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Yield and Chemical Composition of Brachiaria Forage Grasses in the Offseason after Corn Harvest

Gean Alves Maia[1], Kátia Aparecida de Pinho Costa[2], Eduardo da Costa Severiano[1], Patrícia Soares Epifanio[2], José Flávio Neto[1], Matheus Gonçalves Ribeiro[2], Patrick Bezerra Fernandes[2], José Fausto Guimarães Silva[1], Wainer Gomes Gonçalves[1]

[1]Laboratory of Soil Physics, Federal Institute Goiano, Rio Verde, Brazil
[2]Laboratory of Forage and Grassland, Federal Institute Goiano, Rio Verde, Brazil
Email: eduardo.severiano@ifgoiano.edu.br

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Abstract

This study evaluated the dry matter production and chemical composition of *Brachiaria* forage grasses in the offseason after corn harvest in integrated crop-livestock system. The experiment was conducted at the Federal Institute of Goiás, Rio Verde Campus, using a randomized complete block experimental design, with four replications. The treatments consisted of the forages: *Brachiaria brizantha* cv. Marandu; *Brachiaria brizantha* cv. Xaraes; *Brachiaria brizantha* cv. Piata; *Brachiaria brizantha* cv. MG-4; *Brachiaria decumbens* and *Brachiaria ruziziensis*, intercropped in oversown corn for implantation of integrated crop-livestock system. The results showed that intercropping corn with *Brachiaria* grasses favors the production of high-quality forage in the offseason, and the cultivars of *Brachiaria brizantha* and *Brachiaria decumbens* showed higher dry matter production. And cultivars of *Brachiaria brizantha* (Marandu palisadegrass, Xaraes palisadegrass and Piata palisadegrass) are the most suitable for presenting food of better quality, compared with *Brachiaria brizantha* cv. MG-4, *Brachiaria decumbens* and *Brachiaria ruziziensis*.

Keywords

***Brachiaria brizantha*; *Brachiaria decumbens*; *Brachiaria ruziziensis*; Crop-Livestock Integration**

1. Introduction

In recent years, intercropping between annual crops and tropical forages, known as integrated crop-livestock

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system, has been increasingly adopted by farmers in the Cerrado [1], especially because studies demonstrated the feasibility of the intercrop between the annual culture and the various forage species simultaneously planted [2]. This system consists of the exploitation of the same area with the purpose of producing grains and livestock farming (production of meat, milk, etc.) [3], with the potential to increase yield and reduce the risk of degradation of pastures, thus improving the chemical, physical and biological soil properties, and yield potential of grain, forage and silage [4]. Moreover, [5] it is reported that this technique stands out as being part of sustainable and competitive technologies to boost the Brazilian agribusiness. Among the forages for crop rotation, succession or intercropping in the Cerrado region [6] stands out the Brachiaria grasses. The advantages of using this genus in integrated system are because these species have abundant roots which contribute to the collection of water, soil aggregation and aeration [7]. Furthermore, these forages have good adaptability, tolerance, and resistance to biotic factors and show high dry matter production with good nutritional value, capable of meeting the requirements of animals, especially in the dry season [8].

Identifying the best association between annual crops and different species of Brachiaria allows the exploitation of grain and biomass. After harvesting the grain, the area will be used as a standard pasture. The use of more productive forages during the dry season is important because they minimize the effect of the seasonality of production. In this way, the forage is suitable for intercropping in addition to promoting grain production of annual crops, and it must have good establishment and growth when intercropped, as well as major forage production [9].

However, most studies on crop-livestock integration evaluate the use of *Brachiaria brizantha* cv. Marandu, *Brachiaria decumbens* and *Brachiaria ruziziensis* [10], and the release of new cultivars of *Brachiaria brizantha* is lacking in information about the cultivars xaraés and piatã, especially regarding the yield and quality of these forages when subjected to intercropping in the offseason. Therefore, the identification of the best association between annual crops of different Brachiaria species allows the exploitation of grain production [11] and forage production in the winter, which shows low forage production. Once restored, the pastures have better nutritional value in autumn-winter, alleviating the pronounced effect of seasonality. In view of this, considering the importance of supplying better quality food, the present study aimed to evaluate the dry matter production and chemical composition of Brachiaria forage grasses in the offseason after corn harvest in integrated crop-livestock system.

