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INFLUENCE OF THE TIME AND QUANTITY OF NITROGEN APPLICATION ON GROWTH AND YIELD COMPONENTS IN SORGHUM (CSH-5)[1]

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Field experiments were conducted in summer and *kharif*, under irrigation, to study the effect of time and quantity of N application on the growth and yield components of sorghum (CSH-5). There was no significant difference in plant height due to different N treatments. Increase in N levels significantly decreased the number of days required for 50 per cent flowering. In summer, N levels had significant influence on the leaf area per plant. Weight of grains per ear head was found to vary significantly due to N levels in *kharif*. In summer, N levels had highly significant influence on thousand grain weight. N management resulted in attaining adequate growth and yield components which contributed to increased yield.

Sorghum agronomy has undergone a revolutionary change with the introduction of high yielding hybrids. These hybrids accumulate dry matter very rapidly and have the capacity to distribute a greater portion of the accumulated dry matter to reproductive parts, thereby increasing the harvest index. But the potentialities of these hybrids cannot be fully exploited without supply of N at the time when the crop needs it most. So it is imperative to study the influence of time and quantity of nitrogen application on the growth and yield components.

MATERIALS AND METHODS

Field experiments were conducted during summer (Feb.-May) and *kharif* (July-Nov.) seasons in 1974 with sorghum (CSH-5) in the Tamil Nadu Agricultural University Farm, Coimbatore. The treatment schedule is given in Table 1. The summer experiment was conducted in a black clayey loam soil high in available N, P_2O_5 and K_2O with a pH of 8.2. The *kharif* experiment was conducted in red sandy clayey loam medium in available N, P_2O_5 and high in avilable K_2O with a pH of 7.4. Fertilisers were placed approximately 5 cm away from the seedlings at a depth of 5 cm. In the case of foliar application of N, concentration of urea varying from 1.32 to 5.28 per cent was applied depending on the quantity of N to be supplied, with 0.1 per cent Teepol as surfactant. Package of practices recommended for irrigated sorghum in Tamil Nadu was followed. Various growth and yield components were recorded in both summer and *kharif* seasons. The data were statistically scrutinised with IBM 1420 computer at the Indian Agricultural Statistics Research Institute, New Delhi.

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Table 1. Treatment Schedule

Summer, 1974 Treatments	Symbol	*kharif*, 1974 Treatments	Symbol
Main Plot:		Main Plot:	
Four levels of N		Four levels of N	
0 kg/ha	N_0	50 kg/ha	N_{50}
50 kg/ha	N_{50}	100 kg/ha	N_{100}
100 kg/ha	N_{100}	150 kg/ha	N_{150}
150 kg/ha	N_{150}	200 kg/ha	N_{200}
Sub-Plot:			
Six times of application		Sub-Plot:	
All N at planting	T_1	Five times of application	
		$\frac{1}{2}$ at planting and	
$\frac{1}{2}$ at planting,		$\frac{1}{2}$ on 30th day	T_1
$\frac{1}{2}$ on 40th day	T_2		
$\frac{1}{4}$ at planting,		$\frac{1}{3}$ each at planting,	
$\frac{1}{4}$ each on 26th,		30th and 45th day	T_2
52nd and 80th day	T_3		
$\frac{1}{5}$ each at planting,		$\frac{1}{4}$ each at planting,	
on 15th, 30th,		30th, 45th and 60th day	T_3
45th, 60th, and 80th day	T_4		
$\frac{1}{6}$ each at planting,		$\frac{1}{5}$ each at planting,	
on 20th, 30th,		30th, 45th, 60th	
40th, 50th, 60th,		and 75th day	T_4
70th and 80th day	T_5		
Foliar application:		Foliar application:	
$\frac{1}{2}$ at planting through soil and		$\frac{1}{2}$ at planting through soil and	
$\frac{1}{2}$ through foliage in		$\frac{1}{2}$ through foliage in equal	
equal quantities on 40th,		quantities on 30th,	
60th and 80th day.	T_6	45th and 60th day	
Date of sowing:	Feb. 24, 1974		July 20, 1974
Date of harvest:	May 31, 1974		Nov. 1, 1974

Split plot design with 3 replications. Plot size: 4.5 X 3.0 m (Gross)
A common application of 45 kg/ha each of P_2O_5 and K_2O was made to all plots at the time of planting.

RESULTS AND DICUSSION

1. Growth components

(a) Height of the plant: Height of the plant was recorded on 90th day after sowing. There was no significant difference in plant height due to different N treatments in both the seasons (Table 2 and 3). This is in agreement with the findings of Raheja and Krantz [1958] and Porter *et al.* [1960], who stated that N had little influence on the height of sorghum plant.

