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**Original**

# *Megathyrsus maximus* silages: Effect of cutting schedule and microbial inoculation

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## ABSTRACT

**Objective.** To evaluate the effect of the cutting time and the addition of a microbial inoculum on the fermentative and nutritional characteristics of *grass silage of the genus Megathyrsus maximus*. **Materials and methods.** The combination of forage (Tanzania and Mombasa cultivars and corn), cutting time (a.m.-p.m.) and use of additive (with-without) represented the treatments. Was used a completely random design in factorial arrangement. **Results.** The sensory evaluation was acceptable in all silages, and in those cut at p.m., the dry matter content tended to be higher (p=0.071), as well as digestibility (p<0.02). The addition of inoculum reduced (p<0.05) protein losses. The Mombasa silage presented a higher concentration of dry matter and fibrous components (p<0.001), and that of corn had a higher content of soluble carbohydrates (p<0.001) and a lower pH (3.76) (p<0.001). Fermentation losses were higher in Mombasa and lower in corn (p=0.003). **Conclusions.** In general, cutting in the afternoon hours improves the digestibility of the silage, and the addition of microbial inoculum reduces protein losses.

**Keywords:** Forage; fermentation; inoculum; ruminant (*Source: CAB*).

## RESUMEN

**Objetivo.** Evaluar el efecto del horario de corte y de la adición de un inóculo microbiano sobre las características fermentativas y nutricionales de ensilados de gramíneas del género *Megathyrsus maximus*. **Materiales y métodos.** Los tratamientos fueron conformados por la combinación de los factores tipo de forraje (cultivares Tanzania y Mombasa, y maíz), horario de corte (a.m.-p.m.) y uso de aditivo (con-sin). Se utilizó un diseño completamente al azar en arreglo factorial. **Resultados.** La evaluación sensorial fue aceptable en todos los ensilados, y en los cortados en el horario p.m., el contenido de materia seca tendió a ser mayor (p=0.071), al igual que la digestibilidad (p<0.02). La adición de inóculo redujo (p<0.05) las pérdidas de proteína. El ensilado de Mombasa presentó mayor concentración de materia seca y de componentes fibrosos (p<0.001), y el de maíz mayor contenido de carbohidratos solubles (p<0.001) y el pH (3.76) más bajo (p<0.001). Las pérdidas por fermentación fueron mayores en Mombasa y menores en maíz (p=0.003). **Conclusiones.** En términos generales, el corte en horas de la tarde mejora la digestibilidad del ensilado, y la adición de inóculo microbiano reduce las pérdidas de proteína.

**Palabras clave:** Forrajes; fermentación; inóculo; rumiante (*Fuente:CAB*).

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## INTRODUCTION

Livestock production in Colombia is based on grazing and its use is conditioned, among other factors, by climatic variations (1). In the Caribbean region there are two climatic seasons (rainy and dry) of varying intensity, which causes limitations in livestock production due to the variation of forage supply and nutritional composition (2).

To make up for the fodder deficiency, it is common to use silage (3). Besides corn, there are other options, such as on-farm pastures, which can reduce feed costs. Grasses of the *Megathyrsus* genus have been used for silage production due to their high dry matter yields and nutritional quality (4). However, there are difficulties in the ensiling process due to the low concentration of dry matter (DM) and soluble carbohydrates (5), factors that compromise the nutritional quality of the silage (6) and increase its cost (7). To minimize these problems, moisture percentages below 78% and soluble carbohydrates between 6 and 8% of the DM are recommended (7), to obtain lactic acid concentrations greater than 50 g kg-1 of DM (8,9,10). For this reason, when silage is ensiled with reduced concentrations of these elements, the addition of compounds rich in soluble carbohydrates, such as molasses, is also recommended (11,12).

Furthermore, to produce better fermentation, harvesting at times when a higher concentration of soluble carbohydrates is expected (13) and using microbial inoculums to dominate fermentation (14) has been evaluated.

