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EFFECT OF NITROGEN AND ZINC ON YIELD AND QUALITY OF FODDER SORGHUM [*SORGHUM BICOLOR* (L.) MOENCH] VARIETIES

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SUMMARY

A field experiment was conducted on loamy sand soil of the Agronomy Instructional Farm, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar to study the effect of nitrogen and zinc on yield and quality of fodder sorghum [*Sorghum bicolor* (L.) Moench] varieties during summer season of 2011. Eighteen treatment combinations consisting of two varieties viz., GFS 4 and GFS 5; three levels of nitrogen viz., 40, 80 and 120 kg N/ha and three levels of zinc viz., 0, 2 and 4 kg Zn/ha were tried in factorial randomized block design with three replications. The results indicated that among the varieties of fodder sorghum, GFS 5 performed better in respect to green forage (257 q/ha) as well as dry matter (119 q/ha) yield than variety GFS 4. The variety GFS 5 exhibited maximum crude protein, crude fiber**,** N and Zn content as well as its uptake. Application of 120 kg N/ha significantly increased green forage (262.44 q/ha) as well as dry matter yields (120.28 q/ha) and enhanced the crude protein, crude fibre content as well as uptake of N and Zn over 40 and 80 kg N/ha . Application of zinc @ 4 kg Zn/ha was found significantly superior and produced highest green forage (254 q/ha) and dry matter yield (120 q/ha) than 2 kg Zn/ha. Crude protein as well as content and uptake of N and Zn were also found maximum with 4 kg Zn/ha.

Key words : Fodder sorghum, nitrogen, varieties, zinc

Indian economy is primarily agricultural based where animal health is very important. To establish and improve the animal production, the availability of quality forage crops and grasses and their production needs urgent attention. Dairy farming is a back bone of the farmers and economy in North Gujarat area owing to poor land holding and uncertain climatic conditions. Under the circumstances, it is rather difficult to supply green fodder to milking cattle round the year. In this area, farmers mainly grow sorghum as a fodder crop. Sorghum [*Sorghum bicolor* (L.) Moench] is an important cereal fodder crop due to its excellent growing habit, high potential, better nutritive value and quick regrowth. It can withstand heat, drought and also tolerate waterlogging better than other forage crops. Fertilizer is the single most important input for securing higher production. Nitrogen is the most important nutrient for plant growth and is the most limiting nutrient in our soils. A comparative study made for the assessment of zinc status of Gujarat soils has clearly indicated that Banaskantha district with sandy soil recorded the highest per cent of zinc deficient soils (4.4%) with less than 0.5 ppm DTPA extractable zinc. The total content of zinc in soils of Gujarat varied between 20-95 ppm. The delineation work revealed that overall deficiency of available zinc was 24.0 per cent ranging from 2 to 10 per cent, respectively, in different pockets of state (Dangerwala *et al*., 1996). The decline in deficiency could be ascribed mainly to use of micronutrient fertilizers and organic manures by the farmers.

MATERIALS AND METHODS

The field experiment was conducted at S. D. Agricultural University, Sadarkrushinagar, during summer 2011. The soil of experimental field was loamy sand in texture, low in organic carbon and available nitrogen, medium in available phosphorus and rich in

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available potassium. Eighteen treatment combinations consisting of two varieties viz., V_1 : (GFS 4), V_2 : (GFS 5), three levels of nitrogen viz., N_1 : 40 kg N/ha, N_2 : 80 kg N/ha and N_3 : 120 kg N/ha and three levels of zinc viz., Zn_0 : 0 kg Zn/ha, Zn_1 : 2 kg Zn/ha and Zn_2 : 4 kg Zn/ha were tested under factorial randomized block design with four replications. The crop was sown by maintaining 45 cm spacing between two rows before sowing the seed, half dose of nitrogen and full dose of zinc fertilizer as per treatment was applied. The nutrient N and Zn were applied in the form of urea and zinc sulphate, respectively. The recommended dose of phosphorus (40 kg P_2O_5/ha) in the form of diammonium phosphate was applied before sowing in all the plots. The remaining half dose of nitrogen in the form of urea was applied at 35 days after sowing as per treatment.

RESULTS AND DISCUSSION

Effect of Varieties

The data presented in Table 1 show that variety GFS 5 produced significantly the highest green forage (257 q/ha) and dry matter (118.93 q/ha) yield. The fodder quality of variety GFS 5 was superior to the GFS 4 with higher crude protein content (5.51%) and crude fibre content (30.95%). Chemical parameters viz., nitrogen content (0.88%), nitrogen uptake (104.79 kg/ha), zinc content (0.52%) and zinc uptake (62.24 kg/ha) were significantly the highest with the variety GFS 5. These results are in accordance with those of Pankhaniya *et al.* (1997), Ammaji and Suryanarayan (2002) and Bishnoi *et al.* (2005).

