NIGERIAN AGRICULTURAL JOURNAL
ISSN: 0300-368X
Volume 51 Number 1, April 2020 Pg. 151-154
Available online at: http://www.ajol.info/index.php/naj

EFFECT OF COW DUNG MANURE ON THE GROWTH AND YIELD OF FINGER MILLET [*Eleusine coracana* (L) Gaertn] IN NORTHERN GUINEA SAVANNAH AGRO-ECOLOGICAL ZONE OF NIGERIA

[1]Garjila, Y. A., [2]Lakurbe, O. A., [3]Angyu, A. E. and [4]Raymond, J

[1]Department of Agronomy; [2]Department of Animal Science,
Faculty of Agriculture, Federal University, Kashere, P. M. B. 0182, Gombe State, Nigeria
[3]Department of Biological Sciences, Taraba State University Jalingo, Nigeria
[4]Department of Horticultural Technology,
Federal College of Horticultural Technology, Dadin-Kowa,
P. M. B. 0108, Gombe, Gombe State, Nigeria
Corresponding Authors' email: ygarjila@yahoo.com

Abstract
Field trials were conducted in 2017 and 2018 cropping seasons at the Teaching and Research Farm of Crop Science Department, Taraba State College of Agriculture, Jalingo, to determine the effect of cow dung manure on the growth and yield of finger millet (*Eleusine coracana* (L) Gaertn)**.** Treatments evaluated consist of 0, 2.5, 4.5, 6.5 and 8.5 t/ha of cow dung each. Each treatment was replicated three times and laid out in a randomized complete block design (RCBD). Data collected include; plant height, number of tillers, stem girth, days to 50% flowering, spikes/plant, finger length, grain yield and 1000 seed weight. The data were subjected to analysis of variance (ANOVA), and mean differences were separated using Least Significant Difference (LSD) at P = 0.05. Results obtained indicated that cow dung manure enhanced the performance of finger millet plants at 8.5t/ha and were significantly (P<0.05) taller (45.33/51.40cm) with highest grain yield of 2.2957 and 2.2984t/ha in 2017 and 2018 cropping seasons respectively. Therefore, applications of cow dung manure at 8.5t/ha could be adopted to maximize the productivity of *Eleucine coracana* for enhanced yield and economic benefits of farmers in the study area.

Keywords: Cow dung manure, Finger millet, Growth and Yield

Introduction

Finger millet (*Eleusine coracana* (L) Gaertn) is a cereal grass grown mostly for its grain. It is a robust, tufted, tillering annual grass, which grows up to 170cm high (De Wet, 2006; Quatrocchi, 2006). The inflorescence is a panicle with 4-19 finger-like spikes that looks like a fist when mature, hence the name finger millet (De Wet, 2006). It is a staple food in many African and South Asian countries, and also considered as famine crop, because, it is easily stored for a long time. The grain is readily digestible, and can be cooked like rice, ground to make porridge or flour, or used to make cakes (De Wet, 2006). Sprouted grains are recommended for infants and elderly. Finger millets is also used to make liquor and beer, and by-products for livestock feeding (Raji, 2012).

Finger millet is a fast growing cereal crop that matures within 3 to 6 months (Dida and Devos, 2006), and generally found in cultivated areas, road sides and banks (Quattrocchi, 2006). It grows best at an average temperature of 23°C but can withstand cooler and hotter conditions. Finger millet adapts to a wide range of soil conditions though it performs better in fertile, well-drained sandy to sandy-loam soils, with pH ranging from 5 to 7. However, it also grows on lateric or black heavy vertisols, and has some tolerance to alkaline and moderately saline soils (Dida and Devos, 2006). According to Raji (2012), finger millet has the potential to improve resource management and serve as a staple and weaning food, or a cash crop which provides income generating opportunities. Research and improvement efforts are therefore needed to explore the potential of finger millet for enhanced productivity, crop diversification and a better nutritional environment. There is dearth of research studies and necessary information for crop improvement on finger millet. Therefore, the objective of this study is to access and determine the use of organic manure as a substitute of inorganic fertilizer which is not readily available and not cost effective, and to determine the quantity of organic manure (cow dung) that will give optimum yield in the study area.

Materials and Methods

The field experiment was carried out in 2017 and 2018 cropping seasons at the Teaching and Research Farm of the Department of Crop Science, Taraba State College of Agriculture, Jalingo (Latitude 80°50'N and Longitude 11°50'E). The treatments applied to *E. Coracana* were 0, 2.5, 4.5, 6.5 and 8.5t/ha cow dung with zero manure check. The experiment was laid out in a randomized complete block design (RCBD), with each treatment replicated three times. The cow dung manure sourced from the College Diary farm were well composted under shade for four weeks before being incorporated into the soil two weeks before planting. Before applying the manure, composite soil samples were taken from the gross plot area for routine analysis in the laboratory using the procedure by Black, (1965). The nutrient contents of the manure were also analysed. Seeds of *Eleucine coracana* were sourced from farmer's seed banks in Jalingo and drilled in unit plots measuring 2m × 3m ($6m^2$) and later thinned to one plant per stand spaced 20cm × 50cm apart, at three weeks after sowing (WAS). The grains were harvested at 12WAS when the plant was fully matured. The *E. coracana* was harvested by cutting the plant beneath using sickle, sun dried before threshing in drum, and then winnowed. Data collected on five tagged plants used for sampling were plant height, number of tillers, stem girth, days of 50% heading, number of spikes, spike length, leaf area index, grain yield t/ha and 1000 – grain weight. Leaf area index was determined at 4 and 8WAS following Abuzar *et al*., (2011) thus;

