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## Is the sorghum silage nutritive value influenced by the species intercropped?

### O valor nutritivo da silagem de sorgo é influenciado pelas espécies em consórcio?

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### ABSTRACT

Consortium is becoming a sustainable alternative for producing silage as dry season livestock feed. However, the mix of different species can alter the silage quality. So, this work objective was to evaluate the nutritive value of silage produced by sorghum monocropped, sorghum intercropped with a tropical grass, sorghum intercropped with a leguminous and sorghum intercropped with a tropical grass and a leguminous. Treatments were arranged in a randomized complete block design, with four replications. The treatments were: monocropped sorghum silage and sorghum silage intercropped with dwarf pigeon pea, palisade grass, palisade grass and dwarf pigeon pea, guinea grass, and guinea grass and dwarf pigeon pea. The bromatological quality of silage were determined. Palisade grass enhances the silage values of in vitro dry matter digestibility and total digestible nutrients. Guinea grass increases the silage crude protein content of both silages.

**Keywords:** *Cajanus cajan*; *Megathyrsus maximus*; *Sorghum bicolor*; *Urochloa brizantha*.

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## RESUMO

Consórcio está se tornando uma alternativa sustentável para a produção de silagem como alimentação do gado na época da seca. Porém, a mistura de diferentes espécies pode alterar a qualidade da silagem. Assim, o objetivo deste trabalho foi avaliar o valor nutritivo da silagem de primeiro corte e rebrota produzida por sorgo em monocultivo, sorgo consorciado com gramínea tropical, sorgo consorciado com leguminosa e sorgo consorciado com gramínea tropical e leguminosa. Os tratamentos foram dispostos em delineamento de blocos completos casualizados, com quatro repetições. Os tratamentos foram: silagem de sorgo monocultivo e silagem de sorgo consorciada com guandu-anão, capim-marandu, capim-marandu e guandu-anão, capim-mombaça e capim-mombaça e guandu-anão. Foi determinada a qualidade bromatológica da silagem. O capim-marandu aumenta os valores da silagem de digestibilidade *in vitro* da matéria seca e dos nutrientes digestíveis totais. O capim-mombaça aumenta o teor de proteína bruta da silagem de ambas as silagens.

**Palavras-chave:** *Cajanus cajan*; *Megathyrsus maximus*; *Sorghum bicolor*; *Urochloa brizantha*.

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## INTRODUCTION

In regions with restrain water, producers frequently find themselves dependents on preserved forage to feed the cattle, such as silage (LIMA; GOMES; DETONI, 2004; PERAZZO et al., 2017). In these regions, the key to achieve greater productivity is to select species that can rapidly develop and growth using the available resources (COSTA et al., 2016).

In this scenario, sorghum can be chosen because of its rusticity, quality and capacity to grow when intercropped (BROCKE et al., 2014; COSTA et al., 2016; GETACHEW et al., 2016). Sorghum is the fifth most important cereal grown in the world (FAO, 2018) and represents one of the manly pillars of producers that have no resources or technology (SRIVASTAVA et al., 2010), especially because of the regrowth capacity after harvested, which permits to produce a silage without the need for replanting (PERAZZO et al., 2017).

Because sorghum requires less nitrogen fertilization and uses 30% less water than corn to produce forage (CONTRERAS-GOVEA et al., 2010, NEWMAN et al., 2013, GETACHEW et al., 2016) and equals corn in terms of nutritional and agronomic value (PERAZZO et al., 2014; QU et al., 2014; COLOMBINI et al., 2015), it can be an option to ensure food security worldwide, since it can be grow where corn cannot (SANTOS et al., 2013b; PERAZZO et al., 2014; PINHO et al., 2015).

Besides its rusticity, sorghum also have the prerequisites necessary to produce an adequate lactic acid fermentation (SANTOS et al., 2013a), such as high concentration

of soluble carbohydrates, suitable dry matter content, low buffering capacity, and high nutritional value (SANKARAPANDIAN et al., 2013; KUMAR et al., 2015). Also, sorghum silage can provide fibers with physical characteristics required to proper rumen function (GETACHEW et al., 2016).

However, high carbohydrate concentration in sorghum silage could result in the development of undesirable aerobic microorganisms, such as yeasts, when the silo is open, reducing the silage stability (RAMOS et al., 2016). To avoid this problem, an alternative is to intercrop sorghum and grasses. Tropical grass silage, on the other hand, have low dry matter content, high power buffering capacity and low carbohydrate concentration in the early stages (EVANGELISTA et al., 2004).

According to Ramos et al. (2016), mixing tropical grasses and sorghum can result in a high-quality silage, because grasses silages have lower carbohydrate concentration and larger pH, and it can increase acetic acid production, which is essential to heterofermentative bacteria grow and injurious to fungi development. Also, Costa et al. (2016) found that intercropping tropical grasses does not reduce sorghum development and dry matter production.

Leguminous can also be add to increase silage protein and mineral content. Leguminous are used by farmers in some regions to reduce production costs, as commercial protein supplies are expensive. In addition, leguminous can use the atmospheric N (MAXIN et al., 2017), and improve forage cereal silage quality because of a higher crude protein concentration (ROSS et al., 2004).

Although it is known the characteristics of sorghum, grasses and leguminous fermentation, there is a lack of information regardless the nutritive value of silage produced by mixing all three kinds. The mixture between different species present a whole new feed and it is necessary more studies to understand how much a species can influence the silage final nutritive value. To Costa et al. (2016), studies that can determine the nutritional quality of intercropped silages are important to improve tropical agriculture.

