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Full-Length Research Paper

Effects of Sowing Methods on Dry Matter and Proximate Composition of Two Rangeland Grasses in Sokoto, North Western Nigeria

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ABSTRACT: The research is on the effects fertilizer sources and planting pattern on the growth of the two grass species was conducted at Janzomo farm, Shagari LGA, Sokoto State. Sokoto lies on Latitude 12.00^0 and 13.60^{0}N, Longitude 4.80^0 and 6.50^{0}E and 350m above sea level. . It involved sole planting of *A. gayanus*, *P. pedicellatum* and combination of the two grasses. The seeds were drilled and broadcasted in fertilizer treated and untreated plots of 2.5m x 2.5m under rain fed conditions. The results indicated that drilled plants produced significantly ($P<0.05$) higher amount of biomass which was attributed to large number of leaves and tillers produced in the drilled plots. This was possibly due to competition for space and resources in which plants maximized space to occupy and survive. These led to production of more leaves for photosynthetic activities hence production of higher biomass. Drilled plants had significantly higher Cp and Ash content than broadcasted plants. The higher Cp and Ash content of drilled plants was possibly due to large number of leaves and tillers. The high Cf and Ee content of the broadcasted plants were attributed to the stemmy nature of the plants as they were taller and accumulated more fibrous tissues required for mechanical support to the plants.

Keywords: Proximate composition, Dry matter, Sowing methods, Rangeland grasses, North western Nigeria

INTRODUCTION

Livestock –keeping often represents a way of life as well as providing beef, milk and other amenities. It is only when modern Agriculture and industrialization emerged that increased demands for meat, milk and milk products, wool and other animal products aroused. These forced changes in livestock keeping and prompts consideration of intensified animal and pasture/rangeland management (Chlleda and Crowder, 1982).Gefu (1998) reported that some of the factors that contributed to the problem of inadequate feeding for livestock in the Savanna zones of Nigeria include the increasing demands of land for uses other than those related to livestock production. This had considerably reduced the number of grazing reserves/rangelands in the country; including the traditional grazing lands, fallows and marginal lands, through their conversions into non-pastoral uses.

The problem of inadequate feed availability for the ruminants (and other livestock) is more severe in the semi-arid environment where the animals are able to make appreciable weight gains during the short wet season only. There is usually the abundance of good quality pasture in the grazing reserves/rangelands during this period which provides adequate nutrition. On the other hand, in the long dry season the pasture becomes

reduced both in quantity and quality and the animals are unable to meet their nutritional requirements for maintenance which lead to serious weight loss. Thus, the animals' overall annual productivity is low (Nuru, 1982; Steinbach, 1997; Maigandi and Owanikin, 2002). More so as feed and feeding occupy a central position among the factors that militates against the improved and sustainable livestock production in Nigeria. Therefore, forage production is vital for actualising sustainable livestock production, particularly in Sokoto, a semi-arid zone of Nigeria. Hence, the urgent need to increase the feed availability (in terms of quality and quantity) for the livestock so as to improve the productivity of livestock production in the state. Over exploitation of grasses and other domestic uses had resulted in massive loss of pasture land to advancing Sahara deserts. Obueh (2000) estimated loss up to 350,000 square kilometres within a year in the rural areas of the northern grasslands as a result of overgrazing, grass harvesting for fuel and other domestic usages. The production of ruminant livestock in Nigeria and Sokoto State in particular is constrained by inadequate feed availability especially during the dry season (Bincan, 1990; Ajileye, 1993; and Umunna and Iji, 1993).

Hoffmann *et al* (1998) and Maigandi and Owanikin (2002) also reported that the problem of feed scarcity is more severe in the semi-arid zone; where about 49, 47, 37 and 90% of cattle, goats, sheep and camels, respectively are located in the country. Pasture grasses should contain adequate nutrients for enhanced animal productivity. Nutrients are substances that are required for the nourishment of an organism, providing a source of energy for structural components. In animals, nutrients form part of the diet and include major nutrients such as Proteins, Ether, Crude fibre and minerals. Umunna and Orji (1991) have observed that the low nutrients content of forages is the most critical constraint to livestock production in Nigeria. This is because ruminant animals depend mainly on natural forages grown on rangelands for most of their feed requirements. De Leeuw (1979) stated that in general however, the nutritive value of forage is individually and collectively affected by various factors, including genetic, edaphic, climatic type and level of utilization, management and stage of growth. Nutrient composition of forages also varies from time to time and location to location.

