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Effect of cutting management and fertility levels on growth and seed yields of multicut forage sorghum [*Sorghum bicolor* (L.) Moench] var. CoFS-29

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Abstract

A field experiment was conducted during *kharif* 2015-16 to 2017-18 to study the effect of cutting management and fertility levels on growth and seed yields of multicut forage sorghum [*Sorghum bicolor* (L.) Moench] var. CoFS-29 at Main Forage Research Station, Anand Agricultural University, Anand. The soil of experimental site was loamy sand in texture (locally called as "Goradu" soil) having good drainage and moisture retention capacity. The experimental site was low in Organic Carbon and available N, medium in available P and K.

Twelve treatment combinations comprising of three cutting management practices (C₁: No cutting, C₂: One cut at 50 DAS for green fodder then seed production, C₃: Two cuts for green fodder (at 50 days interval) and then seed production), two nitrogen levels (120 and 160 kg N/ha), two phosphorus levels (40 and 60 kg P/ha) were tested in randomised block design (Factorial) with four replications.

The results revealed that, among the different cutting management treatment, One cut at 50 DAS for green fodder then seed production (C₂) recorded significantly the seed yield (925 kg /ha) and test weight (5.97 g). Two cuts for green fodder at 50 days interval and then seed production (C₃) recorded significantly the higher number of tillers per metre row length at harvest (153.27) and green fodder yield of 680 q/ha. Application of nitrogen at 160 kg/ ha given significantly higher growth and yields attributes as well as yields while phosphorus application had no significant impact on growth, yield attributes and yields of multicut forage sorghum [*Sorghum bicolor* (L.) Moench] var. CoFS-29.

Keywords: Cutting management, green fodder, multicut forage sorghum, nitrogen, phosphorus

Introduction

Sorghum [*Sorghum bicolor* (L.) Moench] is an important forage crop cultivated throughout the country during the summer, monsoon and winter seasons to meet out both green as well as dry fodder requirement for livestock. It is an excellent fodder owing to its quick regrowth, better nutritive value and drought tolerance with higher production potential, yet its seed production is very much limited. Sorghum is dual purpose and nutrient exhaustive crop. Fodder sorghum required liberal supplementation of nutrients through fertilizer application to meet the nutritional requirement of crop and to maximize productivity of crop. The yield decreases drastically if balanced nutrients are not applied. Sorghum crop exhausts more nutrients than other forage crops and being a cereal crop, it requires higher amount of nitrogen. Nitrogen, being one of the most important nutrient plays a vital role in plant growth and development, It promotes shoot elongation, tillering and governs to a considerable degree to utilize potassium, phosphorus and other elements in the plant. Phosphorus plays a major role in energy storage and also critical in root development in crop with maturity of seed production. Hence, the present investigation was planned to find out "Effect of cutting management and fertility levels on growth and seed yields of multicut forage sorghum [*Sorghum bicolor* (L.) Moench] var. CoFS-29".

Materials and Methods

In order to achieve the pre-set objectives of the present investigation, a field experiment was conducted during *kharif* season of 2015-16 to 2017-18 at Main Forage Research Station,

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Anand Agricultural University, Anand. The soil of experiment site was loamy sand in texture having good drainage capacity with low available N (172.48 kg ha⁻¹), medium in available P (33.92 kg ha⁻¹) and K (214.30 kg ha⁻¹). The experiment was laid out in randomized block design with factorial concept encompassing four replications and twelve treatment combinations. The treatments consisting of three cutting management practices (C₁: No cutting, C₂: One cut at 50 DAS for green fodder then seed production, C₃: Two cuts for green fodder (at 50 days interval) and then seed production), two nitrogen levels (120 and 160 kg N/ha), two phosphorus levels (40 and 60 kg P/ha). Nitrogen was given as per treatments, one fourth of nitrogen was applied as basal and remaining quantity of three fourth nitrogen was applied in three equal splits at 30 days after sowing, after first cut (50 DAS) and 30 days after first cut (80

DAS) in the form of urea. The full dose of phosphorus as per treatments was applied in the form of SSP. Common dose of FeSO₄ @ 25 kg ha⁻¹ and ZnSO₄ @ 8 kg ha⁻¹ were applied at the time of sowing. The seeds of multicut fodder sorghum cv. CoFS-29 were sown at spacing of 30 cm between the lines and 10 cm between the plants with a seed rate of 15 kg ha⁻¹ in the gross plot size of 3.0 m x 5.0 m and net plot size of 4.0 m x 2.4 m. The economics was worked out for pooled results on current market price basis.

Results and Discussion

The results pertaining to growth parameters, yield attributes, yield, quality and economics of multicut sorghum are presented in Table 1 revealed the significant effect of cutting management and nitrogen levels during the course of investigation.

