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ORIGINAL ARTICLES

Effect of Fertilizers (Urea, Farmyard and Chicken Manure) on Growth and Yield of Rhodes Grass (*Chloris gayana* L. Knuth.)

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ABSTRACT

A field experiment was conducted during (2009/2010) season in Demonstration Farm of the Faculty of Agricultural Studies, Sudan University of Science and Technology at Shambat, Sudan. The objective was to study the effect of fertilizers (urea, farmyard and chicken manure) on growth and yield of Rhodes grass. The fertilizer treatments used in this study were urea [U (100KgN/ha)], farmyard manure [FYM (5ton/ha)], chicken manure [CHM (3ton/ha)], combinations between them (U+FYM, U+CHM, FYM+CHM, and U+FTM+CHM) with 8 cuts (Two monthes firstly and monthly after that to 8th cut). The experimental was laied out in Randomized Complete Block Design (RCBD) with three replicates. The results revealed that growth parameters had not significantly affected by fertilizers except plant population but yield parameters had significantly affected by fertilizers.

Key words: Rhodes grass; fertilizers; Sudan

Introduction

Forage production is gaining more attention in the tropics and subtropics; in both developed and developing countries. New species, varieties and cultivars of forage and pasture plant have been introduced from areas and countries rich in forage and pasture plant to areas where they are scare. In Sudan forage production is very important because the forage is basic source of energy for growth and maintenance and product increment of livestock. Additionally, it is important due to the fact that Sudan has a huge number of animals which is estimated to about 143 million heads in 1998 (63 m goats, 42 m sheep, 35 m cattle and 3 m camels) (Mohammed, 2000).

Rhodes grass (*Chloris gayana* L. Kunth.) is a summer-growing, stoloniferous perennial, whose runners provide good soils, from infertile sands to fertile brigalow clays. It is difficult to established and have persistent on heavy cracking clay soils. Rhodes grass is one of the best grasses for rotation land in tropical and subtropical areas, useful for establishment pasture leys. It is suitable for silage and hay like by all kinds of stock but may causes skin trouble in horses. It's ability to establish rapidly makes it valuable for soil conservation (Reed, 1976).

Burhan and Hago (2000) stated that nitrogen plays and important role in plant growth and physiological processes, as it enters all enzymes composition and enhances vegetative growth and yield. Valenzuela and smith (2002) found that Rhodes grass responds well to nitrogen fertilizer after a basic pre-plant phosphorus application. Application of 50-60 1b/acre nitrogen when seedlings are 4-8 inch's tall gives vigorous stand. Khair (1999) pointed that Rhodes grass responds well to N fertilization when applied in separated dose after any harvesting.Gasim (2001) found that the increase in N fertilizer increase leaf area and leaf to stem ratio of maize forage. Brima (2007) stated that mean number of leaves per plant of Rhodes grass was significantly affected by NPK but mean plant height, leaf area index and leaf to stem ratio were not significantly affected by NPK. Abedelrahman (2007) reported that no significant effect of nitrogen fertilizer was detected on mean plant height of Rhodes grass in the first and second cuts and Saad (2009) found a significant effect of nitrogen fertilizer on mean plant height. Abass (2007) who stated all fertilizers treatment had significant effect on fodder yield (fresh and dry), compared to control in (*Sorghum bicolor L. Moench)* and *(Sorghum Sudanese*).

The manure produced on extensively grazed land is not available for application to the arable crop. Manure is bulky, odorous, difficult and extensive to store, handle and transport. Therefore, the ease of fertilizer use has some time let to neglect of the use of organic materials in agriculture. However, in general, surveys show that farmers apply manure and compost where they are available and where there is adequate labour to collect, store and spread them (FAO, 2006). Obied (2003) and Ismael (2007) were reported that manure was significantly increased the yield of different forage. Organic manures are composed mainly of wasted and residues from plant

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and animal. They contain much carbon and relatively small percentage of plant food; usually those come from the plant that fixed the carbon (Elawad, 2004). Elzelal (2002) showed that chicken manure applied at comparatively high rate; substantially increase the yield of dry matter plant. Irshad (2002) reported that the application of composted manure fertilizer enhanced plant growth and nutrient uptake compared with non-treated control. Maize growth was better under fertilizer than under composed manure. The objective was to study the effect of fertilizers (urea, farmyard and chicken manure) on growth and yield of Rhodes grass.