The objective of the research was to evaluate the effect of the cutting schedule and the addition of a microbial inoculum on the fermentative and nutritional characteristics of grass silages of the genus *Megathyrsus maximus*.

## MATERIALS AND METHODS

**Location.** The experiment was performed at the farm owned by the Universidad de Sucre, located at coordinates 75°24’ West Longitude, 9°12’ North Longitude, Sabanas sub-region. The pastures used were obtained from a forage bank on the farm, except for the corn forage (*Zea mays*), which was obtained from another property.

**Silo treatment and preparation.** The treatments were formed by the combination of the factors of forage (three species), cutting schedule (9 a.m. or 5 p.m.) and the use of microbial additive (with or without). The forages used were corn (*Zea mays*) and the Tanzania and Mombasa cultivars (*Megathyrsus maximus*). Corn forage was included as a reference since it is the most used material for silage in the region. The design used was completely randomized with a 3×2×2 factorial arrangement, with three replications, forming 36 silos. The cutting age of the grasses was 35 days and for the corn was set at 60 days. The cut was made to obtain particles of 2-4 cm. A commercial product composed of homofermentative and heterofermentative species was used as a microbial additive (*Lactobacillus plantarum* >1.17×1010 UFC/g; *Pediococcus acidilactici* >5.8×109 UFC/g; *Enterococcus faecium* >3.2×109 UFC/g; *Lactobacillus salivarius* >3.0×108 UFC/g). The inoculum was prepared by adding 6 g of the product in 1000 ml of distilled water. Of this mixture, 1 ml was used for each kilogram of material to be ensiled

The material was stored in PVC microsilos (45 cm in height and 11 cm in diameter) adapted with exhaust valves. Each silo was filled with 3 kg of material with a density of 700 kg/m³. In each silo, 1 kg of sand was placed, separated by a cloth, for effluent collection. Molasses at 2% was added to all silages.

**Opening of silos and analysis of chemical composition.** The silos were opened on the 60$^{th}$ day and a sensory test was performed (15), as detailed in table 1.

After opening, a sample was taken and placed in a forced ventilation oven (60°C for 48 hours). It was then ground to a mesh size of 1 mm, using a type of Wiley mill. Moisture, ash, CP and EE contents were quantified (16), as well as neutral detergent insoluble fiber (NDF) and acid detergent insoluble fiber (ADF) (17). The organic matter (OM) content was calculated from the difference between 100 and the ash percentage, the hemicellulose content by the difference between the NDF and ADF values, and the non-fiber carbohydrate (NFC) content by the formula NFC = 100 - (CP + ASH + NDF + EE) (18). To estimate the concentration of total digestible nutrients (NDT), we used as a variable the concentration of NDF (19).

**Table 1.** Applied method for sensory evaluation of silage

| Indicator | Description | % | Max% |
|---|---|---|---|
| Odor | Pleasant (lactic) | 54 | 54 |
| | Unpleasant (acetic) | 36 | |
| | Putrid (butyric) | 18 | |
| Colour | Green, yellowish green and light green | 24 | 24 |
| | Reddish green, brown green and dark green | 16 | |
| | Yellowish brown, greenish brown and dark brown. | 8 | |
| Texture | Well defined, comes apart easily | 22 | 22 |
| | Soapy to the touch, ill defined | 11 | |
| **Total %** | | | **100** |

Max%=Maximum indicator %

A DAISY II® incubator was used to calculate the *in vitro* digestibility of dry matter (IVDMD) (17). The rumen inoculum, donated by a local commercial meat packing plant, was obtained in a controlled manner from the rumen of two freshly slaughtered cattle from a farm near the meat packing plant and kept under grazing conditions. The rumen contents were kept in airtight containers at 39°C without the presence of air. The pre-dried silage samples (0.5 g), after grinding with a 2 mm mesh, were placed in F57 filter bags. The fermentation temperature was maintained at 39°C for 48 hours. In each jar of the equipment, in addition to the samples and the rumen inoculum (400 ml per jar), previously filtered, artificial saliva (1 g/l) was placed. During the procedure, the jars were gassed with $CO_2$. After 48 hours, the bags were removed and the NDF analysis was carried out (17).

