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RESPONSE OF FORAGE SORGHUM [*SORGHUM BICOLOR* (L). MOENCH] CULTIVARS TO NITROGEN LEVELS

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Abstract: The application of 125 % N of RDF ha^{-1} level significantly increased forage weight g plant^{-1}, forage yield kg plot^{-1}, forage yield kg day^{-1} production and forage yield (60.6 t ha^{-1}) as compared to other treatments. The chlorophyll content, Brix content, crude protein and hemi-cellulose content in forage sorghum were significantly higher under application of 125% N of RDF ha^{-1}. However, hemi-cellulose content was at par with the treatment fertilized @ 100% N of RDF ha^{-1}. Whereas, application of 125% N of RDF ha^{-1} in forage sorghum registered significantly minimum Acid detergent fiber (ADF) and Neutral detergent fiber (NDF) content than application of 100%, 75% and 50% N of RDF ha^{-1}.

Keywords: Nitrogen fertilizer, quality parameters.

INTRODUCTION

In Indian agriculture, livestock plays a pivotal role in the development and progress of mankind with crop production programme as a complementary enterprise. The status of green fodder and dry fodder in India indicated the availability of 390 and 443 m tons respectively as against the requirement of 1025, and 570 m tons. It creates the deficit of 62 and 22 per cent respectively (Hegde, 2006). Maharashtra has about 4 crore livestock population which needs about 12 crore tonnes dry fodder. However, only 7 crore tonnes dry fodder is available from all sources, it means about 42 per cent fodder is deficit for livestock in Maharashtra.

Kharif fodders are comparatively poor yielder having low nutritive value and poor rationing ability, for improving this condition it is essential to determine its fertilizer requirements. Different varieties might respond differently to fertilizer application under changing soil and environmental conditions. The plant nutrition may not only affect the forage production but

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also improve the quality forage from view point of its protein contents. Fertilizers are the kingpin in the present system of agriculture. Scientific use of fertilizer assumes vital importance in sustainable agriculture. Fertilizers pay back more profit per unit investment. Judicious use of fertilizer is an important management practice to increase single cut sorghum forage production. Nitrogen is the most important plant nutrients required for crop production and is required in large quantities (Balasubramanian *et al.,* 2010). It is main constituent of amino acid which is directly related to crude protein yield (Almodares *et al.,* 2009). Protein supply is one of major factor that influence the productivity of animals which is an effective to build assets and increase livestock productivity in term of yield and quality both. High levels of protein feeding may be effective in promoting rapid weight gains and milk yield (Hoffman *et al.,* 2001). Therefore the present experiment was planned on these aspects.

MATERIALS AND METHODS

The trial was carried out at the Research area of Sorghum Improvement Project, Mahatma Phule Krishi Vidyapeeth, Rahuri (M.S) during *kharif* season of 2015 to study the response of forage sorghum [Sorghum *bicolor* (L). Moench] cultivars to nitrogen levels. The experiment was laid out in factorial randomized block design with three cultivars of forage sorghum (V_1- Phule Godhan, V_2- Phule Amruta, V_3- Phule Ruchira) and four levels of nitrogen percentage (N_1- 50 % N of RDF, N_2-75 % N of RDF, N_3- 100 % N of RDF, N_4-125 % N of RDF) replicated three times.

The soil of the experimental field was clay in texture, low in available nitrogen (248 kg ha^{-1}), low in available phosphorus (11.62 kg ha^{-1}) and very high in potassium (314 kg ha^{-1}). The soil was slightly alkaline in reaction (pH 8.23) with low in electrical conductivity 0.38 dSm^{-1}. The moisture at field capacity and permanent wilting point were 32.16 and 16.02 per cent, respectively, with bulk density 1.38 Mg m^{-3}. As per the treatment split dose of nitrogen and entire dose of phosphorus and potassium was applied by placement method, through straight fertilizers. The total rainfall received during the crop growth period was 180.7 mm. The experimental plot was irrigated at regular intervals depending on the moisture condition of the soil.

Sorghum cultivars were sown on 23rd June, 2015. The crop was harvested on 7th September, 2015.

RESULTS AND DISCUSSION

Effect of forage sorghum cultivars

The crude protein (7.0), hemi cellulose content (24.4%) content in the forage sorghum cultivar

Phule Godhan was significantly more than cultivar Phule Amruta and Phule Ruchira.

The Acid detergent fiber (ADF) (48.9), Neutral Detergent Fiber (NDF) (69.6%), crude fiber content (39.4%) in the forage sorghum of cultivars Phule Ruchira was significantly more than cultivar Phule Amruta (45.0) and Phule Godhan (42.3).

Effect of nitrogen levels

The forage yield of sorghum was significantly increased linearly with increased nitrogen levels. Forage sorghum received with 125% N of RDF ha^{-1} has significantly maximum forage yield (60.6 t ha^{-1}) followed by application of 100% N of RDF ha^{-1} (56.5 t ha^{-1}). The reason for higher forage yield was the plants received higher N may be attributed to the most lucrative consumption of applied nitrogen and other allied environmental resources by the forage sorghum crop which resulted in maximum biomass yield. Increase in forage yield with increased nitrogen was mainly associated with greater plant height, number of leaves $plant^{-1}$ and stem diameter. The lower application of 50% N of RDF ha^{-1} significantly decreased forage yield (t ha^{-1}) because of significant reduction in yield attributes. These results are in full conformity with those reported by Shahin *et al.* (2013), Karwasra and Anil Kumar (2006) and Verma *et al.* (2005).

