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EFFECTS OF FORAGE TYPES AND CUTTING INTERVAL ON BIOMASS YIELD AND CHEMICAL COMPOSITION OF SELECTED FORAGES

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ABSTRACT
A 12-week investigation was conducted on effect of forage types and cutting interval on herbage yield and chemical composition of selected forages. Three forages (maize, millet and sorghum) and five cutting intervals (2, 4, 6, 8, 10 and 12 post planting) were laid in 3 x 5 factorial arrangement using randomized completely block design. The treatments were replicated three times. Results revealed that among the three selected forages, the value recorded for herbage yield of maize (493.13g) was significantly ($P<0.05$) higher than other forage types while the highest biomass yield was recorded for 12 weeks post planting (470.11g). Millet had the highest value for dry matter (90.48%), crude protein (11.43%) but lower NDF (60.78%). Dry matter content was increasing while crude protein was decreasing with advancement in cutting intervals. Therefore, millet harvested at 12 weeks post planting had better dry matter and chemical compositions. This study showed that Maize produced better yield, thus it could serve as a fodder bank for ruminant production. It could be concluded that maize had better herbage yield than other forages while cutting of the three selected forages can be done up to 12th weeks for optimum utilization.

Key words: Biomass yield, Forage types, Cutting interval.

DESCRIPTION OF PROBLEM

The major constraint faced by ruminant farmers in Nigeria is how to make quality forage available for their animal all year round (1; 2). In developing countries, the variability in quality and quantity of pasture available to grazing animal all year round are the main challenge in Livestock production (3). Low quantity and quality of forages available on grazing lands was perhaps responsible for encroachment of many nomadic herdsmen grazing animals on arable farmland during cropping season. This consequence is causing severe damages to and loss of arable crops and lives of farmers resisting the nomads (4). This poses urgent need for sustainable feed supply for livestock production. The area under green forage is shrinking due to increase in human population and urbanization (5) while pasture are degraded, poorly managed leading to a fluctuation in quality and quantity of all year round feeds resource to meet the nutritional requirement of ruminants (6). Forages remain the bed rock of ruminant's nutrition in quantity and quality: therefore its significance in ruminants' production cannot be over –stressed. (1) Observed that forage is relatively available and lower in cost when compared with concentrate diets in ruminant production. Production of good quality fodder is of great importance in ruminant's production both in quantity and quality. Stage of growth is one of the most important factors affecting nutritional quality of fodder (7).

Objective of the study

To evaluate the effects of cutting age on biomass yield and chemical composition of maize, sorghum and millets forages.

MATERIALS AND METHODS

Experimental site

The experiment was carried out at the Teaching and Research Farm, Osun state University, College of Agriculture, Ejigbo Campus. The experimental site was located on the latitude 7 ^{0} 54 N and longitude 4 ^{0}18 E and at and 4 ^{0} S 4 E M.

Land preparation

Land measuring 100 m x 30m (3,000m^2) was ploughed and harrowed. Forty-five seed beds

were made and each bed measured 3 m x 3 m in area ($9m^2$) each seed bed was separated by a space of 2 m distance. Nine seed beds represented a block and in each of the blocks were three treatments.

Planting materials

The planting materials comprised seeds of three cereals (Sam maize -43, Sorghum Almum and Pear Millet. The forages seeds were purchased from a reputable research institute Kaduna Nigeria.

Experimental layout and experimental design

The experimental layout had 45 seed bed comprising of 15 treatments in three replicates. The experimental design was 3 x 5 factorial arrangements in a randomized complete block design. Weeding was carried out manually on all the seed beds as at when necessary.

Data collection

The first harvesting was carried out when the three forages were four weeks old , while the subsequent one were taken at six, eight, ten and twelve weeks old. The agronomic parameters measured were: plant height, number of leave and leaf to stem ratio.

Dry matter determination

About 200g of each sample of maize, sorghum and millet were weighed and parked in large sized envelope. Each of the envelopes was number and carefully placed in an oven (Model Memmert), and allowed to dry.

Laboratory analysis

The oven dried samples forages were analyzed chemically according to the official methods (9).

RESULTS AND DISCUSSION

Effects of forage types and cutting ages on agronomic parameters

The effects of forage types and cutting ages on agronomic parameters are presented in Table 1. The value recorded for Biomass yield for Maize was significantly higher than other forage type while Sorghum has the lowest value. The plant height values ranged between 191.33cm (Maize) and 181.67cm (Sorghum). The value recorded for number of leaves for Maize was significantly higher ($p< 0.05$) than other forages. The value recorded for age at harvest for biomass yield revealed that forage cut at 12 weeks was significantly highest ($p<0.05$) but similar ($p<0.05$) for forages cut at age 8 and 10 weeks and were significantly higher ($p<0.05$) than the forages cut at age 4 and 6 weeks. The plant height at 12 was significantly higher ($P<0.005$) than other ages. The results of this study confirmed that as the forage advance in age, it leads to a significant increase in yield, this was in agreement with the findings of (10) and (11) who reported that a pronounced increased in fresh yield was observed when the crop was harvested at 55days compared to harvesting at 45 days.

