EFFECTS OF GROUNDNUT FOARAGE ON THE ENSILING QUALITY OF GAMBA GRASS

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ABSTRACT
The study was designed to determine the effects inclusion of groundnut forage on the ensiling quality of gamba grass. Field grown gamba grass (Andropogon gayanus Kunth.) was incorporated with groundnut (Arachis hypogaea L.) forage at graded levels and ensiled for 21 days incubation period in laboratory silos. After incubation period, the resultant silages were scored for colour, aroma, and pH. Proximate compositions, fiber fractions, digestible matter, dry matter intake, metabolizable energy and reference feed value were also determined. The result revealed that the resultant silages moderately acidic, pale yellow coloration and averagely very sweet. Groundnut inclusion improved CP, EE, NFE, Ash, TDN, DDM, DMI, RFV and ME with corresponding declined in fiber fractions. Groundnut inclusion at 60% level is recommended for ensiling gamba grass. Further research to determine voluntary feed intake and animal performance were also recommended.
Key words: groundnut, gamba grass, silage, proximate analysis

INTRODUCTION

Animal production is an integral component of farming system that plays a significant role in sustainability and intensification of agricultural production. The rapid increases in human population and changes in dietary habits associated with rapid urbanization and higher income poses higher demand for food of animal origin. On the other hand, ruminant animal producers are experiencing serious challenges in feeding the animals particularly the long dry season (8 to 9 month). Over 90% of cattle and 70% of small ruminant animals in Nigeria were hosted in the semi-arid ecological zone of the country but the zone had the lowest forage resources and reports indicated increasing indices towards intensification of livestock in the country (Muhammad *et. al.,* 2009). The erratic supply of forage feed year round in the region leads to seasonal emaciation, weight loss, retarded growth, poor performance and consequently death in most livestock species (Owen *et al*., 2010) leading to significant loss of the animals and poor animal protein intake among the populace. These suggest the need for the production and conservation of high quality forages like gamba grass for future use. The two principal forage conservation methods are hay and silage. Silage offers advantages over hay as ensilage is not dependent on weather conditions; this will allow farmers to conserve high-quality forages during wet humid condition which is practically impossible for hay making (Kallah *et. al*., 1997), ensiled forages are secured against combustion, rodents' destruction and the regrowth following harvesting will provide additional feed for in-situ grazing. However, Tropical grasses were characterized as of poor quality due to low nutritional value, higher buffering capacity and low water soluble carbohydrate which counteract the desired quick acidification (Wilkins, 2010) leading to poorly fermented silage. Incorporation of legume with grass for ensilage will improve the silage quality (Baba *et al.,* 2016) by improving nutrient concentration, reduce buffering and prevent proteolysis (Lattemae and Tamm, 2002). Thus, the aims of the study was to determine the suitability of groundnut forage and its optimum inclusion level with gamba grass for better silage production.

MATERIALS AND METHODS

Experimental site: The study was conducted at Teaching and Research Farm of Bayero University, Kano. Kano is situated between latitude 11° 59ˆN and longitude 8° 36ˆE at an altitude of 460m above sea level. The climate is characterized by a well-defined wet season (May to September) and dry season (October to April). The mean annual rainfall varies from 600 to 1000 mm (KNARDA, 2001).

Experimental pasture and silage preparation: The forage materials were separately planted on a well prepared seed beds following ploughing and harrowing. The gamba grass was sampled at full inflorescence while groundnut was sampled at flowering to early pod stages. Intact whole plants were

separately chopped to 1 to 2 cm length. The groundnut forage was incorporated at 0, 20, 40 and 60 percent and designated as GB, GBGN20, GBGN40 and GBGN60 respectively. Each of the treatment combination was compressed and tightly screwed back in laboratory silo in three replicates and kept for 21 days incubation period. Thereafter, the silos were opened and contents were scored for colour and aroma on a scale of 1 – 4 (Table 1). The pH was determined using a digital pH meter. A sub sample from each replicates were taken and oven dried at 60^0C for 48hrs and preserved for chemical analysis.

Table 1: Description of colour and aroma rating used as indices of silage quality

Rating	Colour	Aroma
1	Dark or deep brown	Putrid or rancid
2	Light brown	Pleasant
3	Pale yellow	Sweet
4	Yellowish green	Very sweet

Sources (Muhammad *et. al*., 2009)

Chemical and statistical analysis

The dried silage samples were milled to 1mm using Tecator Cyclotec 1093 laboratory mill. Proximate analysis was carried out according to AOAC (1999), fiber fractions according to Van Soest *et. al.*, (1991). Metabolizable energy (ME) was estimated as described by Pauzenga (1985). Total digestible nutrients (TDN), digestible dry matter (DMI), dry matter intake (DDM) and relative feed value (RFV) were estimated according to Jeranyama and Garcia (2004). Data collected were analyzed using the General Linear Model of Statistical Analytical System (SAS, 1999-2000) package. Differences between the means were considered significant at 5% probability level.

RESULTS AND DISCUSSION

Silage characteristics: pH, aroma and colour of the compounded silages were presented in Table 2. Physical characteristics and nutritional value are yard sticks for judging silage quality (Penn State Extension, 2014). The resultant silages were moderately acidic, pale yellow and averagely very sweet. The result indicated that good silages were prepared as proved by its favorable pH, colour and aroma. The result were in agreements with the report of Baba *et al* (2016) and Abdulrahaman et. *al.* (2018).

