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NITROGEN RESPONSE IN MAIZE

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ABSTRACT

The response of N on maize in fifteen soils viz., ten low N soils and five medium N soils with N at 0, 67.5, 135 and 202.5 kg/ha revealed that the responses were quadratic in medium N soils and sigmoid in low N soils. The optimum dose for grain and straw yield was 148 and 173 Kg N/ha respectively in medium N soil.

Maize is one of the important cereal crops of the world. Numerous workers have related maize yields to the N content of the soils and have indicated N to be the dominant limiting factor. Soils differ widely in their fertility and hence the response to added fertilizers is highly variable resulting in the use of varied quantities of fertilizers to obtain a given yield. The data on the response pattern for added fertilizer N in Indian soils for maize are meagre.

Thus, efforts have been made to work out the N response pattern under varied soil conditions to the graded doses of fertilizer N and to arrive at the optimum dose for maximum maize yield.

MATERIALS AND METHODS

A pot experiment was conducted during Rabi season in fifteen maize growing soils at Agriculture College, Coimbatore with maize as a test crop. The details of soils are furnished below.

The soils S_1 to S_{10} belong to the low N status (0-280 kg/ha) and S_{11} to S_{15} are the medium N status (280-450 kg/ha). The treatments consisted of 15 soils and four levels of N viz., O, 67.5 135 and 205.5 kg/ha with a common dose of P and K at 67.5 and 45 kg/ha respectively. The trial was laid out using factorial completely randomized design

Soil No.	Location	Soil sub-group	Soil series
S_1	Coimbatore - TNAU F.No.37	Vertic Ustropepts	Perianaickenpalayam
S_2	Perur	Ultic haplustalfs	Pichanur
S_3	Vallakundapuram	Typic ustorthents	Irugur
S_4	Thirumurthy Nagar	Typic ustochrepts	Manupatti
S_5	Malayandigoundanur	Typic ustorthents	Irugur
S_6	Annur	Typic rhodustalfs	Vellalur
S_7	Thondamuthur	Typic haplustalfs	Somayanur
S_8	Coimbatore - TNAU Eastern Block NA 8	Typic chromusterts	Peelamedu
S_9	Pattukkottai	Typic haplustalfs	Pattukkottai
S_{10}	Coimbatore - TNAU F.No.3, New Area	Vertic ustropepts	Perianaickenpalayam
S_{11}	Poolankinar	Typic chromusterts	Peelamedu
S_{12}	Erisanampatti	Typic ustorthents	Irugur
S_{13}	Poluampatti	Typic haplustalfs	Somayanur
S_{14}	Periapatti	Typic ustochrepts	Manupatti
S_{15}	Kottur	Typic ustorthents	Irugur

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Table 1. Initial soil analysis

Soil	Clay (%)	Silt (%)	Sand coarse + fine (%)	EC m m hos/cm	pH	Available nutrients (ppm) N	P	K
Low N soil (mean of 10 soils)	28.9	7.2	71.2	0.3	7.6	93	5	210
Medium N soil (mean of 5 soils)	30.0	7.3	59.7	0.2	8.0	161	7	215

Table 2. Grain yield of maize (Mean values g/pot)

Soil	N levels	N_0	N_1	N_2	N_3	Mean	SE	CD
i)	Low N soils	22.9	28..5	37.4	38.8	31.9	0.4	1.1
ii)	Medium N soils	29.1	36.8	38.0	37.8	35.4		
	Mean	26.0	32.6	37.7	38.3	-	0.2	0.5

Table 3. Straw yield of maize (Mean values g/pot)

Soil	N levels	N_0	N_1	N_2	N_3	Mean	SE	CD
i)	Low N soils	28.5	35.2	43.7	46.5	38.4	0.5	1.5
ii)	Medium N soils	35.1	43.7	46.3	47.4	43.2		
	Mean	31.8	39.4	45.0	46.9	-	0.3	0.8

with four replications. Seeds were sown in the pots at the rate of 4 per pot and later thinned to 2 plants.

