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Response of guinea grass (*Panicum maximum* Jacq) to organic and inorganic fertilizers

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Abstract

The experiment was conducted at the Department of Agronomy, N. M. College of Agriculture, Navsari Agricultural University, Navsari (Gujarat) during the *khariif-rabi*-summer seasons of 2014-15 to 2016-17. The treatment consists of two levels of FYM (0 and 10 t/ha) and four levels of inorganic fertilizers viz 75% FD (Fertilizer Dose), 100% FD, 125% FD and 150% FD. The field experiment was carried out in a factorial randomized block design with three replications. The result revealed that growth parameters viz. plant height and numbers of tiller per plant significantly increased with treatment FYM 10 t/ha. Green fodder yield and dry fodder yields were also significantly highest with FYM 10 t/ha. More or less same trend were observed in case of nutrients content, nutrient uptake, crude protein content and crude protein yield, but EE, NDF and ADF were not affected significantly. Application of FYM 10 t/ha was recorded maximum net monetary returns. In case of inorganic fertilizer, significantly higher growth attributes viz. plant height and numbers of tillers per plant were recorded with 150% FD however it was at par with lower levels 125% RDF and 100% RDF in pooled. Green and dry fodder yields significantly higher with 150% FD, but it was at par with 125% RDF in pooled. More or less same trend observed in content and uptake of nutrients. However, Ether Extract (EE), Neutral Detergent Fiber (NDF) and Acid Detergent Fiber (ADF) were not affected significantly due to various levels of fertilizers. The highest gross income, net income and B:C ratio recorded by 150% FD followed by 125% FD.

From the three years experimentation, It can be concluded that for getting higher growth, green fodder yield, dry fodder yield, quality, better economic return and higher nutrient uptake, the guinea grass crop should be fertilize with 10 t/ha FYM and 125% FD (62.5-37.5-37.5 N-P₂O₅- K₂O kg/ha) as basal as well as 37.5 kg N/ha after each cut and 50 kg P₂O₅/ha each year.

Keywords: Guinea grass, FYM, EE, NDF and ADF

Introduction

Guinea grass (*Panicum maximum* Jacq.) is very useful multicut forage grass, because of its easy propagation, fast growing habit and high quality forage. It has excellent and quick recovery after cutting and good quality herbage. The crop is grown both as annual and perennial. It can give 6-8 cuttings annually. It does not become course quickly and hence suitable for hay and silage. It can tolerate saline and sodic conditions. The dry matter contains 7-10% crude protein, 30% crude fiber, 2.33% ether extract and 8.36% ash. It is more nutritious and palatable and also free from oxalates. Guinea grass is also tolerant to the light stress and can perform very well under shaded condition. Proper management practice together with correct application of fertilizer and cutting at the suitable height and interval is important for maximum profit and persistence of the crop. The basic concept of nutrient management is the maintenance or adjustment of soil fertility and to supply plant nutrient at an optimum level for sustaining the desired crop productivity. The role of organic fertilizers are well recognized. It supplies macro and micro nutrients necessary for plant growth. Organic manures also improve the physical, chemical and biological properties along with conserving and improving the moisture and nutrient holding capacity of the soil. Considering the above fact and views, the present experiment entitled "Nutrient management in guinea grass (*Panicum maximum* Jacq) under south Gujarat condition" was planned.

Materials and Methods

The present experiment was conducted during *khariif-rabi*- summer seasons of 2014-15, 2015-16 and 2016-17 at instructional farm, Department of Agronomy, N. M. College of Agriculture, Navsari Agricultural University, Navsari. The experiment was conducted on clayey texture soil which have low, medium and high rating for available nitrogen, phosphorus and potassium respectively. The soil was found slightly alkaline with normal electrical conductivity.

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The experiment was laid out in factorial Randomized Block Design with eight treatment combination *viz* two levels of organic manure FYM 0 t/ha and 10 t/ha and four levels of inorganic fertilizers *viz* 75% FD, 100% FD, 125% FD and 150% FD (FD = 50:30:30, N: P₂O₅:K₂O kg/ha as basal, 30 kg N/ha after each cut and 40 kg P₂O₅/ha at each year with three replications. The guinea grass variety JHGG -08-01 was used.

Results and Discussion

Effect of FYM levels

The result shown in Table-1 revealed that growth parameters *viz.* plant height and numbers of tiller per plant significantly increased with treatment FYM 10 t/ha over no application of FYM. Green fodder yield and dry fodder yields were also significantly highest obtained with FYM 10 t/ha. The result presented in Table-2 showed that significantly the highest value of N and P content and total uptake were recorded with application of FYM 10 t/ha over no FYM. The quality parameters, crude protein content and crude protein yield were also significantly the highest with FYM 10 t/ha. Other nutritional parameters *viz.* Ether Extract, Neutral Detergent Fiber and Acid Detergent Fiber were not affected significantly by application of FYM, however numerical improvements were seen with application of FYM. Application of FYM 10 t/ha was gave maximum gross returns, net monetary and B:C ratio. Application of organic manures *viz* FYM is known to improve the physical, chemical and biological properties of soil, besides providing major, secondary and micronutrients to the crop resulting in better crop growth and ultimately the

yield. Similar results were reported by Patel (2005) ^[6].

