Effect of Nitrogen and Spacing on green fodder yield and economics of MP Chari (*Sorghum Bicolor* L.)

ABSTRACT

At the Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology And Sciences, Prayagraj (U.P.), India, a field experiment was carried out during the Harvest season of 2022. To investigate how spacing and nitrogen affect sorghum growth and fodder production (Sorghum bicolor L.). The treatments include nitrogen at rates of 60, 80, and 100 kg/ha, spaced 35, 45, and 55 cm, respectively. There were 10 treatments total, with three replications of each. The soil in the trial plot had a sandy loamy texture, a pH of 7.8 that was almost neutral, a low level of organic carbon (0.35%), and high levels of available N (163.42 kg/ha), available P (21.96 kg/ha), and available K (256.48 kg/ha) nutrients. In accordance with the results, nitrogen application at a rate of 100 kg per hectare and a spacing of 55 cm apart had a significant impact on plant height (186.96 cm), plant dry weight (52.78 g/plant), crop growth rate (55.0 g/m2/day), and green fodder yield (28.36 and 22.43 t/ha) for the first and second cuttings. With nitrogen 100 kg/ha and the spacing 5515cm, there were also larger gross returns (INR 83809.00/ha), net returns (INR 58133.00/ha), and B:C ratios (2.26).

Keywords: *sorghum, nitrogen, spacing, green fodder yield and economics.*

INTRODUCTION

Sorghum (Sorghum bicolor (L.) Moench), the primary kharif and rabi season crop of the Poaceae family, is widely cultivated to meet the demands of livestock for both green and dry feed. The sudanese and bicolor are two species that are important economically. Bicolor is utilised as food, feed, and forage in India, whilst Sudanese are only used as fodder. All three crops—sorghum, Sudan grass, and hybrids of the two—are adaptable and have a range of uses. Grain sorghum is utilised for different purposes than forage sorghum. In many parts of the world, sorghum is evolving into a more major feed crop. It is superior to corn in terms of drought resistance and produces more with less irrigation, making it the ideal feed crop for desert regions. Sorghum can be used as fodder in a variety of ways, such as single-cut varieties for rain-fed farming, multi-cut varieties for irrigated agriculture in the form of stover, silage for storage, and other long-term uses.

For the purpose of generating assets and increasing livestock output, protein availability is a significant factor that affects animal productivity in terms of yield and quality. High protein intake may facilitate rapid weight gain and milk production (Hoffman et al., 2001).

The lack of acceptable genotypes and appropriate and correct fertilisation is one of the main factors limiting the production of fodder sorghum in our country. , and, and, and, and, and, and, and, and, and, and, and, and, and, and, and, and, and, and, and, and, and, and, and, and, and, and, and, and, and, and, and, and, and, and (Pushpendra and Sumeriya, 2012). For the production of fodder, nitrogen application is essential. According to Iqbal et al. (2009), nitrogen supplementation increases the yield, dry matter production, and quality of oat-based green fodder. Furthermore, it was found by Ayub M. (2002) and Saleem et al. (2009) that the time and manner of nitrogen treatment significantly affected the yield of a number of maize hybrids. adequate mowing and the appropriate the two most important agronomic factors for generating higher fodder yields are planting geometry.

One of the essential elements of the crop establishment technique that influences the crop stand and other yield metrics in many crops is row spacing. A persistent problem for farmers is choosing the right planting density. Yields, radiation effectiveness, and weed infestation all suffer from lower plant density. However, a dense plant population may result in lodging, restricted light penetration in the canopy, a loss in photosynthesis due to lower leaves being shaded, and a markedly slowed pace of production (Lemerle et al. 2006).

Keeping these points in view, the present investigation entitled **‘‘Influence of Nitrogen and Spacing on Green fodder Yield and Economics of M P Chari (*Sorghum bicolor* L.)”** was conducted during *Zaid*-2022, at crop research farm, SHUATS, Prayagraj (U.P).

MATERIALS AND METHODS

During the zaid season of 2022, a field experiment was carried out at the Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology And Sciences, Prayagraj (U.P.), India. The experimental plot's soil was sandy loamy in texture, nearly neutral in soil reaction (pH 7.8), and low in organic carbon (0.35%). The treatments included nitrogen at 60 kg per ha with spacing of 35 x 15 cm, 45 x 15 cm, and 55 x 15 cm, as well as nitrogen at 80 kg per ha with spacing of 35 x 15 cm, 100 kg per ha with spacing of 45 x 15 cm, and 100 kg per ha with spacing of 55 x 15 cm. Ten treatments were reproduced three times in a randomised block design experiment.

Plant height, dry weight, the number of leaves per plant, crop growth rate (g/m2/day), and the yield of green fodder (t/ha) were all noted. The data was gathered and statistical analysis using the analysis of variance approach was performed (Gomez and Gomez, 1976).

