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Nutritive Value Assessment of Some Gamba Grass (*Andropogon gayanus* Kunth.) Accessions in the Southern Guinea Savannah of Benue State, Nigeria

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Abstract

Benue State of Nigeria has a high potential for ruminant livestock production with its extensive grass cover of the southern Guinea savanna, dominated by gamba grass (*Andropogon gayanus* Kunth.). However, this has not been evaluated for forage utilization in the state. Investigations were therefore conducted to identify suitable genotypes. Forage nutrient assessments of 20 accessions of *A. gayanus,* from Benue and neighbouring Kogi States were evaluated at three locations in Benue State: Makurdi (7°43'N, 8°32'E), Otukpa (7°04'N, 7°39'E) and Yandev (7°22'N, 9°02'E). Forage was harvested every six weeks during the rainy season over two years in a completely randomized design with three replicates. These were assessed for crude protein (CP), *In-vitro* Organic Matter Digestibility (IVOMD) and Metabolizable Energy (ME). There were significant differences in the CP, IVOMD and ME values. Crude protein content ranged from 64.5 g/kg (Ass.11) to 80.5 g/kg DM (Acc.2), IVOMD from 526 (Ass.4) to 563 g/kg DM (Ass.9) and ME from 7.7 (Ass.4) to 8.3 MJ/kg (Ass.9). On the basis of superior CP, IVOMD and ME, *Andropogon gayanus* Accessions 2 and 9 may be recommended for forage utilization in Benue State.

1. Introduction

Benue State, one of the "Middle Belt" states of the country, lies in the southern Guinea savannah of Nigeria, east of the river Niger and south of the river Benue, between longitude 6° 45' and 8° 15'E and latitude 7° 30' and 9° 45'N with an estimated land area of 32,511 km^2. It exhibits the AW type climate i.e. tropical, seasonally wet and dry, according to the Koppen's classification scheme [5]. There is, on average, seven months of rainfall in the year with annual total ranging from 1,200 to 2,000 mm with the monthly highest in June, August and September [8]. Temperatures are high throughout the year with the average minimum ranging from 17.5 to 18.5°C in December and January while the maximum ranges from 28 to 32°C although it may occasionally reach 37°C in March – April [8].

The most widespread vegetation type is the savannah woodland. Essentially, the savannah woodland is dominated by grasses and shrubs with few tall trees. Grass species

that occur in this area include: *Andropogon gayanus, A. ascinodis, A. fastigiatus, A. pseudapricus*, *A. schirensis, A. tectorum, Beckeropsis uniseta, Brachiaria jubata, Cymbopogon giganteus, Hyparrhenia* species, *Hypathelia dissoluta, Monocymbium ceresiiforme, Panicum phragmitoides, Pennisetum pedicellatum, Schizachyrium sanguineaum* and *Urelytrium muricatum* [9].

Hitherto, very little attention has been directed towards developing the vast areas of natural grasslands vis-à-vis livestock production in Benue State. It has been estimated that gamba grass (*A. gayanus* Kunth.) the predominant grass species constitutes 60% of the grass biomass in the natural vegetation of the southern guinea savannah, which can contribute to livestock production in the state [9]. However, the abundant grassland resources are underutilized and even depleted through annual bush burning often in search of large wild rodents and other small mammals which when processed for consumption are collectively termed 'bush meat', a local delicacy. The fires have caused economic hardship in the loss of buildings and agricultural produce apart from the exposure of the soils to erosion. Knowledge of the nutritive value of this forage (*A. gayanus* Kunth.) in this area, which does not have any major industries, could lead to more systematic livestock production. An increase in livestock production would help solve part of the perennial protein shortage in the diet of the people, the major reason for hunting 'bush meat' as well as provide diversification in agricultural activities. Thus, increased livestock production will also help in the development of meat production, dairy and leather works.

For improved use of this forage (*A. gayanus* Kunth.) in the State, there is need to assess the nutritive value of the forage species (*A. gayanus* Kunth.) which is abundant in the state. The relative scarcity of data on CH_4 production from ruminants fed tropical forages particularly *A. gayanus* [2] [10] at various stages of maturity [6] suggests a need for further studies. The present study was therefore embarked upon to:-

Evaluate the parameters that constitute quality indices of the Benue State local accessions of *Andropogon gayanus* to determine those that may be suitable for utilization. bhopal

2. Materials and Methods

The study was conducted in three locations viz. Makurdi (7°43'N, 8°32'E), Otukpa (7°04'N, 7°39'E) and Yandev (7°22'N, 9°02'E) in Benue State, which lies in the southern Guinea savanna zone of Nigeria (Figure. 1).