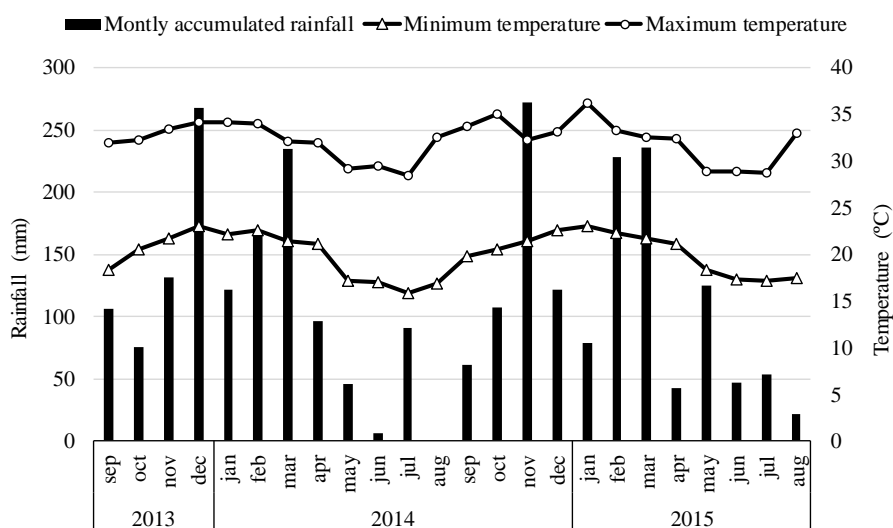
This work objective was to evaluate the nutritive value of first cut and regrowth silage produced by sorghum monocropped, sorghum intercropped with a tropical grass, sorghum intercropped with a leguminous and sorghum intercropped with a tropical grass and a leguminous. The hypothesis was that silage produced with more than one forage specie and with the addition of legume would have different nutritive value regardless fiber and protein content and nitrogen forms than sorghum monocropped silage.

## MATERIALS AND METHODS

The experiment was carried out at the São Paulo State University Experimental Station, in Selvíria, Mato Grosso do Sul state, Brazil (20°18'S, 51°22'W, at 370 m above sea level), over two consecutive growing seasons.

According to Köppen-Geiger, the region climate is classified as Aw (ALVARES et al., 2013), characterized as tropical and humid, with a rainy summer and a dry winter. Monthly weather data (i.e. precipitation, maximum, and minimum temperature) during the study are shown in Figure 1.

**Figure 1.** Monthly rainfall, maximum and minimum temperatures during the 2013-2014 and 2014-2015 growing seasons in Selvíria, Mato Grosso do Sul state, Brazil.



The original vegetation found in this area was described as a typical Cerrado (Brazilian savanna), with a predominance of shrubby plants in a deep and mildly fertile soil. The soil was classified as a Haplic Acrustox, with a slope of 0.025 m<sup>-1</sup>. In 1970, this area was covered in the native vegetation of the Cerrado Biome until 1978 when it was deforested to cultivate annual crops (soy, maize and cotton).

The soil is classified as a Typic Haplorthox (FAO, 2006) or Latossolo Vermelho distrófico under the Brazilian classification system (EMBRAPA, 2013). Soil characteristics were determined in the 0.0–0.20-m layer before the experiment beginning: pH 4.6; 18.5 g dm<sup>-3</sup> total soil organic matter; 39.5 mg dm<sup>-3</sup> P (resin); 1.3, 9.5, 8, and 42.5 mmolc dm<sup>-3</sup> exchangeable K, Ca, Mg, and total acidity at pH 7.0 (H+Al), respectively; base saturation of 30.5% according to Raij et al. (2001); 0.03 and 0.4 m<sup>3</sup> macro and

microporosity, respectively,  $1.6 \text{ g cm}^{-3}$  soil density (EMBRAPA, 1997) and 3.0 MPa soil penetration resistance (STOLF, 1991).

Treatments were arranged in a randomized complete block design, with four replications, consisting of six treatments implemented over two growing seasons. The treatments consisted of six cropping systems: (i) monocropped sorghum (*Sorghum bicolor*) silage (SS), (ii) sorghum silage intercropped with pigeon pea (*Cajanus cajan*) (SC), (iii) sorghum silage intercropped with palisade grass (*Urochloa brizantha* cv. Marandu) (SU), (iv) sorghum silage intercropped with palisade grass and pigeon pea (SUC), (v) sorghum silage intercropped with guinea grass (*Megathyrsus maximus* cv. Mombaça) (SM), and (vi) sorghum silage intercropped with guinea grass and pigeon pea (SMC). Plots were 20 m long and contain 7 sorghum rows, totalizing 58,4 m<sup>2</sup> per plot.

Forage sorghum was sown mechanically at 5 seeds m<sup>-1</sup> to a depth of 0,05 m, in rows 0,45 m apart. Palisade grass and guinea grass seeds were mixed with fertilizer in the seeder's fertilizer compartment and placed below sorghum seeds during sowing. It was used 13 kg ha<sup>-1</sup> and 10 kg ha<sup>-1</sup> of palisade grass seeds and 15 kg ha<sup>-1</sup> and 10 kg ha<sup>-1</sup> of guinea grass seeds in 2013 and 2014, respectively. Dwarf pigeon pea was sown between sorghum' rows, immediately after sorghum seeding, at 20 seeds m<sup>-1</sup> to a depth of 0,05 m.

