



Potencial forrageiro de quatro variedades de sorgo sacarino¹

Carolina Nantes Moitinho², Marco Antonio Previdelli Orrico Junior³, Marciana Retore⁴, Oscar Fontão de Lima Filho⁴, Débora Maurício Manarelli⁵, Ana Carolina Amorim Orrico³, Brenda Bertola de Mattos²

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²Aluna do curso de Zootecnia – UFGD, Dourados-MS, Brasil, Bolsista de Iniciação Científica/Capes. e-mail: c_nantesm@hotmail.com

³Curso de Zootecnia – UFGD, Dourados-MS, Brasil. e-mail: marcojunior@ufgd.edu.br

⁴Pesquisador da Embrapa Agropecuária Oeste.

⁵Aluna de Mestrado em Zootecnia– UFGD, Dourados-MS, Brasil.

Resumo: O sorgo sacarino é muito estudado para a produção de etanol em função do elevado teor de açúcar presente nos colmos, mas poucas são as pesquisas que avaliam sua utilização na alimentação animal. O objetivo do trabalho foi comparar quatro variedades sacarinas no que diz respeito à produtividade e a qualidade nutricional. Foi utilizado um delineamento em blocos ao acaso com quatro tratamentos e três repetições, utilizando-se como tratamentos as variedades de sorgo sacarino BRS 506, 508, 509 e 511. Foram avaliadas as produções de folha, colmo, panícula e planta inteira, além dos teores de proteína bruta (PB), fibra em detergente neutro (FDN), fibra em detergente ácido (FDA), hemicelulose, celulose, lignina e digestibilidade “*in vitro*” da matéria seca. Das variedades testadas a 511 foi a que apresentou maiores produções de matéria seca total, colmo e folha, já a variedade 509 obteve o pior desempenho para esses parâmetros. A variedade 508 apresentou a maior produção de panícula (104,79 kg), melhorando a digestibilidade da planta inteira (70,65%). Independente da fração da planta analisada a variedade 506 foi a que apresentou os maiores teores de FDN, FDA, celulose e lignina o que interferiu de maneira negativa na digestibilidade “*in vitro*” das plantas. Recomenda-se a utilização das variedades de sorgo sacarino BRS 508 e BRS 511 na alimentação de ruminantes, em função da produção e qualidade das plantas.

Palavras-chave: forragicultura, ruminantes, valor nutritivo, volumoso

Forage potential of four saccharine sorghum varieties

Abstract: Saccharine sorghum is widely studied for ethanol production due to the high content of sugar present in the stalks, but there are few studies that evaluate its use in animal feed. The objective was to compare four saccharine varieties with regard to productivity and nutritional quality. A randomized block design with four treatments and three replications was applied in which the varieties of saccharine sorghum BRS 506, 508, 509 and 511 were considered as treatments. The parameters evaluated were the productions of leaf, stem, panicle and whole plant, in addition to crude protein (CP), neutral detergent fiber (NDF), acid detergent fiber (ADF), hemicellulose, cellulose, lignin and *in vitro* dry matter digestibility. Among the tested varieties, variety 511 showed the highest production of total dry matter, stem and leaf, whereas the variety 509 had the worst performance for these parameters. The variety 508 had the highest production of panicle (104.79 kg), improving the whole plant digestibility (70.65%). Regardless of the plant fraction, variety 506 was the one that presented the highest NDF, ADF, cellulose and lignin which affected negatively *in vitro* digestibility of the plants. It is recommended the use of varieties of saccharine sorghum, cultivars BRS 508 and BRS 511 for ruminants feeding due to production and quality of the plants.

