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Effect of cutting and nutrient management on yield and economic of summer fodder sorghum under North Gujarat condition

SR Rabari, LJ Desai and KN Prajapati

Abstract
An experiment was conducted during summer season of the year 2020 at Agronomy Instructional Farm, C. P. College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar to study the effect of cutting and nutrient management on yield and economic of summer fodder sorghum under north Gujarat condition. Nine treatment combinations comprising three levels of cutting management and three levels of nutrient management were evaluated in randomized block design with factorial concept with three replications. Three cutting of forage sorghum registered significantly higher green and dry forage yield with highest net realization. 125% RDF registered significantly higher plant height, leaf length, stem girth, number of leaves per plant, leaf area and leaf: stem ratio in all cuts. Significantly higher total green and dry forage yield were recorded with 125% RDF, at par with 100% RDF. Similarly highest net realization and B: C ratio was registered with application of 125% RDF.

Keywords: Cutting and nutrient management, economics, forage sorghum, growth and yield attributes, loamy sand

Introduction
Sorghum (*Sorghum bicolor* L.) locally known as "*Jowar*" or "*chari*" is under cultivation since ancient times for grain, feed and fodder in tropical countries. It is popular dual-purpose crop, and is mainly grown as fodder during summer and kharif seasons as a single as well as multi-cut crop. Sorghum ranks first among the cereal fodder crops, because of its faster growing habit, high yield potential, palatability and nutritious fodder quality, higher digestibility and various forms of its utilization like green chop, stover, silage, hay, etc. Among the different agronomic practices, cutting management is one of the most important practices. The time of cutting intervals and cutting frequency are also very important agronomic practices for multi-cut forage crops. Amongst growth factors, adequate inorganic fertilizers specially, nitrogenous is considered to be of prime importance. Nitrogen and phosphorus play a vital role in maximizing the forage yield as majority of Indian soils are low in nitrogen. Nitrogen application increase crude protein and metabolize energy, besides improving succulency and palatability of forage crops. Phosphorus plays a key role in various physiological processes like root growth and dry matter production, nodulation and nitrogen fixation and also in metabolic activities especially in protein synthesis.

Material and Methods
The field experiment was conducted at Agronomy Instructional Farm, Department of Agronomy, Chimanbhai Patel College of agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar. Total 9 treatments *viz.*, T_1: Single cut at maturity (105 DAS) + 125% RDF, T_2: Single cut at maturity + 100% RDF, T_3: Single cut at maturity + 75% RDF, T_4: Two cuts (60 DAS + 45 days after 1st cutting) + 125% RDF, T_5: Two cuts (60 DAS + 45 days after 1st cutting) + 100% RDF, T_6: Two cuts (60 DAS + 45 days after 1st cutting) + 75% RDF, T_7: Three cuts (60 DAS + 45 days after 1st cutting + 45 days after 2nd cutting) + 125% RDF, T_8: Three cuts (60 DAS + 45 days after 1st cutting + 45 days after 2nd cutting) + 100% RDF, T_9: Three cuts (60 DAS + 45 days after 1st cutting + 45 days after 2nd cutting) + 75% RDF were tried in factorial randomised block design with three replications. Fodder sorghum variety CoFS 29 was used as a test crop. The soil of experimental field was loamy sand in texture, slightly alkaline in nature, low in organic carbon, available Zn and Cu; medium in available P_2O_5, available S, Fe and Mn and high in available K_2O.

Results and Discussion

Effect of cutting management

Cutting management did not exert its significant effect on plant height, girth of the stem, leaf length, number of leaves per plant and leaf area per plant. Significantly higher total green forage yield (655.7 q/ha) and total dry forage yield (131.4 q/ha) were recorded with three cuts (60 DAS + 45 days after 1st cutting + 45 days after 2nd cutting) while significantly lower total green forage yield (400.6 q/ha) and total dry forage yield (80.1 q/ha) were registered with single cut at 105 DAS. The percent increase in green forage yield of three cuts was 30.6% over two cuts (60 DAS + 45 days after 1st cut) and 63.7% over single cut at 105 DAS, while dry yield of forage sorghum with three cuts was higher about 29.1% and 64.0% over two cuts and single cut, respectively. The increase in total green and dry forage yield in three cuts was due to more number of cuts, which resulted into higher total biomass production. Manjanagouda *et al*. (2017) [1], Ram, (2018) [6] reported results in accordance with our experiment. The highest gross realization (131149 ₹/ha), net realization (82044 ₹/ha) and benefit: cost ratio (2.67) was accrued with treatment C_3 (Three cuts each at 60 DAS + 45 days after 1st cutting + 45 days after 2nd cutting).