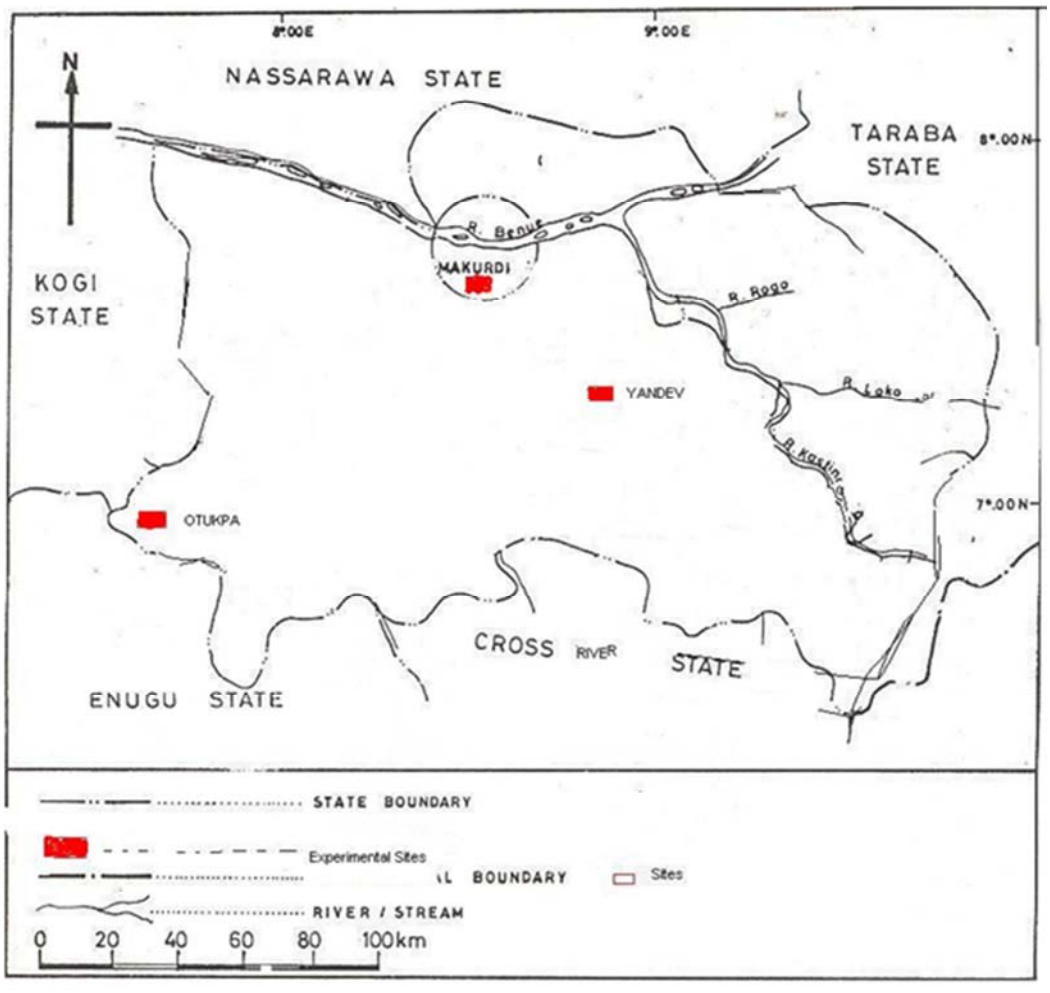

Figure 1. *Map of Benue State showing Experimental sites.*

Crown splits of *Andropogon gayanus* ecotypes were collected from 20 locations in Benue and Kogi States (Figure. 2) i.e. from Benue State: Otukpa I, Makurdi I, Otukpa II, Owukpa I, Naka I, Otukpo I, Makurdi II, Yandev I, Katsina-Ala, Makurdi III, Makurdi IV, Adoka I, Owukpa II, Naka II, Makurdi V, Adoka II and Gbajimba with Ankpa I, Ankpa II and Idah from Kogi State.

The Makurdi site was previously cropped to maize and groundnut while the Otukpa and Yandev sites were cropped to maize and groundnut, and maize and melon, respectively.