Effect of fertilizer level

Data mentioned in Table-1 clearly showed that significantly improve plant height and number of tillers per plant recorded by 150% FD, which was at par with 125% FD and 100% FD in pooled data. In case of yields, significantly higher green fodder and dry fodder yields were recorded with 150% FD which was at par with 125% FD in pooled. It might be due to application of right rate of nutrients to crop which significantly improve the growth and yield. Data presented in Table-2 indicated that treatment 150% FD recorded significantly higher content and uptake of N and P but this was at par with 125% FD. Same trend were found in case of crude protein content and crude protein yield. Nitrogen fertilization significantly improves the quality parameters. Other nutritional parameters *viz.* EE, NDF and ADF were not affected significantly by different levels of fertilizers. However NDF and ADF decreased with increasing levels of fertilizers. Maximum gross returns, net returns and B:C ratio were noted under treatment 150% FD followed by 125% FD. These results are in similar to the results obtained by Pathan *et al.* (2008) ^[7].

Interaction effect

All the interactions between organic manures and inorganic fertilizer were failed to give any significant effect on growth, yield, quality, nutrient content and uptake of guinea grass.

Table 1: Effect of organic and inorganic fertilizers on plant height, No. of tillers per plant green & dry fodder yields and economics of guinea grass (Pooled of three years)

Treatments	Plant height (cm)	No. of tillers per plant	Green fodder (q/ha)	Dry fodder (q/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B:C ratio
FYM levels							
0 t/ha	110.80	35.56	356.80	90.10	107068	78529	2.75
10 t/ha	122.20	42.16	425.90	107.30	127776	79237	1.63
S. Em. ±	1.781	0.701	7.10	1.77	-	-	-
CD (P=0.05)	5.03	1.983	20.00	5.03	-	-	-
Fertilizer Levels							
75% FD	102.10	26.99	294.10	73.90	88239	50730	1.35
100% FD	119.50	41.60	407.90	101.80	122385	84190	2.20
125% FD	121.00	42.62	424.50	107.40	127375	88493	2.28
150% FD	123.40	44.22	438.90	111.70	131688	92119	2.33
S. Em. ±	2.480	0.99	10.10	2.57	-	-	-
CD (P=0.05)	6.99	2.795	28.60	7.26	-	-	-
Interaction (FYM X FD)							
S. Em. ±	3.460	1.366	24.46	6.20	-	-	-
CD (P=0.05)	NS	NS	NS	NS	-	-	-
CV%	10.74	12.50	12.50	12.56	-	-	-

Table 2: Influence of organic and inorganic fertilizers on nutrient content and uptake of guinea grass (Pooled of three years)

Treatments	Content (%)		Uptake (q/ha)		CP content (%)	CP Yield (q/ha)
	N	P	N	P		
FYM levels						
0 t/ha	0.897	0.158	81.69	14.35	5.83	531.04
10 t/ha	0.948	0.170	102.57	18.41	6.17	666.77
S. Em. ±	0.0071	0.0013	1.75	0.318	0.046	11.43
CD (P=0.05)	0.0200	0.036	4.97	0.901	0.129	32.32
Fertilizer Levels						
75% FD	0.832	0.155	61.51	11.47	5.41	399.86
100% FD	0.901	0.162	91.86	16.57	5.86	597.06
125% FD	0.975	0.170	105.06	18.25	6.34	682.86
150% FD	0.983	0.171	110.12	19.23	6.39	715.82
S. Em. ±	0.0099	0.0019	2.50	0.465	0.065	16.25
CD (P=0.05)	0.0280	0.0052	7.063	1.314	0.182	45.91
Interaction (FYM X FD)						
S. Em. ±	0.0248	0.0027	6.13	1.109	0.161	39.89
CD (P=0.05)	NS	NS	NS	NS	NS	NS
CV%	5.38	5.46	13.32	13.54	5.38	13.32

Table 3: Effect of organic and inorganic fertilizers on nutritional parameter of guinea grass

Treatment	EE		NDF		ADF	
	2015-16	2016-17	2015-16	2016-17	2015-16	2016-17
FYM levels						
0 t/ha	1.52	1.54	67.40	67.78	45.21	44.97
10 t/ha	1.53	1.56	66.46	66.74	43.93	43.77
S. Em. ±	0.016	0.022	0.782	0.707	0.621	0.596
CD (P=0.05)	NS	NS	NS	NS	NS	NS
Fertilizer Levels						
75% FD	1.51	1.53	67.65	67.91	45.79	45.64
100% FD	1.52	1.54	67.37	67.70	45.26	45.07
125% FD	1.52	1.56	66.67	67.08	44.15	43.92
150% FD	1.55	1.57	66.02	66.34	43.07	42.86
S. Em. ±	0.023	0.015	1.106	1.000	0.878	0.843
CD (P=0.05)	NS	NS	NS	NS	NS	NS
Interaction (FYM X FD)						
S. Em. ±	0.032	0.031	1.56	1.42	1.24	1.19
CD (P=0.05)	NS	NS	NS	NS	NS	NS
CV%	3.63	3.46	4.05	3.64	4.83	4.65

Conclusion

From the three years experimentation, It can be concluded that the guinea grass crop should be fertilize with 10 t/ha FYM and 125% FD (62.5-37.5-37.5 N-P₂O₅- K₂O kg/ha) as basal as well as 37.5 kg N/ha after each cut and 50 kg P₂O₅/ha each year for getting higher growth, green & dry fodder yields, better quality, higher economic return and nutrient uptake.

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