International Journal of Sciences: Basic and Applied Research (IJSBAR)

ISSN 2307-4531
(Print & Online)

http://gssrr.org/index.php?journal=JournalOfBasicAndApplied

The Effect of Chicken Manure on the Yield and Nutritive Value of Fodder Sorghum Sudanese Under Rain-fed Conditions

Asma Himmed[a*], Mohammed Fatur [b], Abu bakr Ismail[c], Hafiz Ali[d], Magda Elmahdi[e]

[a]*Faculty of Agricultural and Environmental Sciences, GadarifUniversity, Sudan*

[b]*College of Animal Production, University of Bahari, Khartoum, Sudan.*

[c] *Faculty of Agriculture, Sinnar University, Sudan.*

Email: asmahimmed@yahoo.com

Abstract

This experiment was conducted in the field of Faculty of Agricultural and Environmental Sciences, University of Gadarif, in the autumn season in year (2014-2015). The aim of this experiment was to study the effect of fertilization by chicken manure in the production and nutritive value of fodder Sudan grass (Grawia) under rain-fed conditions. A completely randomized design was used, with three treatments and three replicates per treatment. Three levels of chicken manure namely, 0, 3.3 and 6.7 tons/ha were used. Parameters measured were dry and fresh yield, numbers of leaves/ plant, plant height (cm), diameter of the stem (cm) and the chemical analysis. The results revealed that as chicken manure increased the fresh and dry matter weight increased but the difference was not reach the significant level. The highest forage dry matter yield (1.83kg/m2) was recorded for the highest level of chicken manure applied (6.7tons/ha) compared to 0.67kg/m2 for the control. The highest forage fresh yield (4.53kg/m2) was recorded for the highest level of chicken manure applied (6.7 tons/ha) compared to 2.17kg/m2 for the control.

---

* Corresponding author.

There was no significance difference among treatments in the number of leaves/ plant and diameter of the stem but there was higher significance difference (P<0.001) in height of the plant. The chicken manure significantly affected Ash, CP, CF and NFE and there was no significant effect on DM and EE. Application of chicken manure significantly improved the nutritive value of Sudan grass by increasing the crude protein content.

Keywords: Chicken manure; Fertilization; Nutritive value; Sudan grass; Forage yield.

1. Introduction

Sudan is the largest country in Africa, with an area of 1.88 million Km2. The production of forage crops is very important for livestock production in the Sudan. The country is endowed with more than 104.9 million heads of animals including (29.8) cattle, (39.5) sheep, (30.8) goats and (4.75) camels [1]. In Sudan, forage production is very important because the forage is basic source of energy for growth and maintenance and product increment of livestock [2]. The demand for fodder has greatly increased in recent years in the Sudan. In order to meet this rising demand, there are continuous efforts to expand the production of forage crops [3]. The rangeland of the Sudan is diminishing due to overgrazing, tremendous expansion of rain fed agriculture and climate change. This has a negative impact on animal's production. To maintain high level of forage production, choice of suitable cultivars and fertilization programs are of great importance [4].

Sudan grass (Sorghum sudanense (Piper) Stapf.) and sorghum x sudangrass hybrids (S. bieolor (L.) Moench) x (S. sudanense (Piper) Stapf.) are grown as summer annual forages. They may be used for pasture, hay, or silage [5]. The common names of Sorghum sudanense are Sudangrass in Australia and USA and Grawia in Sudan. Compared with Sorghum bicolor, Sudan grass has slender stem, narrow leaves, numerous tillers and small seeds fully enclosed by glumes [6]. The change of the physical and chemical properties of the soil in Gadarif may have attributed to the changes in the land use / land cover resulting in land degradation, which in turn has led to a decline in soil productivity [7]. Among the organic fertilizers available in large quantities in Sudan is chicken manure[8]. The authors in [9] reported that fresh poultry droppings contain twice as much as farmyard manure. They are much richer in phosphorus and contain as much potassium as farmyard manure. The main objective of this study was to investigate the effect of fertilization by chicken manure on yield and nutritive value of fodder Sudan grass (Grawia).

2. Materials and Methods

2.1. General Description of the Experimental Site

A field experiment was carried out during the period (2014-2015) in the Demonstration Farm of the Faculty of Agricultural and Environmental Sciences of the University of Gadarif, Sudan. The soil of the experiment site is cracking clay with the annual rainfall is about 875.9 mm. The total area of the experiment was 270 square meters.

2.2. Land Preparation

The experimental site was disc ploughed, disc harrowed to crush clods and levelled out to maintain a well

levelled seed bed and then followed by ridging up to 70 cm between ridges. Individual plot size was 6×5 meters.

2.3. Treatments and Design

The treatments in this study consisted of three levels of chicken manure (0, 3.3 and 6.7 tons/ha). The treatments were arranged in a completely randomized Design with three replications.

