EVALUATION OF NUTRIENT COMPOSITIONS OF IRRIGATED GAMBA (*ANDROPOGON GAYANUS*) FORAGE IN ZARIA, NIGERIA

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ABSTRACT
A field experiment was conducted to evaluate the effect of varying levels of irrigation volume, irrigation frequency and compost on chemical compositions of gamba (*Andropogon gayanus)* forage. The experiment was laid out in a complete randomized block design with Split-Plot arrangement. The factors were arranged in a 3×2×2 factorial arrangement, with three replications. There were three (3) levels of irrigation volumes (25, 50 and 100 L), two irrigation frequencies (3 and 6-day intervals) and two levels of compost manure application (25 and 50 kg/ha), respectively. Irrigation volumes were assigned as the main plots, while irrigation frequencies and compost were sub-plot factors. The result showed there were no treatment effects (P >0.05) on all variables measured of the proximate composition (%) of gamba froage at 8 and 12 weeks. However, there were significant on interactions variables (P< 0.05) detected but the trend was inconsistent at all the age intervals considered. The mineral composition at all ages remained similar (P >0.05) in all the irrigation volume, intervals and compost treatments. However, interactions showed inconsistent trend (P< 0.05) in some mineral composition variables throughout the plant age. In conlusion, it is revealed that the combination of treatments imposed, have a significant effect on the chemical composition of Gamba. It is therefore, economically feasible for famers to irrigate the forage based on the minimum irrigation volume (25L) that supplies adequate soil moisture in combination with cheap nutrient source (25kg/ha Compost manure) at 6 days irrigation interval for better nutritional quality and to save the extra cost of labour and waste of resources in Zaria, Nigeria.
Keywords: Gamba, chemical composition, irrigation, compost.

INTRODUCTION
The supply of nutrients to animals can be improved by cultivation of promising tropical forage species (Bayble *et al.*, 2007). Irrigation gives a powerful impetus to forage production and use by providing high quality feed in the dry season as trials by Akinola (1975) and Kallah (1988) in the Savannah zone of Nigeria have shown that various grass and legume forages can be grown during the dry season with varying degrees of success as farmers have a lot of control over how much water to supply and when to apply it. Gamba is grass forage that has soft leaves and grows well on infertile, acid soils in hot climates and in a wide range of climates, but is particularly useful in areas with a long dry season. Gamba stays green long into the dry season when most other grasses are already dry, it is easy to cut and can tolerate grazing. The quality of any forage material depends to some extent on the presence or absence of mineral content of the forage. Mineral content of these forage plant is low with about (0.08 P and 0.27 Ca in DM) (Ajiji *et al.*, 2013). The problem with *Andropogon gayanus,* like other tropical grasses, is the rapid decline in crude protein and soluble carbohydrate with age. This is coupled with a progressive increase in crude fibre and lignin (Lambert and Litherland, 2000). Chemical analysis has become an initial step in assessing the potential nutritional value of forage feedstuff to animals. The chemical composition of a forage feedstuff may vary from locality to locality due to variation in Soil, climate and

rainfall. However, much work has been done on

but at the moment, it appears that there is scanty information on the chemical composition of Gamba forage indigenous to Zaria area in Nigeria. This study will therefore attempt to assess the chemical composition of Gamba forages indigenous to Zaria area in Nigeria. The main objective of this reseach is to deterine the chemical composition of Gamba forage indigenous to Zaria Nigeria under flood irrigation.

MATERIALS AND METHODS

ExperimentalSite

The experiment was conducted at the Irrigation Site of the Institute for Agricultural Research (I.A.R), Samaru-Zaria, Kaduna State. Samaru is located on latitudes 11^0 and 11'N and on longitudes 7^0 and 11'E with an altitude of 686 m above sea level in the Northern Guinea savanna of Nigeria (Ovimaps, 2014). The maximum temperature for the period (February to April) recorded at Samaru, in Sabon Gari Local Government Area of Kaduna state showed the maximum temperature of about 30°C. The relative humidity in the months of February and April is about 70 – 80%, during dry season (I.A.R, Samaru Weather Station, 2015).

