

Short Communication

## Response of Sorghum to Nitrogen and Plant Density

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In Rajasthan, the sorghum (*Sorghum bicolor* L. Moench) productivity is very low due to non-adoption of proper agro-techniques, like fertilization in context of plant density. Farmers in this region generally go for higher plant population of kharif crops for good harvest of fodder. Therefore, a study was conducted to work out the optimum plant density with least adverse effect on grain yield and to study the response of nitrogen in conjunction with plant density to augment the kharif sorghum production.

The field experiment was conducted at Rajasthan College of Agriculture, Udaipur, with four levels of nitrogen (0, 40, 80 and 120 kg N ha<sup>-1</sup>) and four plant densities (1,50,000, 1,80,000, 2,10,000 and 2,40,000 plants ha<sup>-1</sup>) under rainfed conditions during kharif 1996-97 in randomized block design with three replications. The soil was sandy loam in texture having pH 7.2, low in organic carbon (0.41%) and available nitrogen (214.30 kg ha<sup>-1</sup>), medium in available phosphorus (16.90 kg ha<sup>-1</sup>) and available potassium (212.82 kg ha<sup>-1</sup>). Half dose of nitrogen (as urea) was applied at sowing and the remaining half dose was broadcasted 30 days after sowing (DAS) when there was a good moisture regime

in the top 0-15 cm soil. Basal dose of 40 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> was applied at sowing. Carbofuran – 3G @ 15 kg ha<sup>-1</sup> was applied in furrows at sowing to control the shoot fly incidence and atrazine @ 0.5 kg ha<sup>-1</sup> was applied as pre-emergence herbicide uniformly over the experimental field to control weeds. Kharif sorghum (cv. CSV-10) was sown on 7<sup>th</sup> July 1996 at 45 cm row spacing. Crop was harvested on 2<sup>nd</sup> November 1996. Results show that application of 80 kg N ha<sup>-1</sup> significantly increased the dry matter by 100, 90.17 and 67.99% over control at 30, 60, 90 DAS, respectively. However, increase in dry matter production 90 DAS was at a slower pace, which might be due to senescence of leaves (Table 1). The results corroborate the findings of Bobde and Khuspe (1973). Dry matter production plant<sup>-1</sup> at 60 and 90 DAS significantly decreased when plant density increased from 1,50,000 to 1,80,000 plants ha<sup>-1</sup>. Further increase in plant density up to 2,10,000 plants ha<sup>-1</sup> did not reduce the dry matter production. Similar findings were also reported by Reddy and Hussain (1968). Nitrogen application also increased the number of green leaves plant<sup>-1</sup> at harvest, possibly due to delayed leaf senescence

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Table 1. Effect of nitrogen and plant density on dry matter, green leaves/plant, grains/earhead, test weight, grain yield and fodder yield

Treatment	Dry matter production (g plant <sup>-1</sup> )			Green leaves plant <sup>-1</sup> at harvest	Grains ear- head <sup>-1</sup>	1000- grain weight (g)	Yield (q ha <sup>-1</sup> )	
	30 DAS	60 DAS	90 DAS				Grain	Fodder
<b>Nitrogen (kg ha<sup>-1</sup>)</b>								
0	1.23	18.82	40.70	6.42	574.60	18.75	12.08	26.94
40	2.04	30.76	58.90	6.90	877.40	21.36	15.70	33.29
80	2.46	35.79	68.25	7.36	1072.60	22.20	18.20	38.66
120	2.65	36.38	70.06	7.93	1093.55	22.12	15.84	45.92
S.Em±	0.084	1.52	2.20	2.257	39.82	0.86	0.45	1.10
CD at 5%	0.242	4.40	3.18	0.742	114.97	2.48	1.30	3.17
<b>Population densities (plants ha<sup>-1</sup>)</b>								
1,50,000	2.25	35.14	64.82	8.24	986.24	23.25	17.90	28.31
1,80,000	2.18	32.62	61.23	7.54	944.84	21.36	17.22	38.51
2,10,000	2.13	28.51	59.44	6.78	871.62	20.15	14.68	44.38
2,40,000	1.82	25.48	52.42	6.05	815.45	19.67	12.02	33.61
S.Em±	0.084	1.52	2.20	2.257	39.82	0.86	0.45	1.10
CD at 5%	0.242	4.40	3.18	0.742	114.97	2.48	1.30	3.17

at higher level of nitrogen application than control (Krishnamurthy *et al.*, 1975).

Application of 80 kg N ha<sup>-1</sup> had significant effect on grains earhead<sup>-1</sup> amounting to 86.67% increase over control. Application of 40 kg N ha<sup>-1</sup> registered 13.92% increase in grain test weight over control. The grain yield increased significantly with nitrogen application. Crop fertilized with 80 kg N ha<sup>-1</sup> produced maximum grain yield (18.20 q ha<sup>-1</sup>), while fodder yield was highest with 120 kg N ha<sup>-1</sup>. The application of 80 kg N ha<sup>-1</sup> increased all the yield-attributing parameters (except 1000-grain weight) and gave the highest grain yield. The grain yield is positively correlated with 1000-grain weight, grain ear head<sup>-1</sup> and uptake of nitrogen (Bhosekar and Rajkhelkar, 1990).

The grain yield declined with increasing crop density. The decrease was significant at and above 2,10,000 plants ha<sup>-1</sup>. Yield parameters were not much affected by increase in plant density. A significant reduction in grain yield (2.54 q ha<sup>-1</sup>) was recorded when density was raised from 1,80,000 to 2,10,000 plants ha<sup>-1</sup>, but there was substantial increase in fodder yield (5.87 q ha<sup>-1</sup>) at 2,10,000 plants ha<sup>-1</sup>.

## References

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