When the rainy season was well established, the sites were ploughed and harrowed. The crown splits were planted in three locations in Benue State viz. Makurdi at the University of Agriculture.

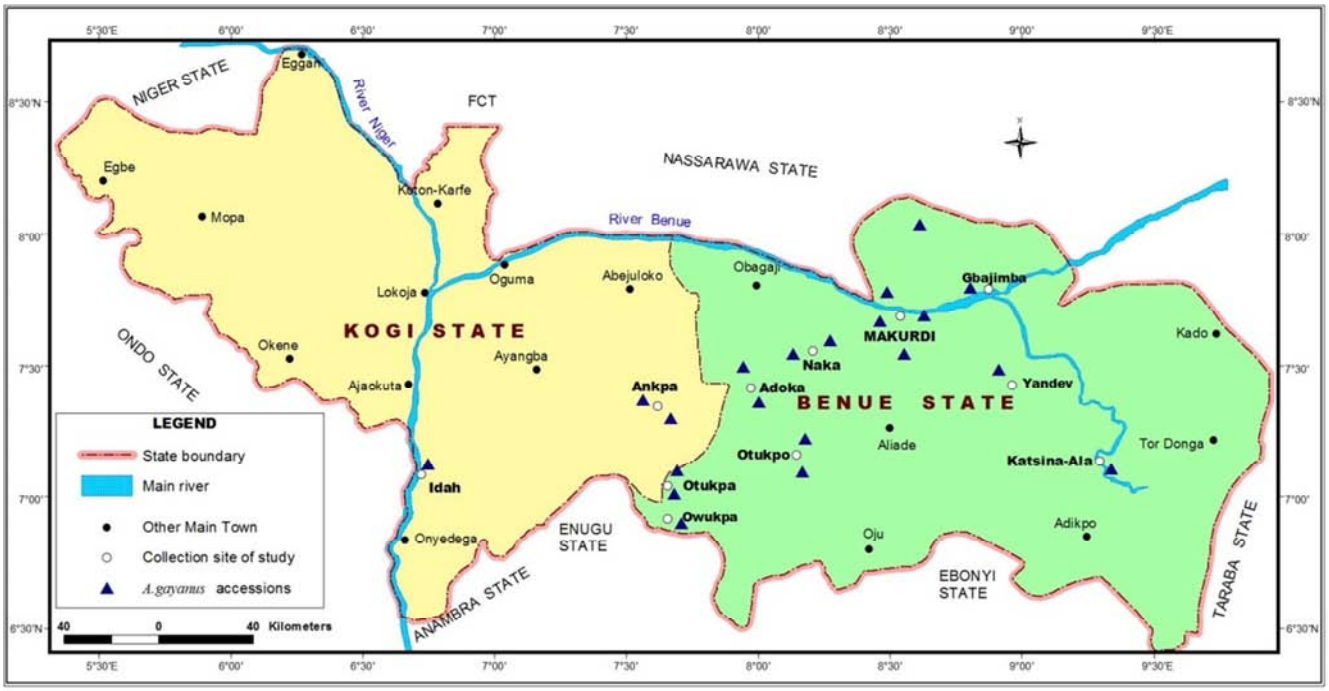

Figure 2. *Map of Benue and Kogi States showing locations where A. gayanus accessions were collected.*

Livestock Teaching and Research Farm, Otukpa and Experiment Station at Yandev. Crown splits taken from locations close to each other were planted at all sites within two to three days of removal from the soil of its original habitat. This was done to ensure that crown splits were not left too long on the ground after to enable them retain viability. Crown splits of each accession were set every 50 cm in single, 4 m long row plots spaced 1 m apart and arranged in a completely randomized design with three replicates. Soil samples (0-15 cm depth) were taken from the three sites and analysed for physical and chemical parameters. During the establishment the plots were weeded as necessary to minimize weed competition and subsequently at each harvest.

In the following two years, with the full establishment of rains in June, surviving plants at the three sites were cut at 15 cm above ground level and the cut herbage discarded. The plots were subsequently harvested every six weeks with the third and last harvest in October at the onset of the dry season. After each harvest except the last, nitrogen fertilizer (N: P: K, 20:10:10) was applied at a rate to supply 20 kg of nitrogen per hectare (20 kg N/ha). After the last harvest, the plants were rested and allowed to grow to flowering for observation of morphological features viz. leaf and stem characteristics. The fresh herbage was sub-sampled, separated into leaf i.e. lamina and the stem with leaf sheath portions, weighed and oven-dried at 70°C to constant weight. The dried samples were then milled in a RETSCH milling machine and passed through a 0.5 mm sieve. The milled samples were subjected to chemical analysis.