IVDMD calculation:

$$\text{IVDMD, \% (Dry matter basis)} = \frac{100 - (\text{W3} - (\text{W1} \times \text{C1})) \times 100}{\text{W2} \times \text{DM}}$$

Where:
W1 = Bag tare weight
W2 = Sample weight
W3 = Final bag weight after *In Vitro* and sequential ND treatment.
C1 = Blank bag correction

For pH measurement, a sample of 9 g of silage was taken and macerated in 60 ml of distilled water, leaving it to stand for 20 minutes before taking the reading, using portable equipment (SI ANALYTICS LAB pH). The titratable acidity was determined with the necessary volume of NaOH 0.1N to bring the pH of the solution to 7.

The proportion of material lost during the process was calculated from the ratio between the weight of losses (difference between the net weight of the silage on days 0 and 60) and the weight of the ensiled material (day 0).

**Statistical analysis.** The data were subjected to an analysis of variance, according to a completely randomized design in a 3×2×2 factorial arrangement, including as sources of variation the main factors and the respective interactions. Probability values between 0.05 and 0.1 were considered as trend. Means were compared using Tukey's test (α=0.05). Pearson's correlation analysis was performed. The InfoStat program (20) was used for these analyses.

## RESULTS

**Sensory evaluation.** According to the sensory evaluation, all the ensiled materials exceeded a score of 68.5, so they were considered acceptable (Table 1).

**Nutritional composition.** Table 2 shows the means of all the variables under study. For DM content, an interaction (p=0.023) was observed between the forage and schedule factors, explained by what happened in the Mombasa silage, where the highest values were observed when the material was harvested in the p.m. schedule. No differences were observed between corn silage and Tanzania silage. The Mombasa silage had a higher (p<0.001) proportion of DM (25.2%). The addition of inoculum did not affect (p=0.118) DM content, but there was a tendency (p=0.072) for the effect of the time factor. There were correlations (p<0.05) between DM content and values of EE (r=0.44), ash (r=0.40), organic matter (r=0.40), pH (r=0.40) and titratable acidity (r=- 0.43). The DM content of the Mombasa silage (p.m.) exceeded the rest by more than 7%.

**Tabla 2.** Means[1] of the nutritional composition and ensilability of three forage species cut at a.m. or p.m. and added (Con) or not (Sin) with homofermentative inoculum

