

SEED YIELD OF GUINEA GRASS (*PANICUM MAXIMUM*) AS AFFECTED BY PLANTING METHOD AND SWINE MANURE APPLICATION RATES IN THE NORTHERN GUINEA SAVANA OF NIGERIA

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ABSTRACT

The effects of swine manure rates and planting method on the seed yield of *Panicum maximum* were studied. The design was a 2×4 factorial laid out in a split-plot and replicated 3 times. The treatments were two planting methods (drilling and broadcasting) and four swine manure rates (0, 5, 10 and 15t/ha). Manure rates was the main plot effect while planting method was sub-plot effect. Results show that the seed yield obtained from the grasses planted by the broadcast method was 26% higher ($P<0.05$) than that recorded for the drilling method. The application of swine manure at 15t/ha produced higher ($P<0.05$) yield than other rates of application. This study recommends the application of swine manure at 15t/ha and the use broadcast method for high seed yield of *Panicum maximum* when propagated by seed.

Key words: swine manure, seed yield, broadcast, drill, harvesting.

INTRODUCTION

Forage seed production in the tropical region is characterized by variable production (Martiniello, 1999). The instability of seed yield from forage species may be a consequence of the contrasting environmental condition during the vegetative and reproductive growth stages of crops (Clua and Gimenez, 2003). Seed yield of species, varieties or ecotypes that are widely used and well adapted to the West Africa region is not sufficient to meet the demand for seed. Consequently, studies on agronomic factors influencing the adaptability and seed yield of species, varieties or ecotypes would be useful to determine potential agronomic techniques that could help increase seed production.

Research on fertilizer requirement of seed-producing grasses tend to focus on the rate and timing of application. Increasing N fertilizer is associated with an increase in seed yield until an optimum application is reached. Optimum rate varies widely in the literature, probably due to differences in soil nitrogen status, cropping history and type of grass. Furthermore, the range of maximum yield reported for some grasses suggests that N is not the major limiting nutrient for seed yield (Phaikaew *et al.*, 2002). The effect of either drilling or broadcasting on grass seed production vary and this depends on forage grasses species, varieties, ecotypes and environmental conditions (Gbenou *et al.*, 2018).

Panicum maximum is one of the dominant forage species with high yield, palatability and ease of establishment (Akinola, 2018). However, there is a paucity of information on the seed yield of *P. maximum* in response to manure application and planting method. Hence, the aim of this study is to access the effects of different rates of swine manure application and planting methods on the seed yield of *Panicum maximum*.

MATERIALS AND METHODS

The study was carried out at the Experimental Field of the Feed and Nutrition Research Programme of National Animal Production Research Institute (NAPRI), Ahmadu Bello University, Shika, Zaria, Kaduna State, Nigeria. The site is located in the Sudan savanna agroecological zone of Nigeria (Latitude 11° 12'N, Longitude 07° 33'E; altitude = 660m asl) along Zaria-Funtua axis. The study area has definite wet (September and early October) and dry (October to April every year) seasons. The average rainfall is 1058.60mm with a range of 1110-1580 mm. The minimum and maximum air temperature in May and October was 30°C and 8.23°C, and relative humidity was ~70% during the rainy season (IARMS, 2018). The experimental site (50m × 25m) was cleared, ploughed, and harrowed. Seedbed was prepared for easy germination and early establishment of seedlings. The seeds

of *P. maximum* were sourced from the Seed Store of the Feed and Nutrition Research Programme of National Animal Production Research Institute (NAPRI), Shika, Zaria. Dress Force was used to treat the seeds against insect attack. Planting was carried out using drilling and broadcast methods and four levels of swine manure (0t/ha, 5t/ha, 10t/ha and 15t/ha) were applied as a single dose. The study was a factorial experiment laid out as a split-plot design with three replications. A total land area of was used while the sub-plots measured 6m×4m with a space of 1m apart. Swine manure rates was the main plot effect while the planting method was the sub-plot effect.

Seed harvesting and collection

The matured inflorescence of *P. maximum* was harvested 10-15cm below the panicle with the aid of a sickle. Harvesting was carried out when about 60-70% of the seed heads have emerged; the harvested seeds were sundried and piled for three days to allow for more seed maturation. The seeds were manually threshed, cleaned and weighed using a digital scale for the estimation of the seed yield per treatment. All data collected were subjected to three-way analysis of variance (ANOVA) using General Linear Model (GLM) procedure of SAS (2005). Significant ($P<0.05$) differences between treatment means were compared using Duncan Multiple Range Test (Duncan, 1995) of the SAS package.

RESULTS AND DISCUSSION

The seed yield of *P. maximum* was higher at 15t/ha (863.17 kg) compared to other rates of application (Table 1). Besides, all manured treatments had a higher seed yield than the unfertilized grasses. This implies that The N and other nutrients in the manure translated into a higher number of tillers, increased number of florets and higher seed yield. Our result contradicts earlier reports (Tesfaye, 2020; Irshad *et al.*, 2002 and Ismail, 2007) that the application of cattle manure at 5 t/ha produced maximum seed yield of Rhode grass. The discrepancy between the former and present study could be as a result of differences in manure type, mode of propagation, biotic and abiotic factors such as nutrient status of the soil, temperature, duration of daylight and precipitation (Gbenou, 2018).

We found 26% increase ($P<0.05$) in the seed yield of the grass established by broadcast method over the drilling method. This could be as a result of higher tiller number, a larger amount of florets and a little or moderate level of competition among the plants. This is in contrary to the findings by Ogbonna *et al.*, (2015) and Da Silva *et al.*, (2016) who reported that row planting is more advantageous for tussock grasses such as *Panicum maximum*. However, seed density, inflorescence density and the proportion of seed harvested are the major factors that vary most with management. More importantly, the product of shoot density and inflorescence density is critical to the potential seed yield (Amodu, 2004).

Table 1: seed yield as affected by manure rate and planting methods

Manure rate (t/ha)	Seed yield
0	348.00 ^c
5	641.83 ^b
10	587.83 ^b
15	863.17 ^a
P-value	0.0001
Planting methods	
Broadcast	684.00 ^a
Drilling	536.42 ^b
P-value	0.0013
Interaction between planting method and manure rate	
B*0	438.33
B*5	682.00
B*10	623.33
B*15	992.33
D*0	257.67
D*5	601.67
D*10	552.33
D*15	734.00
P-value	0.2893

CONCLUSION AND RECOMMENDATION

From the results of this study, the seed yield of *Panicum maximum* was higher when swine manure was applied at 15t/ha than other rates of application while the broadcast method had a higher seed yield than the drilling method. Therefore, this study recommends the application of swine manure at 15t/ha and the use broadcast method for high seed yield of *Panicum maximum* when propagated by seed.

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