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EFFECT OF N LEVELS AND SOILS ON THE N, P AND K UPTAKE BY MAIZE

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ABSTRACT

Pot culture experiment conducted with fifteen soils (ten representing low N and five medium N soils) under graded doses of N to study the uptake of nutrients revealed that the N P K uptake showed a positive trend with N application at all stages of crop growth. Application of 202.5 Kg N/ha recorded the highest N uptake by shoot and grain. The N uptake was higher in medium N soils compared to low N soils.

Maize (*zea mays* Linn) is one of the important food crops grown in Tamil Nadu. This cereal is cultivated widely due to its high yield potential and the capacity to utilize the added nutrients especially the nitrogen. Numerous

workers reported the nutrient uptake pattern by the amounts of nitrogen applied to the soil. Khera et. al. (1976) observed 95 per cent uptake of applied N at 150 Kg N/ha. Bar-Yosef and Kafkafi (1972), Banarsi Das and Ranjodh Singh (1979) and Haurissa et.al.(1979) reported that the increased levels of N resulted in increased N uptake by maize. This study was undertaken to obtain information on the uptake of nitrogen, phosphorus and potassium at various stages of crop growth of maize as affected by the application of different levels of nitrogen in low and medium N soils.

MATERIALS AND METHODS

A pot culture experiment was conducted with maize during 1982 Rabi season in fifteen soils at Agricultural College, Coimbatore. Ten representing the low N status (45 to 125 ppm) and five medium N status (143 to 186 ppm) collected from the maize growing tracts were utilized for the experiment. The treatment consisted of 15 soils and four levels of N viz. N₀, (0) N₁ (67.5), N₂(135) and N₃ (202.5 Kg/ha) with a common dose of P and K at 67.5 and 45 kg/ha respectively. The N was applied in the form of urea in three splits, 50 percent at the time of sowing, 25 percent each at 30th and 60th days after sowing. The trial was laid out using factorial completely randomized design with four replications. The uptake of nutrients were worked out for various plant components viz., shoot at kneehigh (30 days after sowing) and silking stage (60 days after

sowing) and shoot and grain at harvest stage. Nitrogen content of plant sample was estimated by Microkjeldhal's method (Jackson, 1973) and potassium by triple acid extract using "EEL" flame photometer.

RESULTS AND DISCUSSION

N Uptake :

Nitrogen levels significantly increased the N uptake at all stages of crop growth. At knee-high and silking stages the N uptake increased with the application of 202.5 kg N/ha. At harvest the N uptake by shoot showed similar trend. However, at higher levels the increase in uptake was on par with each other. The grain N uptake showed a positive trend with increased N levels. At all stages the N uptake with the successive higher doses was comparatively lesser than the preceding lower doses. The increased dry matter production and N concentration as a result of increasing levels of N would have contributed for the positive response between N uptake and N levels. Similar results were reported by Rajan and Sankaran (1974) and Pathak et.al., (1971).

The interaction of N levels with the soils was found to be significant. The low N soils showed a marked increase in N uptake compared to medium N soils both by grain and shoot. However, the N uptake in medium N soils was more than low N soils as a result of higher N releasing power of medium N soils.

P uptake :

Phosphorus uptake was significantly influenced by N application at all stages of crop growth. P uptake was more in grain than in shoot at harvest. Increasing levels of N enhanced the P uptake. This might be due to increased growth and dry matter production with the application of N. This might also probably be due to an increased N uptake as well as N concentration resulting in large quantities of N compounds containing P such as nucleo-protein. This is in line with the findings of Pathak et.al., (1971), Pun-tamker et.al., (1965) and Nayyar and Sawarkar (1980).

The effect of soils and N levels on P uptake was significant in grain and not significant in shoot. Low N soils

showed lesser P uptake than medium N soils. However, the magnitude of increase in P uptake was high in low N soils.

K uptake :

The graded levels of N significantly influenced the K uptake at all stages of crop growth. The uptake of K was lower in grain compared to shoot. The probable reason might be the poor translocation of K from shoot to grain. The increase in K uptake with the addition of N was noticed at all stages. Applied N might have resulted in release of K, might be the reason for increased K uptake.

Interaction of N levels with soils on K uptake was significant both in grain and shoot. Medium N soils

Table - 1: Effect of N levels on N, P and K uptake (Mean Values mg/pot)

N levels	Stages		Harvest	
	knee-high	silking	shoot	grain
	N Uptake			
N ₀	59.4	363.4	160.3	370.7
N ₁	107.5	517.8	245.0	504.2
N ₂	140.3	699.3	322.9	653.4
N ₃	152.7	760.8	322.5	695.0
SE	4.0	17.2	4.2	5.6
CD (0.05)	11.5	49.1	11.8	15.9
	P Uptake			
N ₀	11.4	56.8	29.2	72.5
N ₁	17.9	86.5	43.4	99.5
N ₂	25.1	122.5	54.6	125.4
N ₃	27.7	131.6	61.8	131.2
SE	0.5	2.1	0.8	0.9
CD (0.05)	1.3	6.1	2.4	2.6

N levels	Stages		Harvest	
	knee-high	silking	shoot	grain
	K Uptake			
N ₀	93.2	734.1	323.3	138.1
N ₁	150.8	1021.7	448.3	198.1
N ₂	215.3	1328.6	553.9	267.0
N ₃	233.4	1430.9	584.0	283.9
SE	5.5	23.5	5.9	3.9
CD (0.05)	15.8	66.9	16.9	9.5

recorded higher K uptake in grain than that of low N soils. Applied N along with the soil available N might have

increased the concentration in the soil solution resulting in increased release of K from exchange complex.

Tale 2 : Effect of N and soils on N, P and K uptake (Mean values mg/pot)

N levels	Soils			
	Shoot		Grain	
	Low N soil	Medium N soil	Low N Soil	Medium N Soil
	N Uptake			
N ₀	142.6	196.7	334.5	443.1
N ₁	217.6	304.0	453.3	615.9
N ₂	315.7	337.4	643.7	672.9
N ₃	336.8	323.9	698.7	687.6
SE		16.2		21.8
CD(0.05)		45.9		61.5
	P Uptake			
N ₀	26.3	34.9	65.2	87.0
N ₁	37.9	54.1	38.5	120.6
N ₂	52.5	58.9	123.7	128.9
N ₃	60.7	64.1	131.7	130.0
SE		3.3		3.6
CD(0.05)		NS		10.0

N levels	Soils			
	Shoot		Grain	
	Low N soil	Medium N soil	Low N Soil	Medium N Soil
	K Uptake			
N ₀	297.7	374.7	125.6	163.0
N ₁	409.0	526.8	179.4	237.5
N ₂	537.0	587.5	266.5	268.2
N ₃	577.9	596.4	288.8	274.0
SE		23.2		13.1
CD (0.05)		65.6		36.9

NS = Non significant

From the results, it is concluded that the N uptake showed a positive trend with N application in all stages of crop growth. The N uptake was

higher in medium N soils compared to low N soils. The uptake of P and K was significantly influenced by N application at all stages of crop growth.

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