| Treatments | | | Variables | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **F** | **H** | **I** | **DM %** | **OM %** | **MM %** | **CP %** | **EE %** | **NDF%** | **ADF%** | **HEM %** | **NFC%** | **IVDMD %** | **NDT %** | **pH** | **T.A.** | **E.L.%** |
| *Z. m* | a.m. | Con | 17.9[a] | 93.1[b] | 6.9[a] | 8.7[ab] | 1.7[ab] | 68.5[a] | 56.5[a] | 12.1[a] | 14.2[abc] | 64.1[a] | 60.7[a] | 3.7[a] | 3.85[b] | 9.7[a] |
| | | Sin | 18.6[a] | 92.4[b] | 7.6[a] | 8.4[ab] | 2.1[ab] | 64.6[a] | 50.5[a] | 14.2[a] | 17.2[bc] | 65.8[a] | 62.1[a] | 3.8[ab] | 3.42[b] | 13.6[a] |
| | p.m. | Con | 18.5[a] | 92.2[b] | 7.8[a] | 11.9[b] | 1.7[ab] | 67.5[a] | 53.5[a] | 14.0[a] | 11.2[abc] | 65.9[a] | 62.2[a] | 4.6[ab] | 3.77[b] | 22.7[ab] |
| | | Sin | 19.7[a] | 91.7[b] | 8.3[a] | 10.0[ab] | 1.9[ab] | 60.7[a] | 44.6[a] | 16.1[a] | 19.1[c] | 68.0[a] | 64.0[a] | 3.8[ab] | 3.8[b] | 21.8[ab] |
| Mom | a.m. | Con | 21.5[ab] | 87.7[a] | 12.3[b] | 11.7[b] | 2.3[ab] | 70.8[a] | 57.0[a] | 13.8[a] | 2.9[a] | 61.7[a] | 58.6[a] | 4.9[ab] | 1.05[a] | 29.5[ab] |
| | | Sin | 21.9[ab] | 87.7[a] | 12.3[b] | 10.5[ab] | 1.3[a] | 71.2[a] | 48.2[a] | 23.0[a] | 4.6[ab] | 59.6[a] | 56.8[a] | 4.4[ab] | 1.50[a] | 39.1[b] |
| | p.m. | Con | 25.6[ab] | 86.7[a] | 13.3[b] | 8.4[ab] | 1.6[ab] | 72.1[a] | 58.2[a] | 13.9[a] | 4.6[a] | 61.6[a] | 58.6[a] | 4.6[ab] | 1.26[a] | 24.0[ab] |
| | | Sin | 31.8[b] | 85.4[a] | 14.6[b] | 6.2[a] | 3.0[b] | 66.1[a] | 53.2[a] | 12.9[a] | 10.1[abc] | 69.5[a] | 65.3[a] | 5.4[b] | 0.68[a] | 21.9[ab] |
| Tan | a.m. | Con | 19.4[a] | 85.8[a] | 14.2[b] | 7.8[ab] | 1.8[ab] | 69.9[a] | 55.0[a] | 14.9[a] | 6.4[ab] | 59.3[a] | 56.6[a] | 5.2[ab] | 0.84[a] | 14.2[a] |
| | | Sin | 22.4[ab] | 85.6[a] | 14.4[b] | 9.2[ab] | 2.5[ab] | 66.1[a] | 52.6[a] | 13.5[a] | 7.9[abc] | 64.2[a] | 60.8[a] | 5.4[ab] | 0.87[a] | 31.8[ab] |
| | p.m. | Con | 19.7[a] | 87.1[a] | 12.9[b] | 12.5[b] | 2.0[ab] | 65.7[a] | 49.0[a] | 16.7[a] | 7.0[ab] | 66.4[a] | 62.6[a] | 4.3[ab] | 1.36[a] | 30.4[a] |
| | | Sin | 19.6[a] | 87.1[a] | 12.9[b] | 8.3[ab] | 1.5[ab] | 70.5[a] | 47.5[a] | 23.0[a] | 6.8[ab] | 63.5[a] | 60.1[a] | 4.4[ab] | 1.27[a] | 13.2[a] |
| SEM[3] | | | 2.0 | 0.5 | 0.5 | 1.1 | 0.3 | 2.2 | 5.0 | 4.0 | 2.3 | 2.2 | 1.9 | 0.3 | 0.3 | 1.62 |
| *P Value*[4] | | F | 0.001 | 0.001 | 0.001 | 0.753 | 0.650 | 0.022 | 0.621 | 0.589 | 0.001 | 0.148 | 0.147 | 0.001 | 0.001 | 0.004 |
| | | H | 0.072 | 0.203 | 0.001 | 0.805 | 0.949 | 0.273 | 0.432 | 0.711 | 0.634 | 0.014 | 0.014 | 0.363 | 0.558 | 0.794 |
| | | I | 0.118 | 0.119 | 0.119 | 0.033 | 0.276 | 0.063 | 0.74 | 0.223 | 0.016 | 0.141 | 0.141 | 0.530 | 0.567 | 0.475 |
| | | F×H | 0.023 | 0.001 | 0.001 | 0.001 | 0.175 | 0.693 | 0.426 | 0.180 | 0.540 | 0.639 | 0.639 | 0.037 | 0.199 | 0.006 |
| | | F×I | 0.686 | 0.676 | 0.776 | 0.931 | 0.846 | 0.197 | 0.694 | 0.931 | 0.321 | 0.837 | 0.837 | 0.989 | 0.909 | 0.841 |
| | | H×I | 0.660 | 0.612 | 0.612 | 0.033 | 0.334 | 0.930 | 0.918 | 0.858 | 0.492 | 0.719 | 0.719 | 0.307 | 0.499 | 0.002 |
| | | F×H×I | 0.303 | 0.508 | 0.508 | 0.256 | 0.003 | 0.066 | 0.894 | 0.301 | 0.601 | 0.028 | 0.028 | 0.271 | 0.219 | 0.059 |

