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Response of Forage Sorghum Hybrids to Nitrogen

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ABSTRACT

A field experiment was conducted with three forage sorghum hybrids (AS-9, GFSH-1 and X-988) and four nitrogen levels (0, 40, 80 and 120 kg N/ha) at Forage Research Farm, Anand (Gujarat). Forage Sorghum hybrids GFSH-1 and AS-9 produced significantly higher green forage yield than pioneer hybrid X-988 during 1988, 1989 as well as on pooled basis. Forage Sorghum hybrids GFSH-1 also gave significantly higher dry matter yield than X-988 during 1988, but they were at par on pooled basis. Increasing N application increased the forage production, but significant response of N was observed upto 40 kg N/ha for green forage and dry matter production. Crude protein yield and crude protein content increased markedly with the successive increase in nitrogen levels. From the economic point of view, maximum net ICBR was also obtained from the application of 40 kg N/ha.

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INTRODUCTION

Sorghum (*Sorghum bicolor* (L.) Moench) is an important cereal fodder crop admirably adapted to varying soil and climatic conditions. Nitrogen fertilizer plays an important role in increasing forage production of sorghum with better nutritive value. The plant height of the hybrid GFSH-1 is ranged between 237 to 263 cm alongwith 10 to 15 number of dark and broad leaves, medium thickness of stem and compact earhead. Maturity period (50% flowering days) of this hybrid is 67-80 and 63-75 days for *kharif* and summer season, respectively. It can also be profitably cultivated in saline sodic soils as it performed well in *Bhal* area. It resists better to the incidence of pest and diseases. It is also suitable for single as well as multicut management. The maximum green forage yield produced by the hybrid GFSH-1 was found 65.95% and 82.07% higher than the pioneer hybrid X-988 in single cut and two cut, respectively. To study the forage production potential of promising hybrid AS-9 alongwith recently released forage sorghum hybrid GFSH-1 by the Gujarat Agricultural University in the year 1992 and Pioneer Hybrid X-988 under N fertilization, this experiment was conducted at Forage Research Farm, Gujarat Agricultural University, Anand.

MATERIALS AND METHODS

A field experiment was conducted during *kharif* seasons of 1989 and 1990 on alluvial soils, low in available nitrogen (258.7 and

TABLE 1

Forage yields and other ancillary characters of forage sorghum hybrids as affected by nitrogen levels.

Treatment	Yield in q/ha						Morphological characters							
	Green forage			Crude protein			Plant height (cm)		Leaf length (cm)		Leaf width (cm)		Leaf stem ratio	
	1989	1990	Pooled	1989	1990	Mean	1989	1990	1989	1990	1989	1990	1989	1990
Sorghum Hybrids														
AS-9	339 *(71.5)	500 (93.7)	420 (82.6)	5.36 **(7.34)	6.22 (6.56)	5.79 (6.95)	186.6	212.2	68.6	83.4	4.5	5.8	1.04	0.74
GFSH-1	375 (80.6)	488 (87.4)	432 (84.0)	5.26 (6.45)	6.20 (6.93)	5.73 (6.69)	216.1	215.4	71.2	82.1	5.0	6.1	0.75	0.54
Pioneer hyb. X-988	285 (67.5)	407 (92.8)	346 (80.2)	4.66 (7.01)	6.29 (6.70)	5.48 (6.86)	190.3	206.4	67.9	82.5	3.9	5.3	0.92	0.56
S.Em. ±	16 (3.5)	21 (4.2)	13 (5.0)	– (–)	– (–)	– (–)	–	–	–	–	–	–	–	–
C.D. (5 %)	46 (10.4)	60 (NS)	37 (NS)	– (–)	– (–)	– (–)	–	–	–	–	–	–	–	–
Nitrogen (kg/ha)														
0	215 (43.7)	318 (62.4)	266 (53.0)	2.81 (6.72)	3.52 (5.68)	3.17 (6.20)	183.9	190.5	69.2	81.7	4.4	5.3	1.11	1.06
40	330 (77.7)	531 (100.0)	431 (88.9)	4.96 (6.39)	6.71 (6.68)	5.84 (6.54)	199.7	213.0	67.0	80.7	4.5	5.2	0.93	0.65
80	394 (83.4)	494 (101.2)	444 (92.3)	6.07 (7.29)	6.73 (6.65)	6.40 (6.97)	203.1	218.4	68.8	84.0	4.5	6.3	0.88	0.42
120	394 (88.0)	519 (101.6)	456 (94.8)	6.53 (7.34)	7.98 (7.92)	7.26 (7.63)	203.9	224.3	71.9	84.3	4.5	6.2	0.68	0.32
S. Em ±	18 (4.1)	24 (4.8)	15 (3.2)	– (–)	– (–)	– (–)	–	–	–	–	–	–	–	–
C. D. (5 %)	53 (12.0)	70 (14.1)	43 (9.1)	– (–)	– (–)	– (–)	–	–	–	–	–	–	–	–

Figures in parenthesis indicates * dry matter yield and ** Crude protein concentration (%) respectively.

