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Effect of Nitrogen Fertilizer on the Quality of Rhodes Grass *(Chloris gayana. L. kunth.)* Cultivars•

Hamdi Hassan Saad[1*], Yassin Mohamed Ibrahim[2] and Mohamed Eltigani Salih [2]

[1]Department of Agronomy, Faculty of Agriculture, Omdurman Islamic University, Sudan.
[2] Department of Agronomy, College of Agricultural Studies, Sudan University of Science and Technology, Sudan.

[*]**Correspondent author: Mobile:** +249922125317 **Email**: hmiligi69@gmail.com

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ABSTRACT

A field experiment was conducted in the Demonstration Farm of the Faculty of Agricultural Studies, Sudan University of Science and Technology, during the season (2006/2007) to investigate the effect of nitrogen fertilizer on crude protein, fiber, ash content, ether extract, nitrogen free extract and metabolizable energy of Rhodes grass *(Chloris gayana L.)* cultivars. Four cultivars of Rhodes grass (Katambora, Callide, Boma and Finecut) were used in this study. Four levels of Nitrogen fertilizers (0, 40, 60 and 80 kg N/ha) were used. The treatments were arranged in a split-plot with four replications. Nitrogen applications lead to insignificant increase in crude protein for all cultivars except for Katambora cultivar. The results revealed that, crude fiber insignificantly

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affected by nitrogen applications for the cultivars Callide and Boma. Whereas; the cultivars Katambora and Finecut were significantly affected. Ether extract significantly affected by nitrogen application in all cultivars. The results showed that, ash was not affected by nitrogen levels for all cultivars except for cultivar Callide. Nitrogen free extract was significantly affected by nitrogen levels for all cultivars. Moreover, the metabolizable energy was significantly affected by nitrogen applications in all cultivars except cultivar Katambora. It can be concluded that, the best cultivars in the terms of forage Dry Weight, Crude Protein and Nitrogen Free Extract were Finecut, Callide, Katambora and Boma respectively with added fertilizer (80 kg N /ha).

Key words*: Quality; Cultivars; Fertilizers; Nitrogen; Rhodes grass.*

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1. INTRODUCTION

Forage production is gaining more attention in both developed and developing countries. New species and cultivars of forage and pastures plants have been introduced from areas and countries rich in forage and pastures plant to areas where they are scarce. In Sudan forage production is very important because it's the basic source of energy for both growth and maintenance of livestock and increase of their products. Additionally, Sudan has a huge number of animals which was estimated to about 108 million heads in *2018* (FAO, 2019).

Rhodes grass (Chloris gayana L. Kunth) is a member of the family Poaceae and subfamily Chloridoideae (Luna *et al.*, 2002). Rhodes grass has been a popular perennial grass in the tropics and the subtropics of east and southern Africa, Australia and Central of America. The crop is originated in eastern and southern Africa, and it is valued for its ability to cover ground surface. Rhodes grass is one of the best grasses for rotations grasslands in tropical and subtropical areas, useful for

establishment of pastures leys. It's suitable for silage and hay, as well as for fodder. Liked by all kinds of stock, but it may cause skin troubles in horses. Its ability to establish rapidly makes it valuable for soil conservation (Wayne, et. al., 2014). The establishment of Rhodes grass experienced several problems. One major problem is the tiny grain size (Ibrahim, 1992). Nitrogen fertilizer is recommended to use directly after every cut to increase stand, maximize yields and minimum weed competition (Blackshaw et. al., 2003).

Rhodes grass is excellent for soil erosion control, weeds suppression, well for quick growth, tolerates drought and saline conditions. It has a fair forage production, nutritional, quality and palatability as described by Valenzuela and Smith (2002), but the farmers are not aware of most of Rhodes grass cultural practices such as nitrogen fertilizer requirements and the difference between cultivars on yield quantity and quality.