Crude protein (CP) content of each sample was determined using the modified Kjeldhal method, which involved the use of the Tecator digesting block set at 340°C and Spectrophotometer set at 584 nm as outlined by AOAC. [4], while ether extract (EE) and organic matter (OM) were determined using the modified method outlined by AOAC. [4]. The neutral detergent and acid detergent fibres (NDF and ADF) were determined according to the modified acid detergent (MAD) fibre procedure of Van Soest [12]. The minerals were determined using the inductively coupled plasma spectrophotometer (I. C. P.) in accordance with the manufacturer's instruction manual. *In-vitro* organic matter digestibility (IVOMD) was determined according to Tilley and Terry's [11] two-stage technique as modified by Alexander [3] using rumen liquor obtained from a canula-fitted sheep fed high quality oat hay at the Scottish Agricultural College (SAC) Teaching and Research Farm in Scotland. The metabolizable energy (ME) was calculated from the determined OM and IVOMD i.e. ME (MJ/kg) = [(%IVOMD x 1.207) - 10.21(OM/1000) x 0.16)] [2]; (where

1.207, 10.21 and 0.16 are constants used for the purpose if the material under consideration is grass hay). All laboratory analyses were carried out at the Biochemical Sciences II Laboratory of the Scottish Agricultural College, Scotland in the United Kingdom.

In the second year, as in the previous year, plants were cut 15 cm above ground level every six weeks and cut herbage weighed. Same treatments were carried out on the samples as in the first year. All the data generated were subjected to analysis of variance and Means with significant differences were separated using the Fisher's Test of significance as embedded in the Minitab Statistical Software [7].

3. Results

Chemical composition, dry matter content, digestibility and metabolizable energy of *Andropogon gayanus* accessions in Benue State.

The chemical composition of *Andropogon gayanus* accessions in Benue State are presented in Table 1.

3.1. Crude Protein (CP)

Accession 2 recorded the highest CP content of 80.5 g/kg. This was significantly different from the values of the remaining twelve accessions with CP contents ranging between 64.5 and 76.0 g/kg. Accession 19 recorded the second highest CP content of 76.0 g/kg after Acc.2. This was, however, not significantly different from the CP content of three other accessions i.e. 5, 7 and 10 with 74.0, 75.5 and 75.5 g/kg, respectively. Of these three accessions i.e. 5, 7 and 10, accessions 7 and 10 were significantly different from the CP content of the remaining eight accessions, while Acc.5 was not significantly different from the CP value of Acc.9, but significantly different from those of the remaining seven accessions. Accession 9 was not significantly different from the CP values of two other accessions i.e. 14 and 18 with 70.0 and 69.6 g/kg, respectively but significantly better than those of the remaining five accessions. Accession 14 with a CP value of 70.0 g/kg was not significantly different from the CP content of three other accessions viz. 4, 6 and 18 (68.5, 67.5 and 69.5 g/kg, respectively) but significantly different from those of the remaining three accessions i.e. 3, 11 and 20. Out of these three remaining accessions, Acc.11 recorded the lowest CP content of 64.5 g/kg which was not significantly different from the values of accessions 3 and 20 (67.0 and 66.5 g/kg, respectively) but significantly so from all the other accessions.

3.2. Ether Extracts (EE)

Accession 5 recorded the highest EE content of 12.7 g/kg. This was, however, not significantly different from the EE contents of accessions 3 and 6 with 12.3 and 12.5 g/kg, respectively. Out of these three accessions, accessions 5 and 6 excluding Acc 3, were significantly different from the remaining ten accessions. Accession 3 was not significantly different from two other accessions i.e. 4 (11.8 g/kg) and 20 (11.8 g/kg), but significantly so from the remaining eight accessions. Accession and 20 recorded the fourth highest EE content of 11.8 g/kg which was not significantly different from the values of seven other accessions i.e. 2, 4, 9, 10, 14, 18 and 19 with EE contents ranging between 11.5 Acc.2) and 11.8 g/kg (Acc.4) but significantly different from the values of the remaining two accessions i.e. 7 and 11. Accession 11 recorded the lowest EE content of 9.5 g/kg which was significantly different from all other accessions.