RESULTS AND DISCUSSION

The yield differences between N levels, types of soil and the interaction of N levels and soil types were significant. The grain yield ranged from 26.0 to 38.3g and the straw yield from 31.8 to 46.9 g/pot. (Tables 2 and 3)

a) Grain yield

i) Low N soils: In low N soils, the grain yield ranged from 22.9 (no N) to 38.8 g/pot with the application of 202.5 kg N/ha (Table 2). The response curve was found to be sigmoid for low N soils. The logistic equation was estimated and is as follows:

$$Y = \frac{53.4}{1 + e^{-(3.33 + 1.34x)}}$$

Where Y = yield (g/pot)

X = applied N (g/pot)

The response to N could be attributed to low N status of soils. Kumaraswamy *et al.* (1975) reported that 193 kg N/ha a physical optimum and 180 kg N/ha by Shukla (1972) for low N soils.

ii) Medium N soils: In medium N soils, the grain yield was enhanced from 29.1 g/pot with no N, to 38.0 g/pot with 135 kg N/ha and then it declined to 37.8 g/pt with 202.5 kg N/ha. The response was found to fit into second order polynomial curve. The equation for the curve is

$$Y = 29.3 + 25.6\,x - 17.3\,x^2$$

X = yield (g/pot)

X = applied N (g/pot)

The physical optima was worked out by using the formula $-b/2c^{o}$ From the above response curve, the physical optima was found to be 148 kg N/ha (0.7419/pot). Higher initial N contents and high amount of losses of N due to higher level of N application might be the cause for quadratic nature of the curve. Singh and Yriyo (1980) obtained maximum response with 150 kg N/ha on medium N Soil.

b) Straw yield

i) Low N soils: The straw yield was enhanced by 63 per cent over control at

higher level of N (202.5 kg/ha) in low N soils. The response equation was worked out and is as follows:

$$Y = \frac{59.3}{1+e^{-(-1.84+1.48)}}$$

Y = yield (g/pot)

X = applied N (g/pot)

The genetic potential and varietal characters might be the probable reasons for this type of curve. Krogman *et al.* (1980) observed a maximum whole-plant yield at 225 kg N/ha level.

ii) Medium N soils: The straw yield was enhanced by 35 per cent over control with the addition of 202.5 kg N/ha. The response was quadratic in nature and equation worked out for this curve is:

$Y = 35.3 + 28.5\,x - 16.5\,x^2$

Y = yield (g/pot)

X = applied N (g/pot)

From the above response equation, the physical optima was found to be 173 kg N/ha (0.864 g/pot). Soil factors such as high initial N status, lower efficiency of added N at higher levels might have resulted into quadratic response.

It is concluded that the grain and straw yields increased upto 202.5 kg N/ha in low N soils while in medium N soil, the optimum dose to get the highest grain and straw yield was 148 and 173 kg N/ha, respectively.

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EFFECT OF NEW HERBICIDES IN LOW LAND RICE

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ABSTRACT

Pre-emergence application of anilofos at 0.4 kg ha^{-1} and piperophos at 1.0 kg ha^{-1} at 4th day after transplanting were effective in controlling Echinochloa crus-galli and other rice weeds. Fluoroxypyr at 0.8 kg ha^{-1} was found to control broad leaved and aquatic weeds effectively. Highest grain yield of 5808 kg ha^{-1} and 7034 kg ha^{-1} was recorded in piperophos at 1.0 kg ha^{-1} and anilofos at 0.4 kg ha^{-1} treated plots in Kharif and summer respectively.

Weeds are bane to crop productivity. Chang (1970) found that *Echinochloa crus-galli* at densities of 100-200 plants m^{-2} reduced rice yield by 86-91 percent respectively. Park and Kim (1971) reported 48 percent yield reduction in rice due to weeds. Weeds compete with the crop for light, space and nutrients.

Pre-emergence herbicides like butachlor and thiobencarb are in vogue for the control of rice weeds. The performance of weedicides varies with climate, dose, nature of weed flora and intensity. A detailed study was conducted during *Kharif* 1985 and summer 1986 in IR 50 paddy with a view to evaluate the performance of new

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