EFFECT OF SPACING AND FERTILIZER RATE ON FORAGE YIELD OF IRRIGATED CONGO GRASS (*Brachiariaruziziensis)* IN DUTSE, JIGAWA STATE

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ABSTRACT
The study was conducted to determine the effects of spacing and fertilizer rate on growth parameterss of Congo grass (Brachiaria ruziziensis). The experiment was conducted at Teaching and Research Farm, Faculty of Agriculture, Federal University Dutse, Jigawa State, Nigeria. The experiment was laid out on a Split plot design; with spacing (Zero spacing and 20×20cm spacing) as main plot, while fertilizer rate (200g, 250g and 300g) was assigned to subplots. Upon analyses using R-Software, Plots with 20×20cm spacing showed the highest positive response compared to zero spacing in terms of growth parameters, Total plant height (TPH) 10.82, Number of tillers per plant (NTPP) 7.00, Number of leaves per plant (NLPP) 15.78, and Leaf length per plant (LLPP) 7.46. Fertilizer rates showed no significant difference ($P<0.05$) although variations exist across the treatments.. It was concluded that interaction between spacing and fertilizer rate showed a reliable result that can increase farmer's income and feed for their livestock.
Keywords: *Brachiaria ruziziensis*, Spacing, Fertilizer, Rate and Irrigated.

INTRODUCTION
Background of the study
Grass is one of the most important sources of nutrients for domesticated ruminants during a large part of the year (Taweel *et al.*, 2005). According to Herrera (2004), he argued that pasture turn out to be an appropriate source of food for ruminants, mainly in countries of tropical climate. This is due to the high number of species that can be used, possibility of cultivating them throughout the year, capacity of ruminant using fibrous feeds, does not compete for food with humans and tends to be a cheap economical source. There is a need therefore, for pasture species that can improve the quality of the natural pastures and significantly increase dry matter production to enhance livestock productivity. One of these pastures has been found to be Brachiaria (Machogu, 2013). Brachiaria grasses have been reported to have good adaptability, tolerant and resistant to abiotic factors. Furthermore, the grasses have high forage quality and high dry matter production making them capable of meeting the nutritional requirements of animals especially during the dry seasons (Lascano and Euclides, 1996; Brighenti *et al.*, 2008). According Cook *et al.*, 2005; Quraishi 1999, grass is more easily accessible, better in taste and quicker in digestion than shrubs and trees. Animals do not compete with humans

for grasses as food and they are therefore a cheap and economical feed source (Taweel 2005). The major limitation of livestock production is that lack of suitable available fodder crops that can produce green forage all year round. This situation becomes severe in the areas constrained by low rainfall and acidic soils.Considering the production of improved Brachiaria grass and its adaptation to the various geographical areas, the grass may be able to address unavailability of all year-round supply of fodder in the areas of low rainfall and acidic soils. This will also allow the farmers to select the best varieties adapted to their respective areas while helping to increase profit from cattle production (Rivas and Holmann, 2005). The genus Brachiaria includes about 100 species which occur in the tropical and subtropical regions of both eastern and western hemispheres but mostly in Africa (Renvoize *et al*, 1996). It is on this basis that this study is designed to evaluate the productivity of Brachiaria grass specie; *brachiaria ruziziensis*. Specifically, investigation morphological characteristics of irrigated Brachiaria grass

MATERIAL AND METHOD

Experimental area

The experiment was conducted in the experimental field of Crop Science Department, Faculty of Agriculture, and Federal University Dutse, Jigawa state, located between latitude 11.00ºN to 13.00ºNand longitudes 8.00ºE to 10.15ºE. High temperature is normally recorded between the month of April and September. The daily minimum and maximum temperature are 15ºC and 35^{O}C. Rainy season last from May to September with average rainfall of between 600mm to 1000mm. The Sudan savannah vegetation zone is also made up vast grazing land suitable for livestock production and free from tse-tse fly infestation. The environment is conducive for different species of livestock production such as cattle, sheep, goats, Rabbits donkeys, horses and poultry JARDA (2012). Crops grown in the region include millet, rice, sorghum, maize, cowpea, groundnut, water melon, tomato, soya beans, sesame and so many tree crops.

Materials used in the research

The seed of *Brachiaria ruziziensis*was purchased at National Animal Production Research Institute (NAPRI) Zaria. The NPK fertilizer was used. Other materials used were the weighing scale, measuring tape, sickle, hoe and watering can.

Experimental layout, design and treatments

The experiment was laid out based on split plot design consisting of plots measuring 1m^2 each with spacing as main plots (9m^2) while fertilizer rate as sub-plots, replicated three times. Treatments consisted of combination of two spacing and three fertilizer rates: Zero spacing, 20 by 20cm spacing and three fertilizer rates: 0.30kg NPK, 0.35kg and 0.40kg applied at 3 weeks post emergence. Interaction studies were based on the following: 0 spacing ×0.30kg NPK, 0 spacing ×0.35kg NPK, 0 spacing ×0.40kg NPK, 20×20cm spacing + 0.30kg NPK, 20×20cm spacing + 0.35kg and 20×20cm spacing + 0.40kg NPK.

Data collection

The morphological data of growth parameters was collected at 6th week, and 8th week post sowing respectively. In each plot, mean of three plants was randomly selected in recording number of tiller per plant (NTPP), total number of leaves per plant (TLPP), leaf length per plant (LLPP) and total plant height (TPH).

Morphological parameters

- Measurement of plant height

The height of 3 randomly selected plants was measured from the base of the plant to the tip of the tallest leaf. The height of each plant was recorded in centimeters, and the mean values of 3 plants from each plot were determined.