3.3. Acid Detergent Fibre (ADF)

Accession 20 recorded the highest ADF content of 425.3 g/kg. This was not significantly different from the ADF content of Acc.11 with 421.8 g/kg. Excluding Acc.11, Acc.20 was significantly different from the remaining eleven accessions with ADF values ranging between 379.0 and 418.0 g/kg. Accession 11 was not significantly different from the ADF values of two other accessions viz. 5 and 14 with 417.3 and 418.0 g/kg, respectively, but significantly so from the remaining nine accessions. Accession 7 recorded ADF content of 411.0 g/kg which was not significantly different from the value for Acc.9 (409.5 g/kg) but significantly better than those of the remaining seven accessions. Accession 19 with 401.8 g/kg of ADF, was not significantly different from those of two other accessions viz. 4 and 6 with 398.3 and 400.3 g/kg, respectively. These three accessions i.e. 4, 6 and 9, were however, significantly different from those of the remaining four accessions viz. 2, 3, 10 and 18. Accessions 10 and 18 with ADF contents of 393.0 and 390.5 g/kg, respectively, were not significantly different from each other, but significantly different from those of the remaining two accessions viz. 2 and 3. Accession 2 recorded the lowest ADF content of 379.0 g/kg which was not significantly different from the value for Acc.3, but significantly so from all the other accessions.

3.4. Neutral Detergent Fibre (NDF)

Accession 20 recorded the highest NDF content i.e. cell wall constituents, of 716.0 g/kg. This was significantly different from the remaining twelve accessions with NDF content ranging between 658.5 (Acc.3) and 705.0 g/kg (Acc.11). Accession 11 recorded the second highest NDF content of 705.0 g/kg after Acc.20. This value was not significantly different from those of other two accessions viz. 5 and 9 with NDF contents of 702.0 and 700.0 g/kg respectively. Excluding accessions 5 and 9, Acc.11 was significantly different from the remaining nine accessions. Accessions 5 and 9 were not significantly different from two other accessions viz. 14 and 19 (699.5 and 699.0 g/kg, respectively). These four accessions i.e. 5, 9, 14 and 19 were, however, significantly different from the NDF contents of the remaining seven accessions. Accession 4 recorded an NDF content of 690.5 g/kg, which was not significantly different from the contents of two other accessions viz. 7 and 10 (687.5 and 686.5 g/kg respectively). Out of these three accessions i.e. 4, 7 and 10, Acc.10 NDF content was not

significantly different from the content of Acc.6 (682.0 g/kg). Accession 6, in turn, was not significantly different from the content of Acc.2 (680.0 g/kg). These two accessions i.e. 2 and 6 were significantly different from those for the remaining two accessions viz. 3 and 18. Accession 3 recorded the lowest NDF content of 658.5 g/kg which was significantly different from all other accessions.

Table 1. *Chemical composition of Andropogon gayanus accessions of Benue State.*

Accessions	CP	EE	ADF	NDF
			g/kg	
1	nr	nr	nr	nr
2	80.5a	11.5c	379.0f	680.0f
3	67.0fgh	12.3ab	382.8f	658.5h
4	68.5efg	11.8bc	398.3d	690.5d
5	74.0bc	12.7a	417.3b	702.0bc
6	67.5efg	12.5a	400.3d	682.0ef
7	75.5b	10.5d	411.0c	687.5d
8	nr	nr	nr	nr
9	72.0cd	11.5c	409.5c	700.0bc
10	75.5b	11.7c	393.0e	686.5de
11	64.5h	9.5e	421.8ab	705.0b
12+	nr	nr	nr	nr
13	nr	nr	nr	nr
14	70.0de	11.5c	418.0b	699.5c
15	nr	nr	nr	nr
16	nr	nr	nr	nr
17	nr	nr	nr	nr
18+	69.5de	11.6c	390.5e	674.5g
19+	76.0b	11.5c	401.8d	699.0c
20	66.5gh	11.8bc	425.3a	716.0a

DM = Dry matter; CP = Crude protein; EE = Ether extract; ADF = Acid detergent fibre; NDF = Neutral detergent fibre; OM = Organic matter; IVOMD = *In-vitro* organic matter digestibility; ME = Metabolizable energy
* Means in the column followed by the same letter(s) are not significantly different at the 5% level by Duncan's multiple range test.
ns = no significant differences among accessions
+ Kogi State accessions
nr = no records owing to poor stand establishment.