LAI = Leaf area / Area occupied by plant

The data were subjected to analysis of variance (ANOVA) using Gen Stat Release 8.1. Treatment means were separated using the least significant difference (LSD) at 5% level of probability.

Results and Discussion

Soil and cow dung manure analysis

The result of the physico-chemical analysis of the soils for 2017 and 2018 cropping seasons is shown in (Table 1). The result revealed that, the soils were sandy, loam with slightly acidity levels in both cropping seasons. The available Phosphorus is higher in both seasons and lower N than Na. The cow dung analyzed showed that it contained higher Phosphorus followed by K and Na, while the N content was lower.

Growth and Yield Parameters

The influence of cow dung manure on plant height of finger millet in 2017 and 2018 are shown in Table 2. The result shows there were significant differences ($P < 0.05$) in plant height throughout the sampling period of 4 and 8 weeks after sowing (WAS) in both cropping seasons. The application of 8.5t/ha of cow dung manure in both cropping seasons produced taller plants than the other levels with average heights of 26.33 and 45.33cm in 2017 and 2018 respectively and 30.10/51.40cm in 2016 cropping seasons at 4 and 8 WAS respectively. The control produced shorter plants in both cropping seasons. The increase in plant height is attributed to increase in the fertility of the soil as a result of the application of cow dung manure which supplied Nitrogen, Phosphorus, Potassium and other chemicals which enhanced the growth of the plant, following Kumara *et al.,* (2007), who reported that the application of farm yard manure at 5t/ha increased the growth parameters of finger millet.

Application of cow dung manure significantly ($P<0.05$) influenced the production of tillers by increasing the number per plant and leaf area index in both cropping seasons (2017 and 2018). The result revealed that increase in the level of cow dung manure application increased the number of tillers and higher leaf index. The application of 8.5t/ha of cow dung manure produced highest number of tillers with means of 8.40 and 8.60 tillers per plant in 2017 and 2018 cropping seasons respectively and the leaf area index with means of 40.70/52.40 in 2017 and 40.90/52.90 in 2018 at 4 and 8 WAS respectively (Table 2). The control plots produced the lowest number of tillers per plant and leaf area index (Table 2). The result is in agreement with Kumara *et al.,* (2007), who reported that the application of farm yard manure increase the growth parameters of finger millet.

Application of cow dung manure had a significant ($P<0.95$) effect on days to 0 50% heading of finger millet. The application of 8.5t/ha of cow dung manure produced shortest days to 50% heading in 2017 and 2018 cropping seasons with means of 103.30 and 103.20 respectively. While the control plots produced longest days to 50% heading with means of 113.32 and 112.50 days in 2017 and 2018 cropping seasons respectively (Table 3). Application of cow dung manure significantly ($P<0.05$) influenced the number and length of spikes of finger millet. The application of 8.5t/ha significantly produced higher number of spikes at 18.60/18.90 in 2017/2018 respectively, and longer spikes with means of 4.73/4.83cm in 2017/2018 respectively, while the control produced lowest number and shorter spikes (Table 3). Length of spikes and number of spikes are significant determinants of seeds of the plant. Application of cow dung manure increased the length and number of spikes or fingers which is in agreement with Ahiwale *et al.,* (2013), who reported highest number of seeds due to longest finger and highest number of fingers with the application of farm yard manure at 5t/ha.

Cow dung manure application significantly influenced grain yield and seed weight of finger millet (Table 3). The application of 8.5t/ha of cow dung manure produced the highest grain yield (2.29/2.31) and seed weight (3.33/3.38g) in 2017/2018 respectively. The control produced lower grain yield and 1000-grain weight respectively. The highest grain yield and seed weight could be attributed to increase in spike length and number of spikes or fingers with increase in seed as a result of cow dung manure application. This is in agreement with the findings of Sinha, (2015) and Tsado *et al.,* (2016), who reported similar highest grain yield.

Conclusion

The application of cow dung manure at the rate of 8.5t/ha produced the longest plant height, highest tillers, leaf area index, attained 50% heading earlier, longest spikes, highest number of spikes and grain yield and heaviest seed of finger millet. From the findings of this trial, farmers in the Northern Guinea Savannah Agro-ecological zone (Jalingo and its environs) should be encouraged to grow finger millet with the application of cow dung manure for enhanced grain yield.