For all treatments and during both growing seasons, the basic fertilization in the sowing furrows consisted of 24 kg ha<sup>-1</sup> N, 84 kg ha<sup>-1</sup> P<sub>2</sub>O<sub>5</sub> and 48 kg ha<sup>-1</sup> K<sub>2</sub>O in an 08-28-16 formula. In December of both years all plots were fertilized with 120 kg N ha<sup>-1</sup> and 50 kg K<sub>2</sub>O ha<sup>-1</sup>, when sorghum plants presented 6 well developed leaf (RAIJ; CAMARGO, 1997). It was used ammonium sulfate as nitrogen source and KCl as potassium source.

The crops intercropped were harvested in the first cut and 30 days later in the regrowth cut, when there was approximately 70% dry matter (DM) in the sorghum grains (physiological maturity). The crops in each plot were harvested using a mechanical silage forage harvester (Model JF C-120 with 12 knives and total area platform of 1.30 m). The crops were chopped into particles with an average size of 2.5 cm. A one-line platform was used to harvest the plant mass for ensiling. The cutting height of the species for silage was approximately 0.30 m above the ground surface.

During both growing seasons, the material was collected and appropriately compacted for storage by pressing (with an adapted hydraulic press) into plastic buckets capable of holding 10 kg of green dry matter at a density of 600 kg m<sup>-3</sup> (green mass). Flanges were fitted against the silicon of the laboratory silos to allow for gas flow (Bunsen

valves), and sand was placed in the bottom to recover the effluent. After filling, the buckets were hermetically sealed using adhesive tape to prevent air exchange with the environment, and the silos (buckets) were unsealed 30 days later.

When the material was ensiled, four samples were collected to determine the total DM percentage and four samples were frozen in plastic bags for subsequent laboratory analysis. Crude protein content (CP), ether extract (EE), pH, neutral detergent fiber (NDF), acid detergent fiber (ADF), neutral-detergent insoluble nitrogen (NDIN), acid-detergent insoluble nitrogen (ADIN), and Ash were determined according to Silva e Queiroz (2002). Total digestible nutrient (TDN) were calculated using Capelle et al. (2001) method. In vitro dry matter digestibility (IVDMD) were measured by methods of Tilley and Terry (1963).

Fermentative' parameters were also determined only to determine the silage process quality and it is show in Figure 2. It was not our objective to compare the losses between treatments or years. Since there was a gas release valve, gas losses (GL) were calculated by the difference between initial weight (silo + harvest material) and final weight (silo + silage). It was placed in each silo a sand bag before ensiling. The difference between the initial sand bag weight and the final sand bag weight (after the silo opening) was used to calculate effluent losses (EL). The dry matter recovery (DMR) were calculated using dry matter content and weight of the harvest material and the final silage. The GL, EL and DMR calculation followed methodology proposed by Schmidt (2006).

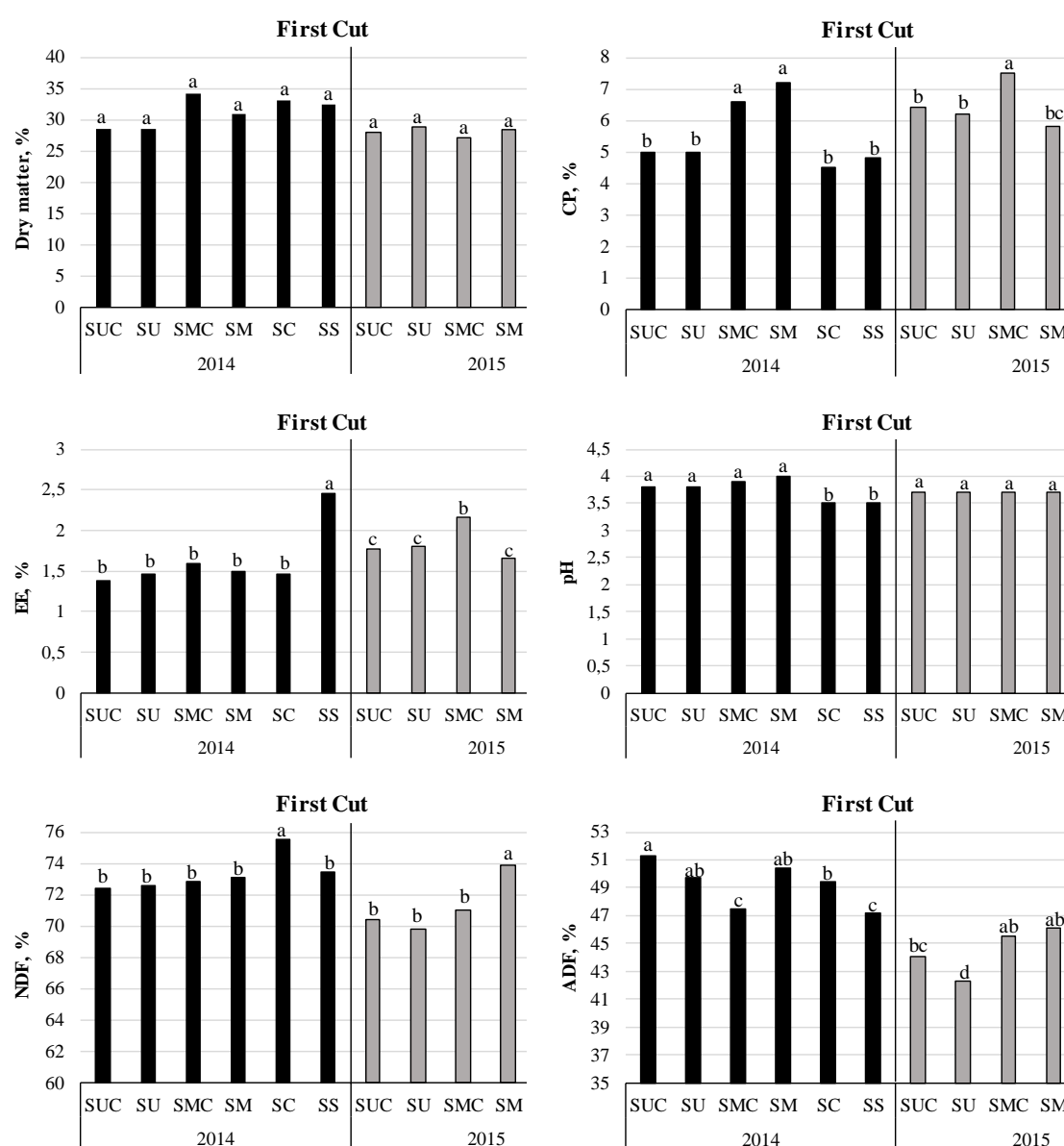
The analysis of the randomized block data was performed as a mixed model two-way analysis of variance. Silage sorghum cropping system and year was the fixed factors, block and block interaction were considered the random factor. If the F-test was significant ( $P < 0.10$ ) means were separated using the least significant difference (LSD) test ( $P < 0.10$ ). All the statistical analyses were performed using the statistical software package SISVAR (FERREIRA, 2014).