Material and Methods

A field experiment was conducted during (2009/2010) season in Demonstration Farm of the Faculty of Agricultural Studies, Sudan University of Science and Technology at Shambat, Sudan, to study the effect of fertilizers (urea, farmyard and chicken manure) on growth and yield of Rhodes grass. The experimental site lies at latitude 15º40N, longitude 32º40´E and 280 meters above sea level. The climate of the locality is semi-desert (Adam, 1996). The soil is alkaline (pH 8.0), cracking clay with about 50% clay content. It contains about 0.065% nitrogen (N), 0.230 meq/L potassium (K) and 0.193 meq/L available phosphorus (P) as determined by El Basari (1999). The treatments composed of three fertilization treatments 100kg N/ha urea (U), 5ton/ha farmyard manure (FYM), 3ton/ha chicken manure (CHM) and combinations (U+F, U+CHM, FYM+CHM and U+FYM+CHM) and no fertilizer as the control, in three replications. Treatments were arranged in a Randomize Complete Block Design (RCBD) with 8 cuts (The first cut was harvested after two mnothes and the others were mnothly.

The forage was sown on 1st June 2009 to 1st March 2010 and the fertilizer treatments were applied at sowing. Plant height, number of leaves per plant, plant population, Leaf area index and leaf to stem ratio were measured as growth parameters and fresh wieght addition to dry weight were measured as yield parameters. The data were statistically analyzed by Computer program (M STAT-C) (1989). Means separation was performed by using LSD (Least Significant Differance) procedure.

Results and Discussion

Plant population (Table 1)and yield parameters (fresh weight,table2 and dry weight,table3) were significantly affected by fertilizers. A similar results finding by Abass (2007) who stated all fertilizers treatment had significant effect on fodder yield (fresh and dry). Othrs similar finding by Abdelrahman (2007) found that forage dry wieght was significant influenced by increased in NPK fertilization levels and Ismael (2007) was reported that manure was significantly increased the yield of different forage.

But plant height, number of leaves per plant, leaf area index and leaf to stem ratio were not significantly affected by fertilizers (Table 1, 2, 3, 4, 5, 6 and 7). The non significant response of the crop obtained in this study may be due to the previous of the experimental site and the different agronomic practices done on it. A similar finding by Brima (2007), who stated that mean plant height, leaf area index and leaf to stem ratio of Rhodes grass were not significantly affected by NPK and Abedelrahman (2007) who reported that no significant effect of nitrogen fertilizer was detected on mean plant height in the first and second cuts. In these regard, the hihest plant density and dry yield were obtained with (CHM) fertilizers but the highest fresh yield was obtained with (FYM+CHM). Similar findings were reported by Hassan (2002) who reported that the highest yield of both Abusabien and Pioneer 988 was obtained with chicken manure and Omer (1998) who reported that manure alone or mixed with the urea resulted in an increase in growth attributes.

Table 1: The effect of different fertilizers on Plant Population during2009/2010.

Treatments	No. of Cuts							
	1	2	3	4	5	6	7	8
Urea (U)	520	477	559	639	316	532	263	356
Farmyard Manure (FYM)	418	605	889	750	347	461	183	376
Chicken Manure (CHM)	478	693	848	1057	522	569	281	605
U+FYM	522	641	737	882	569	568	290	638
U+CHM	453	576	761	635	302	580	317	516
FYM+CHM	503	661	878	875	456	589	241	485
U+FYM+CHM	498	687	811	822	362	767	251	548
Control	517	537	897	867	258	440	267	406
LSD 5%	119.11	226.75	322.13	365.13	291.81	354.82	187.67	284.58
C.V	13.91	21.25	23.07	25.69	44.45	36.79	43.01	33.09
SE±	68.01	129.48	183.95	208.50	166.63	202.61	107.17	162.50

U= Urea. FYM= Farmyard Manure. CHM= Chicken Manure. LSD= Least Significant Difference. CV%= Coefficient of Variation. SE±= Standard Error.

