PHYSICO-CHEMICAL PROPERTIES OF ENSILED *FICUS LYRATA* WITH VARYING PROPORTION OF COWPEA HUSK FOR DRY SEASON RUMINANT PRODUCTION IN BALI, TARABA STATE, NIGERIA

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ABSTRACT
Dry season production of ruminant in north central part of Nigeria is a challenge. Edge-row plants, being used as shade in livestock rural communities are available all year round. Full potentials of Ficus lyrata has not been explored. This study was therefore, conducted to evaluate the physical characteristics proximate composition and mineral assay of ensiled Ficus lyrata with varying proportion of cowpea husk for dry season ruminant production. Fresh leaves and their soft stalks of Ficus lyrata were harvested in September and wilted for 12 hours before chopping into 2-3cm particle size. Chopped forage was mixed with cowpea husk at 0%, 20% 40% and 50% then, 3% blended honey residue was added as additive for all treatments. The materials were ensiled and analyzed for Dry Matter (DM), chemical composition, silage features and mineral contents. Results showed that DM contents were between 41.52- 45.35%. CP varied from 12.54-14.15% and increased with increased proportion of cowpea husks. CF ranged between 23.32-23.93% and increased as cowpea proportion increased. EE varied among treatments (T1 =3.78%, T2=2.96%, T3=3.07%, T4=3.42%). Ash content (9.62-12.09%) increased as cowpea proportion increased. The NDF content of the silages ranged from 46.41-50.74%. Minerals investigated were Ca (1.93-33.22%), P (0.19-0.40%), K (1.00-1.41%), Na (0.84-1.10%), Mg (0.25-0.60%) and iron (32.1-35.8ppm). The silage had sweet vinegar taste, pleasant aroma, smooth texture and colour range of brownish green, olive green and yellowish green, It was concluded that the silage showed good physico-chemical properties which can meet the nutrient requirements of ruminant. Ficus lyrata can be ensiled with cowpea husks up to 50% and utilized by ruminants during dry season.

INTRODUCTION

Dry season is a critical period that poses a serious threat to sustainable ruminant production (Lamidi and Ologbose, 2014) and peaceful coexistence of pastoral nomads and host community (Lamidi *et al*., 2021). Silage making is one of the important ways of conserving excess forages available during the wet season for ruminant utilization during dry season (Lamidi *et al*., 2019a). It serves as a feed bank for natural forages which are considered to be the main source of feed for ruminant livestock production in Nigeria, as most the famers can hardly afford to keep their animals on concentrate ration (Lamidi *et al*., 2019a). Ensiling forage o□ers a strategic solution to the o□-season feeds for ruminants (Babayemi and Igbekoyi, 2008) especially for those browse forage trees that do not blossom but shed their leaves and loose most of their nutrients during the dry season (Mbatha and Bakare, 2018)). During this period of the year, fodder trees such as fiddle leaf fig and shrubs play an important role for ruminant nutrition, providing proteins, minerals, vitamins and energy (Sylva-Nyom *et al*., 2022). However, there is dearth of information on the use of browse plants as silage (Ogunbosoye *et al*., 2016). *Ficus lyrata* (fiddle leaf fig) is a common browse forage grown naturally and abundant in the wet lowlands of Nigeria especially in Taraba State; blossoms during the rainy season (Sylva-Nyom, 2023) but withers greatly in the harmattan. Its cousin, *Ficus polita* has been successfully used for silage production with maize residue (Ogunbosoye *et al*., 2016).

Materials and methods

Location of the study

The study was carried out at the microbiology laboratory of Department of Animal Health and Production Technology, Federal Polytechnic, Bali, Taraba State. Bali lies within the guinea savanna zone and extends between latitude 8^{O} and 35 '00'' North of the equator and 10^{O} 46' 00'' East of the Greenwich Meridian (Taraba State Government, 2015). Several *Ficus spp* such as *Ficus lyrata, Ficus sycamorus, Ficus thoningii, Ficus regiolisa and Ficus polita* grow naturally in the lowlands.

Sources and preparation of experimental materials, and treatments

Ficus lyrata leaves and soft stalks were harvested in September within the Polytechnic community and wilted for 12 hours before they were chopped into 2-3cm size. The forage was then mixed thoroughly with different proportion of cowpea husk as follows: 100% *Ficus lyrata* and 0% cowpea husk (T_1), 80% *Ficus lyrata* and 20% cowpea husks (T_2), 60% *Ficus lyrata* and 40% cowpea husks (T_3), and 50% *Ficus lyrata* and 50% cowpea husks (T_4). Each treatment was mixed thoroughly with 3% blended honey residue which acted as an additive. The mixed forages had three replicates and each sample was compactly packed into Bama® Mayonnaise bottles (960ml) used as laboratory silos and tightly sealed to avoid air penetration after which they were stored at room temperature of 32-37□C for 30 days according to the procedure of Lamidi *et al*. (2019a).

Evaluation of Physical Properties

When silage samples were ready, physical characteristics such as sample aroma, taste, colour, texture, wetness were assessed based on sensory evaluation while temperature and pH were determined using a thermometer and digital pH meter respectively. The colour was determined by comparing the colour of the silage samples to a colour chart and texture was done by pressing with fingers while wetness was done by pressing the silage with hands as described by ((Lamidi *et al*., 2019a). Afterward, sub-samples were collected from each silage sample and dried in an oven before grounding using a dry mill blender and taken for proximate and mineral analyses.