## RESULTS

A significant interaction ( $P < 0.10$ ) was observed between the systems evaluated and year for all variables, except DM (Figure 2). The sorghum intercropped with guinea grass treatment was the one with the highest crude protein (CP) value (7.0% in SM and 6.5% in SMC) in both years (Figure 2). The lowest CP value was observed for silage produced from single sorghum (5.1%).

The single sorghum silage showed the highest values of ether extract (EE) (2.3%) (Figure 2) in both agricultural years, being equaled in value by the sorghum silage with dwarf pigeon pea in the second year (2.5%). The pH value of the silage (Figure 2) produced from single sorghum (3.5) and sorghum with dwarf pigeon (3.5) were lower in the first year. There were no significant differences between treatments for the second year.

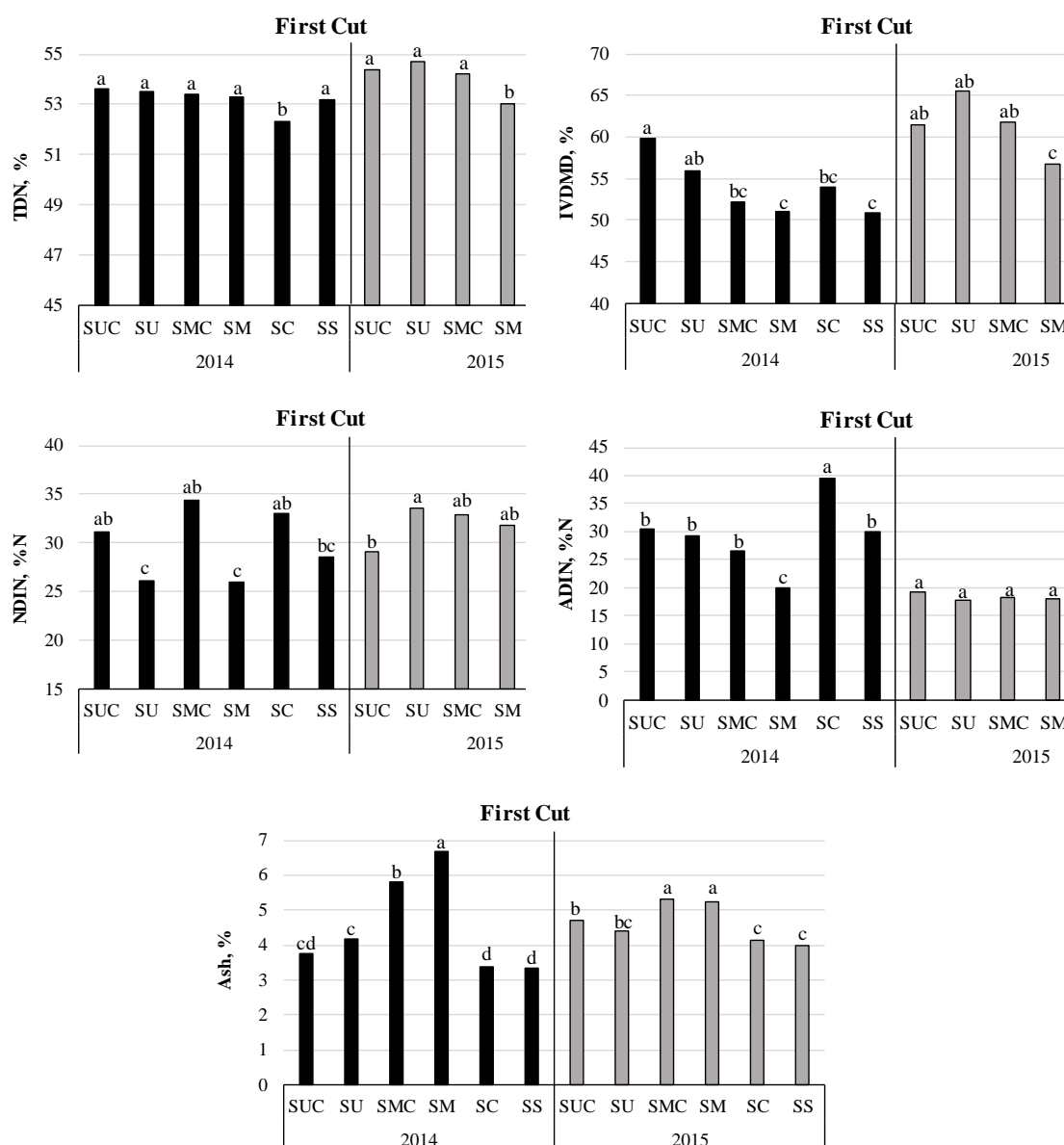
**Figure 2.** Chemical composition of silages produced by sorghum monocropped or sorghum (S) intercropped with palisade grass (U), guinea grass (M) and/or dwarf pigeon pea (C) (i. e. dry matter, crude protein, EE, pH, NDF and ADF) of first cut silage.