2. Material and Methods

The study was conducted in an experimental area of 2016 m^2 at the Federal Institute of Education, Science and Technology Goiano—Rio Verde Campus, Rio Verde, Goiás State, 17˚48’34.25"S and 50˚54’05, 36"O, at 731 meters above sea level. The climate was classified according to Köppen, as megathermal or Humid Tropical (Aw), subtype Tropical Savanna, with dry winter and rainy summer. The average annual temperature is 25˚C and the average annual rainfall is about 1600 mm, with maximum rainfall in January and lowest in June, July and August (<50 mm·month^{-1}). The soil was classified as Dystroferric Red Latosol [12], with 530 g·kg^{-1} clay, 250 g·kg^{-1} silt and 220 g·kg^{-1} sand. The chemical characteristics of the soil at 0-20 cm before planting are presented in **Table 1**.

Corn (*Zea mays*) was sown in the first crop, on November 19th, 2010, with the aim of producing forage for silage. We used a row spacing of 0.8 m, with a population of 55,000 plants·ha^{-1}. For planting it was applied 200 kg·ha^{-1} P_2O_5, 30 kg·ha^{-1} nitrogen, 60 kg·ha^{-1} K_2O, 2 kg·ha^{-1} boron, 0.4 kg·ha^{-1} molybdenum, using as sources: simple superphosphate, potassium chloride, boric acid and sodium molybdate. After crop emergence, plant thinning was carried out in carriers and plots were delimited with dimensions of 5.4 × 6 m (32.4 m^2), randomly arranged into four blocks. Twenty-five days after corn sowing, *Brachiaria* forage grasses were planted in over-sowing corn for implantation of integrated crop-livestock system. Topdressing fertilization of corn was

Table 1. Chemical characteristics of the Dystroferric Red Latosol under integrated crop-livestock systems during sowing of *Brachiaria* species intercropped with corn (crop 2010/2011).

Ca	Mg	Al	H+Al	P	K	V[2]	*m*[3]	OM[4]	pH
	$cmol_c·dm^{-3}$			mg·dm^{-3}		%		g·kg^{-1}	$CaCl_2$
3.20	1.30	0.00	5.60	2.90	104.0	46.6	0.00	27.30	5.20

[1]20 cm depth; [2]V: base saturation; [3]*m*: aluminum saturation; [4]OM: Organic Matter. P: Determined by Mehlich extractor.

performed thirty days after emergence with 30 kg·ha^{-1} nitrogen and 90 kg·ha^{-1} K_2O, using ammonium sulphate and potassium chloride. The experiment consisted of a randomized complete block experimental design, with four replications. Treatments were comprised of the forages: *Brachiaria brizantha* cv. Marandu; *Brachiaria brizantha* cv. Xaraes; *Brachiaria brizantha* cv. Piata; *Brachiaria brizantha* cv. MG-4; *Brachiaria decumbens* and *Brachiaria ruziziensis*, intercropped in over-sowing corn for implantation of integrated crop-livestock system. Corn for silage was harvested mechanically at 90 days after sowing, on February 17th, 2011, with dry matter content ranging from 30% to 35%. To evaluate the development of *Brachiaria*, depending on climatic seasonality, after corn harvest, were conducted topdressing of 50 kg·ha^{-1} nitrogen and 25 kg·ha^{-1} K_2O, using urea and potassium chloride, respectively. In October of the same year (beginning of the rainy season) was applied the same amount of nitrogen and potassium. The evaluation periods of dry matter production and nutritive value of forages were conducted during the dry season and at the beginning of the rainy season. In this period were monitored daily rainfall data and monthly mean temperature (**Figure 1**).