The dry matter content, digestibility and metabolizable energy of the accessions are presented in Table 2.

3.5. Dry Matter (DM) Content

Accession 14 recorded the highest DM content of 341.0 g/kg which was not significantly different from the value for Acc. 7, but significantly higher than the values of the remaining 11 accessions which had DM contents ranging from 262.4 to 313.8 g/kg. Accession 19 recorded the lowest DM content of 262.4 g/kg which was not significantly different from the value for Acc. 6, but significantly different from all the other accessions.

3.6. Organic Matter (OM)

Organic Matter content ranged from 896.5 g/kg for Acc.4 to 906.0 g/kg for Acc.3. There were no significant differences among accessions.

3.7. *In-Vitro* Organic Matter Digestibility (IVOMD)

Accession 9 recorded the highest IVOMD value of 563 g/kg. This was significantly different from the IVOMD values of the remaining twelve accessions with values ranging between 526 (Acc.4) and 550 g/kg (Acc.6). Accession 6 recorded the second highest IVOMD value of 550 g/kg after Acc.9. This was, however, not significantly different from the value of one other accession viz. 20 (546 g/kg), but significantly so from the values of the remaining ten accessions. Accession 14 and 20 with IVOMD values of 541 and 546 g/kg respectively, were not significantly different from each other. However, Acc.20 was significantly different from the remaining nine accessions. Accession 14, on the other hand, was not significantly different from six other accessions viz. 2, 3, 5, 7, 10 and 18 with values ranging from 536 (Acc.7) to 540 g/kg (Acc.5). Excluding accessions 5 and 14, five accessions viz. 2, 3, 7, 10 and 18 were not significantly different from the value for Acc.19 (533 g/kg). Accession 4 recorded the lowest IVOMD value of 526 g/kg which was not significantly different from the IVOMD value of Acc.11 (530 g/kg), but significantly so from all other accessions.

3.8. Metabolizable Energy (ME)

There were no significant differences in ME among accessions. Metabolizable energy levels ranged from 7.7 MJ/kg for Acc.4 to 8.3 MJ/kg for Acc.9.

Table 2. *Dry matter content, digestibility and metabolizable energy of Andropogon gayanus accessions of Benue State.*

Accessions	DM[1]	OM	IVOMD	ME
		g/kg		MJ/Kg.
1	nr	nr	nr	nr
2	291.8e*	897.5	538de	7.9
3	300.8cde	906.0	537de	7.9
4	303.9bcd	896.5	526g	7.7
5	295.6de	899.5	540g	7.9
6	271.2f	904.5	550b	8.0
7	329.4a	900.0	536de	7.8
8	nr	nr	nr	nr
9	294.4de	898.5	563a	8.3
10	298.7cde	899.5	538de	7.9
11	313.8b	904.5	530fg	7.8
12+	nr	nr	nr	nr
13	nr	nr	nr	nr
14	341.0a	897.0	541cd	7.9
15	nr	nr	nr	nr
16	nr	nr	nr	nr
17	nr	nr	nr	nr
18+	303.2bcde	899.5	538de	7.9
19+	262.4f	902.0	533ef	7.8
20	309.0bc	902.5	546bc	7.9
		ns		ns

* Means in the column followed by the same letter(s) are not significantly different at the 5% level by Duncan's multiple range test
[1] DM = Dry matter; OM = Organic matter; IVOMD = *In-vitro* organic matter digestibility; ME = Metabolizable energy;
ns = no significant differences among accessions + Kogi State accessions.
nr = no records owing to poor stand establishment

4. Mineral Composition

The mineral content values of the *A. gayanus* accessions are presented in Table 3.

4.1. Calcium (Ca)

Accessions 10 and 19 recorded the highest Ca contents of 6400 mg/kg. These were not significantly different from the values of accessions 2 and 7 with 6100 and 6200 mg/kg, respectively. Excluding accessions 2 and 7, these two accessions i.e. 10 and 19, were significantly different from the remaining nine accessions with Ca values ranging between 5200 and 5900 mg/kg. Accessions 2 and 7 were not significantly different from the Ca content of Acc.14 (5900 mg/kg), but differed significantly from the remaining eight accessions. The Ca value of Acc.14 was not significantly different from those of five other accessions viz. 4, 5, 6, 18 and 20 with values which ranged from 5600 (Acc.6) to 5800 mg/kg (Acc.4). In addition to accessions 5, 6 and 18, Acc.20 was not significantly different from the Ca value of Acc.9 (5400 mg/kg). Accession 3 recorded the lowest Ca content of 5200 mg/kg which was not significantly different from the Ca values of accessions 9 and 11 (5400 and 5200 mg/kg, respectively), but significantly so from all other accessions.

