Agronomic characteristics of different Sorghum cultivars for silage production in the agreste of Pernambuco State[1]

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Abstract: In this study, we evaluated the productivity of green matter (PGM) and dry matter (PDM); plant height (PH); percentage of lodged plants (PLP); percentage of broken plants (PBP); and proportions of panicle, stem, and leaf in the GM and DM of five sorghum genotypes (SF15, 2502, BRS655, BR506, BR601) indicated for the agreste of Pernambuco State. The experiment was set up in a randomized block design with five treatments and five repetitions. SF15 was prominent for PH, with mean value of 2.24 m. SF15, BR506 and 2502 attained the highest PDM (11.3; 11.12 and 9.54 t/ha, respectively). The evaluated genotypes had a good balance of leaf:stem:panicle ratios and were in accordance with those exhibited by sorghum genotypes selected for silage production in different Brazilian regions.

Keywords: forage**,** nutrition**,** ruminant**,** semiarid

Características agronômicas de diferentes cultivares de sorgo para a produção de silagem no agreste pernambucano

Resumo: Foram avaliadas as produtividades de matéria verde (PMV), de matéria seca (PMS), altura de planta (AP), porcentagem de plantas acamadas (PAC), porcentagem de plantas quebradas (PQB) e as proporções de panícula, colmo e folha na matéria verde e na matéria seca de cinco genótipos de sorgo forrageiro (SF15, 2502, BRS655, BR506, BR601). Foi utilizado o delineamento experimental em blocos ao acaso, com cinco tratamentos e cinco repetições. O genótipo SF15 destacou-se em relação à altura de plantas, apresentando média de 2,24 m. Os genótipos SF15, BR506 e 2502 obtiveram as maiores produções de matéria seca (11,3; 11,12 e 9,54 t/ha). Os genótipos avaliados apresentaram relação folha: colmo: panícula adequada para produção de silagem, indicando sua possibilidade para produção de silagem no semiárido pernambucano.

Palavras–chave: forragem, nutrição, ruminante, semiárido

Introduction

Improving the production systems efficiency through the selection of sorghum genotypes for silage production is a good alternative, since it is a forage of easy planting, drought tolerant, has high yield of green and dry matter, and characteristics that help the fermentation process, such as high content of dry matter, adequate soluble carbohydrates, and low buffering capacity (Oliveira et al., 2010).

This study evaluated agronomic characteristics of the cultivars SF15, 2502, BRS655, BR506, and BR601, and focused on the production of sorghum silage in the agreste of Pernambuco State.

Material and Methods

The experiment was conducted from May to August 2011 at the Experimental Station of the Agronomic Institute of Pernambuco State (IPA), in São Bento do Una, Pernambuco State, Borborema Plateau. The area has an annual average rainfall of 655 mm; a semiarid megathermal climate; and soils predominantly of sandy loam textural class, known as "psament".

The investigation used a randomized block design with five treatments (2502, SF 15, BRS 655, BR 506 and BR 601) and five replications. Each treatment comprised approximately 10 plants/m, which was attained after thinning at 20 days after emergence.

Fertilization was performed according to soil analysis. At sowing fertilization, we used 150 kg/ha ammonium sulfate + 450 kg / ha triple superphosphate + 100 kg/ha potassium chloride. Two-side dressing fertilizations were applied, the first on the 30th day, and the second on the 60th day after plant emergence, with the dose equivalent to 150 kg / ha of ammonium sulfate.

Agronomic evaluations were performed when the plants exhibited grains in the middle of the panicle at the milky/dough stage.

Variables were tested to check data normality, and later subjected to an analysis of variance, and means were compared using Tukey's test at the 5% level. All procedures were performed using R (R Development Core Team, 2011).

Results and Discussion

Significant differences ($p < 0.05$) were detected for PH and PLP (Table 1). The PH of SF15 was 2.24 m, which was superior to that of other varieties ($p<0.05$) at a mean of 1.8 m.