Forages were evaluated under successive cuts, being collected samples of 1 m^2, by randomly directing the square within each plot and cutting at 20 cm height for cultivars of *Brachiaria brizantha* and at 15 cm for *Brachiaria decumbens* and *Brachiaria ruziziensis*. Cuts were held on 21/03/2011 (1st cut), 11/05/2011 (2nd cut), 04/07/2011 (3rd cut), 12/09/2011 (4th cut), 24/10/2011 (5th cut) and 25/11/2011 (6th cut). After assessment, the cut was made to standardize the experimental area, at the same height of the plants evaluated, being removed the residue from the area. The material collected in the field was packed in plastic bags and sent to the laboratory where a representative sample (500 g) of each plot was pre-dried in a forced air oven at 55˚C. Subsequently, samples were ground in a Willey mill, with 1 mm sieve and stored in plastic bags for analysis. Chemical analyses were performed to determine the dry matter (DM), crude protein (CP), neutral detergent fiber (NDF) and acid detergent fiber (ADF) using the method described by [13]. For determining *in vitro* dry matter digestibility (IVDMD), we adopted the technique described by [14], adapted to the artificial rumen, developed by ANKON®, using the instrument "Daisy incubator" of Ankom Technology (*in vitro* true digestibility- IVDMD). The ruminal fluid collection was performed by two cannulated steers with an average weight of 550 kg; animals were kept on pasture of *Brachiaria brizantha* cv. Marandu. Data were subjected to analysis of variance and means were compared by Tukey's test, with significance level of 5% probability. Analyses were performed by the split plot model over time, according to linear Gauss Markov models using the software SISVAR [15].

3. Results and Discussion

Significant effects ($P < 0.05$) were detected for the production of dry matter, crude protein (CP), neutral detergent fiber (NDF), acid detergent fiber (ADF), hemicellulose and *in vitro* dry matter digestibility (IVDMD) for forages of Brachiaria species, cuts, as well as the interaction of these factors. Assessing the dry matter production of cuts between *Brachiaria* species (**Table 2**), it is observed that in the first and sixth cut, higher yield was achieved in *Brachiaria brizantha* cv. Piatã. Although mid-sized and with a height between 0.85 m and 1.10 m, the Piata palisadegrass has good forage yield, high percentage of leaves and thin stems, which results in higher leaf: stem ratio, and better utilization by the [16]. Researches have shown that in plots under cutting the Piata

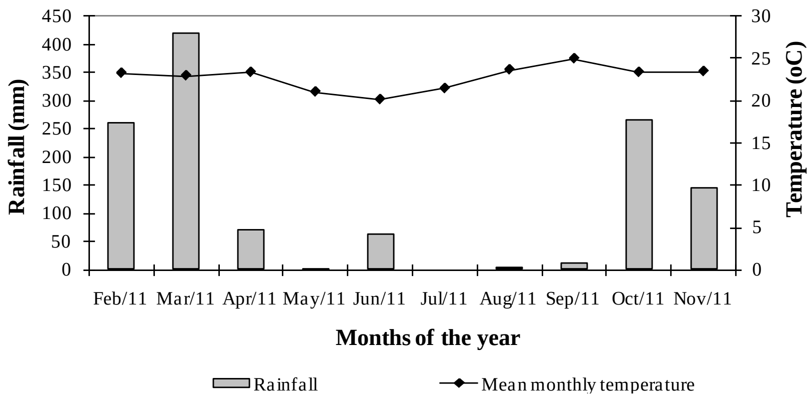

Figure 1. Rainfall (mm) and monthly temperature (˚C) during cultivation of *Brachiaria* forage grasses, Rio Verde, Goiás State.

Table 2. Dry matter production (kg·ha^{-1}) of *Brachiaria* species in different cuts after corn harvest in the offseason.

Species of *Brachiaria*	Cuts					
	1st cut Marc.	2nd cut May	3rd cut July	4th cut Sept.	5th cut Oct.	6th cut Nov.
B. brizantha cv. Marandu	5302Ca	4236BCb	975.6ABc	978.9Ac	786.3Ac	3780BCc
B. brizantha cv. MG-4	4799Da	5110Aa	1268Ac	851.4Ac	838.8Ac	3667Cb
B. brizantha cv. Xaraes	5432Ca	3946Cb	1446Ac	858.4Ad	1119Ad	4139Bb
B. brizantha cv. Piata	7372Aa	3847CDc	1255Ad	882.7Ad	1052Ad	4914Ab
Brachiaria decumbens	6135Ba	4542Bb	1283Ad	773.6Ae	1052Ade	3699Cc
Brachiaria ruziziensis	5528Ca	3434Db	604.4Bd	285.9Bd	330.8Bd	2217Dc

Means followed by different upper cases in the column (cultivars) and lower cases in the row (cuts) are significantly different by Tukey's test (P < 0.05). (1)Sum of production of the six evaluation cuts.