Table 2 Effect of Treatments on the growth and yield components during summer 1974

Treatments Main plots	Growth Components			Yield Components	
	Height of the plant in cm	No. of days to 50% flowering	Apparent feat area/plant in cm^2 on 90th day	Weight of grains/ earhead in g	Thousand grain weight in g
N 0	174	64	428	40	19
N 50	174	60	522	55	21
N 100	171	60	536	50	21
N 150	169	60	525	53	22
S. E.	2.68	0.41	9.30	4.10	0.18
C. D. (P=0.05)	N S	1.45	32.21	N S	0.64
Sub plots					
T_1	169	60	535	55	21
T_2	171	60	524	52	21
T_3	165	61	536	52	21
T_4	174	61	516	55	21
T_5	176	60	526	56	21
T_6	173	59	529	47	21
S. E.	3.50	0.50	11.38	2.11	0.22
C. D. (P=0.05)	N S	N S	N S	N S	N S

N S: Non Significant

Table 3 Effect of treatments on the growth and yield components during *kharif 1974*

Treatments Main plots	Growth Components			Yield Components	
	Height of the plant in cm	No. of days to 50% flowering	Apparent feat area/plant in cm^2 on 90th day	Weight of grains/ earhead in g	Thousand grain weight in g
N 50	186	69	457	45	22
N 100	184	66	505	54	23
N 150	174	63	508	63	23
N 200	179	62	488	73	25
S. E.	3.40	0.65	13.74	2.33	0.35
C. D. [P=0.05]	N S		N S	8.08	N S
Sub plots		2.29			
T_1	184	65	476	60	22
T_2	185	66	492	59	23
T_3	181	65	505	60	23
T_4	180	65	500	57	22
T_5	182	65	476	58	23
S. E.	2.45	0.40	10.42	2.00	0.32
C. D. [P=0.05]	N S	N S	N S	N S	N S

N S: Non Significant

(b) Number of days to 50 per cent flowering: Number of days required for 50 per cent flowering in different treatments was recorded and the data are presented in Table 2 and 3. The data indicate that increase in N levels significantly decreased the number of days required for 50 per cent flowering in both the seasons. In summer, application of N has significantly reduced the period for flowering compared to control. In *kharif*, N levels were highly significant. Application of 200 kg N/ha reduced the days for 50 per cent flowering by 6.73, 4.76 and 1.20 days over 50, 100 and 150 kg levels respectively. Increase in rates of applied N hastened flowering which is in line with findings of Russel (1961) and Murthy (1971). The mean number of days for 50 per cent flowering was 60.03 in summer and 65.10 in *kharif*.

(c) Apparent leaf area: Maximum length and width of 4th leaf from the top was multiplied by 0.747 (Stickler *et al.*, 1961) to get leaf area per plant and the results are presented in Table 2 and 3. In summer, there was no significant difference between 50, 100 and 150 kg N levels on leaf area. This indicated that leaf area was increased by N, only at lower levels and beyond 50 kg level, N did not have much influence. In *kharif* N levels had no significant influence on leaf area. Higher leaf area in summer may be attributed to the high available soil N (462 kg N/ha) in summer in contrast to medium available soil N (323 kg/ha) in *kharif*. Higher intensity of sunlight in summer also might have had some influence in increasing the leaf area in summer.

2. Yield components

(a) Weight of grains per earhead: In summer, N levels had no significant influence on the weight of grains per earhead (Table 2). In *kharif*, N levels had a highly significant influence on this character (Table 3). The increase in weight of grains per earhead with application of 200 kg N/ha, over 150, 100 and 50 kg N levels were 10.37, 19.59 and 28.17 g respectively. Application of N at successive levels had a definite contribution in increasing the weight of grains per earhead which would ultimately have a favourable influence on grain yield. Similar results were reported by Panda (1972).

(b) Thousand grain weight: The data on thousand grain weight are presented in Table 2 and 3. In Summer N levels had highly significant influence on thousand grain weight. Different levels of N were on per but superior to control. Increase in N levels caused increase in thousand grain weight which is in line with findings of Nageswara

Reddy (1968), Kalbhor and Girase (1971) and Premsingh and Choubey (1972). In *kharif*, N levels had no significant influence on thousand grain weight. There was no control plot in this season. Had there been a control plot the effect of applied N on thousand grain weight would have been clearly brought out as in cass of summer season. Weight of thousand grains, which is one of the yield attributes, is a measure of net amount of metabolism translocated to the earheads. Application of N has a great influence in providing sufficient quantity of metabolites for better grain formation.

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