Significantly highest chlorophyll content (55.37%), crude protein content (7.1%) maximum Brix content (8.3 ^{0}Brix), Acid Detergent Fiber (ADF) content (42.0 %), hemi cellulose content (24.5%) were obtained from the treatment fertilized @ 125 % N of RDF ha^{-1} than the other treatments in forage sorghum. Increase in crude protein content (%) of forage sorghum with increase in nitrogen levels have been reported by Muhammad *et. al.* (2011).

Application of 125% N of RDF ha^{-1} in forage sorghum registered significantly minimum Neutral Detergent Fiber (NDF) content (66.5%) and crude fiber percentage (35.9%) than the other treatments. (Table 1)

Interaction

The interaction effects between forage sorghum cultivars and percentage nitrogen levels in respect of yield and quality parameters were found to be non significant.

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References

[1] Almodares, A., Jafarinia, M. and Hadi, M.R. 2009. Effects of Nitrogen Fertilizer on Chemical Compositions in Corn and Sweet Sorghum. *Journal of Agricultural Environmental Science* **6**(4): 441-446.

[2] Balasubramanian, V., Raghauram, N., Abrol, Y.P., Sachdev, M.S., Pathak, H. and Singh, B. 2010. Reactive nitrogen: Good, Bad and Ugly. Comprehensive Status Report, SCON-ING, New Delhi: pp. 52.

[3] Hegde, N.G., 2006. Livestock development for sustainable livelihood of small farmers. *CLFMA Souvenir* : 50-63.

[4] Hoffman, P.C., Esser, N.M., Bauman, L.M., Denzine, S.L., Engstrom, M. and Jonos, H. C. 2001. Effect of dietary protein on growth and N balance of Holstein heifer. *Journal of Dairy Science* **84**: 843-847.

[5] Karwasra, R.S. and Anil Kumar 2006. Effect of nitrogen and phosphorus on fodder sorghum production. MA & UUP Section, *Haryana Journal of Agronomy* **22**(1): 24-25.

[6] Muhammad, A., Asif, I., Muhammad, S., Ibni, Z., Muhammad, M. and Muhammad, A. 2011. Effect of different nitrogen levels and seed rates on yield and quality of maize fodder, *Crop and environment* **2**(2): 47-51.

[7] Shahin, M.G., Abdrabou, R.T., Abdelmoemn and Hamada, W.R.M. 2013. Response of growth and forage yield of pearl millet (Pennisetum glaucumm) to nitrogen fertilization rates and cutting height. *Annals of Agricultural Science* **58**(2): 153–162.

[8] Verma, S.S., Navneet Singh, Joshi, Y.P. and Vijay Deorari 2005. Effect of nitrogen and zinc on growth characters, herbage yield, nutrient uptake and quality of fodder sorghum (*Sorghum bicolor*). *Indian Journal of Agronomy* **50**(2): 167-169.

Table 1. The forage yield and important quality parameters of forage sorghum as influenced by different treatments.

Treatments	Forage yield (t ha $^{-1}$)	Chlorophyll content (SPAD)	Brix content (degree)	Crude Protein (%)	ADF (%)	NDF (%)	Hemi-cellulose (%)	Crude fiber (%)
Forage sorghum cultivars (V)								
V_1- Phule Godhan	60.1	46.52	8.7	7.0	42.3	66.7	24.4	36.8
V_2- Phule Amruta	55.7	46.08	7.5	6.3	45.0	69.3	24.3	38.5
V_3- Phule Ruchira	50.0	44.22	7.2	6.3	48.9	69.6	20.7	39.4
S.Em ±	1.7	0.26	8.7	0.1	0.3	0.4	0.4	0.3
C.D. at 5 %	4.2	0.78	7.5	0.2	0.9	1.1	1.3	0.9
Nitrogen levels (N)								
N_1- 50 % N of RDF	50.9	39.75	7.4	6.0	49.3	71.2	21.9	42.0
N_2 -75 % N of RDF	53.2	41.60	7.7	6.4	46.3	68.6	22.2	38.2
N_3 -100 % N of RDF	56.5	45.69	7.9	6.7	43.9	67.9	23.9	36.7
N_4 -125 % N of RDF	60.6	55.37	8.3	7.1	42.0	66.5	24.5	35.9
S.Em ±	1.6	0.30	0.1	0.1	0.3	0.4	0.5	0.3
C.D. at 5 %	3.5	0.90	0.3	0.2	1.0	1.2	1.5	1.0
Interaction (V x N)								
S.Em ±	3.7	0.53	0.4	0.7	0.5	0.7	0.9	0.6
C.D. at 5 %	NS	NS	NS	NS	NS	NS	NS	NS
General mean	**55.3**	**45.60**	**7.8**	**6.6**	**45.4**	**68.5**	**23.1**	**38.2**