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Fodder quality of rabi fodder sorghum (*Sorghum bicolor* L. moench) as influenced by spacing and nitrogen levels

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Abstract
A field experiment was conducted during rabi season of the year 2017-18 at Instructional Farm, College of Agriculture, Junagadh Agricultural University, Junagadh (Gujarat). The experiment was laid out in a Split Plot Design with four replications. The results obtained from the study revealed that the crude protein content, crude protein yield and crude fiber content of fodder sorghum were remained unaffected due to different row spacing while, crude fiber yield was significantly higher under closer row spacing of 20 cm (S1). Nitrogen content and uptake by fodder were not significantly affected by variation in row spacing. Available nitrogen in soil after harvest of crop was significantly higher under wider row spacing of 40 cm and with application of 120 kg N ha-1.

Keywords: Fodder sorghum, rabi, spacing, nitrogen levels

Introduction

Sorghum is one of the gifted grass genera of the tropics. It provides food, feed, stover and fuel to millions of poor farm families and their livestock in the arid and semi-arid tropical region of the world. India is a notable for its huge livestock population and its economic integration with farm production, particularly under the less mechanized dry land agriculture. Sorghum is very important crop to resource poor farmers for nutritional and livelihood security. India supports 512.1 million of livestock, which includes 37.3 per cent cattle, 21.2 per cent buffalo, 12.7 per cent sheep, 26.4 per cent goat and 2.0 per cent pig (Census, 2012). Deficiencies in feed and fodder have been identified as one of the major components in achieving the desired level of livestock production. The shortage in dry fodder is 21.8 per cent compared with requirement of 560 million tons for the current livestock populations (Rana *et al.*, 2013). Gujarat state has total animal population of 23.78 million heads and their total dry fodder requirement is 15.36 million tones and green fodder requirement is
37.88 million tones whereas, only 15.09 million tones of dry and 26.08 million tones of green fodder is made available in normal year (Shah *et al.*, 2011) [8]. Thus, state is not only in short of quantity but quality fodder also. It is cultivated over 10.0 million hectares as a dual purpose crop and 0.5 million hectare as exclusory forage crop. The production of fodder sorghum can be increased by adopting improved package of practices. Among the various agronomic factors, row spacing and nitrogen are prime importance for getting higher forage yield of better quality. Plant spacing is one factor that determines the efficient use of land, light, water and nutrients. Nitrogen is an essential element for both fodder quantity and quality as it is a component of protein and chlorophyll. It is thus, essential for photosynthesis, vegetative and reproductive growth and it often determines yield of sorghum. Sorghum fodder contains relatively high concentration of soluble carbohydrates and yields a high quality biomass within short period, making it attractive as hay and silage crops for tropical areas. The application of nitrogen not only affects the forage yield of sorghum, but also improves its quality especially its protein content.

Materials and methods

The experiment was conducted in rabi season of the year 2017-18 at Instructional Farm College of Agriculture, Junagadh Agricultural University, Junagadh. The soil of experimental field was medium black in texture, medium in available nitrogen, phosphorus and potassium.

Twelve treatment combinations consisted of three spacing viz., S1:20 cm, S2:30 cm, S3:40 cm and four levels of nitrogen viz., N1:00 kg N ha-1, N2:80 kg N ha-1, N3:100 kg N ha-1 and N4: 120 kg N ha-1 were tested under split plot design with four replications. Furrows at 20 cm, 30 cm and 40 cm distance were opened by bullock drawn cultivar in the whole experimental field. Before sowing the seed, nitrogen was applied through urea. Half of the nitrogen applied at the time of sowing and the rest at 30 - 35 days after sowing as top dressing as per treatments, when there was adequate moisture in the soil. A uniform dose of phosphorus at 40 kg P2O5 ha-1 was applied as basal through diammonium phosphate (DAP). Herbicide Pendimethalin 30 EC @ 0.9 kg ha-1 was applied as pre-emergence with irrigation water. Two manual weeding was done in between the rows at 20 and 35 days after sowing of crop. The first common irrigation was applied immediately after sowing. Second common irrigation was given 7 DAS for proper germination and establishment of the seedlings. Total seven irrigations were given to sorghum crop.