Effect of nutrient management

Application of 125% RDF was recorded significantly higher plant height (155.3 cm), but it was at par with 100% RDF (146.1 cm). The significantly lower plant height (138.2 cm) was recorded with 75% RDF. The increasing in height of forage sorghum was due to the nitrogen, it plays an important role in increasing protoplasmic constituents, which accelerates the process of cell division, cell elongation, chlorophyll synthesis and meristematic activity which increased the number and length of internodes ultimately resulting in better growth. The results are in close vicinity with Nand *et al*. (2019) [5] and Meena *et al*. (2020) [4]. Significantly higher girth of the stem (20.6 mm), leaf length (75.7 cm), number of leaves per plant (51.2), leaf area per plant (415 cm^2) were recorded with application of 100:50:00 kg NPK/ha (125% RDF) as compared to other doses. Significantly lower girth of the stem (17.7 mm), number of leaves per plant (42.5), leaf area per plant (279 cm^2) were recorded with application of 60:30:00 kg NPK/ha (75% RDF). The increase in growth parameters was due to the accelerated meristematic activity, photosynthetic activity and vegetative growth due to nitrogen. The findings are in accordance with the findings of Yadav *et al*. (2016) [8] and Meena *et al*. (2017) [4].

Application of 125% RDF was recorded significantly higher green forage yield of sorghum (569.8 q/ha) and dry forage yield (124.9 q/ha) which were at par with 100% RDF (515.4 q/ha). Significantly lower green forage yield (473.5 q/ha) and dry forage yield (86.9 q/ha) of sorghum was recorded with 75% RDF. The percent increase in green forage sorghum yield with 125% RDF was to the tune of 10.6% and 23.2% higher dry forage yield over 100% RDF, while 20.3% green forage yield and 43.7% dry forage yield over 75% RDF. The reason for higher green forage yield was that, the higher nitrogen received by plants 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. The results are in accordance with the findings of Meena *et al*. (2017) [4], Singh *et al*. (2017) [7] and Meena *et al*. (2018) [2]. Application of 125% RDF secured maximum gross realization (113954 ₹/ha), net realization (69469 ₹/ha) and B: C ratio (2.56).

Table 1: Effect of cutting and nutrient management on growth, total green and dry forage yield of forage sorghum

Treatments	Plant height (cm)	Girth of the stem (mm)	Leaf length (cm)	No. of leaves per plant	Leaf area per plant (cm^2)	Total green forage yield (q/ha)	Total dry forage yield (q/ha)
A. Cutting management							
C_1: Single cut at maturity (105 DAS)	146.4	18.7	70.2	46.3	351	400.6	80.1
C_2: Two cuts (60 DAS + 45 days after 1st cutting)	145.0	19.0	69.9	46.9	350	502.2	101.8
C_3: Three cuts (60 DAS + 45 days after 1st cutting + 45 days after 2nd cutting)	148.2	18.9	70.5	47.2	354	655.7	131.4
S.Em. ±	4.47	0.46	1.97	1.45	8.49	19.31	4.85
C.D. at 5%	NS	NS	NS	NS	NS	57.89	14.55
B. Nutrient management							
N_1: 125% RDF	155.3	20.6	75.7	51.2	415	569.8	124.9
N_2: 100% RDF	146.1	18.4	71.0	46.9	362	515.4	101.4
N_3: 75% RDF	138.2	17.7	63.9	42.5	279	473.5	86.9
S.Em. ±	4.47	0.46	1.97	1.45	8.49	19.31	4.85
C.D. at 5%	13.41	1.38	5.91	4.34	25.45	57.89	14.6
Interaction (C×N)	NS	NS	NS	NS	NS	NS	NS
C.V.%	9.16	7.33	8.42	9.27	7.24	11.15	13.95

Table 2: Effect of cutting and nutrient management on economics of forage sorghum

Treatments	Green fodder yield (kg/ha)	Cost of cultivation (₹/ha)	Gross realization (₹/ha)	Net realization (₹/ha)	B:C ratio
A. Cutting management					
C1: Single cut at maturity (105 DAS)	40063	39694	80127	40432	2.02
C2: Two cuts (60 DAS + 45 days after 1st cutting)	50222	41397	100444	59047	2.43
C3: Three cuts (60 DAS + 45 days after 1st cutting + 45 days after 2nd cutting)	65574	49105	131149	82044	2.67
B. Nutrient management					

N1: 125% RDF	56977	44486	113954	69469	2.56
N2: 100% RDF	51536	43398	103071	59673	2.37
N3: 75% RDF	47347	42312	94694	52382	2.24

Conclusion

In light of results obtained from the present investigation, it could be concluded that for getting higher forage yield, net returns and better quality of forage sorghum, three cutting of crop should be done at 60, 105 and 150 DAS and fertilized the crop with RDF (80:40:00 N, P_2O_5, K_2O kg/ha).

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