palisadegrass produced an average of 9.5 tons per hectare of dry weight, with 57% leaves, 30% yield obtained in the dry season [17]. In addition to the production and nutritional qualities, [18] reported that Piatã grass is indicated for use in crop-livestock integration system, due to the slower initial growth, compared with Marandu palisadegrass and Xaraes palisadegrass and high growth after harvest of annual crops. These characteristics make the cultivar BRS Piata palisadegrass an excellent alternative for reducing large areas characterized by monocultures of Marandu palisadegrass, currently existing in all states of the Midwest and Southeast regions [19]. In the second cut, when begins the dry period, the highest yield was of *Brachiaria brizantha* cv. MG-4. Similar results were found by [9], which evaluated the agronomic performance of genotypes of signal grass succeeding soybeans, and verified that in 2007, the cultivar MG-4 produced 4984 kg·ha^{-1} dry matter of forage, and was superior to Piata palisadegrass and Arapoty grasses, but was not different from palisade, Xaraes palisadegrass and B6 lineage (Paiaguas palisadegrass). Cultivars of *Brachiaria brizantha* and *Brachiaria decumbens* in the third, fourth and fifth cuts presented similar yields, differing only from *Brachiaria ruziziensis* that showed the lowest yield.

It is worth mentioning that even with a drastic reduction of forage production in the dry season (third, fourth and fifth cuts) in relation to the cuts in the rainy season (first, second and sixth cuts), the highest average yields were obtained by cultivars *Brachiaria brizantha* and *Brachiaria decumbens* (**Table 2**). These results demonstrate that these forages are more suitable for the supply of food in the offseason, after harvest of annual crops, in order to minimize the seasonality of forage production.

Evaluating the content of CP of the cuts between *Brachiaria* species (**Table 3**), it in the first cut (March) and Xaraes palisadegrass and Piata palisadegrass showed the highest values, differing from the other species with similar contents. In the second cut, the Piata palisadegrass also had the highest CP content. However, in the third cut, in July, the content of CP was similar between all cultivars of *Brachiaria brizantha*, only differing from *Brachiaria decumbens* and *ruziziensis*. In the fourth cut, Xaraes palisadegrass, MG-4 palisadegrass and *ruziziensis* exhibited the lowest contents of CP, and in the fifth and sixth, the highest contents were registered in marandu, xaraés and piatã grasses. Importantly, for all cuts in different seasons, the Piata palisadegrass reached the highest content of crude protein. This result is due to the higher leaf:stem ratio present in this grass [17], and also to the highest yields of dry matter (**Table 2**), indicating that it is an excellent forage for use in the offseason.

Comparing the *Brachiaria* species within each cut (**Table 3**), it is observed that for Marandu palisadegrass, MG-4 palisadegrass, Piata palisadegrass and *Brachiaria ruziziensis*, lower values of CP were obtained in the fourth cut. This result is due to unfavorable weather conditions during this period, with low rainfall, which was the limiting factor for the development of forages, impairing the growth and formation of new tillers. Moreover, due to lack of rainfall, forages were cut in the growth cycle of 70 days (4th cut) and not in the shorter cycle as in the other cuts (1st cut: 33 days; 2nd cut: 50 days; 3rd cut: 44 days, 5th cut: 42 days and 6th cut: 32 days) certainly leading pasture to maturity due to the seasonality of forage production. A similar result was obtained by [20] that evaluated the effect of season on the nutritional values of Marandu palisadegrass, and reported higher values of CP during the rainy season (9.7%) when compared to dry season (8.9%). It is interesting the high crude protein obtained in the third cut (July). During winter CP usually decreases, given the low temperatures and lack of rainfall, damaging the development of forage. These results indicate the importance of crop-livestock integration, to provide quality food in the winter. From the fifth cut, there was an increase in CP, owing to the beginning of the rainy season and the topdressing fertilization (nitrogen and potassium). Importantly, in periods of low rainfall

Table 3. Content of CP (%) of *Brachiaria* species in different cuts after corn harvest in the offseason.

