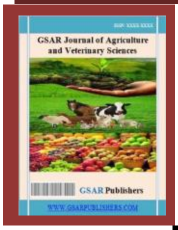

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INFLUENCE OF LACTIC ACID BACTERIA INOCULANTS AS ADDITIVE ON GROWTH PERFORMANCE AND NUTRIENTS UTILIZATION OF WEST AFRICAN DWARF GOAT FED GRASS-LEGUME SILAGE

By

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Abstract

This study evaluated the effects of grass-legume silage fermented with lactic acid bacteria (LAB) inoculants on growth performance and nutrient utilisation of West African Dwarf (WAD) goats. Sixteen growing bucks (5 - 6 kg) were randomly assigned to four treatments in a completely randomised design: T_1 (control, no inoculants), T_2 (Lactobacillus plantarum), T_3 (Lactobacillus acidophilus), and T_4 (combined inoculants). The silage was prepared from Pennisetum pedicellatum (60 %), Mucuna pruriens (30 %), and cassava peel (10 %), and fed for 84 days. LAB inoculation improved silage quality, as shown by lower pH (4.40 - 4.50), higher dry matter, and increased crude protein, particularly in the combined inoculants treatment. Fibre fractions (ADF and NDF) were reduced, indicating enhanced digestibility and nutrient availability. Dry matter intake differed significantly ($p<0.05$), with the highest intake recorded in goats fed the combined LAB silage, suggesting improved palatability. However, growth performance parameters, including final weight, weight gain, and feed conversion ratio, were not significantly affected ($p>0.05$). Nutrient digestibility showed significant differences in crude fibre and dry matter digestibility among treatments, while crude protein and ether extract digestibility were not significantly influenced. Ash digestibility was highest in the control group. Nitrogen utilisation did not differ significantly, although LAB-treated silages showed improved nitrogen retention. In conclusion, LAB inoculation, particularly the combination of Lactobacillus plantarum and Lactobacillus acidophilus, enhanced silage quality, feed intake and some digestibility parameters without significantly affecting growth performance.

Keywords: *Silage, nutrient utilisation, WAD goats, lactic acid bacteria.*

INTRODUCTION

The role of livestock, especially small ruminants, in most developing nations' socio-economic development and food security cannot be overemphasised. Apart from their preference for other livestock due to their ability to withstand harsh environmental conditions. In addition to direct income, ruminants provide indirect benefits, such as manure for fuel and fertiliser, and draft power for farm work. Small ruminants, particularly goats and sheep, play a major role in agricultural livelihoods across low- and middle-income countries (LMICs), where approximately 80% of the global small ruminant population is concentrated, with herd sizes generally ranging between 5 and 30 animals per household (Teshome *et al.,* 2023). Nutritional deficiencies caused by limited feed quality and quantity negatively impact animal health, welfare, and performance, making them more susceptible to diseases and resulting in underperformance

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(Harvatine, 2023). Essien (2024) reported that during the dry season, natural pastures become scarce, fibrous, and deficient in essential nutrients, leading to nutritional deficiencies in ruminants. This decline results in slower animal growth, delayed market readiness, poor reproductive outcomes, and weakened immunity (Dubeux *et al.,* 2020). These adverse effects can be mitigated by conserving surplus forage during the wet season into silage, which can then be used during the dry season (Muck, 2010). Integrating legumes and grasses in silage production can yield high-quality fodder with improved physical and chemical attributes. This combination enhances the protein and energy content, resulting in a balanced and digestible diet for ruminants (Hanum, 2021).

Thus, research into improved forage conservation techniques is necessary to ensure year-round feed availability. Silage, a specialised preserved fodder, is a time-tested strategy for maintaining a consistent, nutritious feed supply, particularly for ruminants like cattle, sheep, and goats. It helps maintain animal health and productivity during feed scarcity (Provenza *et al.,* 2015). Silage not only preserves forage but also improves its palatability and digestibility. It is widely recognised as one of the most effective approaches to ensuring consistent feed and nutrition throughout the year (Provenza *et al.,* 2015).