Table1 Effects of forage types and cutting ages on agronomic parameters

GT	Growth parameters				
	BMY(g)	PH(cm)	N/L	L/SL	L/S
Maize	493.13^{a}	191.33^{a}	9.47^{a}	21.80^{a}	149.53^{a}
Millet	296.00^{b}	177.73^{c}	6.80^{b}	29.27^{b}	92.20 ^{b}
Sorghum	169.73^{c}	181.67^{b}	6.27^{b}	21.80^{b}	52.60^{c}
SEM	25.99	8.69	0.25	3.66	7.99
P- Value	0.250	0.327	0.000	0.000	0.000
Age					
4	88.11^{b}	82.33^{e}	5.22^{c}	16.78^{c}	10.89d
6	179.00^{b}	135.22^{d}	7.00^{b}	34.89^{b}	56.00^{c}
8	402.00^{a}	193.78^{c}	8.33^{a}	45.44^{ab}	124.44^{b}
10	458.89^{a}	236.56^{b}	8.67^{a}	49.22^{ab}	143.33
12	470.11^{a}	270.00^{a}	8.33^{a}	57.11^{a}	155.89^{a}
SEM	33.56	11.23	0.33	4.73	10.32
P-Value	0.000	0.530	0.000	0.000	0.000

abcd: means within the same row with different superscripts are significantly different($P<0.05$).

Key: GT-grain type, BMY-biomass yield (g). PH- plant height (cm). NL- number of leaves. LSL- leave to stem ratio, leave. LSS-leave to stem ratio.

Effects of forage types and cutting ages on chemical composition

From Table 2, the Crude fibre for Maize is 31.33%, Millet is 33.57% and 32.28% for sorghum.

The values recorded for Crude Protein (CP) ranged between 10.09 (Maize) and 11.43 (Millet). The result shows that Millet had the highest CP value (11.43%) which was significantly higher ($p<0.05$) than other treatment types. The forage cut at 4 weeks had the highest ($p<0.05$) value of CF while the forage cut at 12 weeks had significantly lowest ($p<0.05$) value. The value for NDF at 8 weeks was significantly higher ($p<0.05$) than other cutting ages. ADF value at 6 weeks had a significantly highest ($p<0.05$) value while the lowest value was recorded at 12 weeks of age. The ADL value at 6weeks was significantly higher ($p<0.05$). The result on effects of forage types and cutting ages on chemical composition revealed that the dry matter increases as the age of fodder advanced in maturity. But crude protein decrease as the fodder advances in age. The results clarified that advanced maturation of green forage caused a clear decline in the Crude protein content. This was confirmed by findings of (12). The low values of NDF and ADF observed at 10th and 12th week suggest that ruminants will make better use of forage. It could be deduced that ruminants will utilize the forage for optimum production if harvested up to 10th- 12th week.

Table 2: Effects of forage types and cutting ages on chemical composition

	DM	ASH	EE	CF	CP	NDF	ADF	ADL
GT								
Maize	89.32^{b}	11.26^{b}	7.19^{a}	31.33^{c}	10.09^{c}	60.93^{a}	36.25^{b}	23.96
Millet	90.48^{a}	12.11^{a}	5.54^{c}	33.57^{a}	11.43^{a}	60.78^{b}	36.96^{a}	24.24
Sorghum	88.70^{c}	10.64^{c}	6.32^{b}	32.28^{b}	10.90^{b}	60.83^{ab}	36.77^{a}	23.96
SEM	0.09	0.05	0.04	0.05	0.04	0.04	0.14	0.05
P-Value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AGE								
4	88.75^{c}	14.20^{a}	6.12^{b}	33.11^{b}	13.15^{a}	60.86^{c}	34.76	21.74^{c}
6	87.81^{d}	11.87^{b}	6.76^{a}	34.67^{a}	11.53^{b}	62.95^{b}	43.72^{a}	29.78^{a}
8	87.92^{d}	10.14^{d}	5.61^{c}	32.62^{c}	10.25^{c}	67.68^{a}	38.28^{b}	26.64^{b}
10	91.19^{b}	9.60^{e}	6.69^{a}	31.19^{d}	9.56^{d}	59.56^{d}	34.71	21.16^{d}
12	91.89^{a}	10.64^{c}	6.612^{a}	30.01^{e}	9.24^{e}	53.09^{e}	31.39	20.93^{e}
SEM	0.11	0.06	0.05	0.06	0.05	0.05	0.17	0.06
P-Value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

abcd: means within the same row with different superscripts are significantly different($P<0.05$).

Key: DM-dry matter ASH EE-ether extract CF-crude fiber CP-crude protein NDF-neutral detergent fiber ADF-acid detergent fiber ADL-acid detergent lignin

CONCLUSION AND APPLICATION

It could be concluded that maize had better herbage yield than other forages while cutting of the three selected forages can be done up to 12th weeks for optimum utilization.

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