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Response of Forage Sorghum Var. GJ-37 to Nitrogen and Phosphorus Fertilization

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ABSTRACT

An experiment as carried out during the *kharif* seasons of 1989-90 to 1996-97 to study the response of forage sorghum Var. GJ-37 to different levels of nitrogen and phosphorus fertilizers on medium black soils at Dhari. Application of 80 kg N/ha was found to be the optimum dose to incerase green as well as dry fodder yield; net return and net ICBR. In case of phosphorus application, 80 kg P_2O_5/ha produced significantly highest dry fodder yield, however 40 kg P_2O_5/ha was found to be optimum dose in respect to net ICBR.

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INTRODUCTION

Sorghum *(Sorghum bicolor)* is an important source of forage for cattle. Among the different varieties of sorghum, GJ-37 is one of the forage variety producing high quality and quantity of fodder and found stable in biomass production. The main constraint of low production and productivity of forage sorghum crop is their cultivation in poor and marginal lands under rainfed condition with no or little use of fertilizers. The role of nitrogenous and phosphatic fertilizers in boosting agricultural productivity during past three decades is now well recognized (Singh and Singh, 1998). Fertilizer is a costly input and so it should be used judiciously to get maximum monetary return per unit cost. There is paucity of information on this aspect for Dhari region of North Saurashtra Agro Climatic Zone. Therefore, an experiment was conducted to study the response of forage sorghum var. GJ-37 to different levels of nitrogen and phosphorus.

MATERIALS AND METHODS

The field experiment was conducted during the *kharif* seasons of 1989-90 to 1996-97 at Grassland Research Station, Gujarat Agricultural University, Dhari. The soil of the experiment site was medium black having pH 7.6, E.C. 0.21 ds/M, 169 kg/ha total nitrogen, 41 kg/ha available phosphorus and 285 kg/ha available potash content. The treatments comprised 04 levels of nitrogen (00, 40, 80 and 120 kg N/ha) and 03 levels of phosphorus (00, 40 and 80 kg P_2O_5/ha) were tested in randomised block design and replicated thrice. The crop was sown at 45 cm distance between two rows in June - July in each experimental year after receiving sufficient rainfall. Treatment wise full dose of phosphorus in the form of single super phosphate and half nitrogen dose in the form of urea were applied as basal dose and the remaining half dose of nitrogen in the form of urea was top dressed at 30 days after sowing. General cultural practices were

followed as per recommendation. The crop was harvested at flowering stage. The *kharif* seasonal rainfall was 609.4, 597.8, 281.6, 492.4, 605.9, 547.2 and 608.1 mm during 1989-90, 1990-91, 1991-92, 1992-93, 1994-95, 1995-96 and 1996-97, respectively. Standard statistical procedure was followed for analysing the results obtained.

RESULTS AND DISCUSSION

Effect of Nitrogen

The green and dry fodder yields were significantly influenced by various nitrogen levels (Table 01 and 02). The results revealed that application of 80 kg N/ha and 120 kg N/ha were being at par with each other, produced remarkably higher green fodder yield as compared to rest of the nitrogen levels during 1990-91, 1992-93, 1994-95, 1995-96 as well as in pooled analysis. The results indicated similarity with Saheb *et al.* (1997) and Desale *et al.* (1999) who found that green fodder yield of sorghum crop increased with increasing levels of nitrogen upto the maximum dose of 120 kg N/ha.

TABLE 1

Green fodder yield as influenced by nitrogen and phosphorus.