Nitrogen plays an important role in plant growth and physiological processes as it enters in all enzymes composition. It enhances vegetative growth and yield (Burhan and Hago, 2000). Rhodes grass responds well to nitrogen and phosphorus fertilization. High yields are obtained only when nitrogen is given after a basic application of phosphorus. Nitrogen fertilizer increases the proportion of leaf in the herbage, but when applied after flowering it can increase the proportion of the stem (Yousif and Ibrahim, 2013).However, the objectives of this study were to evaluate the effect of different dose of nitrogen fertilizers on nutritive value of Rhodes grass cultivars.

2. MATERIALS AND METHODS

An experiment was carried out during the season 2006/2007 at the demonstration farm of the Faculty of Agricultural studies, Sudan University of Science and Technology, Shambat (Latitude 150 40` N and Longitude 320 32` E), where the soil is clay, alkaline with pH 7.5-8 (Saeed, 1968). Land preparation from tillage to leveling was done as it is recommended for the crop in the area. Phosphorus fertilizer was applied

to the experiment before disc harrowing at a dose of 119.05 kg/ha. Four Rhodes grass cultivars viz. Katambora, Callide, Boma and Finecut were sown on mid-march, 2007 at a seed rate of 19.05 kg/ha. Four levels of nitrogen in the form of Urea were used (0, 40, 60, 80 kg/ha) designated as (N0, N1, N2, N3), respectively. Split plot design with four Replications was used in this study. The cultivars were assigned to the main plot in a Randomized Complete Block Design (RCBD) and the nitrogen levels to the sub-plot. The area was divided to plots of 16 m^2. After sowing the field was uniformly irrigated and the second and third irrigations were done at 5 days interval to ensure optimum germination. Subsequently the crop was irrigated at 7 days interval till final cut. The nitrogen dose was added after 33 days from sowing. Weeding was carried out by hand hoe after 10 days from sowing at the first time and then whenever it was necessary.

Proximate analysis was performed on the dry weight sample of 1st, 3rd, 5th and 7th cuts. The data were statistically analyzed by Computer program (M STAT-C) (1989) was used for means separation by Duncan's Multiple Range Test (DMRT) procedure.

3. RESULTS AND DISCUSSION

Effect of Treatments on Crude Protein (%)

The results showed that, mean of crude protein content on leaf and stem increased with increase in nitrogen fertilizer levels added during all periods. In general, crude protein percent did not show consistent trends towards subsequent cuts. The highest mean crude protein was obtained at first cut with added fertilizer (N3) (Table 1) for Katambra.Whereas, the cultivars Callide, Boma and finecut achieved the highest value of mean crude protein at 3rd cut when nitrogen fertilizer (N3) was added (Table 1). Nitrogen plays a great role in synthesis of protein. The results emphasized this fact as increasing nitrogen fertilization led to slight increase in crude protein percentage and it tended to decrease with cuts. Also nitrogen fertilizer level had no significant effect on crude protein

percent. This observation is in accordance with those obtained by Keftasa (1990) who reported that nitrogen fertilization increased the crude protein of Rhodes grass by about 15% at the early stage of growth but fertilized Rhodes grass contained less crude protein at advanced growth stage (advance in maturity). Also, Abdelrahman (2007) showed that, crude protein increased by increasing nitrogen fertilizer levels but without significant effect. Moreover, El-Hag *et al.* (1993) reported that, crude protein tended to decrease from the first towards subsequent cuts. Similar results were obtained by IFAS (2006).

Effect of Treatments on Crude Fiber (%)

The results revealed that, mean crude fiber content on leaf and stem increased with increase in nitrogen fertilizer levels added during all sampling occasions. In general, crude fiber mean increased with advancing maturity in all nitrogen levels added. The highest mean crude fiber was obtained by Katambra and Finecut at 3rd cut with added fertilizer (N3) (table 1b). Whereas, the highest value of crude fiber was obtained by Callide and Boma at 4^{th} cut with added fertilizer (N3), (Table1).