Species of *Brachiaria*	Cuts					
	1st cut Marc.	2nd cut May	3rd cut July	4th cut Sept.	5th cut Oct.	6th cut Nov.
B. brizantha cv. Marandu	13.41Ba	13.11Ba	13.03Aa	9.74Ab	13.69Aa	12.78ABa
B. brizantha cv. MG-4	13.94Ba	12.54Ba	13.17Aa	7.47Cb	12.59Ba	12.52Ba
B. brizantha cv. Xaraes	15.19Aa	12.78Bb	13.38Ab	8.61Cc	13.76Ab	13.86Ab
B. brizantha cv. Piata	15.01Aa	14.17Aa	14.95Aa	10.19Ab	14.83Aa	14.60Aa
Brachiaria decumbens	13.68Ba	13.55Ba	11.51Bb	9.02Bc	12.73Bb	12.32Bb
Brachiaria ruziziensis	13.40Ba	12.02Ba	12.02Ba	8.88Cb	12.77Ba	12.26Ba

Means followed by different upper cases in the column (cultivars) and lower cases in the row (cuts) are significantly different by Tukey's test ($P < 0.05$).

(winter), when the forage growth is impaired, it is required a management strategy that result in higher percentages of green leaves in the pasture, to contribute and improve the nutritional value of forage during this period. [21] verified that a reduction in the period when the pasture remains deferred and accomplishment of fertilization with nitrogen can contribute to the occurrence of larger mass of green foliage and lower masses of stem and dead material in the forage, being therefore actions recommended for, among other things, improving the nutritional value of deferred forage in some regions. Comparative studies were developed by [22] who evaluated the nutritional values of Marandu palisadegrass, Xaraes palisadegrass and Piata palisadegrass and showed that regardless of the experimental year, the CP were higher during the rainy season. Even presenting a decline in the CP content in the dry season, levels remained above the critical level quoted by [23] for the satisfactory development of ruminal cellulolytic bacteria, that is, the CP content must be equal to or higher than 7.0%. Similar contents were also obtained by [24], who found that the *Brachiaria decumbens* had CP content of 11.69%, 11.08%, 9.43% and 8.93% in spring, summer, autumn and winter, respectively, showing the reduction of CP content during the winter period due to the maturity of the plant. Evaluating fiber fractions of the cuts between *Brachiaria* species (**Table 4**), in the first cut only *Brachiaria ruziziensis* differed from the Piata palisadegrass with higher NDF (70.08%). In the second cut, Xaraes palisadegrass had the lowest NDF. In the third cut NDF were similar between *Brachiaria* species. In the fourth cut, MG4 palisadegrass and *Brachiaria decumbens* grasses showed the highest NDF. However, for all forages in the fourth cut, the values were high and varied from 71.43% to 75.07%, given the low amount of leaves and high of stem owing to the low development of forages in the dry period, due to unfavorable weather conditions for forage development and to forage maturation [25]. From the beginning of the rainy season (fifth and sixth cuts), there was a reduction in NDF (**Table 4**), Piata palisadegrass had the lowest concentrations due to its high percentage of leaves and thin stems, resulting in better quality forage [16].

Comparing the contents of NDF between *Brachiaria* species in different cuts (**Table 4**), we observed higher NDF contents of *Brachiaria brizantha* cv. Marandu and *Brachiaria decumbens* in fourth and fifth cuts. For *Brachiaria brizantha* cvs. MG-4, Xaraés and Piatã grasses, the highest contents were recorded in the fourth cut. And for *Brachiaria ruziziensis* the content of NDF was similar between the first, second, fourth and fifth cuts, only the third and sixth cuts had reduced contents of NDF. For all forages, NDF contents in the fourth cut were above 72%, which can cause low intake. [26] reported that NDF is relevant to the improvement of the forage nutritional value and can be an important parameter to define the forage quality, because the more fibrous pasture occupies more space for longer and limits the intake rate. Similarly, [27] evaluated the Marandu palisadegrass intercropped with corn and obtained 72% NDF. [28] studied the chemical composition of *Braquiarias* after intercropping with corn and achieved NDF content above 60% for Marandu palisadegrass and *ruziziensis* grasses. Furthermore, [10] examined four cultivars of *Brachiaria* intercropped with corn and reported NDF content of 66.4% - 74.3% and 70.3% - 78.1% for mulato grass and Marandu palisadegrass, respectively. It is important to stress that along all cuts, Piata palisadegrass and Xaraes palisadegrass showed less variation in NDF, where weather conditions were influenced, showing greater flexibility when subjected to water deficit, as they presented high regrowth rate [16]. These features make these cultivars excellent alternative for use in the integrated crop-livestock systems, with the purpose of providing quality food in the dry season. By examining the contents of ADF of cuts between *Brachiaria* species (**Table 5**), in the first cut *Brachiaria brizantha* cv. Marandu and *Brachiaria ruziziensis* showed the highest content of ADF, differing from other species. In the second cut,

Table 4. Content of NDF (%) of *Brachiaria* species in different cuts after corn harvest in the offseason.