164.6 kg N/ha), and high in available phosphorus (60.9 and 58.6 kg P_2O_5/ha) and medium in potash (230.0 and 250.0 kg K_2O/ha). Twelve treatment combinations comprising of three forage sorghum genotypes (AS-9, GFSH-1 and X-988) and four levels of N (0, 40, 80 and 120 kg N/ha) were tested in factorial randomized block design with three replications. Half of the required N in the form of urea and entire quantity of P_2O_5 (Single superphosphate) @40 kg/ha were applied at the time of sowing, whereas remaining half of the N was top dressed one month after sowing. Other cultural practices were followed as per recommendations. The crop was harvested at 50 per cent flowering stage. Nitrogen content of plant was estimated by modified Kjeldahl's method and crude protein content was worked out on dry weight basis (Jackson, 1973).

RESULTS AND DISCUSSION

Effect of Genotypes

Forage sorghum hybrids GFSH-1 and AS-9 being at par with each other produced significantly higher green forage yield than Pioneer Hybrid X-988 during both the years as well as when results were pooled. Forage Sorghum GFSH-1 also produced significantly higher dry matter yield than X-988 during 1989. GFSH-1 hybrid also produced the highest dry matter yield on pooled basis, though the differences were to be not significant. Genotype AS-9 synthesized the highest crude protein yield on an average of two years. The higher forage production in GFSH-1 and AS-9 might be due to higher plant height, leaf length and leaf width due to their potentiality (Table-1). Patel (1985) and Raj and Patel (1989) reported that hybrid genotypes of forage sorghum gave higher forage yield than Pioneer hybrid X-988.

Effect of Nitrogen

During 1989, application of 80 and 120 kg N/ha produced equally higher green forage yield and found significantly superior than no application of N and 40 kg N/ha. Application of 40 kg N/ha was also found significantly superior than no application of N. The differences in green forage yield were found not significant for 40 kg, 80 kg and 120 kg N/ha and these levels produced significantly higher yield than no application of N during 1990 and on pooled basis. The signifacant response of nitrogen was observed upto 40 kg N/ha for dry matter yield. There were no significant differences among 40 kg, 80 kg and 120 kg N/ha for dry matter yield during both the years as well as on pooled basis and these levels outyielded the control. The higher forage production with nitrogen application might be due to low availability of initial nitrogen in the soil and hence addition of nitrogen increased plant height, leaf length and leaf width as compared to no application of N (Table 1). Patel (1985) and Patel *et al.* (1990) reported that green forage and dry matter yields of forage sorghum increased with nitrogen application probably due to increased vegetative growth of plants. The crude protein yield increased with increasing levels of nitrogen application. Application of 40 kg, 80 kg and 120 kg N/ha increased crude protein yield by 84.2, 101.9 and 129.0 per cent than no application of N on an average of two years. Increased crude protein content of sorghum by increasing N application was also reported by Desai and Deore (1980), Hussein *et al.* (1980) and Patel *et al.* (1990). Considering the economics of nitrogen fertilizer, application of 40 kg N/ha showed the maximum net ICBR of 1:22.13 followed by the application of 80 kg N/ha (1:11.48) (Table 2).

TABLE 2

Economics of forage sorghum hybrids as influenced by nitrogen levels.

Treatment	*Pooled green forage yield q/ha for 1989 & 1990*	*Total return Rs./ha*	*Additional return control Rs./ha*	*Additional cost Rs/ha (N-fertilizer)*	*Gross ICBR*	*Net ICBR*
Nitrogen (kg/ha)						
0	266	7980	—	—	—	—
40	431	12930	4950	214	1:23.13	1:22.13
80	444	13320	5340	428	1:12.48	1:11.48
120	456	13680	5700	642	1:8.89	1:7.89

Cost calculated on the basis of Rs. 30/- per q of green forage,
Rs. 5.35 per kg of nitrogen fertilizer from urea.
ICBR = Incremental Cost Benefit Ratio.

The results suggested that recently released forage sorghum hybrid GFSH-1 found promising than other getotypes and application of 40 kg N/ha was found optimum for getting higher forage production and net returns.

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