The effect of nitrogen fertilizer levels on crude fiber was not significant and it was increased with increasing nitrogen fertilizer and with advancing maturity as the results indicated. These finding were trended with that reported by Abdelrahman (2007) who reported that crude fiber increased by increasing in (NPK) fertilizer levels but without any significant effect. Also El-Hag and Ali (1991) stated that crude fiber in Rhodes grass increased with advancing maturity. Similar results were reported by Bakhashwain (2010) who reported that, crude fiber content increased with cuts for all cultivars of Rhodes grass.

Effect of Treatments on Ether Extract (%)

The results revealed that, mean ether extract percentage on leaf and stem did not show consistent trends in all nitrogen levels added during all sampling. Ether Extract mean tended to increase towards subsequent cuts

and the highest ether extract mean were attained by Katambora at 4th sampling with added fertilizer (N1) (Table 2). Whereas, the cultivar Callide recorded the highest ether extract at 1 st cut and nitrogen fertilizer (N0). Moreover, the highest ether extract was obtained by cultivar Boma at 4th cut with added nitrogen fertilizer (N3) (Table 2).

Ether extract content did not show consistent trends neither with increase of nitrogen levels nor with subsequent cuts and it was not significantly affected by nitrogen fertilizer levels. This result was in agreement with the finding of El-Hag and Ali (1991) who found that, Rhodes grass did not show consistent trends with cuts. Similar results were obtained by Bakhashwain (2010) on Sorghum (hybrid. Pioneer), and El- Hag *et al*. (1993) on green panic and gatton panic.

Table 1. The effect of treatments on crude protein (%) and crude fiber (%) content

Cultivars	Treatment	Crude Protein (%)				Crude Fiber (%)			
		Cuts				Cuts			
		1st	3rd	5th	7th	1st	3rd	5th	7th
Katambora	N 0	11.18 A	11.25 A	11.00 A	11.40 A	21.00 A	21.25 A	22.25 A	24.00 A
	N 1	11.28 AB	11.30 A	11.23 A	11.53 A	21.50 A	21.50 A	24.00 AB	24.50 A
	N 2	11.53 AB	11.33 A	11.40 A	11.55 A	22.50 A	22.00 A	25.00 AB	25.00 A
	N 3	11.80 B	11.30 A	11.63 A	11.60 A	22.75 A	22.25 A	26.25 B	25.50 A
LSD		0.53	0.58	1.01	0.55	2.07	1.51	3.10	2.69
CV %		3.29	3.60	6.17	3.42	6.48	4.90	8.91	7.64
Callide	N 0	11.10 A	11.15 A	11.10 A	11.38 A	23.00 A	21.00 A	23.75 A	23.75 A
	N 1	11.13 A	11.65 A	11.35 A	11.40 A	22.50 A	21.50 A	24.25 A	24.50 A
	N 2	11.25 A	11.25 A	11.55 A	11.45 A	22.75 A	22.00 A	25.00 A	24.75 A
	N 3	11.33 A	11.45 A	11.90 A	11.58 A	23.75 A	22.25 A	25.25 A	25.75 A
LSD		0.53	0.58	1.01	0.55	2.07	1.51	3.10	2.69
CV %		3.29	3.60	6.17	3.42	6.48	4.90	8.91	7.64
Boma	N 0	11.08 A	10.98 A	11.33 A	11.15 A	21.75 A	21.50 A	24.00 A	24.50 A
	N 1	11.13 A	11.10 A	11.43 A	11.23 A	22.25 A	22.00 A	24.75 A	24.75 A
	N 2	11.28 A	11.18 A	11.93 A	11.40 A	22.75 A	22.25 A	25.00 A	25.25 A
	N 3	11.50 A	11.25 A	12.03 A	11.50 A	22.75 A	22.75 A	25.25 A	26.50 A
LSD		0.53	0.58	1.01	0.55	2.07	1.51	3.10	2.69
CV %		3.29	3.60	6.17	3.42	6.48	4.90	8.91	7.64
Finecut	N 0	11.03 A	11.18 A	10.89 A	10.93 A	20.75 A	20.75 A	22.75 A	23.00 A
	N 1	11.18 A	11.45 A	11.33 A	11.18 A	23.00 B	21.00 A	24.00 A	24.25 A
	N 2	11.20 A	11.53 A	11.55 A	11.35 A	23.25 B	21.25 A	24.50 A	24.50 A
	N 3	11.25 A	11.65 A	11.75 A	11.40 A	23.00 B	22.00 A	25.50 A	25.25 A
LSD		0.53	0.58	1.01	0.55	2.07	1.51	3.10	2.69
CV %		3.29	3.60	6.17	3.42	6.48	4.90	8.91	7.64