The use of specific lactic acid bacteria (LAB) strains, such as *Lactobacillus plantarum* and *Lactobacillus acidophilus*, has been shown to enhance silage fermentation by increasing lactic acid production, reducing pH, and inhibiting spoilage organisms (Köhler *et al.,*2015; Ogunade *et al.,* 2018). These effects ultimately improve silage digestibility and animal performance. **Therefore, this study aims to evaluate the impacts of *Pennisetum pedicellatum–Mucuna pruriens* silage, fermented with *Lactobacillus plantarum* and** *Lactobacillus acidophilus*, **on the performance and nutrient digestibility of growing West African Dwarf bucks.**

MATERIALS AND METHODS

Experimental Site

The experiment was conducted at the Pasture Demonstration Plot and Small Ruminant Section of the Teaching and Research Farm of the Oyo State College of Agriculture and Technology, Igbo-ora. The region is on latitude 7^o 43' North and 3^o 29' East, and having the rainy season between April and November, and the dry season from December to March, with an elevation of 17 meters above sea level (World Atlas, 2015).

Procurement of Lactic Acid Bacteria

Lactic acid bacteria (*Lactobacillus acidophilus and Lactobacillus plantarum*) were purchased from a reputable yoghurt production factory in Ibadan, sub-cultured, and characterized at the Microbiology Laboratory of Oyo State College of Agriculture and Technology, Igbo-ora, Oyo State.

Silage Production

The *Mucuna pruriens* and *Pennisetum pedicellatum* forages were harvested from an established Pasture demonstration plot by cutting at a height of 30 cm above the ground level, before the flowering stage to allow for re-growth, while the cassava peels were sourced from “garri” processing mill within Igboora. The forages were composed in a ratio of 30 *% Mucuna pruriens, 60 % Pennisetum pedicellatum* and 10 % cassava peel after wilted overnight to reduce the moisture content and chopped into small pieces using cutlass and wood log. Liquid inoculants of two strains of Lactic acid bacteria (*Lactobacillus acidophilus* and *Lactobacillus plantarum*) of 10^6 CFU/g were inoculated with 5 and 10 mL/kg weight of chopped forage as additives. The chopped forage materials were packed in a sealed polythene bag with masking tape and compressed to ensure utmost anaerobic conditions before being taken to the bunker silo. After 4 weeks, the opened silage was properly mixed to ensure uniformity and served to the experimental goats.

Experimental animals and management

Sixteen (16) WAD goats of 4 - 6 months of age with a weight range of 5 – 6 kg were sourced from the Cattle kraal market located along Igbo-ora-Abeokuta Road, Igbo-ora, Oyo State. During the 14-days acclimatization period, the animals were subcutaneously injected with Ivermectin at 1 mL per kg body weight against external and internal parasites and drenched with 2 mL of Albendazole® to protect against gastrointestinal tract parasites, and antibiotics and multivitamin were administered through the intramuscular route at a rate of 1 mL per 10 kg body weight as prophylactic treatment. Corn bran and cassava peel were offered to the animals during the adjustment period, while fresh, cool and portable water was made available throughout the experiment. The animals were kept in individual pen compartments, measuring 1.7 x 1.3 m totalling 2.21 m^2 of floor spaces per goat, with a concrete floor, and corrugated iron sheets as the roof cover. Each compartment had plastic feed and water trough to feed experimental diet and water *ad libitum* to individual during the feeding trial period.

Experimental design and dietary treatment

The animals were randomly allocated by weight into four (4) treatments of four bucks (4) per treatment, and each buck served as a replicate in a completely randomized design (CRD) arrangement. Four different silages were prepared consisting of *Mucuna pruriens, Penicillium pedicellatum* and cassava peel, and were assigned into four dietary treatments of:

- **T_1 (Control):** 60% *Pennisetum pedicellatum* forage + 30% *Mucuna pruriens* forage + 10% cassava peel
- **T_2**: 60% *Pennisetum pedicellatum* forage + 30% *Mucuna pruriens* forage +10% cassava peel inoculated with *Lactobacillus planetarium* bacteria strain
- **T_3**: 60% *Pennisetum pedicellatum* forage+30% *Mucuna pruriens* forage + 10% cassava peel inoculated with *Lactobacillus acidophilus* bacteria strain
- **T_4**: 60% *Pennisetum pedicellatum* forage + 30% *Mucuna pruriens* forage + 10% cassava peel inoculated with 5 mL/kg each of *Lactobacillus acidophilus* and *Lactobacillus planetarium* bacteria

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strain

A total of 300g (150g in the morning and afternoon) of experimental feed was fed to an individual animal and the leftover measured daily for 84-days of the feeding trial was used in determining the feed intake and dry matter intake (DMI). The initial weight of each buck was taken and continuously weighed weekly using the Camry 25kg Hanging Scale (part of the Camry NTA series], Hong Kong).