Table 2: The effect of different fertilizers on Fresh Yield (ton/ha) during2009/2010.

Treatments	No. of Cuts							
	1	2	3	4	5	6	7	8
Urea (U)	42.86	20.28	22.00	25.47	9.53	14.52	10.00	7.14
Farmyard Manure (FYM)	26.90	27.38	29.19	23.81	9.28	7.86	7.62	10.00
Chicken Manure (CHM)	44.05	33.95	38.71	37.62	13.10	9.76	9.28	12.62
U+FYM	39.29	26.19	30.33	29.67	18.81	15.24	10.72	13.57
U+CHM	42.86	35.14	30.38	23.81	10.00	12.86	12.62	13.33
FYM+CHM	45.24	31.57	41.05	32.81	17.62	12.14	10.24	13.57
U+FYM+CHM	45.24	31.00	35.71	33.81	15.24	15.00	10.71	10.24
Control	40.48	22.62	28.57	27.38	8.09	12.62	10.67	9.28
LSD 5%	13.15	12.38	16.90	14.62	10.57	10.55	6.67	8.22
C.V	18.38	24.78	30.16	28.48	47.56	48.21	37.23	41.82
SE±	7.51	7.07	9.65	8.35	6.03	6.03	3.81	4.69

U= Urea. FYM= Farmyard Manure. CHM= Chicken Manure. LSD= Least Significant Difference. CV%= Coefficient of Variation. SE±= Standard Error.

Table 3: The effect of different fertilizers on Dry Yield during (ton/ha) 2009/2010.

Treatments	No. of Cuts							
	1	2	3	4	5	6	7	8
Urea (U)	7.29	4.52	5.38	9.05	5.24	6.66	4.52	3.57
Farmyard Manure (FYM)	5.53	5.33	7.05	8.95	6.90	5.57	4.52	4.53
Chicken Manure (CHM)	8.24	8.33	9.05	14.05	6.43	5.33	4.76	4.76
U+FYM	6.67	4.52	8.48	11.33	8.09	6.91	4.76	6.19
U+CHM	7.76	7.14	9.28	8.38	5.62	5.48	5.24	5.24
FYM+CHM	7.96	7.76	12.29	12.14	8.57	6.43	4.05	5.48
U+FYM+CHM	8.71	6.81	10.14	10.95	6.67	6.67	5.72	4.76
Control	7.14	7.09	8.57	10.71	3.68	5.48	4.52	4.28
LSD 5%	2.66	4.92	3.49	4.98	2.60	2.73	2.37	1.83
C.V	20.47	43.60	22.67	26.58	22.88	26.35	28.44	21.51
SE±	1.52	2.81	1.99	2.84	1.48	1.56	1.35	1.04

U= Urea. FYM= Farmyard Manure. CHM= Chicken Manure. LSD= Least Significant Difference. CV%= Coefficient of Variation. SE±= Standard Error.

Table 4: The effect of different fertilizers on Plant Height (cm) during2009/2010.

Treatments	No. of Cuts							
	1	2	3	4	5	6	7	8
Urea (U)	130.0	92.8	89.3	86.8	79.4	64.4	50.5	47.6
Farmyard Manure (FYM)	122.1	117.1	106.7	91.2	77.3	57.6	45.4	53.6
Chicken Manure (CHM)	121.4	97.8	111.7	100.6	79.8	70.9	59.5	48.4
U+FYM	117.4	96.9	101.8	88.9	84.5	66.9	46.4	47.5
U+CHM	133.3	110.1	103.3	94.4	74.8	60.2	57.4	63.2
FYM+CHM	126.9	107.1	116.3	108.9	89.7	62.5	45.1	44.1
U+FYM+CHM	129.6	107.8	83.3	96.4	82.7	70.4	55.0	47.5
Control	156.5	107.4	91.7	101.3	80.4	59.3	48.5	56.2
LSD 5%	31.73	19.37	12.24	22.47	14.58	13.61	17.94	15.84
C.V	13.97	10.57	7.72	13.36	10.27	12.28	20.24	17.72
SE±	18.12	11.06	6.99	12.83	8.33	7.77	10.24	9.04

U= Urea. FYM= Farmyard Manure. CHM= Chicken Manure. LSD= Least Significant Difference. CV%= Coefficient of Variation. SE±= Standard Error.