[1]Means with different letters in the columns differ according to Tukey's test (α=0,05);
[2]DM=dry matter; OM=organic matter; MM=mineral matter; CP=crude protein; EE=ether extract; NDF=neutral detergent fiber; ADF=acid detergent fiber; HEM=hemicellulose; NFC=non fiber carbohydrates; IVDMD =*in vitro* dry matter digestibility; NDT=total digestible nutrients; T.A.= titratable acidity (mL NaOH); E.L.= ensiling losses (%).
[3]Standard error mean.
[4]Probability values for effects of forage (F): *Z.m* (maíz - *Zea mays*); Tan (*M. maximus* cv Tanzania); Mom (*M. maximus* cv Mombasa), schedule cut (H), inoculum (I) and interactions F×H, F×I, H×I y F×H×I

Mineral and organic matter content varied ($p<0.001$) between silages, with interaction ($p=0.001$) between forage and schedule factors. The lowest ash content was observed in corn, with no differences among pastures. There were correlations ($p<0.05$) between ash content and pH values ($r=0.77$), titratable acidity ($r=-0.93$) and fermentation losses ($r=0.33$).

The CP content of silages was affected by the addition of inoculum ($p=0.033$), with interactions between forage and schedule ($p=0.033$) and schedule and inoculum ($p=0.033$) factors. The CP content of inoculated silages was higher (10.16%) than that of non-inoculated silages (8.79%). The interactions are explained by the differentiated response between the *Megathyrsus* and corn silages, as the Mombasa grass presented the highest CP value when the additive was applied in the a.m. schedule, something not observed in the case of Tanzania grass. In corn silage, the highest content was observed in the inoculated material cut in the afternoon. No correlations ($p>0.05$) were observed between the CP content and the other variables.

The content of ether extract (EE) did not vary, but there was an interaction ($p=0.003$) between the factors under study, evidenced by the differences between the silages of the Mombasa cultivar without addition of inoculum, in the two schedules. There was a positive correlation between EE and DM values ($r=0.44$; $p=0.073$), IVDMD ($r=0.40$; $p=0.0073$), NDT ($r=0.40$; $p=0.016$) and pH ($r=0.34$; $p=0.044$). It is noteworthy what happened with the Mombasa silage, in which the highest value occurred in the p.m. cut without the addition of inoculum, and the lowest in the a.m. cut.

As for the NDF content, there was an effect of the forage factor (p=0.022), with the highest value corresponding to Mombasa silage and the lowest to corn silage. The values of NDF concentration were negatively correlated (p<0.05) with those of IVDMD (r=- 0.74), NFC (r=-0.81), TDN (r=-0.74) and titratable acidity (r=-0.46), and positively with those of pH (r=0.48). ADF and hemicellulose concentrations did not vary. When ADF concentration values increased, so did NDF (r=0.58) and pH (r=0.36), while there was a negative relationship (p<0.05) with IVDMD (r=-0.36;), NFC (r=-0.40) and TDN (r=0.36).

The highest proportion of NFC was observed in corn silage. In addition to the correlations between NFC and NDF, ADF and ash values, positive correlations (p<0.05) were also observed between NFC content and IVDMD and TDN content (r=0.59), and titratable acidity (r=0.76), and negative correlations with pH value (r=- 0.68).

**IVDMD.** For the IVDMD, the effect of the cut-off time was found (p=0.014). To the correlations between IVDMD values and those of EE, NDF, ADF, NFC and TDN, the variables pH (r=-0.40) and titratable acidity (r=0.38) are added. On the other hand, TDN content was affected by cutting schedule (p=0.014), with no differences between forages. A negative relationship was found between TND values and pH (r=-0.40) and a positive relationship between TDN and titratable acidity (r=0.38). The higher NFC content coincided with lower pH values, which is an advantage.