There was a significant difference ($P<0.05$) for PLP, with SF15 having 2.17% and 2502 0.50%, but similar to that of BRS 655, BR 506 and BR 601. The mean PBP was 0.90% (Table 1)

The values of PGM and PDM/ha, which showed a significant difference among varieties ($p < 0.05$), are listed in Table 1. Compared to 2502, BRS 655 and BR 601, BR 506 registered the highest production of PGM. Nevertheless, it was not different ($p > 0.05$) from SF15. With respect to PDM, 2502, BR 506 and SF15 excel over the others.

Together with quality traits, PGM and PDM are essential for silage production because, according to Ferrari Junior et al. (2005), these are the first factors to be considered when gathering information about a specific cultivar and on the planning and design of silos.

Table 1. Agronomic characteristics of the sorghum varieties.

Varieties	PH (m)[1]	Plants/ha	PLP (%)[2]	PBP (%)[3]	PGM (t/ha)[4]	PDM(t/ha)[5]
2502	1.70bc	334.285	0.50b	0.83	33.72b	9.54a
SF15	2.24a	336.571	2.17a	0.50	38.42ab	11.30a
BRS 655	1.72bc	327.428	1.67ab	1.84	23.56c	6.78b
BR 506	1.76b	332.571	1.34ab	0.34	38.74a	11.12a
BR 601	1.65c	323.999	1.51ab	1.01	18.92c	5.50b
Mean	1.8	330.971	1.44	0.90	30.67	8.84
CV (%)	2.89	2.39	53.0	94.3	8.42	11.52

Mean values followed by different letters in the same column are significantly different ($P<0.05$) by Tukey's test. [1]PH - Plant height; [2]PLP - percentage of lodged plants; [3]PBP - percentage of broken plants; [4]PGM – production of green matter; [5]PDM – production of dry matter.

Table 2 shows the percentage of panicle, stem, and leaf of each sorghum variety based on GM and DM. There was influence on the percentage participation of all phonological components ($p < 0.05$).

SF15 exhibited the lowest percentage of panicle both in DM and GM (11.40 and 13.40%, respectively). This investigation found mean participation of panicle of 19.95 and 23.74% in GM and DM, respectively.

With regard to stem, SF15 had the highest proportions ($p < 0.05$) compared to the other varieties, although it was equal to BR 506. This investigation found mean participation of stem of 65.04 and 65.04 % in GM and DM, respectively.

The percentage of leaf showed difference ($p < 0.05$). BR 601 was prominent with average of 17.25 and 20.75% in GM and DM, respectively. Nonetheless, it was similar to BRS 655, SF15 and 2502.

Santos et al. (2010) argued that the analysis of the proportionality relationship among panicle, stem and leaf is very important because it indicates the potential of these genotypes to provide soluble carbohydrates in adequate amounts for optimal fermentation and, consequently, the production of high-quality silages.

Table 2. Percentage participation of panicle, stem, and leaf in the sorghum varieties.

Varieties	Panicle		Stem		Leaf	
	%GM	%DM	%GM	%DM	%GM	%DM
2502	21.75a	25.50a	63.25bc	58.25bc	15.01a	16.25ab
SF15	11.40b	13.40b	71.81a	66.60a	16.81a	20.01a
BRS 655	23.00a	27.80a	62.40bc	56.61bc	14.60ab	15.60ab
BR 506	19.64a	24.00a	69.01ab	62.64ab	11.36b	13.36b
BR 601	24.00a	28.00a	58.75c	51.25c	17.25a	20.75a
Mean	19.95	23.74	65.04	59.06	15.00	17.19
CV (%)	19.42	19.30	6.63	6.64	11.74	15.77

Mean values followed by different letters in the same column are significantly different ($P<0.05$) by Tukey's test; GM – green matter; DM – dry matter.

Conclusions

BR 506 excelled in agronomic characteristics for silage production in the Borborema Plateau, a semiarid zone of Pernambuco State.

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