Results and discussion

Effect of spacing:

On quality parameters

The quality parameters such as crude protein content crude protein yield and crude fiber content were not significantly affected by variation in row spacing. The row spacing of 20 cm recorded significantly higher crude fiber yield (3028 kg ha-1) and it was remained at par with row spacing of 30 cm (2766 kg ha-1). This is mainly due to higher dry matter yield in 20 cm and 30 cm row spacing. Similar results were also reported by Manjunatha *et al.* (2013) [4] and Bishnoi *et al.* (2005) [2]. Nitrogen content and uptake by fodder were not significantly affected by variation in row spacing. However, numerically higher nitrogen uptake (111.7 kg ha-1) was noted under closer row spacing of 20 cm (S1).

On available nutrients in soil after harvest:

Soil fertility status after harvest of fodder sorghum was not significantly influenced due to different row spacing (Table-1) except, available soil nitrogen where in wider row spaced fodder sorghum noted maximum available nitrogen (267.4 kg ha-1) and it was closely followed by row spacing of 30 cm. It might be due to nitrogen uptake was more with higher planting density then with lower plant density. After harvest of crop available soil nutrients viz., nitrogen, phosphorus and potash were slightly increased by litter fall and root exudates but cannot reach the levels of significant due to the losses of decomposed materials and immobilization with wider C: N ratio. Similar results were also reported by Sangtam *et al.* (2017) [7].

Effect of nitrogen levels: On quality parameters

Crude protein content increased significantly with increase in nitrogen levels up to 120 kg N ha-1. Per cent increase in protein content (8.84%) and crude protein yield (839 kg ha-1) with the application nitrogen @ 120 kg ha-1 over control were to the tune of 50.1 and 90.4%, respectively. The increase in crude protein content may be due to increased availability of nitrogen there by more uptake and corresponding increase in protein content of herbage. The crude protein yield increased significantly up to 120 kg N ha-1 due to increased crude protein content associated with enhanced dry matter yield. Results showed that no application of nitrogen to fodder sorghum noted significantly maximum crude fiber content of 34.67% but with increase in nitrogen dose fiber production increase although fiber content followed decreasing trend with increase in nitrogen.

Increase in crude fiber content under control was to the tune of 14.1% over 120 kg N ha-1. This might be due to application of nitrogen had depressing effect on crude fiber content because it resulted in leaf weight and wider leaf: stem ratio which might had decreased the crude fiber content in fodder sorghum (Ahmad *et al.*, 2016). Various nitrogen levels produced their significant effect on nitrogen content and uptake by fodder (Table-1). Fodder sorghum fertilized with 120 kg N ha-1 appreciably improved nitrogen content (1.41%) and uptake (134.3 kg ha-1). Higher green and dry fodder yields with supply of nutrients might have increase nitrogen content in fodder which reflected higher uptake of nitrogen by fodder sorghum. Similar findings were also reported by Verma *et al.* (2005) [9] and Patil *et al.* (2017) [5].

On available nutrients in soil after harvest:

Results on soil fertility status after harvest of fodder sorghum as influenced by different nitrogen levels presented in Table-1 showed that available nitrogen was significantly influenced by different nitrogen levels and maximum available nitrogen of 276.4 kg ha-1 was observed when crop was fertilized with 120 kg N kg ha-1 which was closely followed by 100 kg N ha-1. Results confirm with the findings of Sangtam *et al.* (2017) [7].

Conclusion

Based on the results from one year experimentation, it seems quite logical to conclude that under medium black soil of South Saurashtra Agro- climatic zone for getting higher crude protein content, crude fiber content, nitrogent content and available nutrient were increased when rabi fodder sorghum (GFS-5) should be sown at 40 cm while crude protein yield, crude fiber yield and nitrogen uptake were higher when crop sown with 20 cm row spacing. Application with 120 kg N ha-1 have significant effect on crude protein content, crude protein yield, crude fiber yield, nitrogen content, nitrogen uptake and available nutrients along with other recommended package of practices.