- Means followed with in each cultivar/cut by the same letter(s) are not significantly different according to (DMRT) at 5% level.

Effect of treatments on Ash (%)

The results signed that, mean ash content in leaf and stem increased with increase in nitrogen fertilizer levels in all sampling occasions. Ash content decreased from first cut towards subsequent cuts in all nitrogen levels used. Highest ash mean was obtained at first cut with added fertilizer (N3) for three cultivars namely Katambora, Callide and Boma were presented (Tables 2) whereas, Ash mean of finecut cultivar tended to decrease towards subsequent cuts in all nitrogen levels used except level (N1) where it decreased towards subsequent cuts and then increased in sampling four. The highest mean Ash was obtained at sampling one with added fertilizer (N3) (Table 2).

Table 2. The Effect of treatments on ether extract (%) and ash (%) content

Cultivars	Treatment	Ether Extract (%)				Ash (%)			
		Cuts				Cuts			
		1st	3rd	5th	7th	1st	3rd	5th	7th
Katambora	N 0	1.50 A	1.38 AB	2.15 A	2.78 A	12.90 A	13.25 A	10.50 A	10.75 A
	N 1	1.63 A	1.38 AB	2.03 A	2.83 A	13.50 A	14.00 A	11.50 A	11.00 A
	N 2	1.38 A	2.13 B	2.10 A	2.35 A	14.28 A	14.00 A	11.50 A	11.00 A
	N 3	2.25 B	1.13 A	2.20 A	2.68 A	14.45 A	14.50 A	11.75 A	11.50 A
LSD		0.42	0.76	0.68	0.63	1.96	1.94	2.55	2.54
CV %		21.07	35.20	23.68	17.36	9.52	9.79	15.33	15.71
Callide	N 0	1.50 A	1.50 A	1.68 A	2.53 AB	13.68 A	12.75 A	11.00 A	8.75 A
	N 1	1.75 AB	1.50 A	2.35 A	2.88 A	14.30 AB	13.75 AB	12.00 AB	12.25 B
	N 2	3.13 C	2.00 A	2.15 A	2.80 A	15.35 AB	14.50 AB	13.50 AB	13.00 B
	N 3	2.00 B	1.50 A	1.98 A	2.13 B	15.70 B	14.75 B	14.00 B	13.00 B
LSD		0.42	0.76	0.68	0.63	1.96	1.94	2.55	2.54
CV %		21.07	35.20	23.68	17.36	9.52	9.79	15.33	15.71
Boma	N 0	1.50 A	1.75 A	1.75 A	2.35 A	14.05 A	12.75 A	11.50 A	11.00 A
	N 1	1.38 A	1.50 A	1.90 A	2.43 A	14.53 A	13.00 A	11.50 A	11.25 A
	N 2	1.13 A	1.50 A	1.78 A	2.38 A	15.18 A	13.75 A	11.75 A	11.75 A
	N 3	2.25 B	1.50 A	2.00 A	2.63 A	15.48 A	14.25 A	13.25 A	12.00 A
LSD		0.42	0.76	0.68	0.63	1.96	1.94	2.55	2.54
CV %		21.07	35.20	23.68	17.36	9.52	9.79	15.33	15.71
Finecut	N 0	1.50 A	1.38 A	1.88 A	2.35 A	14.15 A	14.00 A	10.00 A	10.00 A
	N 1	0.88 B	1.25 A	2.25 A	2.90 A	14.30 A	14.00 A	10.00 A	11.00 A
	N 2	1.50 A	1.38 A	1.75 A	2.78 A	14.50 A	14.50 A	11.50 A	11.50 A
	N 3	1.25 AB	1.63 A	2.33 A	2.33 A	15.30 A	14.75 A	11.75 A	11.75 A
LSD		0.42	0.76	0.68	0.63	1.96	1.94	2.55	2.54
CV %		21.07	35.20	23.68	17.36	9.52	9.79	15.33	15.71

