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STUDIES ON YIELD CAPABILITY OF DIFFERENT SORGHUM VARIETIES AT VARYING LEVELS OF N AND P*

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Field experiments were laid out with 5 different sorghum varieties namely CO 18, CSH 5, CSH 6, CSV 4, and Composite IX with graded levels of N and P (i. e) 0, 60 and 120 kg/ha. Potash application was common. The variety CSH 6 significantly yielded higher grain wherease straw yield by CSH 5. N levels caused significant differences in grain yield but not P levels. But NP interaction proved benefical as for as straw yield is concerned. Higher grain/N ratio was recorded in CSH 6 which was the most respensive variety among the six varieties tried.

Sorghum is cultivated on a larger scale by farmers of India and the estimated area under sorghum is nearly about 19.0 million hectares. The total annual production is estimated to be 9.8 million tonnes of food grain. In Tamil Nadu, sorghum is grown in about 7.5 lakh hectares. However, the average grain yield of sorghum in India is about 543 kg/ha which works out approximately to just half the world average grain yield of 1003 kg/ha (Anon. 1975). Thus there exists vast scope for increasing the yield of this crop per unit area.

Particular attention is paid to the crop improvement programme of this crop all over the world and a number of varieties of sorghum of high yield potential have been evolved in recent years. However, evolving hybrids alone would not bring in desired results. It needs no special emphsis that adequate supply of plant nutrients depending on the crop varieties is essential for obtaining higher yields. Thangavelu *et al.* (1968) reported that 90 kg N and 45 kg P_2O_5/ha applied to CSH 1 sorghum gave 2310 kg grain/ha and 15880 kg of straw/ha. Mahendra Singh and Mahendrapal (1969) observed that optimum level of N was between 100 and 150 kg N/ha for maximum grain yield. Ramalingam (1975) concluded that application of 140 kg N/ha increased the grain yield of CSV 4. No systematic study has so far been done to make a comparative appraisal of the performance of different sorghum varieties grown under varying levels of N and P. Hence, it becomes imperative to determine the varietal difference as may be influenced by different levels of N and P at varying combinations, aiming at higher crop production.

MATERIAL AND METHODS

A field experiment was conducted on red loam soil at Bhavanisagar,

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adopting split plot design with three replications. The levels of N (0, 60 and 120 kg N/ha) and the levels of P (0, 60 and 120 kg P_2O_5/ha) were assigned to the main plots and varieties to sub-plots. The five varieties of sorghum tried were CO 18, CSH5 , CSH 6, CSV 4 and Composite IX The gross plot size of 4.05 x 3.9 metres with a net plot of 3.15 x 2.70 metres was chosen. At the time of harvest grain and straw yields were recorded.

RESULTS AND DISCUSSION

Grain yield

The varieties showed significant differences among themselves in grain yield (Table 1). The variety CSH 6 recorded the maximum grain yield of 36.54 q/ha, followed by CSH 5 and composite IX recording 31.12 and 27.16 q/ha respectively while CSV 4 recorded the minimum (16 50 q/ha). It may also be mentioned that CSV 4 which has been performing equally well in other tracts reflected a poor performance under conditions of Bhavanisagar tract. From the data available on soil and climatic variations, it is not possible to deduce specific reasons for this poor performence. It merits further study.

The results on grain yield showed significant differences due to N levels but not due to P levels. N levels at 60 and 120 kg N/ha recorded significantly higher grain yield than control without N. As both the levels were on par, the lower level 60 kg N/ha could be considered to be optimum. Response of sorghum to N application is a common feature for any soil (Herron and Erhart, 1960; Bobde and Khsape, 1973. Palaniappan and Ramaswamy, 1975; Rodge and Talk, 1975).

Straw yield

The varieties snowed significant differences in straw yield also. The variety CSH 5 recorded the maximum straw yield of 164.1 q/ha while CSH 6, the minimum (112.8 q/ha). There was an upward trend in straw yield as N levels were increased. Evidently, 120 kg N/ha registered the highest straw yield of 183.9 q/ha while the control recorded only 108.8 q/ha. Here application of N at 60 and 120 kg N/ha caused 35 and 69 per cent increase in straw yield respectively over control (Table 2).

There was a significant interaction between N and P levels. Muthusamy (1962) observed similar significant interaction between the two nutrients in relation to straw yield of sorghum. Results further showed that the choice of CSH 6 sorghum for grain could necessarily be at the expense of straw yield.

Straw/Grain ratio

The straw to grain ratio is an important ecnomic characteristic. This is more closely related to the genotype of the plant. Generally, the hybrid varieties recorded low value of straw/grain ratio implying that grain yield is greater. It could serve the dual purpose of yielding appreciable amounts of grain for human consum-

ption and straw for animal feed. On the contrary, the variety CO 18 generally recorded higher straw/grain ratio. In the present study also, the varieties CO. 18 and CSV. 4 recorded significantly higher values of straw/grain ratio (Table 3) than the rest of the varieties. There was also significant interaction between varieties and N levels in relation to ratio values. This is also probable because N levels had a strong interaction with straw yield. Earlier workers also reported similar differences e.g. Korikanthimath (1975) in the case of CSH 6, Ramalingam (1975) in CSV 4 and Viswanathan (1976) in CO 18.