Table 1: Chemical properties of the organic manure used and the pre-planting and post-harvest soil samples at experimental site

Parameters	Soil properties		Cow dung manure	
	2017	2018	2017	2018
Total N (g/kg)	0.17	0.18	0.32	0.34
Ave. P (mg/kg)	12.40	12.47	29.30	29.38
Na (cmol/kg)	1.10	1.10	3.62	3.70
K (cmol/kg)	5.50	5.60	6.90	6.95
pH	6.35	6.36	7.50	7.50

Table 2: Growth parameters of *Eleusine corocana* as affected by different levels of cow dung manure

Treatment	Plant height (cm)				Number of Tillers		Leaf area index			
Cow dung manure/ha	2017		2018		2017	2018	2017		2018	
	4WAS	8WAS	4WAS	8WAS			4WAS	8WAS	4WAS	8WAS
0 (Control)	17.83	22.00	18.20	23.30	2.30	2.49	24.35	36.50	24.50	36.78
2.5	20.67	31.00	22.30	36.20	4.30	4.70	29.20	40.20	29.35	40.50
4.5	23.33	37.33	25.60	40.25	5.60	6.10	38.55	46.70	38.68	46.25
6.5	26.33	38.33	29.20	44.30	7.20	7.80	39.85	49.30	40.20	49.50
8.5	26.33	45.33	30.10	51.40	8.40	8.60	40.70	52.40	40.90	52.90
LSD(0.05)	1.26	2.07	2.01	3.25	0.84	0.87	0.96	1.76	0.98	1.36

Table 3: Yield Parameters of *Eleusine coracana* as affected by different levels of cow dung manure

Treatment	Days to 50% heading		Number of spikes/plant		Spike length (cm)		Grain yield t/ha		1000-grain weight (g)	
Cow dung manure t/ha	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018
0 (Control)	113.32	112.50	6.20	6.60	3.62	3.67	2.3472	2.2493	2.58	2.59
2.5	109.25	108.70	9.40	10.20	4.17	4.24	2.2543	2.2564	5.80	2.84
4.5	207.35	107.20	12.30	12.80	4.33	4.38	2.2850	2.2866	2.93	2.96
6.5	105.20	104.70	16.20	17.00	4.63	4.70	2.2880	2.2893	3.97	2.99
8.5	103.30	103.20	18.60	18.90	4.73	4.83	2.2957	2.2984	3.33	3.38
LSD(0.05)	1.58	1.62	1.60	1.93	0.16	0.16	19.10	19.13	0.30	0.32

References

Abuzar, M. R., Sadozai, G. U., Baloch, M. S.,Shah, A. A., Javaid, I. H. and Hussain, T. (2011). Effect of plant population densities on yield of maize. *Journal of Animal and Plant Science*, 21(4):692-695.

Ahiwale, P. H., Chavan, L. S., Jagtap, D. N., Mahadkar, U. V. and Gawade, M. B. (2013). Effect of establishment methods and nutrient management on yield attributes of finger millet (*Eleusine coracana* G.). Department of Agronomy. *Journal of Dry land Agriculture*, 45(3):141-145.

Black, C. A. (1965). Methods of soil analysis. Part 2 ASA, 677 Segoe Rd S, Madison WI 53711.

De Wet, J. M. J. (2006). *Eleusine coracana* L. Gaertn. Record from Proabase. Bink, M.&Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa / Resources Vegetables de 13 Afrique tropicale), Wageningen, Netherlands.

Dida, M. M. and Devos, K. M. (2006). Finger millet. In: Chittarajan K., Genome mapping and molecular Breeding in Plants, *Springer Verlag*, 1:333-344.

Kumara, O., Basavaraji-Naik, T. and Palaiah, P. (2007). Effect of weed management practices and fertility levels on growth and yield parameters in finger millet. Karna taka. *Journal of Agricultural Science*, 20(2):230-233.

Quattrocchi, U. (2006). CRC Worland dictionary of grasses: Common names, Scientific names, Eponyms, Synonmyms and Etymology. CRC Press Taylor and Francis Group, Boca Raton, USA.

Raj, K. Adhikari (2012). Economics of finger millet (Eleusine coracana G.) Production and marketing in peri-urban area of Pokhara Valley of Nepal. *Journal of Development and Agricultural Economics*, 4(6):151-157.

Sinha, B. L. (2015). Effect of tillage and nutrient management on yield of pearl millet and soil health in semi arid tropics. College of Agricultural Engineering and Technology and Research station, Indira Gandi Krishi Vishva Vidylay, Chhattisgarh, India International IT. *Eng. Appl. Sci. Res*., 4(2):33-39.

Tsado, E. K., Jatau, D. B. and Daniya, E. (2016). Performance of finger millet (*Eleusine coracana* L. Gaertn) as influenced by nutrient source in the Southern and Northern Guinea Savannah, Nigeria. *Direct Research Journals of Agriculture and Food Science*, 4(7):182-192, ISSN2354-4147.