Means in the same year followed by different letter differ significantly ( $P < 0.10$ ) by LSD test.

Regarding the NDF content (Figure 2), the silage produced with grass palisade, with or without dwarf pigeon, (71.4% in SU and 71.2% in SUC) was numerically equal to single sorghum silage (71.8%) in both years and lower than dwarf pigeon pea silage in the first year (75.5%) and guinea grass in the second year (73.9%). Regardless of the year, sorghum silage with guinea grass showed a higher percentage of ADF (48.3%).

**Figure 3.** Chemical composition of silages produced by sorghum monocropped or sorghum (S) intercropped with palisade grass (U), guinea grass (M) and/or dwarf pigeon pea (C) (i. e. TDN, IVDMD, NDIN, ADIN and Ash) of first cut silage.



Means in the same year followed by different letter differ significantly ( $P < 0.10$ ) by LSD test.



Sorghum silages with palisade grass, with or without dwarf pigeon, showed higher values of total digestible nutrients (TDN) (63.0% in SUC and 63.2% in SU) and in vitro dry matter digestibility (IVDMD) (60.6% in SUC and 60.8% in SU), regardless of the year studied (Figure 3). There was no difference for NDT between treatments with monocropped sorghum and sorghum intercropped with palisade grass, regardless of the presence of dwarf pigeon pea.

When there was a difference between treatments, sorghum silages with pigeon pea showed higher values of NDIN and ADIN in both years (Figure 3). In the first agricultural year, all treatments with the addition of dwarf pigeon were higher in NDIN than the others.

The ash values (Figure 3), regardless of the year studied, were higher for treatments with guinea grass, with or without dwarf pigeon pea (5.5% in SMC and 5.9% in SM).

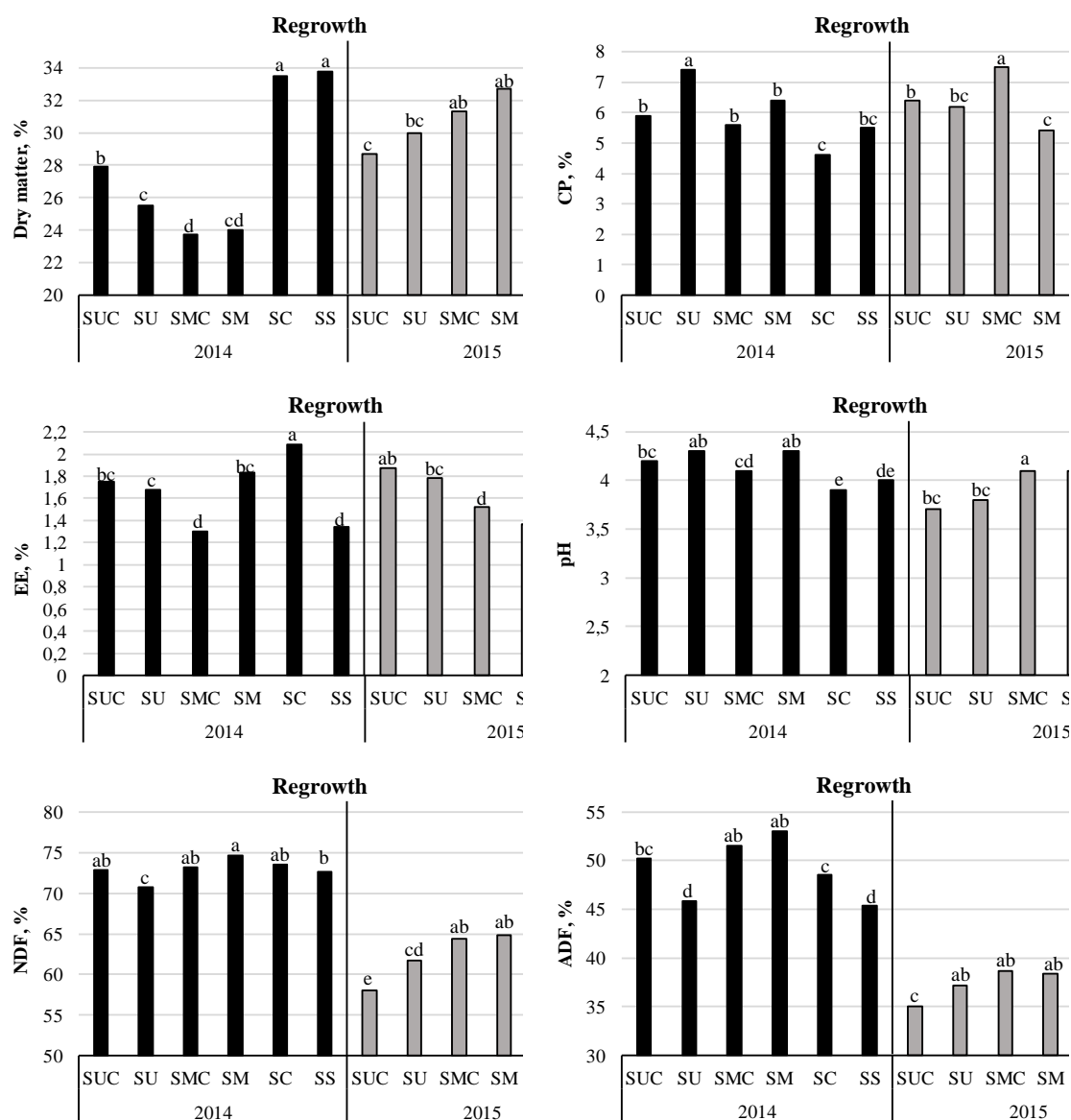
A significant interaction ( $P < 0.10$ ) was observed between the systems evaluated and year for the variables DM, EE, pH, NDF, ADF and Ash. The highest values of DM were obtained in treatments without the presence of palisade grass and guinea grass in the first year (33.5% in SC and 33.8% in SS) (Figure 4). In the other hand, the highest values of CP were found in silages intercropped with palisade grass (7.2% in SU and 6.6% in SUC) and guinea grass (6.3% in SM and 7.4% SMC) in both years.