**pH.** The pH of the silages was affected by the silage material (p<0.001), with interaction between the schedule and inoculum factors (p=0.037). The interaction was due to what occurred in the Mombasa and maize silages, which differed from each other. Corn silage, cut in the morning and inoculated, presented the lowest pH (3.7) and Mombasa silage, cut in the afternoon presented the highest value (5.4), with no differences in the other treatments. The silages from Mombasa and Tanzania had an identical pH value (4.83). The increase in DM, EE, NDF, ADF and ash concentrations was associated with higher pH values, while lower pH values were associated with increased concentrations of MO, IVDMD, NFC, TDN and titratable acidity (r=-0.86). The titratable acidity was affected only by the forage factor (p<0.001), with the highest value (3.71) for corn.

**Losses.** Losses during the ensiling process varied between forages (p=0.0038), with interactions (p<0.01) between forage and schedule, and schedule and inoculum factors. The lowest losses occurred in corn silage, and the highest in Mombasa (858.7g DM). Cutting schedule and inoculum addition had no effect. The interactions are explained by the differentiated behavior of each forage, especially by the magnitude of the losses observed in the Mombasa silage cut in the morning without inoculum addition, and by the response of the Tanzania cultivar in the a.m. and p.m. schedules.

## DISCUSSION

The treatments evaluated allowed silage to be obtained with a satisfactory sensory evaluation. In this sense, despite not having been carried out directly with animals, it constitutes an important criterion to evaluate the quality of a silage, since the method used scores negatively aspects associated with the presence of damage in the silage (15).

In the case of DM content, several studies have shown that grasses show variations in the concentration of certain compounds throughout the day, which influences nutritional composition (21), with variations between C3 and C4 species (13, 22). Although the variations are mainly explained by the increase in soluble carbohydrate content, other components, such as NDF and protein, could affect DM content, as occurred in this study. This explains the presence of interaction between the forage and schedule factors, since in the Mombasa silage the magnitude of the difference between the evaluated schedules was different from that with Tanzania and maize, where the differences were less noticeable.

In conditions of the Caribbean region of Colombia, the variation in the concentration of soluble compounds was evaluated in some species of *Panicum*, *Cynodon* and *Brachiaria* (23), noting daytime variations in *Cynodon*, but not in Mombasa, which differs from the findings of this study, although these materials were not ensiled. In the high tropics (Nariño, Colombia), hourly differences were observed in the concentration of soluble solids in two varieties of ryegrass, being higher at 15:00 h compared to 07:30 (22).

In tests carried out with Mombasa harvested at different ages (24), including 35 days, which coincides with that of this research, a DM concentration of 19.75% was observed, a value lower than that observed in this study. On the other hand, in Tanzania grass silage with the addition of different bacterial inoculums, no effects were observed on the DM content, which was close to 29% (25), a percentage higher than that observed in this study, where the average for Tanzania was 20.27%, a situation that may help to explain the presence of interaction between forage and time factors. For corn, the observed DM content (18.67%), although normal for that age, is not considered the most advisable, due to possible fermentative complications (26,27,28).

In relation to the mineral and organic matter content, which varied between silages and with the presence of interaction, it is noted that the concentration of mineral matter in corn silage is within normal ranges (28). The concentrations of mineral matter observed in the Tanzania and Mombasa silages are higher than those reported by some authors (29 and 30), who found mean concentrations of 7.19 and 10.6%, respectively, in these same grasses. Mombasa grass presented the maximum value when it was cut in the afternoon, which explained the interaction between forage and time factors. The high ash content in pastures can be considered as a limiting factor for pH decrease (31), which was verified by the presence of a significant correlation between these two variables, in addition to buffering capacity and titratable acidity.