- Means followed with in each cultivar/cut by the same letter(s) are not significantly different according to (DMRT) at 5% level.

The increase of ash content with increasing nitrogen levels has no significant effect except for Callide cultivar which tended to decrease

with advancing maturity. The results were in accordance with that obtained by Gasim (2001) who reported that, increase in nitrogen fertilization increased leaf to stem ratio. Also Keftasa (1990) found that ash content declined as maturity advanced but some increase were also observed in non nitrogen fertilized Rhodes grass. Moreover, Bakhashwain (2010) showed that, ash had significant differences between cuts in both Abusabien and Sorghum (hybrid pioneer).

Effect of treatments on Nitrogen Free Extract (%)

The results showed that, mean nitrogen free extract generally decreased with increase in nitrogen levels and did not show consistent trends between cuts , but tended to decrease in nitrogen levels (N0) and (N1) while tended to increase in nitrogen levels (N2) and (N3) in subsequent cuts. The highest mean nitrogen free extract was obtained at 1st cut with no nitrogen fertilizer added (N0) for Katambora cultivar. Whereas nitrogen free extract did not show consistent trends between cuts in all nitrogen levels with the highest nitrogen free extract obtained at 4thsampling with no nitrogen fertilizer added (N0) (Table 3) for two Cultivars Callide and Boma on the other hand, nitrogen free extract mean of Finecut Cultivar did not show consistent trends between cuts in all nitrogen levels and the highest mean nitrogen free extract was obtained at 3rd sampling with no nitrogen fertilizer added (N0) (Table 3).

The results obtained revealed that. Nitrogen Free Extract (NFE) had no consistent trend neither with increasing of nitrogen levels nor with cuts but it is generally tended to decrease with increasing of nitrogen fertilizer. Moreover, nitrogen free extract significantly affected by increasing of nitrogen fertilizer levels and the maximum nitrogen free extract was obtained with non- fertilized treatment. This result is in agreement with that reported by Abdelrahaman (2007) who stated that, the decrease of nitrogen free extract with increasing of nitrogen fertilizer level in Rhodes grass. This might be due to increase in structural constituents (CF. cellulose and lignin) and a decrease in the non-

structural constituents, mainly the soluble carbohydrates. The common explanation for the decline has been the rise in cell wall components coupled with increased lignifications. Also El-Hag and Ali (1991) pointed that nitrogen free extract did not show consistent trend with cuts in Rhodes grass. Similar results were reported by El-Hag *et al.* (1993).

Effect of Treatment on Metabolizable Energy (Mj/kg)

The results showed that, metabolizable energy did not show consistent trends in all nitrogen fertilizer levels during all sampling occasions, as it tended to decrease in 3rd cut and then increased towards subsequent cuts. The highest mean metabolizable energy was obtained at 7th cut with no nitrogen fertilizer added (N0) for cultivars; katambra and Callide (Table 3). However, metabolizable energy in cultivar Boma tended to decrease at 3 rd cut and then tended to increase towards subsequent cuts. The highest metabolizable energy was obtained at 4th sampling with no nitrogen fertilizer added (N0) (Table 3).Moreover, Metabolizable energy mean of finecut cultivar tended to decrease at 3 rd cut and then tended to increase towards subsequent cuts. The highest mean metabolizable energy was obtained at 3 rd sampling with no nitrogen fertilizer added (N0) (Table 3).