Species of *Brachiaria*	Cuts					
	1st cut Marc.	2nd cut May	3rd cut July	4th cut Sept.	5th cut Oct.	6th cut Nov.
B. brizantha cv. Marandu	67.94ABb	68.19Ab	67.43Ab	72.55Ba	70.84Aa	68.69Ab
B. brizantha cv. MG-4	68.53ABb	69.98Ab	70.64Ab	75.24Aa	69.28Ab	69.04Ab
B. brizantha cv. Xaraes	66.18ABb	66.48Bb	69.48Aab	71.43Ba	68.60Ab	68.31Ab
B. brizantha cv. Piata	63.79Bc	69.82Ab	69.56Ab	71.35Ba	66.71Bb	64.45Bc
Brachiaria decumbens	68.35ABb	68.13Ab	69.14Ab	75.07Aa	70.05Aab	66.61Ab
Brachiaria ruziziensis	70.08Aa	70.34Aa	66.78Ab	73.77ABa	71.84Aa	67.02Ab

Means followed by different upper cases in the column (cultivars) and lower cases in the row (cuts) are significantly different by Tukey's test ($P < 0.05$).

Table 5. Content of ADF (%) of *Brachiaria* species in different cuts after corn harvest in the offseason.

Species of *Brachiaria*	Cuts					
	1st cut Marc.	2nd cut May	3rd cut July	4th cut Sept.	5th cut Oct.	6th cut Nov.
B. brizantha cv. Marandu	39.39Ab	39.57ABb	38.09Ab	43.01ABa	40.40Ab	39.07Ab
B. brizantha cv. MG-4	36.75Bc	40.92ABa	39.04Aab	43.43ABa	39.30Aab	38.33Aab
B. brizantha cv. Xaraes	37.17Bb	37.29Bb	37.05Bb	42.64Ba	37.35Bb	37.98Bb
B. brizantha cv. Piata	36.68Bb	37.40Bb	36.86Bb	42.78Ba	36.96Bb	36.86Bb
Brachiaria decumbens	36.32Bc	39.87ABb	39.47Ab	44.99Aa	39.08Ab	38.21Ab
Brachiaria ruziziensis	40.99Ab	41.53Aa	39.87Ab	45.18Aa	40.47Ab	38.09Ab

Means followed by different upper cases in the column (cultivars) and lower cases in the row (cuts) are significantly different by Tukey's test ($P < 0.05$).

only *Brachiaria ruziziensis* was different from palisadegrass Xaraés and palisadegrass Piatã, with high ADF content (41.53%). Nevertheless, from the third to the sixth cut the cultivars xaraés and piatã presented lower content of ADF, differing from *brizantha* (Marandu palisadegrass and MG-4 palisadegrass) and *Brachiaria decumbens* and *ruziziensis*. This may be correlated with the better regrowth of these grasses in the dry period.