The higher CP content was associated with the treatments with addition of the inoculum, the effect being more sustained in the Mombasa silage, indicating lower losses of nitrogen compounds. Similar results were reported by Bumbieris et al (25), who, when evaluating the inoculation with *Lactobacillus plantarum* and *Pediococcus pentosaceus* in Tanzania grass silage, recorded lower nitrogen losses, a result that was attributed to the inhibition of the bacteria responsible for this process (32). The maize and Tanzanian silages presented similar CP contents in the a.m. and p.m. schedules, but in Mombasa, the highest percentages of CP were present in the material cut in the morning, which explains the interaction between the factors cutting time and inoculum.

For EE content, the Mombasa silage is highlighted, in which the highest value occurred in the p.m. cut without addition of inoculum, and the lowest in the a.m. cutoff. The average value for Tanzania (1.93%) was higher than observed (1.45%) in a study where different doses of bacterial and enzyme additives were evaluated (30). In another experiment (33), average EE percentages of 1.82% were found, which are close to the values of 2.07% observed for this forage. Despite being species of the same genus, Tanzania and Mombasa appear to differ in how the diurnal concentration of certain plant chemical components changes, although in general the variations in fatty acid concentration are less (34).

The NDF content was higher in Mombasa grass, while corn had the lowest concentration (65.3%), which is considered normal for 60-day-old plants (35). Correlations between IVDMD values and those of EE, NDF, ADF, NFC, TDN, pH and titratable acidity must be considered when testing this type of silage. In a study evaluating the influence of DM concentration and corn silage density, a strong correlation (r=-0.79) was also found between NFC and ADF content (36), however, corn NFC concentrations were much higher, exceeding 40%, unlike the 15.4% in this study. Also, in corn, it was observed minimum values of 20.5% (37), or ranges between 7.53% and 54.28% (28), indicating the high variability of this characteristic. Although the concentration of NFC was not affected by the cutting schedule, there was a higher digestibility (IVDMD) in the materials cut in the afternoon. The lack of difference between the forages evaluated indicates the technical viability of the silages of the Mombasa or Tanzania pastures, since there were no differences between the CP contents.

For corn silage, pH values are observed fluctuating between 3.7 and 4.2 for plants with 30-40% DM (38). In tests with Mombasa silage, an average pH value of 4.82 (37) was observed after day 45 of ensiling, a value similar to the one observed in this study, since the average value for this cultivar was 4.83. The presence of interaction between schedule and inoculum factors is explained, especially, by the differentiated response between the two cultivars of *Megathyrsus*, and their characteristics in terms of nutritional composition, since most of the variables were correlated, positively or negatively, with the final pH of the silages at the time of opening. Although it was expected that the addition of the inoculum would influence pH, it cannot be inferred with certainty because the silos were opened after day 60 of ensiling, and there could have been effects on fermentation dynamics at earlier stages of the process. Although no clear effects of inoculum addition on fermentation losses were evidenced, it should be taken into account, based on previous results, that inoculum addition is a technique applied in silages to improve silage quality and reduce costs by reducing DM losses (32).

In conclusion, it should be noted that the addition of bacterial inoculum reduced the loss of nitrogenous components in the silages, which represents a beneficial effect, and the cutting of the forages in the afternoon resulted in a higher digestibility of the dry matter and a higher concentration of TDN, which means an improvement in the nutritional quality of the silages due to the hourly variation of the chemical composition of the forages, especially in the case of non-fiber carbohydrates. It also stands out, as a variable associated to ensilability parameters, the mineral matter concentration, since its values are positively correlated with pH values and DM losses. The fundamental role of the concentration of non-fiber carbohydrates on the final quality of the silage was confirmed, as evidenced by the positive correlation between the values of this variable and those of pH and acidity. Despite the different responses of the evaluated materials to the cutting schedule or to the addition of inoculum, it is concluded that Mombasa and Tanzania grasses can be ensiled with satisfactory results, although with ensilability characteristics lower than those of corn.

### Conflict of interest statement

The authors declare that they have no conflict of interests.

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