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EFFECT OF NITROGEN AND SEEDING RATES ON THE STRAW AND GRAIN YIELD OF ACHA (*Digitaria exilis* Kippis Stapf)

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ABSTRACT
The study was conducted at the Federal College of Land Resource Technology, Kuru, Jos, Plateau State in 2019 and 2020to determine the optimum nitrogen and seeding rates on straw and grain yields of Acha. The experiment was laid out in Randomized Complete Block Design with three replications. The treatments were three levels of nitrogen (0, 30, and 60kgNha^{-1} and three seeding rates (10, 20, and 30kgha^{-1} respectively. Seeds were sown by drilling at 50cm inter- row spacing. The parameters measures were number of tillers, plant height, straw weight and grain yield. The results revealed that, Treatments had significant (P > 0.05) effect on all the parameters measured (number of tillers, straw weight and grain yield) except for plant height. It can be concluded that, Nitrogen at 30kgNha^{-1} and the seeding rate of 30kgha^{-1} is the optimum for the production of straw as crop residue for livestock feeding.
Key words:Acha, *Digitaria*, Nitrogen, Seed rate and Straw

INTRODUCTION
Acha or fonio are two cultivated species of cereals in the genius *Digitaria* (*D. exilis* and *D. iburua*) that are important staple crops in West Africa. The two Acha species are referred to as small millets. The crop is an ancient indigenous cereal of West Africa with cultivation record dating back to 7,00 years (Cruz, 2004). It is a low input demanding crop that tolerates a wide range of soil types. It is the most nutritious cereal grain that contains crude protein, leucine, methionine and cysteine that are deficient in major cereals like rice and sorghum (Temple and Bassa, 1991). The diets from Acha are recommended for the diabetics due its low glycemic index. The straw and bran are used for feeding ruminants animals like cow, sheep and goats bran,the amounts of protein, phosphorus, potassium and trace minerals (Cu, Fe, Mn and Zn are reliable materials for formulating poultry and pig feed to meet the nutrient specifications of such feed. The study was conducted to determine the optimum nitrogen and seeding rates for increased straw production and grain yield.

MATERIALS AND METHODS
The experimental site, design and treatments.
The experiments were carried out in 2020 and 2021 at the Federal College of Land Resource Technology, Kuru, Jos, Plateau State, Latitude 09º44'N and Longitude 08º44'E (Bihim, 1987). Six composite soil samples were taken using soil anger at 0 - 30cm depth on the experimental plot. The soil sample was analyzed for routine physical and chemical properties of the soil at Federal College of Forestry, Jos. The experiment was laid in a Randomized Complete Block Design with three replications. The treatments were three levels of Nitrogen (0, 30, and 60kgNha^{-1} and three seeding rates (10, 20, and 30kgha^{-1} respectively. The land was cleared manually, ploughed and harrowed before sowing. All the plots received split doses of the all the fertilizer treatments at 4 and 8 weeks after sowing (WAS). Acha seeds were sown by drilling at 50cm inter- row spacing. Weed management was by manual hand pulling of needs at 4 and 8 weeks after sowing.

Data collection

Data collection begun at 4 and later at 8 and 12 weeks after sowing (WAS). Five plants were selected and tagged in each plot to determine all the parameters. Plant height**:** the heights the 5 tagged plants in each plot were measured from ground level to the tip of the plant using a meter rule at 12 (WAS). Number of tiller**:** The tillers of 5 selected tagged plants were counted at 8 (WAS). Straw weight**:** the straws from each plot were weighed and expressed in kilogram per hectare per treatment, while the grain yieldwas obtained by weighing the yields from all the plots and expressed kilogram per hectare per treatment. The data collected were subjected to analysis of variance (ANOVA) using CropStat and means were separated using Duncan multiple range test.

RESULTS AND DISCUSSION

The influence of nitrogen and seed rates on plant height, number tillers, straw weight and grain yield at 12 (WAS) is presented in Table 1. Treatments had significant effect on number tillers. Nitrogen at 60kgNha^{-1} and seed rate of 30kgha^{-1} gave significantly higher ($P<0.05$) number of tillers per plant in the second year but lower ($P<0.05$) when nitrogen was not applied and at 10kgha^{-1} seeding rate. Ausiku *et al* (2020) reported increase in number of tillers with increase in nitrogen fertilizer rates. Nitrogen and seeding rates had no significant effect on plant height in both years of experimentation. Nitrogen and seeding rates at 60KNha^{-1} and 30kgha^{-1} produced higher ($P<0.05$) straw weight (Kgha^{-1}) and lowest at no application of nitrogen and 10kgha seeding rate. This finding is in line with Dachi (2014) who reported similar result with urea fertilizer. Nitrogen fertilizer and seeding rates had significant effects on grain yield in both years. Nitrogen and seed rates at 30kgNha^{-1} and 30kgha^{-1} had significant effect on grain in both years of experimentation and lowest at no nitrogen application and 10kgha^{-1} seed rate. This finding is in line with Dachi (2014) who reported increase in Acha straw with the application of nitrogen fertilizer.

Table 1: Effect of nitrogen and seeding rates on growth parameters and yield of Acha (*D. exilis*) in 2019 and 2020.

Treatment	Numbers of tillers		Plant height (cm)		Straw weight (kg ha)		Grain yield (kg ha)	
	2019	2020	2019	2020	2019	2020	2019	2020
Nitrogen rates (kg/Nha)								
0	11.5	15.3^{c}	68.4	80.8	344.4^{c}	291.9	164. 6^{c}	269. 1
30	11.3	17.8^{b}	66.2	82.8	477.0^{ab}	717.0^{a}	406.3^{a}	490.1^{a}
60	11.3	20.2^{a}	65.4	83.8	522.2^{a}	821.9^{a}	301.1^{b}	371.3^{b}
S±	0.7	0.3	2.3	1.9	49.5	51.5	17.6	17.3
Seed Rate Kg/ha								
10	11.5	17.1^{c}	65.9	84.4	450.0	629.9	280.0	274.3
20	11.2	17.7^{b}	66.1	81.9	427.0	719.3^{b}	278.4^{b}	371.2
30	11.5	18.6^{a}	68.1	81.1	466.6	762.7^{a}	313.7^{a}	385.6^{a}
S±	0.7	0.3	2.3	1.9	49.5	51.9	17.6	17.3

Mean in a column or row of treatments followed by the letter(s) are not significantly different ($p< 0.05$) levels of probability using DMRT.

CONCLUSION

It can be concluded that, Nitrogen at 30kgNha^{-1} and the seeding rate of 30kgha^{-1} is the optimum for the production of straw as crop residue for livestock feeding.

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