4.2. Sodium (Na)

Accessions 9 and 18 recorded the highest amount of Na content of 50.0 mg/kg each. This was significantly different from the Na content of the remaining eleven accessions with Na values ranging between 0.50 to 35.0 mg/kg. Accession 3 recorded the next highest Na content of 35.0 mg/kg, which was significantly different from Na contents of the remaining ten accessions. Accession 10 with 20.0 mg/kg of Na was not significantly different from the Na content of Acc.7 (15.0 mg/kg), but significant so from the remaining eight accessions. Accession 7 was not significantly different from the values of two other accessions viz. 4 and 6 with 10.0 and 10.0 mg/kg, respectively, but differ significantly from the remaining six accessions. These two accessions i.e. 4 and 6, did not also differ significantly from two other accessions viz. 2 and 5 (5.0 and 5.0 mg/kg, respectively) but significantly so from the remaining four accessions. Accessions 11, 14, 19 and 20 recorded the lowest Na content of 0.1 mg/kg which were not significantly different from the values of accessions 2 and 5, but significantly so from all other accessions.

4.3. Phosphorus (P)

Accession 10 recorded the highest P content of 1600 mg/kg. This was not significantly different from the P content of Acc.7 (1500 mg/kg), but significantly different from those of the remaining eleven accessions with values ranging from 1000 (Acc.6) to 1400 mg/kg (Acc.19). Accession 7 was not significantly different from the P content of three other accessions viz. 2, 3 and 19 with P content of 1400 mg/kg each, but significantly different from the remaining eight accession. Accession 19 was not significantly different from the P content of eight other accessions i.e. 2, 3, 4, 5, 9, 14, 18 and 20 with P content ranging between 1300 (Acc.4) and 1400 mg/kg (Acc.3), but significantly so from the remaining two accessions viz. 6 and 11. Six accessions i.e. 4, 5, 9, 14, 18 and 20, recorded non-significant P contents of 1300 mg/kg each which was not also significantly different from the P content of Acc.11 (1200 mg/kg), but significantly so from the P content of Acc. 6. Accession 6 recorded the lowest P content of 1000 mg/kg which was significantly different from all other accessions.

4.4. Magnesium (Mg)

The highest Mg content was recorded by Acc.7 (11900 mg/kg). This was not significantly different from the Mg content of Acc.11 (11700 mg/kg). These two accessions i.e. 7 and 11, were, however, significantly different from the remaining eleven accessions with Mg content ranging between 1600 (Acc.3) and 2300 mg/kg (Acc.20). Accession 20 recorded the third highest Mg content after Acc.7 and 11, its Mg content was not significantly different from the Mg content of two other accessions i.e. 4 and 14 with 2100 mg/kg each. It was, however, significantly different from those of the remaining eight accessions. Accession 14 (2100 mg/kg) was not significantly different from the Mg contents of four other accessions viz. 2, 4, 9 and 19 with values ranging between 1900 and 2100 mg/kg, but significantly different from the values of the remaining five accessions. Accession 9 recorded an Mg content of 2000 mg/kg which was not significantly different from the values of five other accessions viz. 2, 5, 6, 10 and 19 with values ranging between 1800 (Acc.5) and 1900 mg/kg (Acc.19), but significantly so from those of the remaining two accessions i.e. 3 and 18 (1600 and 1700 mg/kg respectively). Accession 3 recorded the lowest Mg value of 1600 mg/kg which was not significantly different from those of other four accessions viz. 5, 6, 10 and 18 with Mg values that ranged from 1700 to 1800 mg/kg, but significantly so from all other accessions.