Data Collection

Performance traits

After one week of adjustment period, the initial body weight, DMI , followed with weekly weight gain and feed intake were recorded and feed conversion ratio (FCR) were estimated. The following parameters were considered:

$$\text{Feed Intake (g)} = \text{Feed offered (g)} - \text{Feed leftover (g)}$$

$$\text{Average feed intake per animal (g/d)} = \frac{\text{Total feed intake (g)}}{\text{Total number of experimental days}}$$

$$\text{Body weight gain(kg)} = \text{Final body weight (kg)} - \text{Initial body weight (kg)}$$

$$\text{Daily body weight gain (g/day)} = \frac{\text{Total body weight gain (g)}}{\text{Total number of experimental days}}$$

$$\text{Feed Conversion Ratio (FCR)} = \frac{\text{Total dry matter intake (kg)}}{\text{Total body weight gain (kg)}}$$

Digestibility trial

After growth trial, three (3) bucks with weight closer to the mean (6 kg) were randomly selected from each treatment, and put in a thoroughly cleaned and disinfected metabolic cage, measuring 4.0 m x 2.0 m x 0.5 m, with separated feeder and water troughs to prevent feed and water from spilling into the droppings and continued to be fed their respective experimental diet with wire nettings placed on the tray for dung and urine collection.

After a preliminary 7-day feeding period for metabolic cage acclimation, feed intake and leftovers were weighed daily, and faeces and urine samples were collected separately for 7days. Faecal samples were collected twice daily, weighed, and pooled for each animal. The faecal samples were dried to constant weight in an oven, and the moisture and dry matter content for each treatment group were determined. Dried faecal samples were finely ground and labelled for subsequent laboratory analysis.

The urine samples were collected by placing a flat plastic tray underneath the metabolic cage and poured into a vessel with two drops of sulphuric acid (H_2SO_4) added as preservative. A 5% aliquot of total urine output per animal per day was stored in a -20 ^{0}C refrigerator before further analysis.

Proximate Composition Analysis (PCA)

Samples of silage were taken to the Laboratory of the College of Animal Science, Federal University of Agriculture, Abeokuta, Nigeria for proximate composition analysis. The dry matter (DM), crude protein (CP), crude fibre (CF), ether extract (EE) and ash contents of the samples were determined according to AOAC (2012). The Neutral detergent fibre (NDF), Acid detergent fibre (ADF) and Acid detergent lignin (ADL) were determined with the procedure of Van Soest *et al.* (1991). The Silage pH was determined using a pH meter. The pH meter was calibrated before measurement according to the manufacturer's instructions using a standard buffer solution of pH 4.0 and 7.0. The pH electrode was rinsed with distilled water to avoid contamination. Then, the electrode was submerged in the silage sample. The reading was allowed to stabilize, the pH value was recorded, and the procedure was repeated for all the treatments.

- Non-fibre carbohydrate (NFC) was calculated as:

  NFC = 100 - (CP + Ash + EE + NDF)

- Cellulose Content (CC) was calculated as the difference between ADF and ADL, i.e.

  CC = Acid detergent fibre (ADF) - Acid detergent lignin (ADL)

- Hemicellulose Content (HC) was calculated as the difference between NDF and ADF, i.e.

  HC = Neutral detergent fibre (NDF) - Acid detergent fibre (ADF)

Statistical Model and Analysis

The statistical model used for the experimental design was described as:

$$y_{ij} = \mu + T_i + e_{ij}$$

where:

y_{ij} = response variable

μ = overall mean

T_i = fixed effect of the ith bacteria (*Lactobacillus plantarum, Lactobacillus acidophilus*)

e_{ij} = random error

All data were subjected to one-way Analysis of Variance (ANOVA) procedure of SAS version 9.4 (SAS, 2013). The difference among treatment means with p<0.05 was assessed using Duncan's Multiple Range Test (DMRT, Duncan 1955).