With regard to the effect of nitrogen fertilizer on Metabolizable Energy (ME) significant effect was found except for Katambora which showed a decrease in metabolizable energy with increasing nitrogen levels and an increase with advancing maturity. This result was in accordance with those reported by Keftasa (1990) who summarized that the organic matter digestibility of Rhodes grass increase slightly during 25 days of re-growth in the short rainy season and declined steadily at the rate of 0.36 and 0.28 %/day with and without nitrogen fertilization, respectively. Also the organic matter digestibility of nitrogen fertilized in Rhodes grass was inferior to the non-fertilized ones. Protein content decreased with cuts while crude fiber content increased with cuts for all cultivars as the

results showed. Moreover, the best cultivar on protein content was Callide followed by Katambora, Boma and Finecut. This observation was in accordance with those obtained by Bakhashwain (2010) who reported that protein content will decreased with age while fiber content will increase and cultivars Katambora and Callide were giving better quality forage.

Table 3. The Effect of Treatments on Nitrogen Free Extract (%) and Metabolizable Energy Content

Cultivars	Treatment	Nitrogen Free Extract (%)				Metabolizable Energy (Mj/kg)			
		Cuts				Cuts			
		1st	3rd	5th	7th	1st	3rd	5th	7th
Katambora	N 0	47.68 A	45.38 A	46.60 A	46.33 A	9.54 A	9.19 A	9.62 A	9.92 A
	N 1	47.59 A	44.08 A	43.50 A	45.65 A	9.60 A	9.04 A	9.27 A	9.88 A
	N 2	45.58 AB	43.55 A	46.00 A	46.10 A	9.32 A	9.22 A	9.71 A	9.82 A
	N 3	43.76 B	43.03 A	44.17 A	44.98 A	9.39 A	8.84 A	9.57 A	9.80 A
LSD		3.37	2.84	5.26	4.14	0.50	0.38	0.56	0.51
CV %		5.16	4.52	8.12	6.32	3.72	2.90	4.10	3.67
Callide	N 0	47.22 A	46.85 A	48.98 A	49.60 A	9.56 A	9.42 A	9.90 A	10.28 A
	N 1	46.57 AB	45.85 A	45.80 AB	44.98 B	9.53 A	9.37 A	9.71 AB	9.79 AB
	N 2	43.78 B	43.00 B	44.05 AB	44.00 B	9.59 A	9.09 AB	9.48 AB	9.64 B
	N 3	46.10 AB	42.80 B	41.88 B	44.05 B	9.62 A	8.94 B	9.16 B	9.51 B
LSD		3.37	2.84	5.26	4.14	0.50	0.38	0.56	0.51
CV %		5.16	4.52	8.12	6.32	3.72	2.90	4.10	3.67
Boma	N 0	46.63 A	45.40 AC	47.42 A	47.75 A	9.42 A	9.30 AB	9.74 A	9.99 A
	N 1	45.72 AB	46.28 A	45.92 A	47.35 A	9.28 A	9.38 A	9.63 A	9.97 A
	N 2	45.92 AB	42.32 B	44.30 A	45.23 A	9.27 A	8.84 C	9.43 A	9.70 A
	N 3	43.03 B	43.00 BC	42.22 A	43.63 A	9.24 A	8.98 BC	9.23 A	9.64 A
LSD		3.37	2.84	5.26	4.14	0.50	0.38	0.56	0.51
CV %		5.16	4.52	8.12	6.32	3.72	2.90	4.10	3.67
Finecut	N 0	48.58 A	45.95 A	51.40 A	49.48 A	9.63 A	9.24 A	10.24 A	10.12 A
	N 1	46.15 AB	44.55 AB	47.67 AB	46.92 AB	9.22 A	9.05 A	9.93 A	10.02 A
	N 2	44.80 B	43.60 AB	46.70 AB	45.88 AB	9.24 A	8.97 A	9.70 AB	9.87 A
	N 3	45.25 AB	41.98 B	42.53 B	45.03 B	9.23 A	8.89 A	9.33 B	9.65 A
LSD		3.37	2.84	5.26	4.14	0.50	0.38	0.56	0.51
CV %		5.16	4.52	8.12	6.32	3.72	2.90	4.10	3.67