Keywords: forage systems, ruminant, nutritional quality, roughage

Introduction

In Brazil the use of *Sorghum bicolor* (L.) Moench in animal feed is growing every year, mainly due to increased resistance to water stress compared to corn. In the beginning the tallest varieties with high productivity of green mass were the most used ones, by targeting only at reducing the cost per ton of green matter of silage production without considering the quality of this material (Souza et al., 2003). However, over time, producers have demanded a material with greater production of nutrients per unit area. Thus, the development of male-sterile line of grain sorghum allowed the generation of hybrid more suitable for silage production not only with good dry matter yield, but also with high nutritional value (Souza et al., 2003). Because of its high production of stem with high sugar content the varieties of saccharine sorghum (primarily used for ethanol production) can become an excellent alternative of forage to feed ruminants (Durães, 2012). Therefore the objective of this study was to compare the varieties BRS 506, 508, 509 and 511 according to the yield per area, botanical composition and the nutritional quality of the plant and its various parts.



Material and Methods

The study was conducted at the Experimental Field of Embrapa Western Agriculture and chemical analysis was performed at the College of Agricultural Sciences - UFGD both located in Dourados-MS. The experiment was established in 02.06.2014, considered as an "off-season" culture, in an experimental design of randomized blocks with four treatments and three replications, using as treatments the varieties of sorghum saccharine BRS 506, 508, 509 and 511. An amount of 450 kg/ha of 8-20-20 formula was used in the sowing fertilization and also a nitrogen fertilization was applied at 30 days after plant emergence with 500 kg of ammonium sulfate and 100 kg KCl. Sowing was performed by using a planter with 0.45 m between rows and 7 plants/linear meter, totaling 155,000 plants/ha. The experimental plots were eight rows of 5 meters long each, spaced 0.7m between rows. The useful area of the plot was determined by the four internal lines, excluding 1m at each end. The evaluated parameters were production of dry matter per hectare, the proportion of stem, leaves and panicles in plants. Leaf fractions were separated into leaf blade and leaf sheath while the panicle was detached at the insertion of the last leaf. From the useful area of each plot, plants from one line were harvested for the separation of the component parts. The fractions were dried at 55°C in a forced air circulation drying oven for 72 hours and subsequently were ground in a Wiley type mill with 1 mm mesh sieve for laboratory analysis. The dried and ground samples were submitted to the following analyses: dry matter (DM), crude protein (CP), neutral detergent fiber (NDF), acid detergent fiber (ADF), hemicellulose, cellulose, lignin and in vitro dry matter digestibility (Silva & Queiroz, 2002). The results were evaluated by analysis of variance and the means of varieties compared by Tukey test ($P < 0.05$), using the software R

Results and Discussion

Among the tested varieties, cultivar 511 presented the greatest values ($P < 0.05$) of total dry matter production, stem and leaf, whereas variety 509 had the worst performance for these parameters (22.5% lower) (Table 1). The stem was the part of the plant that had the highest average ratio (85.9%) of the botanical composition of the studied varieties. There was no difference ($P > 0.05$) in the stem ratio among varieties; however, the high proportion of this fraction influenced significantly the results of the chemical composition analysis.

Table 1. Production, chemical composition and in vitro digestibility coefficient of panicle, leaf, stem and whole plant from four varieties of saccharine sorghum.

