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EFFECT OF NITROGEN LEVELS ON YIELD AND QUALITY OF [*SORGHUM BICOLOR* (L.) MOENCH] SORGHUM GENOTYPES

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SUMMARY

A field experiment was conducted at Udaipur during **kharif** 2011 to assess N doses for sorghum genotypes. The results revealed that SSV-74 recorded maximum dry matter accumalation at 30 DAS and harvest, green as well as dry fodder yield (55.69 and 16.21 t/ha), respectively. Among nitrogen levels, application of 120 kg N/ha recorded higher dry matter accumalation at 30 DAS and harvest, HCN content at 30 DAS, green as well as dry fodder yield, net returns and B : C ratio over 40 and 80 kg N/ha. Application of 120 kg N/ha recorded 19.70, 7.89 and 20.03, 8.72 (green and dry fodder) 23.57, 9.10 and 13.93, 4.80 (net return and B : C ratio) per cent higher over 40 and 80 kg N/ha, respectively.

Key words : Nitrogen, fodder yield, quality, sorghum

In Indian agriculture, livestock plays a pivotal role in the development and progress of mankind with crop production programme as a complementary enterprise. India supports nearly 20 per cent of the world's livestock and 16.8 per cent human population with only 2.3 per cent of the world's geographical area. It is the leader in cattle (16%) and buffalo (55%) population and has the world's second largest goat (20%) and fourth largest sheep (5%) population. The livestock sector contributes Rs. 1830000 million to the annual revenue i. e. 32 per cent of the agricultural output, which is 27 per cent of total GDP. It is expected to rise to 50 per cent by 2020 (Agriculture Statistics, 2010).

In India, there is a short supply of about 38 per cent green fodder, especially during summer season. Sorghum is an important crop widely grown for grain and forage. It is fast growing, palatable, nutritious and utilized as silage and hay besides fresh feeding. The total area under cultivated fodders is 8.3 million ha on individual crop basis. Among the rainy season (**kharif**) crops, sorghum (2.6 million ha) occupies 54 per cent of the total area under fodder culitivation. The area under chari or sorghum [*Sorghum bicolor* (L.) Moench] is 26 lac ha and the productivity of green forage is 35-70 t/ha (Mal *et al.*, 2006). There is a great need to maintain regular well balanced supply of more nutritious feed and fodder for stall feeding animals, productive milch herds can be maintained, which would accelerate the growth of milk production in the state. Amongst growth factors, adequate inorganic fertilizers specially, nitrogenous and phosphates are considered to be of prime importance due to their profound impact on various aspects of growth and development of the crop. Balanced use of fertilizer has played a key role in the modernization of Indian agriculture and in making the country sufficient in fodder production for animals.

MATERIALS AND METHODS

The field experiment was conducted at Instructional Farm, Rajasthan College of Agriculure, Udaipur during **kharif** 2011 to assess appropriate nitrogen level for single cut fodder sorghum and to assess the economic viability of treatment. The experiment consisted of 12 treatment combinations, comprising four genotypes (SSV-84, SSV-74 ,CSV-19SS and HC-308) and three nitrogen levels (40, 80 and 120 kg N/ha) tested in factorial randomised block design with three replications. The experimental soil was clay loam in texture, slightly alkaline in reaction pH, low in available nitrogen (278.00 kg/ha), medium in available phosphorus and potassium (20.69 and 194.60 kg/ha). The crop was sown on 5 July 2011 with recommended seed rate of 40 kg/ha. Total rainfall (610.2 mm) was recorded during crop season. The data pertaining to growth parameters, green and dry fodder yields and HCN content at 30 DAS

of the crop were evaluated. The crop was harvested on 28 September, 2011 at 50 per cent flowering stage of the crop.

RESULTS AND DISCUSSION

Genotypes

Data presented in Table 1 reveal that maximum dry matter accumulation per plant 30 DAS and at harvest and plant height at harvest, green and dry fodder yield at 30 DAS and at harvest, net retrun and B/C ratio were recorded under SSV-74 which were found signifcantly superior over SSV-84, CSV-19SS and HC-308 and HCN content was lowest at 30 DAS. The variation in plant height of the genotypes might be related to inherent difference and their high vigour. The differential behaviour of these genotypes could also be explained solely by the variation in their genetic constituent. Dry matter production efficiency of genotype determines its potential to produce economic yield (Meena and Mann, 2007). The higher green and dry fodder yield registered by varieties SSV-74 over SSV-84, CSV-19SS and HC-308 appeared to be a resultant of remarkable improvement in plant height and dry matter accumulation. Genotype SSV-74 recorded significantly lesser HCN (130.33 ppm) content over rest of the genotypes tested. Genotype SSV-74 (Rs. 49249, 4.09) provided Rs.13589, 19791 and 14997 higher in net returns and 2.79, 2.45 and 2.85 higher in B/C ratio over varieties SSV-84, CSV-19SS and HC-308. The increases with SSV-74 were by 28.52, 47.71 and 32.43 per cent in green and 31.78, 50.37 and 30.83 per cent in dry fodder over SSV-84, CSV-19SS and HC-308, respectively.