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RESULTS

Proximate composition

The chemical composition of the experimental silages is presented in Table 1. Silage pH ranged from 4.40 - 5.10 and did not differ significantly among treatments ($p > 0.05$). T_1 recorded the highest pH, whereas T_2 and T_3 had the lowest value (4.40), suggesting comparatively better fermentation in these treatments. Dry matter content differed significantly ($p < 0.05$), with the highest value observed in T_2 (90.56%) and the lowest in T_3 (88.44%). Crude protein also varied significantly ($p < 0.05$), with T_4 (17.51%) and T_2 (15.74%) showing higher values than T_1 (11.86%) and T_3 (12.25%). Crude fibre content differed across treatments ($p < 0.05$), ranging from 14.91% in T_4 to 16.61% in T_1. Ash content varied significantly ($p < 0.05$), with T_2 recording the highest value (8.36%) and T_1 having the lowest (7.33%). Ether extract and non-fibre carbohydrate did not differ significantly among treatments ($p > 0.05$), although their values ranged from 10.17% - 11.61% and 1.66% - 4.00%, respectively. T_4 recorded the lowest ADF (20.55%) and NDF (59.42%) values, indicating a potentially greater digestibility than the other experimental silages. Cellulose differed significantly ($p < 0.05$), with values ranging from 10.25% in T_4 to 17.75% in T_2, while hemicellulose remained statistically similar across treatments, ranging from 38.17% to 40.84%.

Table 1: Chemical composition of *Mucuna pruriens* and *Pennisetum pedicellatum* silage cured with cassava peel fermented with two strains of LAB.

Parameters	T_1	T_2	T_3	T_4	SEM	p-*value*
pH	5.10	4.40	4.40	4.50	0.31	0.19
Dry matter (%)	90.14^b	90.56^a	88.44^d	89.13^c	0.25	0.00
Crude protein (%)	11.86^b	15.74^a	12.25^b	17.51^a	0.81	0.00
Crude fibre (%)	16.61^a	15.63^{ab}	15.18^b	14.91^b	0.26	0.05
Ash (%)	7.33^c	8.36^a	7.79^b	7.8^b	0.12	0.02
EE	10.17	10.59	10.96	11.61	0.32	0.51
NFC	1.66^b	4.00^a	2.46^{ab}	2.99^{ab}	0.32	0.04
ADF	28.45^a	26.90^a	23.25^{ab}	20.55^b	1.20	0.00
NDF	64.84^a	64.56^a	64.33^a	59.42^b	0.60	0.00
ADL	10.45	8.95	10.70	10.30	0.44	0.25
Cellulose	17.02^a	17.75^a	12.55^b	10.25^c	0.96	0.00
Hemicellulose	39.55	38.17	40.84	39.55	0.32	0.06

^{abcd}means on the same row with different superscripts are significantly different (p< 0.05). DM= Dry Matter, CP=Crude Protein, CF=Crude Fibre, EE=Ether Extract, NFE=Nitrogen Free Extract, NDF=Neutral detergent fibre, ADF=Acid detergent fibre, ADL=Acid detergent lignin, NFC=Non-Fibre Carbohydrate.

Growth Performance

The growth performance of WAD bucks fed silage fermented with two lactic acid bacteria (LAB) strains is summarized in Table 2. The initial body weight did not differ among treatments ($p > 0.05$), ranging from 5.89kg in T_1 to 6.03kg in T_3, hence suggesting a similar initial body weight across all groups prior to the commencement of the experiment. After the experiment, the final body weight also showed no significant treatment effect ($p > 0.05$), with values ranging from 7.58 kg in T_1 to 8.11kg in T_2. Similarly, the average weight gain did not remain statistically comparable across treatments ($p>0.05$). However, the dry matter intake differed significantly among treatments, with T_4 recording the highest intake per head (28.75 g/head/day), followed by T_3 (27.08 g/head/day), T_2 (25.82 g/head/day), and T_1 (21.95 g/head/day) indicating that the fermentation treatments influenced the amount of feed consumed by the goats. Total dry matter intake showed the same pattern ($p<0.05$), increasing from 261.36 g/day in T_1 to 342.35 g/day in T_4. Feed conversion ratio did not differ significantly among treatments ($p > 0.05$), although T_2 showed the lowest value (11.62) and the highest value of 15.46 was recorded in T_3.

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Table 2: Growth performance of WAD goats fed silage fermented with two strains of lactic acid bacteria (LAB)

Parameters	**T_1**	**T_2**	**T_3**	**T_4**	**SEM**	**p-*value***
Average initial weight (kg)	5.89	6.00	6.03	5.93	0.32	0.99
Average final weight(kg)	7.58	8.11	7.71	7.90	0.36	0.96
Average weight gain (kg)	1.69	2.11	1.68	1.97	0.10	0.36
Daily weight gain (g/day)	20.11	25.11	20.11	23.45	1.21	0.36
Dry matter intake (g/head/d)	21.95^d	25.82^c	27.08^b	28.75^a	0.69	0.00
Total DMI (g/day)	261.36^d	307.41^c	322.45^b	342.35^a	8.32	0.00
Feed conversion ratio	13.29	11.62	15.46	13.39	0.85	9.47