The highest pH values were obtained in silages with the presence of guinea grass (4.2 in SM and 4.1 in SMC, in order). The lowest pH values were obtained in silages without intercropping with forage (3.7 in SC and 3.8 in SS).

The silages with the presence of guinea grass showed higher values of NDF and ADF (69.8% and 45.7% in SM and 68.8% and 45.1% in SMC, in order). The lowest ADF value was obtained in the monocropped sorghum silage (40.7%). There were no significant differences between the silages SUC, SU and SS for NDF.

The highest IVDMD was obtained in silages with the presence of grass palisade (66.4% in SU and 64.1% in SUC) and in the monocropped sorghum silage (64.8%). The lowest digestibilities were obtained in guinea grass silages (58.7% in SM and 61.2% in SMC). The SM and SMC treatments also presented the major values for Ash (9.2% and 8.7%, in order).

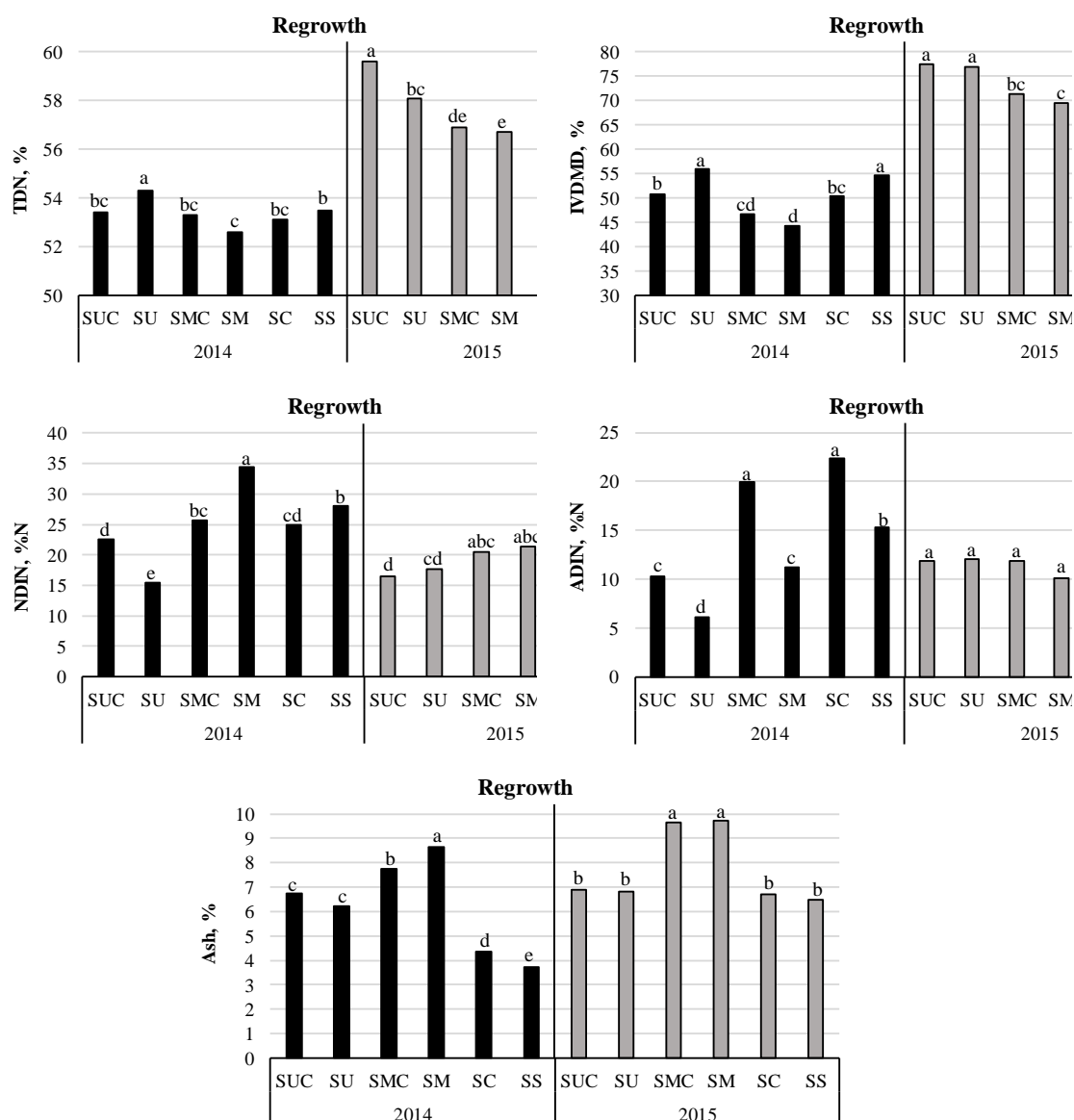
**Figure 4.** Chemical composition of silages produced by sorghum monocropped or sorghum (S) intercropped with palisade grass (U), guinea grass (M) and/or dwarf pigeon pea (C) (i. e. dry matter, crude protein, EE, pH, NDF and ADF) of regrowth silage.