2.4. Sowing Date and Seeding Rate

Sowing was done manually on one side of the ridge and it was carried out on July, 24th. The seed rate applied was 60 gm/ridges. Irrigation was depended on rainfall. Weeding was practiced manually four times from the beginning of the experiment.

2.5. Data collection

Data were collected after 60 days from sowing except productivity data after harvest (70 days). The parameters which were measured during the study period including:

2.5.1. Fresh weigh

The fresh weight was determined after 60 days from sowing using one-meter square sampler for each plot. A sickle was used for clipping plants 5-10cm above the soil surface. The cuts of the green forage of each plot were weighed using a spring balance immediately in the field to get the fresh weight.

2.5.2. Dry matter weight

Sample of the green forage of the one-meter square of each plot was left to dry in an oven until a constant weight was reached then final dry matter yield was recorded.

2.5.3. Number of leaves per plant

This parameter was measured by calculating all leaves of ten randomly selected plants after 60 days from sowing. The mean number of leaves per plant was recorded.

2.5.4. Plant height (cm)

Ten plants were randomly selected from each plot and the plants were tagged. The height of the plant was measured from the ten plants and was recorded in (cm). Plant height was measured after 60, days from planting.

2.5.5. Stem diameter (cm)

Measured by using a vernier (caliper) from the middle of the 2nd inter-node of ten plants selected randomly from each plot and the mean stem diameter were calculated.

2.5.6. Chemical analysis

Analysis of Crude protein (CP %), crude fiber (CF %), ether extract (EE %) and Ash% was carried out according to Association of Official Agricultural Chemists [10].

2.6. *Statistical Analysis*

The data were analyzed statistically and calculate averages and experimental error and coefficient of variation for data. Means were separated using the LSD procedure.

3. Results & Discussion

Table 1. shows the fresh and dry matter yield of Sudan grass forage as affected by chicken manure. The results revealed that as chicken manure increased the fresh and dry matter weight increased but the difference was not reach the significant level. The highest forage dry matter yield (1.83kg/m^2) was recorded for the highest level of chicken manure applied (6.7tons/ha) compared to 0.67kg/m^2 for the control. The highest forage fresh yield (4.53kg/m^2) was recorded for the highest level of chicken manure applied (6.7 tons/ha) compared to 2.17kg/m^2 for the control. Results found in this study were similar to that reported by [8,11] where bio fertilization leads to an increase in the production of dry matter. The increased fresh and dry matter yield when using chicken manure was due to that it was rich in phosphorus, nitrogen and potassium which improve the soil physical condition.

Table 1: Average of dry and fresh yield and growth attributes for Grawia as forage crop produced Under Different Fertilizers Treatments

Treatments	Dry weight Kg/m^2	Fresh weigh Kg/m^2	Number of Leaves	Plant Height(cm)	Stem Diameter(cm)
T1	1.83	4.53	7.23	214.77[a]	0.86
T2	1.03	2.80	6.93	182.20[b]	0.77
T3	0.67	2.17	6.37	151.30[c]	0.61
SE	0.35	0.77	0.30	3.39	0.10
LSD	13.175	3.01	1.16	13.80	0.39
C.V (%)	49.346	41.87	7.49	3.32	22.84
LS	NS	NS	NS	***	NS

Where: T1= Chicken Manure 6.7tons/ha, T2= Chicken Manure 3.3tons/ha, T3= Chicken Manure 0 tons/ha, SE: means Standard Error, LSD = Least Significant Difference, C.V = Coefficient of variation, LS = Level of Significant, NS = Not Significant and *** = Highly Significant at 0.001 Level of Significant.

The results of growth attributes (number of leaves per plant, plant height and stem diameter are shown in Tables

1. The chicken manure significantly affected growth attributes. Increased rate of chicken manures increased plant height (P<0.001). This is in agreement with [12] who reported that chicken manure fertilizer significantly increased plant height. These responses may refer to its high content of nitrogen, phosphorus and potassium [13]. Another explanation may be due to the effect of chicken manure on soil fertility (chicken manure restored soil fertility). This is in agreement with that of [14] who reported that potential uses for poultry manure as a fertilizer and soil amendment. Increased the rate of chicken manure resulted in the increase of number of leaves per plant and stem diameter but not significantly (P>0.05).

The results of chemical analysis DM, CF, CP, EE, Ash and NFE are shown in Tables 2. Crude fibre and ash content were significantly affected by chicken manure (P<0.001). The results disagreed with [15] who reported that mean crude fiber was not significantly affected by nitrogen. In addition, the highest rate of chicken manure was significantly increased the CP and NFE content of the forage. The results cleared that the mean of DM and EE content were not significantly affected by fertilizers. The authors in [12] reported that high rate of chicken manure (7.5tons/fed) significantly increased some of the growth attributes, nutritive value and forage yield than control.