^{abcde}*means on the same row with different superscripts are significantly different (p < 0.05). DMI = Dry matter intake*

Nutrient Digestibility

Table 3 summarizes the nutrient digestibility in WAD goats fed silage prepared from *Mucuna pruriens* and *Pennisetum pedicellatum* and fermented with two LAB strains. The ash digestibility differed significantly among treatments ($p < 0.01$), with T_1 recording the highest value (45.60%), followed by T_4 (40.10%), while T_3 showed the lowest value (35.00%). Crude protein digestibility did not differ significantly ($p > 0.05$), ranging from 59.03% in T_2 to 65.60% in T_4. Crude fibre digestibility varied significantly among treatments, with T_2 showing the highest value (42.00%), followed by T_4 (35.00%), T_1 (34.65%), and T_3 (33.63%). Ether extract digestibility remained statistically similar across treatments ($p > 0.05$), with values ranging narrowly from 66.20% in T_4 to 67.93% in T_2. Dry matter digestibility differed significantly ($p < 0.05$), with T_3 recording the highest value (10.33%), followed by T_1 (9.33%) and T_4 (9.20%), whereas T_2 had the lowest value (8.30%).

Table 3: Nutrient digestibility of WAD goat fed silage prepared from *Mucuna pruriens and Pennisetum pedicellatum* fermented with two strains of LAB

Parameters	**T_1**	**T_2**	**T_3**	**T_4**	**SEM**	**p-*value***
Ash (%)	45.60^a	39.50^{bc}	35.00^c	40.10^b	1.48	0.01
CP (%)	64.38	59.03	59.76	65.60	1.41	0.27
CF (%)	34.65^b	42.00^a	33.63^b	35.00^b	1.04	0.00
EE (%)	66.95	67.93	66.36	66.20	1.22	0.97
DM (%)	9.33^b	8.30^c	10.33^a	9.2^b	0.24	0.05

^{abcde}*means on the same row with different superscripts are significantly different (p<0.05). CP=crude protein; CF=crude fibre; EE=ether extract; DM=dry matter*

DISCUSSION

The chemical composition of the silages significantly varied across treatments, indicating that cassava peel inclusion and microbial action influenced fermentation quality and nutrient preservation highlighting the influence of on silage quality. The observed silage pH (4.40 - 5.10) range suggested a more effective fermentation and rapid acidification, and this pattern agrees with Zhang et al. (2022) who reported that well-fermented silages typically maintain pH values below 4.5, thereby limiting spoilage organisms and reducing nutrient losses. The high DM value of 90.56% recorded in T_2 supports the role of cassava peel as an absorbent, fermentable substrate capable of improving silage dryness and soluble carbohydrate availability (Ezeokeke et al., 2022), while the crude protein increased notably in T_2 and T_4, reaching 15.74% and 17.51%, respectively indicating an improvement that cassava peel-Lactic acid bacteria (LAB) combinations can enhanced nitrogen preservation during ensiling. Similar responses have been linked to LAB-driven reductions in proteolysis and ammonia-N production, particularly in silages inoculated with *Lactobacillus plantarum* (Ni et al., 2017; Yahaya et al., 2023). In contrast, crude fibre declined from 16.61% to 14.91% indicating partial fibre breakdown during fermentation, thus improves digestibility. The nutrient utilization and energy availability in ruminant diets are enhanced due to lower fibre concentrations, and the recorded ash values in this study suggested improved mineral preservation or concentration, potentially due to reduced leaching losses. LAB inoculants support fibre digestibility through acid hydrolysis and

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enzyme-associated fibre degradation during ensiling (Muck et al., 2018; Kim et al., 2020).

The fibre fractions showed notable differences as T_4 recorded lower ADF and NDF values than the other treatments, suggesting improved potential digestibility and intake. Reductions in ADF and NDF remain important in tropical forage silages because high fibre fractions often restrict voluntary ruminant intake, energy availability and animal performance (Khan et al., 2022), and the observed high NFC values, particularly in cassava peel-containing treatments, likely supplied readily fermentable energy for microbial activity during ensiling Hemicellulose peaked in T_3, which may provide a slowly fermentable carbohydrate fraction, while the T_2 and T_4 showed stronger chemical profiles, especially in crude protein and fibre-related indices, confirming that cassava peel and LAB inoculation can improve silage nutritive value and fermentation efficiency (Chen et al., 2020; Adesokan et al., 2023).