*A. gayanus*belongs to the poaceae family and tribe Andropogoneae. It is commonly called Gamba grass (Bodgan, 1977; Grof, 1981; Pagot, 1993; Purse glove, 1979). It is indigenous and widely distributed throughout the savanna zone in Nigeria and the rest of tropical Africa. It is a perennial grass that is tall, erect and tufted/tussock with stems 2 – 4 metres high. It has vigorous tillers and abundant foliage especially during the rainy season. It is propagated vegetatively by splitting the tufts and by seeds, which are usually broadcasted or planted in rows. The field emerges of seeds usually occurs after 5 – 10 days of sowing (Chlleda and Crowder, 1982, Pagot, 1993).Gamba grass is relatively free from major pests and diseases and is resistant to burning and grazing. These features make it useful grass for supporting large numbers of cattle in Northern Nigeria. It is also one of the highly yielding grasses in West Africa.

*P. pedicellatum*Trin, belongs to the tribe Paniceae. It is annual and commonly known as Kyasuwa grass. It is also indigenous and occurs naturally in tropical and subtropical Africa but practically absent in tropical East Africa (Bogdan, 1977).The stem height ranges from 40 – 150 cm, or more in some cases, and may have up to 10 nodes. The stem is smooth, cylindrical, jointed and encircled by the leaf sheath. The leaves are borne on sheaths which arise at the nodes. They are flat and up to 40 cm long and 4 – 16 mm wide.It grows in relatively dry or moderately humid areas. It requires a rainy season of 4 -6 months with an average annual rain fall of 500 – 1000 mm, and well moistured soil during the period of active growth. It grows on poor soils but gives much higher yields on fertile, well-drained loams. It is propagated by seeds and reseeds itself.*P. pedicellatum,* though annual, regenerates easily after cutting. It has been under trial and also under large scale cultivation for a number of years, at first in Nigeria then in other West African countries and eventually in India where it became a popular grass. The initial growth is fast and grass can be utilized some 3.5 months after sowing. The main uses of the grass are fodder, hay, grazing and it can also serve as silage. It is a high yielding and productive species (Magaji *et al.,* 1998).

MATERIALS AND METHODS

The study was conducted at Janzomo Farm in Shagari Local Government Area of Sokoto state. The farm is located along Sokoto-Jega road, about 55 km south-west of Sokoto town, Sokoto state Nigeria. Sokoto is located on latitude 12.00^0 and 13.60^0N and Longitude 4.08^0 and 6.50^0E. It also lies at an altitude of 350m above the sea level (Kowal and Knabe, 2002). The study area is shown in (Figure 1). Sokoto state falls within the Sudan Savanna and is found in the Northwest geopolitical zone of Nigeria. It is characterized by distinct wet and dry seasons that may vary in their duration and intensity from year to year. The wet season lasts from May/June to September/October with an average annual rainfall of 500-700mm. Plant growth essentially takes place during this period. The remaining part of the year consists of long dry season that can be distinguished by cool hamattan winds from November to February followed by hot and dry period from March to May. The mean monthly temperature ranges between 15^0C in December and 40^0C in April.