Table 1: Yield attributes and yield of forage sorghum influenced by cutting management and fertility levels (Pooled over 3 years)

Treatments	GFY q/ha	Plant height at harvest (cm)	HCN content at 50 % flowering (ppm)	No of tillers / m row length	Length of panicle (cm)	Seed yield (kg/ha)	Straw yield kg/ha	Test wt (g)	B:C
Cutting management (C):									
C ₁	000	201.63	105.14	114.17	42.34	575	5870	5.50	8.25
C ₂	424	190.06	90.36	134.56	47.38	925	4544	5.97	12.31
C ₃	680	176.52	56.67	153.27	38.09	308	3601	5.29	5.17
SEm	5.43	2.76	0.61	3.13	1.85	66.47	417	0.19	-
CD	15.35	7.80	1.71	19.04	NS	260.9	1637	NS	-
Nitrogen levels (N):									
N ₁	535	180.33	74.89	129.99	41.45	560	4538	5.47	8.11
N ₂	569	198.47	93.22	138.01	43.76	645	4805	5.70	9.04
SEm	5.43	2.27	0.50	1.44	0.42	7.23	60	0.04	-
CD	15.35	6.37	1.40	4.03	1.19	20.33	170	0.13	-
Phosphorous levels (P):									
P ₁	537	189.19	83.44	133.46	42.61	596	4686	5.60	8.60
P ₂	567	189.61	84.68	134.54	42.60	609	4657	5.57	8.55
SEm	5.43	2.27	0.5	1.44	0.42	13.16	60	0.04	-
CD	15.35	NS	NS	NS	NS	NS	NS	NS	-
CV%	6.82	10.15	5.01	9.09	8.45	10.05	10.93	6.84	-

Effect of cutting management

The data presented in Table 1 indicated that with increase in the number of cut there was a sharp and significant variation in all the fodder and seed yield attributing characters was observed.

Among the different cutting management treatment, two cuts for green fodder at 50 days interval and then seed production (C₃) recorded significantly higher green fodder of 680 q/ha compared to the single cut for green fodder at 50 DAS followed by harvest for seed purpose (424 q/ha). The increase in yield of green forage was proportionate to level of cutting as in treatment C₃ two cut was taken for green forage followed by harvest for grain purpose. These results were in conformity of Kumawat *et al.* (2016) [5]. Plant height at harvest and HCN content at 50% flowering was recorded significantly the highest under treatment C₁ while number of tillers per metre row length was found maximum in C₃ treatment. There were no any significant effect of cutting management treatment was observed on length of earhead and test weight of multicut forage sorghum.

Different cutting management treatment exerted their significant influence on seed and straw yield. The treatment C₂ (One cut at 50 DAS for green fodder then seed production) was found significantly superior in recording the highest seed yield of 925 kg/ha while straw yield of 5870 kg/ha was recorded significantly the highest under treatment C₁ (no cut). The increase in seed yield in treatment C₂ is might be due to single cut facilitates more number of productive tillers and

panicle length as compared to the rest of the treatments. The results are in agreement with those of Patil and Merwade (2016), Hooda *et al.* (2004) and Manjanagouda *et al.* (2016) [7, 3, 6] in pearl millet.

Effect of nitrogen levels

Critical examination of the data given in Table 1 revealed that the significant differences in all the growth and yield attributing parameters, green forage yield and seed as well as straw yield were recorded due to cutting management. Application of 160 kg N/ha (N₂) recorded significantly the highest plant height of sorghum as compared to N₁. The increase in plant height with increasing level of nitrogen is quite obvious because nitrogen influences favourably the meristematic activity, which increased the number and length of internodes ultimately resulting into better growth. The present findings are close agreement with those reported by Kumar and Sharma (2002) and Singh and Sumeriya (2012) [4, 10].

The same trend was observed in number of tillers per metre row length, length of panicle and test weight. Maximum number of tillers per metre row length (138.01), length of panicle (43.76) and test weight was reported under treatment N₂. The increase in length of panicle and number of tillers due to the fact that optimum nitrogen dose might have met the need of crops and encourage the growth and development of individual plant. The results are in conformity with findings of Barik and Nag (2001) Verma *et al.* (2005) [1, 11] for panicle

length and Sheoran and Rana (2006) and Gupta *et al.* (2008) [8, 2] for number of tillers.

Seed and straw yield was also significantly influenced by nitrogen levels. Treatment N₂ (160 kg ha⁻¹) recorded the highest seed and straw yield of 645 and 4805 kg/ha, respectively. Nitrogen fertilization made the plants more efficient in photosynthetic activity and thereby enhancing carbohydrate metabolism in the plant. Thus, there was increase in seed and straw yield due to better availability of nitrogen in soil solution throughout the crop growth period, which remarkably stimulated the yield attributes and finally on the seed and straw yield. Similar findings were obtained by Silli *et al.* (2001), Kumar and Sharma (2002) and Verma *et al.* (2005) [9, 4, 11].

Significantly the highest green forage yield of 569 q/ha was also recorded under same treatment N₂.

Effect of phosphorus levels

Application of different levels of phosphorus had no significant influence on yield and yield attributing characters of multicut forage sorghum [*Sorghum bicolor* (L.) Moench] var. CoFS-29.

Economics

Maximum net realization of Rs. 3, 75,762 was incurred with treatment C₂ (One cut at 50 DAS for green fodder then seed production) the same treatment registered the highest benefit cost ratio (12.31).

Application of 160 kg N/ha recorded (N₂) was recorded the highest net realization of Rs. 2, 63,687 with B: C ratio of 9.04.

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