4.5. Potassium (K)

Accessions 9 recorded the highest K content of 21900 mg/kg. This was not significantly different from the value of Acc.2 (21500 mg/kg), but significantly different from those of the remaining eleven accessions with values ranging between 18.9 (Acc.11) and 21300 mg/kg (Acc.5). Accession 2 was not significantly different from the K contents of three other accessions viz. 5, 10 and 20 with K contents of 21300, 21100 and 21200 mg/kg, respectively, but significantly so from the remaining eight accessions. In addition to accessions 10 and 20, Acc.5 was, also not significantly different from Acc.19 (20900 mg/kg), but significantly different from the values of the remaining seven accessions. Accession 20 (21200 mg/kg) was not significantly different from the K values of four other accessions viz. 7, 10, 18 and 19 with K values ranging from 20800 (Acc.7) to 21100 mg/kg (Acc.10), but differed significantly from the remaining five accessions. Out of these five accessions i.e. 3,

4, 6, 11 and 14, Acc.6 and 14 (19700 and 19900 mg/kg, respectively) were not significantly different from each other, but significantly so from the remaining three accessions viz. 3, 4 and 11. Accession 11 recorded the lowest K content of 18900 mg/kg which was not significantly different from those of Acc.3 and 4 (19100 and 19200 mg/kg, respectively) but significantly so from all other accessions.

4.6. Calcium: Phosphorus Ratio

Calcium: Phosphorus ratio ranged between 4:1 and 6:1. With the exception of accessions 6, 14 and 19 with Ca:P ratios of 6:1, 5:1 and 5:1 respectively, the remaining ten accessions recorded Ca: P ratios that were similar.

Table 3. *Mineral composition of Andropogon gayanus accessions of Benue State.*

Accession number	Ca[1]	Na	P	Mg	K	Ca: P ratio
	mg/kg					
1	nr	nr	nr	nr	nr	nr
2	6100ab*	5.0ef	1400bc	1900cde	21500ab	4:1
3	5200e	35.0b	1400bc	1600f	19100f	4:1
4	5800c	10.0de	1300cd	2100bc	19200f	4:1
5	5700cd	5.0ef	1300cd	1800def	21300bc	4:1
6	5600cd	10.0de	1000e	1800def	19700e	6:1
7	6200ab	15.0cd	1500ab	11900a	20800d	4:1
8	nr	nr	nr	nr	nr	nr
9	5400de	50.0a	1300cd	2000cd	21900a	4:1
10	6400a	20.0c	1600a	1800def	21100bcd	4:1
11	5200e	0.1f	1200d	11700a	18900f	4:1
12+	nr	nr	nr	nr	nr	nr
13	nr	nr	nr	nr	nr	nr
14	5900bc	0.1f	1300cd	2100bc	19900e	5:1
15	nr	nr	nr	nr	nr	nr
16	nr	nr	nr	nr	nr	nr
17	nr	nr	nr	nr	nr	nr
18+	5600cd	50.0a	1300cd	1700ef	20800d	4:1
19+	6400a	0.1f	1400bc	1900cde	20900cd	5:1
20	5700cd	0.1f	1300cd	2300b	21200bcd	4:1

[1] Ca = Calcium; Na = Sodium; P = Phosphorus; Mg = Magnesium; K = Potassium; Ca:P = Calcium phosphorus ratio; * Means in the column followed by the same letter(s) are not significantly different at the 5% level by Duncan's multiple range test; ns = no significant differences among accessions;
+ Kogi State accessions;
nr = no records owing to poor stand establishment

5. Discussion

The nutritional characteristics recorded in Makurdi indicated that DM, CP and IVOMD values were generally higher than those reported by Ademosun and Baumgardt [1] for *A. gayanus* genotypes from Ibadan, in southwest Nigeria. These differences may reflect genotypic and environmental differences. In the present study, the variability in chemical composition, digestibility and mineral composition also indicates genotypic differences within the species which may be exploited in selecting for improved nutritional value. Accession 10 exhibited relatively high nutritive value contents when averaged over the three locations of the study with CP content above the 70 g/kg that is critical in respect of intake of tropical forages and had an IVOMD that was not significantly different from the highest value. Accession 10 may therefore be considered promising for forage utilization in Benue State.

6. Conclusion

The nutritional characteristics recorded in Makurdi indicated that DM, CP and IVOMD values were generally higher than those reported by Ademosun and Baumgardt [1] for *A. gayanus* genotypes from Ibadan, in southwest Nigeria. These differences may reflect genotypic and environmental differences. In the present study, the variability in chemical composition, digestibility and mineral composition also indicates genotypic differences within the species which may be exploited in selecting for improved nutritional value. Accessions 2 and 9 exhibited relatively high nutritive value contents when averaged over the three locations of the study with CP content above the 80.5 g/kg that is critical in respect of intake of tropical forages and had an IVOMD that was not significantly different from the highest value. Accessions 2 and 9 may therefore be considered promising for forage utilization in Benue State.

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