- Number of tillers per plant

The number tillers per plants was counted from the randomly selected sample of 3 plant of each plot and the mean of tillers number per plant were recorded.

- Number of leaves per plant

The numbers of leaves per plant was counted from the sample of 3 plants from the plot. The mean values of number of leaves per plant were then calculated.

- Leaf length per plant

A leaf length per plant was measured from the base of the collar region of the leaf to the tip of the leaf. They were measured from 3 tag selected plants sample plants.

Data analysis

Data collected was analyzed using R SOFTWARE version 3.6.1 to test the significance of treatment effects at 5 % level of probability.

RESULTS AND DISCUSSION

Results presented in Table 1 indicated that planting density had a significant ($P<0.05$) effect on all the four parameters measured at week six. Mean of total plant height (TPH), number of tiller per plant (NTPP), total number of leaves per plant (NLPP) and leaf length per plant (LLPP) were all higher in 20cm by 20cm spacing compared to 0 spacing with means as 10.82, 7.00, 15.78, and 7.46 respectively. This shows a significant difference due to spacing among treatments. However, fertilizer rate shows no significant difference across all the three treatments even though there is an increase in the mean value from 0.30kg up to 0.40kg. This may be attributed to the small variation in the quantity of the fertilizer applied. The interaction effect in table 2 shows a highly significant difference ($P<0.05$) in TPH, NTPP and NLPP while LLPP shows a significant difference, the result is in contrast with the finding of Nguku,(2015) who observed in his studies TPH of 13.0, TNPP is 9.3and NLPP is within the given range of 12.1.

Table 1: Effect of spacing and fertilizer rate on growth parameters of Brachiaria ruziziensis (congo grass) at six weeks

Treatments	Measured parameters at six weeks after emergence			
	Plant Height (cm)	Number of Tillers	Number of Leaves	Leaf Length (cm)
Spacing				
0 spacing	8.88^{b}	2.56^{b}	5.22^{b}	5.80^{a}
20×20cm	10.82^{a}	7.00^{a}	15.78^{a}	7.46^{a}
L.S.D.	1.19	1.23	2.36	1.58
Fertilizer Rate				
0.30kg	9.73	4.5	9.83	6.33
0.35kg	9.78	4.83	10.50	6.55
0.40kg	10.03	5.00	11.16	6.80
Interaction				
Spacing ×FR	**	**	**	*

Means of same column followed by the same letter are not significantly different with each other at 0.05% level of probability,** = highly significant,*= Significant, L.S.D.= Least Significant Difference NS/- = Not Significant

The result of the experiment as shown in table 2 showed variation in the values generated for all the treatments. A significant difference ($P<0.05$) was obtained across all the parameters recorded at20×20cm spacing + 0.40kg shows a better TPH (11.50^{a}), NLPP (16.67) and LLPP (8.06) whereas NTPP (7.67) is higher with 20×20cm spacing + 0.35kg. Parameter under 20×20cm spacing shows significant difference ($P<0.05$), than those with 0 spacing. The number of tiller is in agreement with finding of Kizima *et al.*,(2015) who reported that application of optimum level of nitrogen fertilization significantly affects the advent of new tillers and upsurges the dynamics of tiller population of Cenchrus ciliaris. Conversely, the current result are also buttressed by the findings of Mushtaque *et al*., (2010) who reported that Nitrogen initiates the initiation of resting buds and augments the vegetation sward filling via the highest rate of tiller emergence, which supports a higher percentage of very active healthier young tillers for all plant. The current research observed that, with the increase plant spacing, the higher the numbers of leaves which are vital for the photosynthetic and transpiration surface were formed from afresh emergent tillers. This work is in agreement with finding of Yberkew *et al*., (2020) who observed that, more leaves per plant were produced at the broader plant spacing. This might be attributed to less competition between plants which resulted in taller plants and better growth of leaf which supports more leaves.

Table 2: Parametric ranking of the interactive effect of spacing and fertilizer rate on growth of Brachiariaruziziensis at six weeks.

Treatment	Plant Height (cm)	Number of Tillers	Number of Leaves	Leaf Length (cm)
0 spacing ×0.30kg	8.50[b]	2.67[b]	5.00[b]	5.40[c]
0 spacing ×0.35kg	9.57[ab]	2.33[b]	5.37[b]	6.47[abc]
0 spacing ×0.40kg	8.57[b]	2.67[b]	5.67[b]	5.53[bc]
20×20cm spacing + 0.30kg	10.97[a]	7.00[a]	14.67[a]	7.67[ab]
20×20cm spacing + 0.35kg	10.00[ab]	7.67[a]	16.00[a]	6.63[abc]
20×20cm spacing + 0.40kg	11.50[a]	6.33[a]	16.67[a]	8.06[a]

Means of same column followed by the same letter are not significantly different with each other at 0.05% level of probability,** = highly significant, *= significant, L.S.D.= Least Significant Difference, NS/- = Not Significant.

CONCLUSION AND RECOMMENDATION

The study was conducted with the aim of accessing and comparing the forage yield of Congo grass with different level of fertilizer as influenced by planting density. Parameters (TPH, NLPP, LLPP and NTPP were recorded, Despite variation in values generated across all the treatments, T3(20×20cm spacing + 0.40kg) showed a better satisfying result compared to others although there were no significant difference with some treatments at some points. Statistical evaluation showed that there is significant difference between the two spacing while that of fertilizer rate showed little or no significant difference despite variation in values. For the six treatments used in this study, recommendation could be proffered such that amongst the treatments;T3 (20×20cm spacing + 0.40kg) showed highest response compared to others and as such, adequate spacing should be provided while sowing and the rate of fertilizer levels should be increased so as the quantify the difference between the treatments.

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