Nitrogen Levels

It is clear from data in Table 1 that application of 120 kg N/ha recorded signifcantly higher plant height (276.92 cm), DMA 30 DAS and at harvest (5.88 and 124.49 g/plant), HCN content at 30 DAS (142.10 ppm), green and dry fodder yield (48.54 and 14.08 t/ha), net returns (Rs. 40893) and B/C (3.27 : 1) ratio over 40 and 80 kg N/ha. Application of 120 kg N/ha recorded 19.70, 7.89 and 20.03, 8.72 and 23.57, 9.10 and 13.93, 4.80 per cent higher green fodder, dry fodder, net returns and B/C ratio over 40 and 80 kg N/ha, respectively. Application of 40 kg N/ha recorded minimum HCN (131.97 ppm) content as it increased with the increase in N levels. The HCN content was maximum at germination and then continuously decreased with age 30 DAS stage, the content of dhurin correlated with the activity of two biosynthetic enzymes, CYP 79 A1 and CYP 76 E1 and with protein and mRNA level for the two enzymes. During dhurin development, the activity of CYP 79 A1 was lower than the activity of CYP 76 E1 suggesting that CYP 79 A1 catalyzes the rate limiting set up using etiolated seedling. The site of dhurin synthesis shifts from leaves to stem during plant development. In combination , the results demonstrate that dhurin (HCN)

TABLE 1
Effect of genotypes and nitrogen levels on yield and economics of forage sorghum

Treatment	Plant height (cm)	DMA (g/plant)		HCN content (ppm)	Green fodder yield (t/ha)	Dry fodder yield (t/ha)	Net returns (Rs./ha)	B/C ratio
		30 DAS	At harvest					
Genotypes								
SSV-84	260.78	5.39	112.30	130.85	43.33	12.30	35660	2.97
SSV-74	288.11	6.10	126.67	130.33	55.69	16.21	49249	4.09
CSV-19 SS	251.44	5.01	104.41	144.93	37.70	10.78	29458	2.45
HC-308	264.00	5.02	102.79	140.47	42.05	12.39	34252	2.85
S. Em±	2.87	0.09	2.89	1.44	1.35	0.41	1479.57	0.12
C. D. (P=0.05)	8.42	0.27	8.49	4.23	3.95	1.21	4339.45	0.36
Nitrogen (kg/ha)								
40	247.00	4.83	95.52	131.97	40.55	11.73	33092	2.87
80	274.33	5.43	114.22	135.86	44.99	12.95	37480	3.12
120	276.92	5.88	124.49	142.10	48.54	14.08	40893	3.27
S. Em±	2.49	0.08	2.50	1.25	1.17	0.36	1281.35	0.10
C. D. (P=0.05)	7.29	0.24	7.36	3.66	3.42	1.05	3758.07	0.32

content in sorghum is largely determined by transcriptional regulation of the biosynthetic enzymes, CYP 79 A1 and CYP 76 E1 (Busk and Moller, 2002).

It may be due to the fact that nitrogen application enhanced the growth parameters like plant height, leaves/ plant, leaf : stem ratio, which ultimately reflected in increased total green and dry fodder yields. It is well known fact that nitrogen plays an important role in increasing protoplasmic constituents and accelerating the process of cell division and elongation. In general, overall improvement in growth of sorghum plants under the influence of increasing rates of fertilty could be ascribed to the potential role of N fertilizers in modifying soil and plant environment conducive for better development of both morphological and biochemical components of the growth. Thus, the increase in green and dry fodder yields of sorghum with application of N could be attributed to its marked impact on improving growth attributes of plant. The existence of favourable nutrional environment under the influence of N had a positive influence on the growth of crop, which ultimately led to realization of higher fodder yields. The results of present investigation are in close agreement with the findings of Chotiya (2005) and Singh (2007). Under the present investigation preponderant effect of increasing rate of nitrogen levels on growth of the crops was due to the improvement in nutritional environment of the plants.

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