Means in the same year followed by different letter differ significantly ( $P < 0.10$ ) by LSD test.

The silages with palisade grass (SU and SUC) showed the lowest values of NDIN in both agricultural years and ADIN in the first year. There was no significant difference between treatments for ADIN in the second year. The silages of the first year showed higher values of pH, NDF, ADF, NDIN and ADIN and lower values of DM, TDN, INDMD and Ash as of the second year (Figures 4 and 5).

**Figure 5.** Chemical composition of silages produced by sorghum monocropped or sorghum (S) intercropped with palisade grass (U), guinea grass (M) and/or dwarf pigeon pea (C) (i. e. TDN, IVDMD, NDIN, ADIN and Ash) of regrowth silage.



Means in the same year followed by different letter differ significantly ( $P < 0.10$ ) by LSD test.

## DISCUSSION

During the growing season, the temperature was in the optimum range described for sorghum (SRIVASTAVA et al., 2010; ZINYENGERE et al., 2013; MATEUS et al., 2016; COSTA et al., 2016). According to Maiti (1996), the ideal range for seed germination is 21-35°C, for vegetative growth and development is 26-34°C and for reproductive growth is 25-28°C. The difference in the nutritional value of silages between agricultural years and between cuts is related to the fermentative quality and weather conditions in the development of plants. The lowest precipitation during the initial stage

of crop development and the highest precipitation during the harvest in the second year resulted in lower values of DM content and recovery of dry matter in the first cut silage.

The regrowth silage was cultivated and harvested 30 days after the first cut harvest, so, the climatic conditions were different. While in the first cut silage the total rainfall during the sorghum development were around 690 mm in 2014 and 700 mm in 2015, during the regrowth development in the 30 days period the total rainfall was 235 mm. Also, the development itself of the plants was different.

Although it is not usual to producers to regrowth sorghum after the first cut for silage, it is an important option to be consider for producers with low technology or low income such as those in the North of Brazil. According to Bernard and Tao (2017) and Perazzo et al. (2017), the regrowth silage is an option that reduces total labor and operational costs, since it is not necessary to spend money buying seeds or seeding them.

The ideal DM content range is between 30 and 35% so that there is no damage to the preservation and fermentation of the silage (MCDONALD; HENDERSON; HERON, 1991). Low DM content values mean high humidity values, which favor the development of microorganisms that produce butyric acid and acetic acid, such as *Clostridium* and enterobacteria, which result in nutrient losses in the material (SANTOS, 2013a). According to these same authors, unwanted fermentation during the ensiling period is among the causes of dry matter loss, along with residual respiration when filling the silo and producing effluents.

One of the parameters that indicates the unwanted fermentation possibility is the pH. The pH can be use to assess the aerobic stability of silages and the fermentation profile (BERNARDES et al., 2015, KUNG et al., 2018). A well-preserved silage should have pH between 3.7 and 4.2 and pH values above 5.0 indicates low-quality silages (MCDONALD; HENDERSON; HERON, 1991; VAN SOEST, 1994). Both silages produced in the first cut and regrowth presented pH below 5.0. The first cut silage range of pH was between 3.5 and 4.0 in both years and could be considered a well-preserved silage. The regrowth silage pH was higher in the first year than in the second, but remained below 5.0.

The hypothesis presented was that production with different forage species and the addition of a legume would alter the nutritional value of the silage in relation to single sorghum silage. The results of this work helped to confirm this hypothesis. The addition of palisade grass or guinea grass resulted in a higher percentage of ADF and lower percentage of NDF than silages without forages, in the first cut silage. The regrowth silage

also presented higher percentage of ADF when sorghum was intercropped with guinea grass (SM and SMC), although the NDF was also higher in these consortia.

Studying consortium systems, Costa et al. (2016) observed that the addition of forage grasses to sorghum silage increases the fiber content of the material. In general, an increase in fiber content results in a decrease in food digestibility (VAN SOEST, 1994), the main parameter for assessing food quality (BEHLING NETO et al., 2017), which was not observed in this study.