Table 2: chemical composition of Garawia as a forage crop grown under Different Fertilizer Treatments

Treatments	DM %	CF%	CP %	EE %	NFE %	ASH %
T1	92.50	48.00[a]	9.16[a]	0.80	35.89[a]	9.44[a]
T2	92.20	46.00[a]	7.16[b]	0.60	28.67[b]	8.57[b]
T3	92.20	40.00[b]	6.94[b]	0.60	27.10[b]	7.48[c]
SE	0.12	0.88	0.20	0.12	0.86	0.07
LSD	0.47	3.36	0.84	0.45	3.39	0.28
C.V (%)	0.23	3.42	4.70	30.00	4.90	1.49
LS	NS	***	**	NS	**	***

Where: T1 = Chicken Manure 6.7tons/ha, T2 = Chicken Manure 3.3tons/ha, T3 = Chicken Manure 0 tons/ha, SE: means Standard Error, NS = Not Significant, LSD= Least Significant Difference, C.V =Coefficient of variation, LS= Level of Significant and **, *** Means High Level of Significant

4. Conclusions & Implications

Chicken manure resulted in an increase in growth attributes as well as forage yield and nutritive value of Sudan grass. Application of Chicken manure at rate of (6.7tonns/ha) produced higher fresh and dry forage at harvest than the control. Due to the high cost of chemical fertilizers and the difficulties in obtaining them due to scarcity, the study recommend using organic fertilizers (chicken manure) because it is of great importance in raising productivity and nutritive value.

References

[1] SBAR. Statistical Bulletin for Animal Resources. Ministry of animal resources and fisheries, Issues No. 20, Sudan. 2011.

[2] Ahmed M. Yossif and Yassin M. Ibrahim. Effect of Organic and Inorganic Fertilizers on Proximate Analysis of Rhodes Grass (Chloris gayana L. Knuth.). Universal Journal of Plant Science 1(4): 137-140. 2013.

[3] Abusuwar, A.O. Effect of seed rate, sowing methods and fertilization on the performance of forage sorghum (Sorghum bicolor L. Moench) grown on saline-sodic soil. M.Sc. Thesis. Fac. of Agric. University of Khartoum, Sudan. 1981.

[4] Omer, E. Effect of farmyard manure and urea fertilization on growth and yield of teff grass (Eragrostis Tiff. Z. ucc.).M.Sc. Thesis. Fac. of Agric. University of Khartoum, Sudan. 1994.

[5] Nichols. R.L. and Allinson. D.W. Poultry Manure Fertilization of Sudangrass. Storrs agricultural experiment station college of agriculture and natural resources the University of Connecticut, storrs, connecticu.1979.

[6] Edumnds, L.K. and Zumo, W. Sorghum Disease in the United State and their Control. Agriculture Handbook No.468, pp 46. 1975.

[7] Biro K.,B.Paradhan,M.Buchroithner and F.Makeschin,. Land use/Land cover change analysis and its impact on soil properties in the Northern part of Gadarif region, Sudan. Land degradation &development, volume 24, Issue 1pp:90-102. 2013.

[8] Abusuwar A.O. and Hala A. El Zilal. Effect of chicken manure on yield, quality and HCN concentration of two forage Sorghum (Sorghum bicolor (L) Moench) cultivars. Agric. Biol. J. N. Am., 1(1): 27-31. 2010.

[9] Cooke, G.W. Organic Manure and Fertilization. Fertilizing for Maximum Yield. 3rd edition, 1982, pp. 107-110.

[10] AOAC.Official Methods of Analysis, 15th ed., Association of Official Chemists, Washington, D.C. USA. 1990.

[11] Bowman, G. Shirtey, C. and Cramer, C. Managing Cover Crops Profitably. (A Publication of Sustainable AgricultureNetwork Handbook Series bk.3). 2nd ed. P: 80-82. 2000.

[12] Hassan, E.A.H.Effect of chicken manure and season on the performance and HCN Content of two Forage sorghum cultivar, Ph.D. Thesis, Faculty of Agriculture, University of Khartoum, Sudan. 2002.

[13] SchjegelAJ. Effect of composted manure on soil chemical properties and nitrogen use by grain sorghum. J. Prod. Agric. 5: 153-157.1992.

[14] Bendfeldt. Poultry litter as fertilizer and soil Amendment. Associate Extension Agent, Agricultural and Natural Research, R.A. Clark, Extension agent, Agriculture and natural resources. 2002.

[15] Saad, H.H. Evaluation of Nitrogen Fertilizers on Quality and Quantity of Rhodes Grass (Chloris gayana L. Kunth). M.Sc. Thesis. Faculty of Agriculture Studies, Sudan University of Science and Technology, Sudan. 2009.