Table 2: Effect of groundnut forage inclusion on pH, aroma and colour of gamba grass silages

Treatment	**Colour**	**Aroma**	**pH**
GB	3	3	3.9
GBGN20	3	4	4.4
GBGN40	3	4	4.5
GBGN60	3	3	4.8

Proximate composition:

The proximate composition of gamba-groundnut mixtures were presented in Table 3. The resultant silages were comparable ($P>0.05$) in percent dry matter. Higher DM content was noted in GB treatment. However, % DM for all the treatments satisfied recommended minimum requirement influencing feed intake (Rashid, 2008). Percent ash differed ($P<0.05$) from 4.65 to 6.10%. The %CP varied from 9.84 to 7.00%. Significant ($P<0.05$) higher and lower CP were recorded in GBLL60 and GB treatments respectively. The CP value recorded were above gestation and lactation requirement of matured goat (Yami and Merkel, 2008). Fibre is the slowly digestible or indigestible feed components, the CF is a gross estimate of energy content of a feed; the higher the CF, the lower the digestible energy (Machen, 2011). Increased groundnut level improved CP, Ash, EE and NFE with corresponding declined of DM and CF. The present result is in accordance with the report of Muhammad *et al,* (2009) and Abdurrahaman *et al.* (2018). The CP value for all the treatments evaluated meets the minimum requirement desirable for good rumen fermentation (Rego, *et. al*., 2010).

Table 3: Proximate composition (%) of mixed gamba grass-groundnut forage silages

Treatment	DM	ASH	CP	CF	EE	NFE
GB	95.35	4.65^{b}	7.00^{c}	45.10^{a}	1.72^{b}	46.18^{c}
GBGN20	94.70	5.30^{ab}	8.43^{b}	38.31^{b}	2.09^{ab}	51.17^{b}
GBGN40	94.20	5.80^{a}	9.12^{ab}	32.01^{c}	2.14^{ab}	56.73^{a}
GBGN60	93.90	6.10^{a}	9.84^{a}	30.45^{c}	2.52^{a}	57.19^{a}
SEM	3.05	1.10	1.30	4.50	0.50	4.25

Means with different letter superscripts within the same column differ significantly (P<0.05).

Fiber fractions, digestible matter, dry matter intake, reference feed value and metabolizable energy: percent fiber fractions (ADF, NDF), digestible matter (TDN, DDM), dry matter intake (DMI), reference feed value (RFV) and metabolizable energy (ME MJkg^{-1}) of gamba grass-groundnut silages were presented in Table 4. The fiber fractions of feedstuffs were partitioned to acid detergent fiber (ADF) and neutral detergent fiber (NDF). The ADF is the least digestible fibrous potions while NDF is considered a close estimate of the total fiber constituents. Groundnut inclusion negatively affect the ADF and NDF contents. The declined in NDF could be due to hydrolysis of hemicelluloses to monosaccharide that provides additional sugars for lactic acid production during ensiling. The declining trends observed were in accordance with findings of Mbuthia and Gachuiri (2003) and Ahmad *et al,* (2019). Groundnut inclusion improved TDN, DDM, DMI, ME and RFV with corresponding declined in ADF and NDF. The increasing trends observed agreed with the finding of Baba *et al* (2016) who reported higher DMI, DDM, TDN and RFV in mixed grass-legume forages. The ME of the resultant silages satisfied daily requirement of cow at 6 – 8 months pregnancy (Moran, 2005) and maintenance requirement of 800kg cow (Herdt, 2018). The RFV is a predictor of forage intake and energy value (Lithourgidis *et al.* 2006). Inclusion of groundnut at 60% level results fairly good silage as feed with less than 75% RFV value were rejected (Albayrak, 2012).

Table 4: Fiber fractions, digestible matter, dry matter intake and metabolizable energy of mixed gamba grass-groundnut silages

Treatment	NDF	ADF	TDN	DDM	DMI	ME	RFV
GB	77.10^{a}	53.21^{a}	32.66^{d}	1.56^{b}	47.45^{c}	15.24^{e}	57.23^{d}
GBGN20	63.40^{bc}	51.03^{b}	35.47^{c}	1.89^{a}	49.12^{bc}	15.38^{cd}	72.09^{abc}
GBGN40	63.09^{bc}	50.28^{bc}	36.44^{bc}	1.90^{a}	49.73^{b}	15.52^{de}	73.31^{ab}
GBGN60	62.40^{c}	48.00^{d}	39.38^{a}	1.92^{a}	51.51^{a}	16.02^{a}	76.65^{a}
SEM	9.05	2.05	2.75	0.20	1.75	0.25	10.55

Means with different letter superscripts within the same column differ significantly (P<0.05).

CONCLUSION

Inclusion of groundnut forage for ensiling gamba grass leads to improved nutritional quality and digestibility of the resultant silages. Mixing gamba grass and groundnut forages at 40:60 had higher nutritional value, energy, dry matter intake and digestibility thus recommended for large scale production. Further research is recommended to ascertain the performance of animals fed on such silage.

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