Table 1: Crude protein content (CPC), crude protein yield(CPY), crude fiber content(CFC), crude fiber yield(CFY), nitrogen content, nitrogen uptake and available nutrients in soil after harvest in soil of fodder as influenced by spacing and nitrogen levels

Treatments	CPC (%)	CPY (kg ha-1)	CFC (%)	CFY (kg ha-1)	Nitrogen content (%)	Nitrogen uptake (kg ha-1)	Available nutrients in soil after harvest (kg ha-1)		
							Nitrogen	Phosphorus	potassium
Spacing (S):									
S1- 20 cm	7.34	698	32.08	3028	1.17	111.7	250.6	49.2	238.5
S2- 30 cm	7.57	646	32.82	2766	1.21	103.4	262.0	50.4	243.5
S3- 40 cm	8.05	639	32.45	2512	1.29	102.3	267.4	51.0	251.0
S.Em.±	0.17	27.7	0.71	108.5	0.03	4.4	3.66	0.90	4.17
C.D. at 5%	NS	NS	NS	375.6	NS	NS	12.67	NS	NS

C.V. %	8.93	16.75	8.71	15.68	8.93	16.75	5.63	7.14	6.83
Nitrogen levels (kg N ha-1):									
N1- 00	5.89	440	34.67	2615	0.94	70.5	243.9	49.1	240.6
N2- 80	7.20	581	32.89	2663	1.15	93.1	250.8	50.1	240.9
N3- 100	8.69	783	31.86	2878	1.39	125.4	268.8	50.5	247.0
N4- 120	8.84	839	30.39	2919	1.41	134.3	276.4	51.1	248.8
S.Em.±	0.19	21.7	0.75	107.2	0.03	3.5	3.60	0.79	4.31
C.D. at 5%	0.55	63.0	2.19	NS	0.09	10.0	10.44	NS	NS
C.V. %	8.60	11.38	8.05	13.42	8.60	11.38	4.79	5.43	6.12
Interaction S x N:									
S.Em.±	0.33	37.62	1.31	185.73	0.05	6.02	6.23	1.36	7.47
C.D. at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS

References

1. Ahmad S, Muhammad A, Muhammad I, Abdul S. Proximate analysis of forage sorghum cultivars with different doses of nitrogen and seed rate. Turkish Journal of Field Crops. 2016; 21(2):276-285.
2. Bishnoi NR, Mali AL, Sumeriya HK. Fodder quality of dual purpose sorghum genotypes as influenced by varying plant population and nitrogen levels. Forage Research. 2005; 30(4):229-230.
3. Census. 19th Livestock Census, Department of Animal Husbandry, Dairying and Fisheries, Government of India, 2012. http://dahd/ Write Read Data/ Livestock. pdf accessed on date 5th Oct. 2017.
4. Manjunatha SB, Angadi VV, Palled YB, Hosamani SV, Babalad HB, Hosamani MH. Response of multi cut fodder sorghum (CoFS- 29) to row spacing and nitrogen levels under irrigated condition. Karnataka Journal Agricultural Science. 2013; 26(4):511-513.
5. Patil JB, Arvadia MK, Tharave DS. Effect of integrated nitrogen management on nutrient content, uptake, quality and yield of rabi sorghum (*Sorghum bicolor* L.) under South Gujarat Condition. International Journal of Chemical Studies. 2017; 6(1):1095-1097.
6. Rana DS, Singh B, Gupta K, Dhaka AK, Pahuja SK. Effect of fertility level on growth, yield and quality of multi cut forage sorghum (*Sorghum bicolor* L.) genotypes. Forage Research. 2013; 39(1):36-38.
7. Sangtam S, Gohain T, Kikon N. Assessment of nitrogen doses and planting densities for optimizing growth and yield performance of rainfed maize (*Zea mays* L.). Indian Journal of Agricultural Research. 2017; 51(5):473-477.
8. Shah VD, Makwana M, Sharma S. Economics of production, processing and marketing of fodder crops in Gujarat. Agro-ecological Research Centre, Sardar Patel University, 2011.
9. Verma SS, Singh N, Joshi YP, Deprari V. Effect of nitrogen and zinc on growth characters, herbage yield, nutrient uptake and quality of fodder sorghum (*Sorghum bicolor* L. Moench). Forage Research. 2005; 50(2):167-169.