Treatments	Green fodder yield in q/ha, years							
	1989	1990	1991	1992	1994	1995	1996	Pooled
Nitrogen (kg/ha)								
N_1 = 00 (Control)	83.59	84.88	46.42	78.45	43.72	150.46	237.91	103.63
N_2 = 40	95.80	104.17	33.44	106.74	79.09	243.05	182.61	120.70
N_3 = 80	102.88	158.18	42.31	130.53	83.59	282.92	231.48	147.41
N_4 = 120	106.73	153.04	49.51	143.39	82.30	353.65	204.47	156.15
S. Em. ±	8.79	13.11	7.63	5.38	6.49	10.91	7.08	12.33
C. D. at 5%	NS	38.44	NS	15.79	19.03	32.02	20.78	36.64
Phosphorus (kg/ha)								
P_1 = 00 (Control)	100.30	128.76	36.65	119.59	65.58	236.30	240.16	132.48
P_2 = 40	95.96	117.67	55.46	111.88	72.82	263.31	204.47	131.65
P_3 = 80	95.48	128.76	36.65	112.84	78.12	272.95	197.72	131.79
S.Em. ±	7.61	11.35	6.61	4.66	5.62	9.45	6.13	5.12
C.D. at 5%	NS	NS	NS	NS	NS	27.73	17.99	NS

TABLE 2

Dry fodder yield, additional net return and net ICBR as influenced by nitrogen and phosphorus.

Treatments	Dry fodder yield in q/ha, years								Additional net return over control Rs./ha	Net ICBR
	1989	1990	1991	1992	1994	1995	1996	Pooled		
Nitrogen (kg/ha)										
N_1 = 00 (Control)	45.01	48.86	18.13	35.75	23.01	53.75	77.16	43.09	—	—
N_2 = 40	53.36	63.01	23.14	58.89	46.81	87.70	80.37	59.04	821	1:2.66
N_3 = 80	59.15	99.02	23.40	81.40	50.15	90.14	81.01	69.18	1700	1:2.75
N_4 = 120	60.44	106.99	29.96	87.31	50.79	104.68	99.66	76.99	1649	1:1.78
S. Em. ±	6.74	8.76	3.77	3.65	3.57	3.55	2.84	5.24		
C.D. at 5%	NS	25.71	NS	10.73	10.47	10.41	8.33	15.57		
Phosphorus (kg/ha)										
P_1 = 00 (Control)	57.87	84.37	20.73	67.22	39.41	73.68	76.19	59.92	—	—
P_2 = 40	52.56	71.85	31.05	65.00	43.78	80.05	83.91	61.17	836	1:1.11
P_3 = 80	53.04	81.50	70.95	65.29	44.84	98.47	93.55	72.52	1400	1:0.98
S.Em. ±	5.83	7.59	3.26	3.16	3.09	3.07	2.46	2.84		
C.D. at 5%	NS	NS	9.59	NS	NS	9.01	7.22	7.95		

The results on dry fodder yield presented in table 02 indicate that increasing levels of nitrogen from 00 to 120 kg/ha progressively increased the dry fodder during all the individual years (except during 1989 and 1991) as well as in pooled analysis. The highest dry fodder yield was recorded with 120 kg N/ha, but statistically it was at par with 80 kg N/ha. With regard to monetary return, the treatment of 80 kg N/ha secured the highest additional net return of Rs. 1700/ha and net ICBR of 1:2.75. Kushwaha and Chandel (1997) and Vasanthi and Kumaraswami (1999) also reported that the dry matter yield of sorghum increased with increase in levels of nitrogen dose upto 150 kg N/ha.

Effect of Phosphorus

It was observed (Table 1) that the difference in green fodder yield due to phosphorus application was found significant only during 1995-96 and 1996-97 out of seven years of experiment and was nonsignificant in pooled results.

The data on dry fodder yield presented in Table 02 reveal that the application of 80 kg P_2O_5/ ha produced significantly highest dry fooder yield during 1991-92, 1995-96, 1996-97 and in pooled results. In the remaining years, phosphorus could not produce any signifiant effect on dry fodder yield. In respect to monetary return, the application of 80 kg P_2O_5/ha produced the highest additional net return of Rs. 1400/ha, while application of 40 kg P_2O_5/ha gave highest net ICBR of 1:1.11. The results agreed with those of Vashishatha and Dwivedi (1997) and Sutaria *et al.* (1999).

The results indicated that application of nitrogen @ 80 kg/ha and phosphorus @ 40 kg/ ha was found to be optimum dose in respect to fodder yield and monetary returns for forage sorghum Var. GJ-37 under rainfed conditions of North Saurashtra Agro Climatic Zone.

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