Grain/N ratio

The index of grain to N ratio was used by Ramachandran (1971) for purpose of determining whether a particular variety is responsive or not. The higher the value, the greater was the responsive nature of the genotype. N in this instance refers to the applied N level. From the values of ratios (Table 4), it was seen that the highest value was recorded by CSH 6 at 60 kg N/ha level which was also observed to be the optium level. On the basis of above index, CSH 6 sorghum could be considered most responsive and other varieties which followed in decending order were CSH 5, composite IX, CO 18 and CSV 4.

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Table 1. Grain yield of sorghum varieties (Mean of three replications in q/ha)

Particulars	V_1			V_2			V_3			V_4			V_5		
	N_0	N_1	N_2	N_0	N_1	N_2	N_0	N_1	N_2	N_0	N_1	N_2	N_0	N_1	N_2
P_0	8.46	19.89	25.93	22.16	29.43	33.46	29.66	47.49	38.35	13.21	15.85	18.73	18.89	28.38	36.41
P_1	10.29	26.61	21.26	25.04	39.58	40.75	32.04	36.98	41.78	13.84	17.36	17.59	24.86	30.80	29.98
P_2	15.74	24.00	23.55	19.60	31.03	39.03	25.09	40.18	37.30	13.84	16.17	21.94	19.47	23.35	32.24

		V_1	V_2	V_3	V_4	V_5	C. D. (0.05)
Varieties		19.53	31.12	36.54	16.50	27.16	3.38
		N_0	N_1	N_2			
N levels		19.48	28.48	30.55			5.34

Table 2 Straw yield of sorghum varieties (Mean of three replications in q/ha)

Particulars	V_1			V_2			V_3			V_4			V_5		
	N_0	N_1	N_2	N_0	N_1	N_2	N_0	N_1	N_2	N_0	N_1	N_2	N_0	N_1	N_2
P_0	109.7	173.8	178.3	132.6	192.0	182.9	68.6	123.5	128.0	86.9	128.0	192.0	137.2	173.8	182.9
P_1	114.3	146.3	173.8	123.5	173.8	192.0	86.9	128.0	150.9	109.7	118.9	205.8	146.3	150.9	190.1
P_2	128.0	155.5	192.0	118.9	155.5	205.8	68.6	123.5	137.2	96.0	132.6	242.3	105.2	128.0	205.8

		V_1	V_2	V_3	V_4	V_5	C. D. (0.05)
Varieties		152.4	164.1	112.8	145.8	157.8	24.50
		N_0	N_1	N_2			
N levels		108.8	146.9	183.9			9.52
		N_0	N_1	N_2			
N x P	P_0	106.9	158.2	172.8			16.49
	P_1	116.1	143.6	182.5			
	P_2	103.3	138.9	196.6			

Table 3. Straw/Grain ratio in different sorghum varieties (Mean of three replication

Varieties	V_1			V_2			V_3			V_4			V_5		
levels	N_0	N_1	N_2	N_0	N_1	N_2	N_0	N^1	N_2	N_0	N_1	N_2	N_0	N_1	N_2
P_0	13.36	10.33	7.28	6.25	6.93	5.50	2.48	2.60	3.58	6.54	8.16	10.25	8.11	6.88	5.23
P_1	13.08	5.54	8.38	5.29	4.52	4.72	2.71	3.73	3.75	7.91	7.11	11.97	6.21	5.11	7.79
P_2	9.39	7.05	9.89	6.20	5.43	5.12	2.75	3.10	3.72	6.99	8.28	11.84	5.58	6.02	6.57

	V_1	V_2	V_3	V_4	V_5	C. D. (0.05)
Varieties	9.3670	5.5511	3.1567	8.7848	6.3896	1.1094

Varieties X N	N_0	N_1	N_2	
V_1	11.94	7.64	8.52	2.0973 (N levels under varieties)
V_2	5.91	5.52	5.22	
V_3	2.64	3.14	3 68	1.9216 (Varieties under N levels)
V_4	7.15	7.85	11.35	
V_5	6.63	6.00	6.53	

Table 4. Grain/N ratio in sorghum varieties (Mean of three replications)

Applied N kg/ha	V_1		V_2		V_3		V_4		V_5	
	Grain yield kg/ha	G/N	Grain yield kg/ha	G/N	Grain yield kg/ha	G/N	Grain yield kg/ha	G/N	Grain yield kg/ha	G/N
60	2350	39.16	3335	55.58	4155	69.16	1646	27.43	2751	45.85
120	2358	19.65	3775	31.45	3914	32.62	1942	16.11	3288	27.33