	69.85	69.70	183.09	181.85	180.15	184.79	182.47	159.58	158.60	156.65	161.53	159.09
L ₂	69.03	68.85	68.58	69.30	68.94	181.23	179.94	178.44	182.73	180.58	157.67	156.16	155.31	156.16	156.92
L ₃	68.49	68.35	68.41	68.43	68.42	177.74	175.54	173.69	179.59	176.64	153.61	153.53	152.21	154.93	153.57
L ₄	70.76	70.31	70.28	70.79	70.53	185.44	183.94	182.97	186.42	184.69	162.15	160.47	158.80	163.81	161.31
I ₁	69.35	69.06	-	-	-	179.35	178.27	-	-	-	156.35	155.14	-	-	-
I ₂	69.70	69.49	-	-	-	184.40	182.36	-	-	-	160.15	159.24	-	-	-
Mean	69.52	69.28	69.21	69.59	-	181.88	180.32	178.81	183.38	-	158.25	157.19	155.74	159.70	-
			SEd		CD		SEd		CD		SEd		CD		
I-Irrigation			0.095		0.232		0.093		0.227		0.235		0.576		
M-Amendments			0.095		0.232		0.093		0.227		0.235		0.576		
L-Layouts			0.093		0.277		0.306		0.749		0.263		0.644		

No Interaction effect

Potassium uptake

The data on the uptake of potassium (Kg ha^{-1}) relating to 30 60 DAS and at harvest are furnished in Table 3. On 30 DAS, 60 DAS and at harvest stages the treatment of 0.75 IW/CPE recorded higher K uptake followed by 0.6 IW/CPE. At harvest stage, irrigation level of 0.75 IW/CPE resulted in higher uptake of K (159.70 kg) as compared to 0.6 IW/CPE (II) accounting for $155.74 \text{ kg ha}^{-1}$. With reference to amendments, coconut fibre waste treatments recorded higher K uptake followed by farmyard manure at all stages. At harvest stages, the coconut fibre waste resulted in higher uptake of $158.25 \text{ kg ha}^{-1}$ followed by farm yard manure with $157.19 \text{ kg ha}^{-1}$. Regarding irrigation layouts, paired row furrow resulted in higher K uptake in all the stages. At harvest stage,

paired row furrow resulted in higher uptake of 161.31 kg followed by all furrow (159.09) and alternate furrow (156.92 kg) skip furrow recorded significantly lesser uptake of 153.57 kg .

It can be concluded that the uptake of nutrients was highly influenced by the treatments. The maximum uptake of nutrients was seen in treatments, at 0.75 IW/CPE, coconut fibre waste and with in paired row furrow, (double row) planting besides water economy.

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EFFECT OF N P K FERTILIZATION ON COCONUT HYBRID

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ABSTRACT

A field experiment was conducted at the Agricultural Research Station, Aliyarnagar from 1988 to 1996 to study the effect of NPK fertilization on coconut hybrid Chandra Sankhara. The results revealed that application of NPK @ 500:250:1000 g/palm/year recorded more nut yield and growth and yield characters.

KEY WORDS : Coconut hybrid, N P K fertilization, nut yield

The coconut palm, a tree crop of the humid tropics, is versatile in its adaptability to a wide range of soil and climatic conditions. Large scale fertilizer demonstration trials conducted showed

that application of 340:340:680 g NPK/palm/yr resulted in increased yield (John and Jacob, 1959). The fertilizer recommendation under Tamil Nadu conditions for adult coconut tall palms are