Table 5: The effect of different fertilizers on No. of Leaves/Plant during2009/2010.

Treatments	No. of Cuts							
	1	2	3	4	5	6	7	8
Urea (U)	11	9	4	7	6	4	4	4
Farmyard Manure (FYM)	10	7	6	7	6	5	4	5
Chicken Manure (CHM)	9	7	5	7	6	5	4	4
U+FYM	11	7	7	5	7	4	4	4
U+CHM	13	8	4	8	5	4	5	5
FYM+CHM	9	8	7	6	6	5	4	4
U+FYM+CHM	9	9	5	6	5	4	5	4
Control	8	8	5	7	6	4	4	5
LSD 5%	5.54	3.52	13.76	24.30	3.31	2.57	2.21	1.51
C.V	31.24	25.36	113.61	147.99	32.14	34.49	29.37	20.50
SE±	3.16	2.01	7.86	13.87	1.89	1.47	1.26	0.86

U= Urea. FYM= Farmyard Manure. CHM= Chicken Manure. LSD= Least Significant Difference. CV%= Coefficient of Variation. SE±= Standard Error.

Table 6: The effect of different fertilizers on Leaf Area Index during2009/2010.

Treatments	No. of Cuts							
	1	2	3	4	5	6	7	8
Urea (U)	16.71	9.38	4.47	6.91	3.08	2.56	1.36	1.66
Farmyard Manure (FYM)	14.15	10.80	9.55	7.01	2.01	2.92	0.66	2.71
Chicken Manure (CHM)	16.50	12.93	8.64	11.18	2.88	3.46	2.96	2.85
U+FYM	17.44	11.52	11.51	6.54	14.21	3.05	1.65	3.82
U+CHM	20.23	15.24	8.27	12.97	2.65	2.92	2.57	5.07
FYM+CHM	13.32	10.16	18.76	6.40	6.21	3.69	1.21	2.17
U+FYM+CHM	14.99	18.01	11.36	5.27	2.52	3.05	1.94	2.66
Control	11.19	11.91	10.76	5.95	2.28	1.79	0.68	2.75
LSD 5%	14.58	9.37	13.84	5.17	12.29	2.61	2.22	4.13
C.V	53.49	42.84	75.88	37.94	156.63	51.19	77.92	79.68
SE±	8.33	5.35	7.90	2.95	7.02	1.49	1.27	2.36

U= Urea. FYM= Farmyard Manure. CHM= Chicken Manure. LSD= Least Significant Difference. CV%= Coefficient of Variation. SE±= Standard Error.

Table 7: The effect of different fertilizers on Leaf to Stem Ratio during2009/2010.

Treatments	No. of Cuts							
	1	2	3	4	5	6	7	8
Urea (U)	1.27	0.79	0.65	0.89	0.71	0.68	0.69	1.35
Farmyard Manure (FYM)	1.26	0.81	0.90	0.92	0.70	0.80	2.24	1.80
Chicken Manure (CHM)	0.95	0.85	0.81	0.78	1.31	1.22	1.41	1.66
U+FYM	1.27	0.66	0.80	0.78	0.88	1.13	0.81	1.82
U+CHM	0.99	0.87	0.90	0.92	0.64	0.70	1.52	1.03
FYM+CHM	0.92	0.83	0.71	0.87	1.04	0.70	1.15	1.11
U+FYM+CHM	0.95	0.75	0.78	0.94	0.64	0.75	0.73	0.99
Control	1.08	0.77	0.64	1.09	0.87	0.93	0.69	1.02
LSD 5%	0.45	0.31	0.31	0.50	0.79	0.58	1.48	1.40
C.V	23.39	22.06	22.72	31.67	53.06	38.37	73.03	59.50
SE±	0.25	0.17	0.18	0.28	0.45	0.33	0.85	0.80

U= Urea. FYM= Farmyard Manure. CHM= Chicken Manure. LSD= Least Significant Difference. CV%= Coefficient of Variation. SE±= Standard Error.

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