Effect of Nitrogen

Results indicated that application of 120 kg N/ha produced maximum green forage (262 q/ha) and dry matter (120 q/ha) yield with higher crude protein and crude fiber content. Significantly higher nitrogen content (0.88%), nitrogen uptake (104.79 kg/ha), zinc content (0.52%) and zinc uptake (62.24 kg/ha) were noted with 120 kg N/ha treatment. These results are in close conformity with those reported by Bhilare *et al.* (2002),

TABLE 1
Effect of nitrogen and zinc on yield, quality, content and uptake of fodder sorghum

Treatment	Green forage yield (q/ha)	Dry matter yield (q/ha)	Crude protein content (%)	Crude fibre content (%)	Nitrogen content (%)	Nitrogen uptake (kg/ha)	Zinc content (%)	Zinc uptake (kg/ha)
Varieties (V)								
V_1 : GFS 4	232	103	5.05	29.58	0.81	83.48	0.46	47.67
V_2 : GFS 5	257	119	5.51	30.95	0.88	104.79	0.52	62.24
S. Em±	4.24	1.61	0.09	0.48	0.01	2.08	0.01	1.32
C. D. (P=0.05)	12.19	4.63	0.27	1.37	0.04	5.97	0.03	3.79
Nitrogen levels (N)								
N_1 : 40 kg N/ha	224	102	5.00	29.54	0.80	81.70	0.44	45.19
N_2 : 80 kg N/ha	248	111	5.28	29.69	0.85	93.86	0.49	54.70
N_3 : 120 kg N/ha	262	120	5.55	31.56	0.89	106.78	0.54	65.15
S. Em±	5.19	1.97	0.11	0.58	0.02	2.54	0.01	1.62
C. D. (P=0.05)	14.93	5.68	0.33	1.68	0.05	7.32	0.03	4.65
Zinc levels (Zn)								
Zn_0 : 0 kg Zn/ha	235	101	5.07	30.38	0.81	82.20	0.46	46.42
Zn_1 : 2 kg Zn/ha	245	112	5.26	30.33	0.84	94.33	0.48	54.01
Zn_2 : 4 kg Zn/ha	254	120	5.50	30.08	0.88	105.65	0.54	64.43
S. Em±	5.19	1.97	0.11	0.58	0.02	2.54	0.01	1.62
C. D. (P=0.05)	14.93	5.68	0.33	NS	0.05	7.32	0.03	4.65
C. V. (%)	9.00	7.53	9.21	8.18	9.21	11.41	10.31	12.34
Interaction								
V x N	NS	Sig.	NS	NS	NS	NS	NS	NS
V x Zn	NS	NS	NS	NS	NS	NS	NS	NS
N x Zn	NS	NS	NS	NS	NS	NS	NS	NS
V x N x Zn	NS	NS	NS	NS	NS	NS	NS	NS

Sig.–Significant, NS–Not Significant.

TABLE 2
Dry matter yield (q/ha) as influenced by interaction of varieties and nitrogen

Treatment	Levels of nitrogen		
	N_1 (40 kg N/ha)	N_2 (80 kg N/ha)	N_3 (120 kg N/ha)
Varieties (V)			
V_1 (GFS 4)	93.89	107.00	109.00
V_2 (GFS 5)	110.22	115.00	131.56
S. Em.±		4.71	
C. D. (P=0.05)		13.56	
C. V. (%)		7.53	

Giri *et al.*, (2006), Gupta *et al.* (2008) and Sonune *et al.* (2010).

Effect of Zinc

Application of zinc @ 4 kg Zn/ha was found significantly superior and produced highest green forage (235.72 q/ha) and dry matter yield (120.06 q/ha) and enhanced the crude protein (5.50%) content. Nitrogen content and its uptake as well as zinc content and its uptake by plant also increased with increasing zinc level up to 4 kg Zn/ha. Similar results were reported by Jain and Dahama (2005) and Patel *et al.* (2008).

Interaction Effect

Interaction between variety and nitrogen (V x N) was found to be significant in respect of dry matter yield of forage sorghum. The treatment combination variety GFS 5 fertilized with 120 kg N/ha gave the highest dry matter yield (Table 2). These results are in accordance with those reported by Ammaji and Suryanarayana (2003).

CONCLUSION

Based on the results from one year experimentation it was concluded that there was higher production of fodder sorghum crop grown in summer season in loamy sand soil of North Gujarat by growing the variety GFS 5 and fertilized with 120 kg N/ha and 4 kg Zn/ha.

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