Sources of Experiental Material

Gamba seeds for the experiment were obtained from the Feeds and Nutrition Research Programme of the National Animal Production Research Institute (NAPRI), Shika-Zaria. 50 kg of compost manure was sourced from Samaru, Sabon Gari Local Government Area of Kaduna state, and was analyzed for the chemical properties at the Department of Soil Science, Faculty of Agriculture, Ahmadu Bello University, Zaria.

Experimental Design and Treatments

The experiment was laid out in a complete randomized block design with Split-Plot arrangement. The factors were arranged in a 3×2×2 factorial arrangement, with three replications. There were three levels of irrigation volumes (25, 50 and 100 L), two irrigation frequencies (3 and 6-day intervals) and two levels of compost manure application (25 and 50 kg/ha), respectively. Irrigation volumes were assigned as the main plots, while irrigation frequencies and compost were sub-plot factors. Soil moisture content was measured with a

chemical composition of Gamba forages,

Tensiometer in each of the plots to determine the Volumetric Water Content. All the experimental plots received a uniform dose of 18 $kgha^{-1}$ NPK fertilizer by broadcasting prior to sowing. A total of 36 plots measuring 2 m^2 with 1m inter-row path and watering channels, were used while the total area used for the experiment was 288 m^2. Prior to the forage establishment the field was cleared, ploughed and harrowed using hand hoes. Seeds of Gamba were broadcasted in each plot.

Chemical composition determination

Forage samples were harvested at the 8th and 12th weeks after planting were analysed for chemical composition which was carried out at the Biochemistry Laboratory of the Animal Science Department, Ahmadu Bello University, Zaria. The contents of dry matter, crude protein, ether extract and ash were determined according to AOAC (1995). Fibre fraction analysis: Neutral detergent fibre (NDF); acid detergent fibre (ADF); acid detergent lignin (ADL) (Van Soest *et al*., 1991); cellulose was taken as the difference between ADF and ADL while hemicellulose was calculated as the difference between NDF and ADF. The samples of the grasses were dried in a forced draught oven at 105°C for 24 hours and were analysed for some macro minerals (Ca, P, K, Na and Mg). The concentration of potassium (K) was estimated with a flame photometer after wet digestion in nitric acid and per chloric acid. Concentration of calcium and phosphorus were determined with atomic absorption spectrophotometry (Fritz and Schenk, 1979).

Statistical analysis

Data collected on chemical compositions were analyzed using Analysis of Variance of the General Linear Model (GLM) Procedure of Statistical Analysis System (SAS, 2002) while the treatment means were separated by Dunnet's Test.

RESULTS AND DISCUSSION

Table 1 shows the effects of varying levels of irrigation volume, frequency, levels of compost, age of maturity and their interaction on the proximate composition of Gamba grass at 8 and 12 weeks after sowing. There were no treatment effects ($P > 0.05$) on all variables measured at all ages. However, significant interactions ($P < 0.05$) were detected in most of the variables but the trend was inconsistent in all the age intervals considered. The observed, variation might be due to higher levels of water stress which could have decreased the amount of fiber content of the forage and increased ash content, crude fiber content and ether extract. Sasani *et al.* (2009) reported that water stress condition could lead to decreased cellulose and structural ligin that, decreased fiber content.

Table 2 shows the effect of varying levels of irrigation volume, frequency, compost and their interactions on mineral composition of Gamba forage at 8 and 12 weeks after sowing. The mineral composition at all ages remained similar (P >0.05) in all the irrigation volume, intervals and compost treatments. However, the interactions also showed inconsistent trend (P< 0.05) in some mineral composition variables throughout the plant age. The significant interactions observed in this study could be related to variation in soil moisture content (Zafar *et al.*, 2007). George *et al.* (2005) reported that mineral content of forage species are influenced by climatic and soil factors.

