

Response of Multicut Forage Sorghum [*Sorghum bicolor* (L.)] to Biofertilizers and Levels of Nitrogen

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The multicut variety of forage sorghum, GFSH-1 in Gujarat State, is becoming popular due to its suitability in intensive agriculture. Information on nutritional requirement of this variety in respect to nitrogen is lacking. Enriching the rhizosphere with biofertilizers economise chemical fertilizer requirement by reducing the cost of production (Subba Rao *et al.*, 1980). With a view an experiment was conducted to findout the response of N and biofertilizer on growth & yield of forage sorghum. The treatment comprises three biofertilizers (uninoculated, Azotobacter and Azospirillum inoculation) combined with four levels of nitrogen (0, 40, 80 and 120 kg/ha) which were tried in a factorial randomized block design with four replications at the Instructional Farm, Gujarat Agricultural University, Junagadh during *kharif* season of 1995-96. The soil was clayey in texture, slightly alkaline in reaction (pH 8.10), normal in salt content (EC 0.33 dS/m), low in available nitrogen (232.5 kg/ha), medium in available phosphorus (35.4 kg/ha) and rich in available potassium (312.5 kg/ha). Half dose of nitrogen, alongwith 40 kg

phosphorus/ha was applied before sowing and remaining half dose of N was applied at 30 days after sowing as per treatment. The seed was inoculated as per treatments with Azotobacter and Azospirillum culture @ 50 g/kg seed. The sowing was done on 12th July, 1995 with a row spacing of 30 cm and seed rate of 30 kg/ha. The second cut crop was fertilized only with nitrogen as per treatments (Half dose of nitrogen applied in the first cut crop). Yield components, yield, nutrient uptake and quality parameters were recorded during the course of experimentation.

During first cut (Table-1 & 2), inoculation either with Azotobacter or Azospirillum produced significantly higher green (481 and 495 q/ha, resp.) as well as dry (221 and 231 q/ha, resp.) forage yield over uninoculated crop. Respective increases in green forage yield were 6.42 and 9.51 per cent and dry forage yield were 6.76 and 11.59 per cent higher over the yield of uninoculated crop. This improvement in yield might be due to significant effect of inoculation on the plant height. The results corroborate with those of Raj Reddy *et al.*, (1977) in respect to Azotobacter and Veerabandran and Rajendran, (1993) in respect to Azospirillum inoculation. In the second cut, there was no significant effect of inoculation on yield components and yield. Inoculation either with Azotobacter or Azospirillum was found very economical,

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TABLE 1
Effect of different treatments on forage yield of sorghum, nitrogen uptake, quality parameters and economics.

Treatments	Green forage yield (q/ha)		Dry forage yield (q/ha)		Nitrogen uptake (kg/ha)		Crude protein (%)		Crude fibre (%)		Net return (Rs/ha)	Net ICBR
	FC	SC	FC	SC	FC	SC	FC	SC	FC	SC		
Biofertilizers												
Uninoculated	452	208	207	116	235	120	6.79	6.36	32.75	31.63	11691	-
Azotobacter	481	215	221	116	297	121	8.31	6.39	32.71	31.66	12691	1:25.01
Azospirillum	495	213	231	117	306	122	8.36	6.38	32.63	31.50	13084	1:34.83
S. Em. ±	10	5	5	2	7	1	0.17	0.04	0.15	0.16	-	-
C. D. at 5%	28	NS	13	NS	20	NS	0.48	NS	NS	NS	-	-
Nitrogen (kg/ha)												
0	346	128	187	91	188	80	6.41	5.47	33.66	32.75	6076	-
40	423	171	203	102	226	94	6.85	5.81	33.25	32.25	9049	1:4.69
80	529	231	226	131	300	139	8.34	6.65	32.36	31.23	13665	1:7.45
120	607	318	261	141	403	172	9.67	7.59	31.51	30.16	18222	1:8.66
S.Em. +	11	5	5	3	8	2	0.19	0.05	0.17	0.18	-	-
C. D. at 5%	32	16	15	8	23	5	0.56	0.13	0.50	0.53	-	-
C.V. %	8.12	8.91	8.21	8.18	9.76	4.89	8.60	2.44	1.83	2.01	-	-
Interaction (B x N)												
S.Em. ±	19	9	9	5	14	3	0.34	0.08	0.30	0.32	-	-
C. D. at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-	-

FC = First Cut SC = Second Cut NS = Non-Significant

TABLE 2

Effect of different treatments on yield components of forage sorghum.

Treatments	Plant height (cm)		No. of internodes /plant		Length of Internodes (cm)		Stem thickness (cm)		Leaf area index	
	FC	SC	FC	SC	FC	SC	FC	SC	FC	SC
Biofertilizers										
Un inoculated	240	119	8.80	6.56	29.88	15.55	1.01	0.70	15.26	7.18
Azotobacter	253	120	9.27	6.62	29.32	15.61	1.03	0.72	18.10	7.31
Azospirillum	255	120	9.08	6.61	29.38	15.72	1.04	0.71	17.24	7.26
S. Em. ±	3	2	0.16	0.10	00.22	00.22	0.02	0.02	00.8	0.12
C. D. at 5%	10	NS	NS	NS	NS	NS	NS	NS	NS	NS
Nitrogen (kg/ha)										
0	203	101	7.56	5.55	28.61	12.83	0.87	0.55	12.90	4.54
40	243	109	9.18	6.36	28.98	16.16	0.98	0.67	15.02	6.32
80	268	130	9.31	6.86	30.00	16.50	1.07	0.74	18.24	8.20
120	282	139	10.51	7.61	30.53	17.01	1.19	0.88	21.30	9.93
S.Em ±	4	3	0.19	0.12	0.25	0.25	0.03	0.02	0.92	0.14
C. D. at 5%	11	8	0.54	0.34	0.73	0.72	0.08	0.06	2.65	0.39
C.V. %	5.55	8.20	7.22	6.14	2.97	5.56	9.04	10.03	18.90	6.47
Interaction (B x N)										
S.Em. ±	6.91	4.92	0.33	0.20	0.44	0.44	0.05	0.04	1.60	0.24
C. D. at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

FC = First Cut SC = Second Cut NS = Non-Significant

which was reflected in net return of Rs. 12691 and Rs. 13084 per hectare and net ICBR of 1:25.01 and 1:34.83, respectively.

Application of nitrogen produced significant effect on the yield as well as yield components and quality parameters including nutrient uptake (Table 1 & 2) of forage. Increased response was found up to the highest level of nitrogen application (120 kg/ha). Every increment in nitrogen produced significantly higher forage yield over the preceding level of nitrogen. Thus significantly higher green (607 and 261 q/ha) and dry (318 and 141 q/ha) forage yields were produced when the forage crop was fertilized with 120 and 60 kg N/ha during first and second cut, respectively over the control. The probable reason for such a positive response to nitrogen application might be due to the poor inherent nitrogen status of the soil and response behaviour of the forage sorghum to nitrogen, which tended to put more vegetative growth and efficient photosynthesis as reflected in significant improvement in yield components viz., plant height, number of internodes/plant, length of internodes, stem thickness and leaf area index and nitrogen uptake with increasing nitrogen (0 to 120 kg/ha). Thus, finally produced more forage yield. This result is in agreement with those

of Patel *et al.* (1994).

From this study, it can be concluded that for getting potential and economic production from multicut forage sorghum (GRSH-1), the seeds of the crop should be inoculated either with *Azospirillum* or *Azotobacter* culture before sowing. Moreover, the first and second cut crop should be fertilized with 120 and 60 kg N/ha respectively.

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