- Means followed with in each cultivar/cut by the same letter(s) are not significantly different according to (DMRT) at 5% level

5. CONCLUSION

It concluded that, nitrogen applications lead to insignificant increase in crude protein for all cultivars except for Katambora cultivar. Crude fiber was not affected by nitrogen applications for the cultivars Callide and Boma, whereas, the cultivars Katambora and Finecut were significantly

affected. Ether extract was significantly affected by nitrogen application in all cultivars. Ash was not affected by nitrogen levels for all cultivars except for cultivar Callide. Nitrogen free extract was significantly affected by nitrogen levels for all cultivars. Moreover, the metabolizable energy was significantly affected by nitrogen applications in all cultivars except cultivar Katambora. It could be concluded that, the best cultivars in terms of forage dry weight , crude protein and nitrogen free extract were Finecut , Callide, Katambora and Boma respectively with added fertilizer (80 kg N /ha).

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Effect of Nitrogen Fertilizer on the Quality of Rhodes Grass *(Chloris gayana. L. kunth.)* Cultivars•

Hamdi Hassan Saad[1*], Yassin Mohamed Ibrahim[2] and Mohamed Eltigani Salih [2]

[1]Department of Agronomy, Faculty of Agriculture, Omdurman Islamic University, Sudan.
[2] Department of Agronomy, College of Agricultural Studies, Sudan University of Science and Technology, Sudan

[*]**Corresponding author: Mobile:** +249922125317 **Email**:hmiligi69@gmail.com

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المستخلص

أُجريت تجربة حقلية بالمزرعة الإيضاحية بكلية الدراسات الزراعية بجامعة السودان للعلوم والتكنولوجيا خلال موسم (2007/2006) لبحث تأثير السماد النيتروجيني على البروتين الخام، الألياف، محتوى الرماد، مستخلص الأثير. خلاصة خالية من النيتروجين والطاقة الأيضية لأصناف عشب رودس (*Chloris gayana. L.*). تم استخدام أربعة أصناف من عشب رودس Katambora، Callide ، Boma وFinecut في هذه الدراسة. تم استخدام أربعة مستويات من الأسمدة النيتروجينية (0، 40، 60، 80 كجم نتروجين / هكتار). تم ترتيب المعاملات على قطعة مقسمة بأربعة مكررات. أوضحت النتائج أن تطبيقات النيتروجين تؤدي إلى زيادة طفيفة في البروتين الخام لجميع الأصناف باستثناء صنف Katambora. أيضا أوضحت النتائج أن الألياف الخام لم تتأثر معنوياً بتطبيقات النيتروجين في الصنفين Callide وBoma حيث تأثر الصنفان Katambora وFinecut تأثراً معنوياً. تأثر مستخلص الأثير معنوياً بإضافة النيتروجين في جميع الأصناف. أظهرت النتائج أن الرماد لم يتأثر بمستويات النيتروجين لجميع الأصناف ماعدا الصنف Callide المستخلص الخالي من النيتروجين تأثر معنوياً بمستويات النيتروجين لجميع الأصناف. علاوة على ذلك، تأثرت الطاقة الأيضية معنوياً بتطبيقات

•جزء من أطروحة تقدم بها المؤلف الأول لنيل درجة الدكتوراة لجامعة السودان للعلوم والتكنولوجيا.

النيتروجين في جميع الأصناف باستثناء الصنف .Katambora يمكن الإستنتاج أن أفضل الأصناف من حيث الوزن الجاف للأعلاف والبروتين الخام والمستخلص الخالي من النيتروجين هي Finecut، Callide، Katambora وBoma على التوالي مع إضافة سماد80 كجم / N هكتار.

كلمات مفتاحية: *أصناف؛ جودة؛ سماد؛عشب الروداس؛ نايتروجين*

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