CONCLUSION

Results of the study revealed that the combination of treatments imposed, have a significant effect on the chemical composition of Gamba *(Andropogon gayanus)*. It is therefore, economically feasible for farmers to irrigate the forage based on the minimum irrigation volume (25L) that supplies adequate soil moisture in combination with cheap nutrient source (25kg/ha Compost manure) at 6 days irrigation interval for better nutritional quality and to save the extra cost of labour and waste of resources in Zaria, Nigeria.

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Table 1: Effects of varying levels of irrigation volume, frequency and compost manure and their interactions on proximate composition of Gamba grass at 8 and 12 weeks after sowing.

	DM		NFE		CP		CF		EE		ASH	
Treatments	8	12	8	12	8	12	8	12	8	12	8	12
I.V (L)												
100	22.22	32.81	52.04	52.88	9.62	10.01	26.83	27.18	0.99	1.17	10.62	8.69
50	25.46	28.12	52.63	51.85	9.23	10.28	26.73	27.76	0.97	1.33	10.34	8.78
25	24.21	30.11	51.13	53.02	9.44	10.51	26.69	26.69	1.01	1.01	11.73	8.76
I.F (days)												
3	24.09	29.35	51.95	52.87	9.63	10.17	26.66	27.00	1.00	1.24	10.77	8.74
6	23.81	31.28	52.04	52.26	9.25	10.32	26.85	27.48	0.98	1.13	10.88	8.75
C (Kg/ha)												
25	24.39	30.89	52.35	52.74	9.23	10.12	26.69	27.09	0.99	1.21	10.72	8.79
50	23.43	29.79	51.60	52.33	9.35	10.39	26.82	27.44	0.98	1.15	10.95	8.69
SEM	1.91	2.31	1.41	1.22	0.87	0.80	1.2	1.03	0.23	0.56	1.1	0.75
Interaction												
V×A	*	NS	NS	NS	NS	NS	*	NS	NS	NS	NS	NS
C×A	NS	NS	NS	*	NS	NS	*	*	NS	NS	NS	*
F×A	*	*	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
V×F C×A	NS	NS	NS	*	NS	NS	NS	*	*	*	NS	*

SEM= Standard Error of Means. NS= Not significantce, * = Significant VA= Volume × Age CA,= Compost manure × Age, FA= freq × Age, VFCA= Volume × frequency × compost manure × Age.

Table 2: Effects of varying levels of irrigation volume, frequency and compost manure, and their interactions on mineral composition (%) of Gamba grass at 8 and 12 weeks after sowing.

	N		Ca		Na		P		Mg		K	
Treatments	8	12	8	12	8	12	8	12	8	12	8	12
I.V (L)												
100	1.27	1.32	1.27	0.88	0.06	0.71	0.69	0.71	0.20	0.23	0.59	0.52
50	1.21	1.15	1.22	0.85	0.14	0.69	0.68	0.69	0.24	0.22	0.59	0.56
25	1.29	1.15	1.28	0.84	0.07	0.72	0.78	0.72	0.23	0.22	0.61	0.57
I.F (days)												
3	1.24	1.23	1.24	0.86	0.09	0.72	0.70	0.72	0.23	0.23	0.60	0.56
6	1.27	1.19	1.27	0.85	0.08	0.69	0.72	0.69	0.22	0.22	0.59	0.54
C (Kg/ha)												
25	1.27	1.18	1.25	0.86	0.08	0.71	0.71	0.71	0.23	0.21	0.59	0.53
50	1.24	1.24	1.27	0.85	0.09	0.70	0.72	0.70	0.22	0.23	0.61	0.57
SEM	0.40	0.42	0.38	0.26	0.36	0.30	0.33	0.30	0.20	0.20	0.24	0.22
Interaction												
V×A	NS	*	*	NS	*	*	*	*	NS	NS	NS	NS
C×A	NS	*	*	*	NS	*	*	*	NS	NS	NS	NS
F×A	NS	NS	*	*	NS	*	*	*	*	*	NS	NS
V×F×C×A	*	NS	NS	NS	NS	*	NS	*	NS	*	*	NS

abc means with different superscripts along the column differed significantly ($P < 0.05$), SEM= Standard Error of Means. VA= Volume × Age CA,= Compost manure × Age, FA= frequency × Age.