Proximate Composition and mineral determination

Proximate compositions of silage samples were determined according to AOAC (2000). Neutral detergent fibre was determined according to Van Soest (1991). Minerals were determined using atomic absorption spectrophotometer.

RESULTS AND DISCUSSION

Table 1 shows the physical properties of silage made using *Ficus lyrata* and varying proportions of cowpea husk. The pleasant aromatic smell perceived for all the samples was a typical smell of lactic acid bacteria and as an indication that the ensiling materials were successful made. The vinegar taste showed that the silage was good (Chiba *et al*., 2005). The brownish green in T_1 was similar to the original colour of the sample without cowpea but slightly brown due to the mixture with honey comb. Olive green colour observed in T_2 was due to the small proportion (10%) of cowpea in it. According to Babayemi and Igbekoyi (2008), a good silage usually assumes the original colour of the ensiled materials. Yellowish green colour observed was similar to the original colour of the *Ficus lyrata* and cowpea mixtures before

Table 1: Physical properties of ensiled *Ficus lyrata* with varying proportions of Cowpea Husks

	Treatments			
Parameters	T1	T2	T3	T4
Aroma	Pleasant	Pleasant	Pleasant	Pleasant
Taste	Sweet vinegar	Sweet vinegar	Sweet vinegar	Sweet vinegar
Colour	Brownish green	Olive green	Yellowish green	Yellowish green
Texture	Smooth	Smooth	Smooth	Smooth
Wetness	Moist/firm	Dry/firm	Dry/firm	Dry/firm
Temperature (□C)	36	35	33	32
pH	4.6	4.1	4.4	4.3

ensiling. Yellow colour in silage is the colour of good silage (Ogunbosoye *et al*., 2016). The textures were smooth and firm, not slimy when felt. When squeezed, none dripped off water but could break easily. This is an indication of a good silage (Ogunbosoye *et al*., 2016). There was no moldiness

observed among the samples. Silage temperatures were decreasing as cowpea proportion was increasing. Temperature range obtained (32-36□C) were within the range (30-37□C) obtained by Lamidi *et al*. (2019a) when he ensiled *Panicum maximum* with different proportions of *Calopogonium mucunoides*. The average pH range was between 4.1-4.6 within the range of a good silage as reported by Menesses *et al.* (2007) even though they were higher than pH (3.5 – 4.0) obtained by Lamidi *et al*. (2019a) for ensiled *Panicum maximum* with different proportions of *Calopogonium mucunoides* but similar to pH (3 – 4.5) reported by Lamidi and Ingweye, (2020) for ensiled fresh maize stover with groundnut haulm.

Table 2: Chemical Composition of ensiled *Ficus lyrata* with varying proportions of cowpea husks.

Parameters	**Treatments**			
	T_1 (0%)	**T_2 (20%)**	**T_3 (40%)**	**T_4 (50%)**
Dry Matter (DM)	41.52	42.51	44.45	45.35
Crude Protein (CP)	12.54	12.88	13.92	14.15
Crude Fibre (CF)	23.32	23.41	23.56	23.93
Ether Extract (EE)	3.78	2.96	3.07	3.42
Ash	9.62	10.36	11.86	12.09
Neutral Detergent Fibre (NDF)	50.74	50.39	47.57	46.41
Calcium (Ca)	1.93	2.30	3.05	3.22
Phosphorus (P)	0.26	0.19	0.23	0.40
Potassium (K)	1.00	1.20	1.41	1.32
Sodium (Na)	0.9	0.84	1.10	1.00
Magnesium (Mg)	0.3	0.25	0.40	0.60
Iron (in ppm)	33.0	32.1	35.0	35.8

ppm=part per ml.

Table 2 shows the chemical composition of silages of *Ficus lyrata* with varying proportions of cowpea husks. Crude protein varied from 12.54-14.15% and increased with increased proportion of cowpea husks. This is above the minimum required for growth (11.3 %) in ruminant animals according to ARC (1984). CF ranged between 23.32-23.93% and increased as cowpea proportion increased. EE varied among treatments (T_1, =3.78%, T_2=2.96%, T_3=3.07%, T_4=3.42%). Ash content (9.62-12.09%) increased as cowpea proportion increased. The NDF content of the silages ranged from 46.41-50.74% which is below the acceptable levels of 60% to 65% recommended for optimum ruminant animal performance as outlined by Meissner *et al*. (1991). Minerals investigated were Ca (1.93-33.22%), P (0.19-0.40%), K (1.00-1.41%), Na (0.84-1.10%), Mg (0.25-0.60%) and iron (32.1-35.8ppm).The chemical composition of the silage is almost similar to that of the silage materials reported by Sylva-Nyom *et al*. (2022) except for NDF. Jianxin and. Jun, (2002) reported that the output of silage depends on the materials being ensiled. Similarly, Ogunbosoye *et al*. (2016) also observed a similar trend, adding that in silage making adequate attention must be drawn into the quality of materials to be ensiled so as to have good feeds for the animals.

CONCLUSION

The silage showed good physico-chemical properties which can meet the nutrient requirements of ruminant. *Ficus lyrata* can be ensiled with cowpea husks up to 50% and utilized by ruminants during dry season.

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