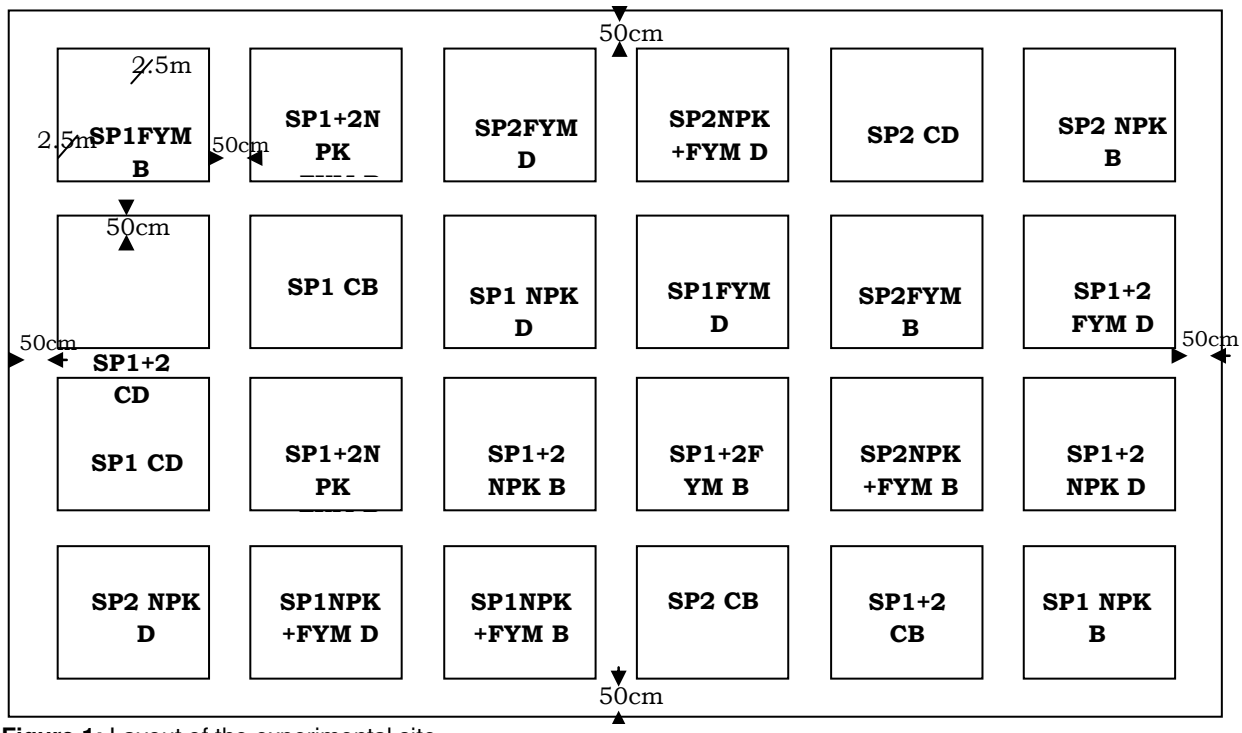

Figure 1: Layout of the experimental site.

Key: SP1 – Species 1 (A. gayanus) FYM – Farm yard manure SP2 – Species 2 (P. Pedicellatum) C – Control (No any form of fertilizer) NPK – Nitrogen Phosphorus and Potassium D – Drilled (Compound fertilizer) B - Broadcasted

The mean annual temperature averaged 27^0C (Mamman *et al.*, 2000). It follows that the coolest months are November to January while the hottest months are March to May. The vegetation of the area, being Sudan Savanna type is composed of scattered trees, many shrubby plants with dominant grasses and herbs. There were twenty four (24) study sub plots which consisted of treatments of *A. gayanus* Kunth, *P. pedicellatum* Trin and the mixture of the two species. Each was drilled, broadcasted and replicated three times. The experiments were laid out in a Randomized Complete Block Design RCBD) as outlined by Gumez and Gumez (1984).The randomization method used was that of Random numbers from the Random Number Table (Figure 1).

Data collection and Analysis

The fresh samples were harvested and taken to the Laboratory for the determination of moisture content, dry matter, crude fibre, crude protein, ether extract and ash. The methods and procedures followed were as outlined by Krishna and Ranjhan (1980) and Payne (1994).The collected data from the experiment was subjected to analysis of variance (ANOVA) procedure by using Statistical Analysis System (SAS, 2002) Statview Statistical Package. Significant differences in the means were separated by using the Least Significant Difference (LSD) test.

RESULTS AND DISCUSSION

The results presented in (Table 1) showed that during the first season,*A. Gayanus* drilled had 29.64 biomass, 40.86% dry matter production and 50.14% moisture content. The broadcasted plants on their part produced 23.78 biomass with 46.24% dry matter and 53.76% moisture content. The result further indicated that drilled *P. pedicellatum* had 38.11 biomass while the dry matter was 45.33% and 54.67% moisture content. The broadcastedplants yielded 32.80 biomass, 38.97% dry matter production and 61.03% moisture content. The result of *A. gayanus* planted in association with *P. pedicellatum* and drilled had 36.01 biomass while dry matter production was 44.37% and moisture content of 55.63%. The broadcasted plants produced 30.90 biomass which represented 39.72% dry matter production and 60.28% moisture content. The results indicated that drilled plants had the highest biomass

Table 1: Effect of planting pattern on the Biomass (BM) and moisture content of *A. Gayanus* and *P. Pedicellatum* at Janzomo Farm during the two seasons.

		First season			Second season		
Species	Planting pattern	BM(g/ 15cm)	DM %	Moisture %	BM(g/ 15cm)	DM %	Moisture %
A. gayanus	Drilled	29.64a	49.86b	50.14b	30.45a	48.80b	51.20b
	Broadcasted	23.78b	46.24a	53.76a	22.48b	44.54a	55.46a
SE ±		1.93	1.77	1.19	1.92	1.48	1.24
LSD		3.96	3.79	3.11	3.35	3.34	3.32
Sign		*	*	*	*	*	*
P. pedicellatum	Drilled	38.11a	45.33a	54.67b	37.15a	43.45a	56.55b
	Broadcasted	32.80b	38.97b	61.03a	31.54b	37.56b	62.44a
SE ±		1.75	2.10	2.10	1.65	2.03	2.03
LSD		3.77	4.13	4.13	3.48	4.00	4.00
Sign		*	*	*	*	*	*
A.gayanus/ P.pedicellatum	Drilled	36.01a	44.37a	55.63b	38.01a	45.00a	55.00b
	Broadcasted	30.90b	39.72b	60.28a	31.89b	41.37b	58.73a
SE ±		1.68	1.53	1.53	1.56	1.47	1.47
LSD		3.69	3.52	3.52	3.23	3.34	3.24
Sign		*	*	*	*	*	*

Means in a column followed by same letter(s) are not significantly different (<0.05) at 5% level using LSD. SE=Standard Error. * = Significant. ns=Not significant

Table 2: The Effect of Planting pattern on the Crude fibre (Cf), Crude protein Cp), Ether extract (Ee) and Ash content of *A. gayanus* and *P. pedicellatum* at Janzomo Farm during.