Composition	Fraction	Variety				P	CV (%)
		506	508	509	511		
Production (kg/ha)	Panicle	41.96b	104.79a	32.24b	43.95b	0.004	29.74
	Leaf	268.40b	275.40b	226.86c	306.86a	0.025	8.12
	Stem	1909.64b	2039.82a	1730.90c	2219.20a	0.036	1.34
	Total production	2220b	2420ab	1990c	2570a	0.023	18.90
CP (% DM)	Panicle	4.29 b	7.65 a	6.31 ab	4.51 b	0.004	15.24
	Leaf	10.87	11.89	11.02	10.63	0.719	12.6
	Stem	3.42 ab	2.84 b	4.18 ab	4.34 a	0.040	15.48
	Total production	4.76 b	2.30 d	3.78 c	5.04 a	<0.001	3.91
NDF (% DM)	Panicle	73.04 a	54.37 c	62.71 bc	68.55 ab	0.0020	6.01
	Leaf	50.35 ab	50.44 ab	54.42 a	49.52 b	0.0410	3.53
	Stem	38.70	37.59	36.97	39.11	0.9117	10.77
	Total production	49.69 a	42.16 b	40.93 b	41.69 b	<0.001	9.98
ADF (% DM)	Panicle	41.13 a	25.88 c	31.12 bc	35.74 ab	0.004	7.37
	Leaf	25.29 ab	24.36 b	28.03 a	23.16 b	0.007	4.94
	Stem	20.25	20.82	18.68	21.34	0.783	16.43
	Total production	28.48 a	24.42 b	23.64 c	20.86 d	<0.001	2.21
Hemicellulose (% DM)	Panicle	31.91	28.48	31.58	32.82	0.2468	8.06
	Leaf	25.06	26.08	26.39	26.37	0.3232	3.58
	Stem	18.46	18.77	18.30	17.77	0.9446	11.31
	Total production	21.21 a	17.75 d	20.38 b	19.23 c	<0.001	1.52
Cellulose (% DM)	Panicle	32.70 a	19.99 c	22.72 bc	27.88 ab	0.0004	8.25
	Leaf	18.76 ab	19.82 ab	21.89 a	18.05 b	0.0285	6.52
	Stem	15.23	15.45	14.14	16.87	0.6457	16.56
	Total production	23.64 a	20.49 b	20.48 b	20.74 b	<0.001	4.86
Lignin	Panicle	7.65a	5.35b	7.56a	6.98ab	0.003	16.21



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(% DM)	Leaf	5.90a	3.63c	5.13b	3.99b	0.030	18.23
	Stem	4.62a	4.77a	3.98b	3.94b	0.020	13.45
	Total production	3.84 a	3.17 b	3.92 a	3.18 b	0.031	15.69
Digestibility (% DM)	Panicle	32.30 b	62.00 a	40.50 b	36.10 b	0.003	16.21
	Leaf	56.17	55.53	49.27	52.53	0.141	6.61
	Stem	65.63	63.73	65.53	60.70	0.789	10.54
	Total production	65.67 c	70.65 a	65.93 c	67.61 b	<0.001	1.74

Means within rows (varieties) with different letters differ from each other according to Tukey's test $P < 0.05$. P = p-value; CV% = coefficient of variation.

Crude protein content was greater in the leaf fraction but there was no significant difference among varieties (average of 11.10% CP). However, the crude protein content of whole plant was higher ($P < 0.05$) in the variety 511 (5.04% CP). Rodrigues Filho et al. (2006) observed variations of 4.85% to 7.78% in the CP content (average of 6.73% CP) for different varieties of sorghum. The fibrous fractions were higher in the panicle of the tested varieties due to a low grain yield (average of 2.4% panicle) that was found mainly in the varieties 506, 509 and 511. Variety 508 had the highest ($P < 0.05$) digestibility coefficient of whole plant (70.65% DM) despite having the lowest level of CP. This result is because this variety, BRS 508, has presented the highest production (104.79 kg/ha) and panicle ratio (4.33%) which are composed by sorghum grains that increased the quality of the plant. Regardless of the evaluated plant fraction, variety 506 was the one that presented the highest NDF, ADF, cellulose and lignin which affected negatively the in vitro digestibility of the plants. Van Soest (1994) pointed out the importance of NDF to assess the quality of forage plants. As stated by the aforementioned author the higher the NDF ratio the lowest voluntary intake of forage by the animals and therefore, the worse the animal performance. Thus, varieties 506 and 509 would be less suitable for animal feeding due to the combination of low dry matter production and /or low nutritional quality of the plants. Similar result was obtained by Rodrigues Filho et al. (2006) with variety BRS 506 in comparison to BRS 610, BR 700 and CMSXS762. According to the authors BRS 506 showed the same productive potential like other varieties, but with lower levels of crude protein and total digestible nutrients. Thus, varieties BRS 508 and BRS 511 stood out in regard to productions of panicle and stem, resulting in plants with lower fiber content and higher in vitro dry matter digestibility.

Conclusions

Cultivars BRS 508 and BRS 511 presented the best results from the standpoint of production as well as nutritional quality. Therefore, it is recommended to use these varieties as roughage sources in ruminant feed.

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