Growth responses, however, showed differences across the treatments. Initial weight, final weight, weight gain, and daily weight gain did not differ significantly among treatments, indicating that LAB fermentation improved feed quality without producing a clear short-term growth advantage. This agrees with Makinde et al. (2015), who reported that fermentation can enhance feed quality without necessarily translating into immediate gains in live weight. Nevertheless, dry matter intake differed significantly, with T_4 producing the highest intake, followed by T_3, T_2, and T_1. This intake response suggests that LAB fermentation influenced the goats' appetite and improved silage acceptability, likely through better aroma, reduced anti-nutritional effects, and more favourable fermentation products such as lactic acid which can enhance palatability and nutritional quality (Tang et al., 2018; Adesokan et al., 2022).

The absence of significant differences in feed conversion ratio (FCR), despite higher intake in some treatments, suggests that greater consumption did not translate proportionally into weight gain. This outcome supported with earlier report by Solomon et al. (2014) that FCR is not always influenced by only changes in feed intake, but factors such as the metabolic efficiency of the animals and the nutrient composition of the feed play significant roles in determining growth performance. Differences in nutrient density, digestibility, rumen fermentation efficiency, and metabolic use of absorbed nutrients may explain this response (Akinfemi and Ladipo, 2020). However, the numerical trend in daily weight gain, particularly the stronger performance of T_2 and T_4, points to the potential value of selecting specific LAB strains or strain combinations to improve animal response. This interpretation aligns with Ogunsanmi et al. (2023), who reported improved nutrient availability and growth-related outcomes when *L. plantarum* and cassava peel served as a fermentable substrate.

Nutrient digestibility results provide additional insight into the animal's growth performance. Ash digestibility differed among treatments reflecting a treatment-related differences in mineral preservation, binding, or availability during fermentation, and this is consistent with reports that feed processing methods can alter mineral digestibility (Jiwuba et al., 2024). Crude protein digestibility remained statistically similar across treatments, suggesting that LAB fermentation did not markedly alter protein availability and digestibility in all treatments. However, the numerically higher value in T_4 may indicate a beneficial effect of combining LAB strains, as reported in studies where mixed fermentation strategies improved protein digestibility in goat diets (Ogunleke et al., 2022).

Crude fibre digestibility responded significantly to the treatments. A higher fibre digestibility reflected a strain-specific activity of *Lactobacillus acidophilus* in breaking down complex carbohydrates to improve the ruminal fermentability, which is consistent with evidence that selected LAB strains can enhance fibre degradation in silage systems (Li et al., 2023). Ether extract digestibility remained relatively consistent across treatments, indicating that LAB fermentation had little influence on fat content and digestibility, a trend also reported by Ogunleke et al. (2022). Dry matter digestibility differed significantly, with T_2 producing the lowest value and T_3 had the highest value which might be related to the activity of *Lactobacillus plantarum* in improving carbohydrate breakdown and overall feed utilization, as previously observed in goats fed *L. plantarum*-fermented silage (Xu et al., 2022).

Taken together, the results showed that cassava peel inclusion and LAB inoculation improved key aspects of silage quality (particularly acidification, crude protein concentration, fibre reduction, and intake) which did not produce significant short-term differences in growth or feed conversion efficiency. However, these suggested that LAB-fermented cassava peel–forage silage can enhance feed quality and palatability, but its effect on growth performance may depend on LAB strain selection, nutrient density, digestibility, feeding duration, and the physiological status of the animals.

CONCLUSION

This study demonstrates that inoculation of *Pennisetum pedicellatum–Mucuna pruriens* silage with lactic acid bacteria (LAB) enhances fermentation quality and improves its nutritional profile. LAB-treated silages exhibited reduced pH values, indicative of improved preservation and fermentation stability. Notably, the combined inoculation of *Lactobacillus plantarum* and *Lactobacillus acidophilus* resulted in higher dry matter and crude protein contents, alongside reduced fibre fractions, suggesting enhanced nutrient availability and potential digestibility. Feeding trials further showed that goats offered LAB-treated silages had higher dry matter intake, reflecting improved palatability and acceptance. However, no significant differences were observed in final body weight, total weight gain, or feed conversion ratio across treatments, indicating that animal performance was maintained without adverse effects. Collectively, these findings support the efficacy of combined LAB inoculation with grass-legume silage as a practical strategy to improve silage quality, forage

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intake and utilization, and feed availability for West African Dwarf goats under tropical production systems.

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