		First	Season			Second	Season		
	Planting pattern	**Cf %**	**Cp %**	**Ee %**	**Ash %**	**Cf %**	**Cp %**	**Ee %**	**Ash %**
A gayanus	**Drilled**	**25.60**	**6.65**	**7.14**	**10.00**	**24.68**	**6.23**	**6.45**	**10.05**
	Broadcasted	**28.340**	**4.14**	**9.55**	**7.17**	**29.35**	**3.80**	**9.00**	**7.10**
	SE±	**0.19**	**0.72**	**0.71**	**0.92**	**1.54**	**0.72**	**0.70**	**1.01**
	LSD	**2.72**	**2.40**	**2.40**	**2.73**	**4.39**	**2.40**	**2.30**	**2.86**
	Sign	**Ns**	*	*	*	*	*	*	**Ns**
		First		**Season**		**Second**	**season**		
P. pedicellatum	**Drilled**	**29.35**	**8.64**	**6.68**	**9.85**	**28.24**	**9.85**	**6.11**	**10.66**
	Broadcasted	**33.14**	**6.05**	**6.10**	**7.25**	**34.22**	**6.34**	**8.73**	**8.16**
	SE±	**1.24**	**0.81**	**0.45**	**0.81**	**1.97**	**1.15**	**0.82**	**0.71**
	LSD	**3.17**	**2.56**	**1.91**	**2.56**	**3.99**	**3.05**	**2.58**	**2.40**
	Sign	**Ns**	*	*	*	*	*	*	**Ns**

The two seasons. Means in a column followed by same letter(s) are not significantly different (<0.05) at 5% level using LSD. SE=Standard Error. * = Significant. ns=Not significant

production in both species. Similar trend was exhibited by the results obtained during the second season.

The results indicated that drilled plants produced significantly (P<0.05) higher amount of biomass which was attributed to large number of leaves and tillers produced in the drilled plots. This was possibly due to competition for space and resources in which plants maximized space to occupy and survive. These led to production of more leaves for photosynthetic activities hence production of higher biomass. Therefore plant spacing is another important factor that influences forages growth, biomass and dry matter yield. Adeoye *et al.* (2011) also reported higher biomass and dry matter yield for closer grass spacing. *P. Pedicellatum* had significantly (P>0.05) higher amount of biomass compared with other species during both seasons. This was possibly due to large number of leaves which may have contributed to its higher biomass production. This was also reported by AFRIS, (1980).

The results in Table 2 showed that during the first season, *A. Gayanus* drilled plants had 25.60% Cf, but reached 28.40% in the broadcasted plants. On the other hand, Cp content was 6.65% and 4.14% in the drilled and broadcasted plants respectively. The Ee content of plants that were drilled had 7.14% while the broadcasted plants produced 9.55%. In terms of Ash content, drilled plants had 10.00% and the broadcasted plants yielded 7.17%. The results of second season followed similar pattern although the figures vary for the parameters investigated. The results further indicated during first season that *P. Pedicellatum* drilled plants had Cf content of 29.35%. The broadcasted plants on their part had 33.14% during the

period. Furthermore, the Cp content reached 8.64% and 6.05% respectively in the drilled and broadcasted plants. Ee stood at 6.68% in drilled plants with broadcasted plants having 8.10%. It was also noted that Ash content of 9.85% was realized in the drilled plants while it was 7.25% for the broadcasted plants.

The results of the second season showed similar trend in the parameters investigated. Drilled plants had significantly higher Cp and Ash content than broadcasted plants. The higher Cp and Ash content of drilled plants was possibly due to large number of leaves and tillers Similar observations were made by Dugje, (2004). Ash is the approximation of total mineral elements of forages therefore high Ash content revealed the amount of mineral elements content of forages. The high Cf and Ee content of the broadcasted plants were attributed to the stemmy nature of the plants as they were taller and accumulated more fibrous tissues required for mechanical support to the plants. Umunna and Orji (1991) have observed that the low nutrients content of forages is the most critical constraint to livestock production in Nigeria. This is because ruminant animals depend mainly on natural forages grown on rangelands for most of their feed requirements.

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