When compared the ADF content of *Brachiaria* species in the different cuts (**Table 5**), for all species the highest levels were achieved in the fourth cut, because it was held in the growth cycle of 70 days, causing the maturation of the pasture, due to the seasonality of forage production. In this context, the digestibility of foods is related to the fiber because the indigestible portion has a proportion of ADF, and the higher the value of ADF the lower the food digestibility [29]. [30] reported that forage with ADF content around 40%, or more, shows low intake and digestibility. In the present study only in the fourth cut the ADF content remained above 40%. For the other cuts, forages exhibited content below 40%, indicating that intercropping annual crops with forages is a good option for providing quality food at critical periods of drought, as from the corn harvest; there is recovery of emergence of new tillers, providing yield and forage with good digestibility. Evaluating the IVDMD of cuts between *Brachiaria* species (**Table 6**), in all cuts higher IVDMD values were obtained in *Brachiaria brizantha* cvs. Xaraes and Piata, being different from other grasses, which showed similar IVDMD. These results can be related to higher content of CP and lower fiber fractions obtained for these grasses (**Tables 3-5**). [31] argued that increased digestibility is probably associated with shifts in the chemical composition with decreased content of NDF, ADF and hemicellulose, which certainly make available readily digestible carbohydrates for rumen microorganisms. Nevertheless, when comparing the IVDMD of *Brachiaria* species in different cuts (**Table 6**), for all cultivars of *Brachiaria brizantha*, the highest values were detected in the first, second, fifth and sixth cuts. These results are probably due to the better development of these forages, because in these periods, climatic conditions such as temperature and rainfall were favorable for the production of new tillers. However, for *Brachiaria decumbens* and *ruziziensis*, only the IVDMD of the fourth cut was different from the other cuts. For all forages, lowest IVDMD were obtained in the fourth cut. These results may possibly be explained by the most advanced physiological maturity, due to the seasonality of forage production, undermining the development of forages, once they were cut in the longer growth cycle (70 days), compared to other cuts which were performed in shorter cycles, and with this increases the cell wall components and reduces digestibility.

Table 6. Content of *in vitro* dry matter digestibility (%) of *Brachiaria* species in different cuts after corn harvest in the off-season.

Species of *Brachiaria*	Cuts					
	1st cut Marc.	2nd cut May	3rd cut July	4th cut Sept.	5th cut Oct.	6th cut Nov.
B. brizantha cv. Marandu	75.90Aa	74.50Aa	70.43Ab	63.75Ac	73.13Aa	74.90Aa
B. brizantha cv. MG-4	70.50Ba	72.46ABa	68.50ABb	58.90Bc	70.34Ba	71.57Ba
B. brizantha cv. Xaraes	76.15Aa	77.30Aa	69.28Ab	65.50Ac	74.98Aa	75.63Aa
B. brizantha cv. Piata	77.58Aa	77.15Aa	70.87Ab	66.71Ac	75.50Aa	78.12Aa
Brachiaria decumbens	69.95Ba	68.50Ba	66.82Ba	57.90Bb	70.05Ba	69.85Ba
Brachiaria ruziziensis	68.50Ba	69.43Ba	66.50Ba	59.30Bb	69.56Ba	68.05Ba

Means followed by different upper cases in the column (cultivars) and lower cases in the row (cuts) are significantly different by Tukey's test ($P < 0.05$).

Nevertheless, when comparing the IVDMD of *Brachiaria* species in different cuts (Table 6), for all cultivars of *Brachiaria brizantha*, the highest values were detected in the first, second, fifth and sixth cuts. These results are probably due to the better development of these forages, because in these periods, climatic conditions such as temperature and rainfall were favorable for the production of new tillers. However, for *Brachiaria decumbens* and *ruziziensis*, only the IVDMD of the fourth cut was different from the other cuts. For all forages, lowest IVDMD were obtained in the fourth cut. These results may possibly be explained by the most advanced physiological maturity, due to the seasonality of forage production, undermining the development of forages, once they were cut in the longer growth cycle (70 days), compared to other cuts which were performed in shorter cycles, and with this increases the cell wall components and reduces digestibility. Note that with the exception of the fourth cut, the digestibility is considered high for the offseason; it shows once again the importance of crop-livestock integration, for supplying high quality food in the dry season, when low production and forage quality are obtained under normal conditions. [9] investigated genotypes of *Brachiaria brizantha* succeeding soybeans in integrated crop-livestock systems, and found a digestibility similar to that of the present study in the offseason with values in 2009 at 74.9%, 74.0%, 67.8%, 71.6%, 83.7% and 77.3% for Marandu palisadegrass, MG-4 palisadegrass, Xaraes palisadegrass, Piata palisadegrass, arapoty and B6 (Paiaguas palisadegrass), respectively.

4. Conclusion

Intercropping corn with *Brachiaria* species favors the production of high quality forage in the offseason, and the cultivars of *Brachiaria brizantha* and *Brachiaria decumbens* show higher production of dry matter. And cultivars of *Brachiaria brizantha* (Marandu palisadegrass, Xaraes palisadegrass and Piata palisadegrass) are the most suitable for presenting food of better quality, compared with *Brachiaria brizantha* cv. MG-4, *Brachiaria decumbens* and *Brachiaria ruziziensis*.

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