The highest values of NDT and IVDMD were observed in silages with palisade grass, with or without dwarf pigeon, in both cuts. This can be explained because when in moderate shading conditions, forage grasses show satisfactory growth, with an increase in the production of aerial and root biomass, specific leaf area and rate of leaf elongation and expansion (PACIULLO et al., 2010; 2016, ABRAHAM et al., 2014, SANTIAGO-HERNANDEZ et al., 2016), which increases the participation of the leaf blade and decreases the participation of the more fibrous parts in the final material to be ensiled. Still, plants grown in shade conditions have their youthful stage prolonged and maintenance of high metabolic levels for a longer period of time, compared to plants in full sun (SOUSA et al., 2010).

Due to its more vigorous initial growth, at the time of harvesting the material for silage, the guinea grass plants were in a more advanced stage of development than palisade grass. This could explain the greater INDMD only in silages with palisade grass since digestibility is inversely related to the advance of physiological maturity (GETACHEW et al., 2016). However, although a greater advance in the physiological maturity of guinea grass has been observed, it was not enough to intensively impair the digestibility of silages produced with forage.

The presence of guinea grass increased the crude protein content of both silages. For the silage to be considered of good quality, it must present a crude protein content of approximately 7%, avoiding losses in the material consumption by the animal (VAN SOEST, 1994). High levels of protein are directly associated with greater digestibility of the material (GETACHEW et al., 2016). In addition, as protein is an expensive component of the animal diet (GETACHEW et al., 2016), finding an alternative that raises the CP content without the need for additives results in economic gains for the producer.

One possible explanation for the protein content found is in interspecific competition. According to Costa et al. (2016), competition between intercropped species

can result in increased tillering and, consequently, the number of panicles per area. The more vigorous growth of guinea grass in relation to palisade grass may have resulted in a greater number of panicles in the final mass to be ensiled, causing higher levels of protein in the silage.

Another theory would be that of greater maintenance of soil moisture in treatments with the presence of guinea grass, due to the greater shading presented by the growth habit of this forage. Sousa et al. (2010) and Paciullo et al. (2014, 2016) also observed higher levels of crude protein in forages under shaded conditions than in full sun, attributing this fact to the increase in soil moisture. According to Wilson (1996), the increase in soil moisture increases the degradation of organic matter and the recycling of nitrogen, resulting in greater availability of N for plants, especially when there is the presence of a legume (XAVIER et al., 2014).

As the regrowth cut occurred only 30 days after the first cut, the palisade grass and the guinea grass had similar growth and the regrowth silage of sorghum intercropped with both grasses presented similar values of CP.

Although it was expected, there was no increase in protein contents with the addition of the dwarf pigeon. As the legume was sown between the sorghum spacing, which was sown in a reduced spacing of 0.45 m, the low light intensity between the spacing resulted in the dwarf pigeon pest, prioritizing the production of stem over the production of leaves. This fact reduced quantitatively the expected participation of the legume in the final mass to be ensiled.

In addition, light limiting conditions can lead to additional photoassimilated costs for maintaining symbiotic root microorganisms in legumes, which decreases the production of aerial dry matter in the crop (LOPES et al., 2018).

Although there was no increase in the CP content in both cuts, the addition of the dwarf pigeon resulted in an increase in the percentage of NDIN in relation to the silages produced without the legume. According to Behling Neto et al. (2017), there are few studies that evaluate nitrogen fractions in sorghum silage. NDIN represents nitrogen bound to NDF, being easier to extract than ADIN (COLOMBINI et al., 2010).

Much of the nitrogenous compounds in roughage is bound to the cell wall in the form of nitrogen insoluble in neutral detergent (NDIN) and nitrogen insoluble in acid detergent (ADIN). Nitrogen insoluble in neutral detergent is digestible but of slow degradation in the rumen, while nitrogen retained in the form of ADIN is practically

indigestible and is generally associated with lignin and other compounds that are difficult to break down (VAN SOEST, 1994).

The high ADIN values are undesirable because they represent an indigestible protein fraction, corresponding to proteins associated with lignin, tannin-protein complexes and products from the Maillard reaction, highly resistant to microbial enzymes and indigestible throughout the gastrointestinal tract (LICITRA; HERNANDEZ; VAN SOEST, 1996). Differences in the contents of this fraction between silages of the same culture in different experiments are possible, since the maturation of the plant at the time of ensiling, associated with the protein and fibrous content, reflect on the differences verified due to its consortia.

The highest values of ether extract were observed in single sorghum silages. Panicles are the part of the plant with the highest EE content (BEHLING NETO et al., 2017). In silages with single sorghum, there is a greater participation of panicles in the final mass to be ensiled compared to silages produced with the addition of other forage species, which may explain the higher EE content.

Although the silages from first cut and regrowth presented different values for the bromatological content, both silages presented the same behavior regardless the digestibility and fiber content. In this line, Bernard and Tao (2017) found that the first cut and regrowth sorghum silages supported similar milk production. Our results stand for the prerogative that allowing sorghum to regrowth it is a viable option for producers and should be consider in regions where technologies don't reach easily.

## CONCLUSION

The presence of different species alters the bromatological quality of sorghum silage. The presence of tropical grasses alters the silage fiber content. Palisade grass increases the first cut silage in vitro dry matter digestibility. It is bromatological viable the sorghum regrowth for silage producing. Dwarf pigeon pea as a leguminous part is not recommended in consortium with sorghum and tropical grasses in similar seeding condition of this experiment.

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