RESULT AND DISCUSSION

YIELD ATTRIBUTE

Green fodder Yield (t/ha) - The significantly higher green fodder yield (28.36 t/ha) was observed in treatment-9 (Nitrogen 100 kg/ha + Spacing 55x15cm) during 1st cutting. However, treatment-8 (Nitrogen 100 kg/ha + Spacing 45x15cm) was found to be statistically at par with treatment- 9 (Nitrogen 100 kg/ha + Spacing 55x15cm). The significantly higher green fodder yield (22.43 t/ha) was observed in treatment-9 (Nitrogen 100 kg/ha + Spacing 55x15cm) during 2nd cutting. However, treatment-8 (Nitrogen 100 kg/ha + Spacing 45x15cm) was found to be statistically at par with treatment- 9 (Nitrogen 100 kg/ha + Spacing 55x15cm). The significantly higher green fodder yield (28.36 t/ha) was observed with the application of nitrogen 100 kg/ha along with the spacing 55x15 cm, The increased plant height, number of leaves, plant population per metre, and leaf to stem ratio all contributed to the higher green fodder output at increasing spacing. In addition, the excessive plant population may fight with each other for light and nutrients, resulting in lanky growth and grassy shoot appearance, which reduced the output of green fodder at decreasing spacing. The benefits of nitrogen on cell division and elongation, the formation of nucleotides and co-enzymes that resulted in an increase in meristematic activity and photosynthetic area and, consequently, more production and accumulation of photosynthates, yielding higher green fodder, are among the nitrogen levels that are primarily attributed to improved growth and yield parameters. These parameters include plant height, number of leaves, plant population per metre, leaf: stem ratio, plant height and dry weight. Similar results are conformity with **Mane Shivprasad and Rajesh Singh (2017), Dudhat *et al.* (2004).** "the Optimum planting pattern is that the necessity for proper utilization of growth resources and ultimately to use the potential productivity of any crop. The higher grain yield was recorded from the interaction impact of sowing dates and spacing" **Manasa and Umesha c. (2022). "**The green fodder yield (28.36 t/ha) was observed with the application of nitrogen 100 kg/ha along with the spacing 55x15 cm, This may be with nitrogen mainly attributed to improved growth and yield parameters, viz., plant height, leaf area, leaf stem ratio and the beneficial effects of nitrogen on cell division

and elongation, formation of nucleotides and Co-enzymes which resulted in increased meristematic activity and photosynthetic area and hence more production and accumulation of photosynthates, yielding higher green fodder"[**Ayub *et al.* (2002)].**

ECONOMIC ANALYSIS

Gross Returns

Observations regarding the economics of treatments are given in table 2.

Highest gross return (83809.00 INR/ha) was obtained in treatment-9 (Nitrogen 100 kg/ha + Spacing 55x15cm) as compared to other treatments.

Net Returns

Net return (58133.00 INR /ha) was found to be highest in treatment-9 (Nitrogen 100 kg/ha + Spacing 55x15cm) as compared to other treatments.

Benefit Cost Ration

Benefit Cost ratio (2.26) was found to be highest in treatment-9 with (Nitrogen 100 kg/ha + Spacing 55x15cm) as compared to other treatments.

CONCLUSION - It was concluded that with the application of nitrogen 100 kg/ha and along with the spacing 55×15cm (Treatment-9), has performs positively and improves growth and yield parameters. Higher green fodder yield and higher gross return, higher net return and benefit cost ratio were also recorded with the application of nitrogen 100 kg/ha and along with the spacing 55×15cm (Treatment-9). These findings are based on one season therefore; further trials may be required for further confirmation.

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Table 1. Influence of nitrogen and spacing on green forage yield of fodder sorghum M P Chari.

Treatment No.	Treatment combinations	Green fodder (t/ha) 1st cutting	Green fodder (t/ha) 2nd cutting
1.	Nitrogen 60 kg/ha + Spacing 35x15cm	22.68	18.17
2.	Nitrogen 60 kg/ha + Spacing 45x15cm	23.97	18.74
3.	Nitrogen 60 kg/ha + Spacing 55x15cm	25.09	19.31
4.	Nitrogen 80 kg/ha + Spacing 35x15cm	24.08	18.39
5.	Nitrogen 80 kg/ha + Spacing 45x15cm	25.19	19.52
6.	Nitrogen 80 kg/ha + Spacing 55x15cm	27.03	21.60
7.	Nitrogen 100 kg/ha + Spacing 35x15cm	26.41	20.08
8.	Nitrogen 100 kg/ha + Spacing 45x15cm	27.45	21.73
9.	Nitrogen 100 kg/ha + Spacing 55x15cm	28.36	22.43
10.	CONTROL	23.25	18.85
	F test	S	S
	SEm±	0.71	0.34
	CD (P=0.05)	2.10	1.02

Table 2. Economic analysis of different treatment combinations of fodder sorghum M P Chari.

		Economics			
S. No.	**Treatment combinations**	**Cost of cultivation**	**Gross return**	**Net return**	**B:C ratio**
1.	Nitrogen 60 kg/ha + Spacing 35x15cm	27206	67397	40191	1.48
2.	Nitrogen 60 kg/ha + Spacing 45x15cm	26006	70466	44460	1.71
3.	Nitrogen 60 kg/ha + Spacing 55x15cm	24806	73260	48454	1.95
4.	Nitrogen 80 kg/ha + Spacing 35x15cm	27636	70070	42434	1.54
5.	Nitrogen 80 kg/ha + Spacing 45x15cm	26436	73766	47330	1.79
6.	Nitrogen 80 kg/ha + Spacing 55x15cm	25236	80234	54998	2.18
7.	Nitrogen 100 kg/ha + Spacing 35x15cm	28076	76714	48638	1.73
8.	Nitrogen 100 kg/ha + Spacing 45x15cm	26876	81153	54277	2.02
9.	Nitrogen 100 kg/ha + Spacing 55x15cm	25676	83809	58133	2.26
10.	CONTROL	26436	69454	43018	1.63

*****DATA WAS NOT SUBJECTED TO THE STATISTICAL ANALYSIS.