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Canopy Characteristics of Gamba Grass Cultivars and Their Effects on the Weight Gain of Beef Cattle under Grazing

Gustavo José Braga *, Allan Kardec Braga Ramos, Marcelo Ayres Carvalho, Carlos Eduardo Lazarini Fonseca and Claudio Takao Karia

Brazilian Agricultural Research Corporation, Planaltina 73310-970, DF, Brazil; allan.ramos@embrapa.br (A.K.B.R.); marcelo.ayres@embrapa.br (M.A.C.); carlos.lazarini@embrapa.br (C.E.L.F.); claudio.karia@embrapa.br (C.T.K.)

* Correspondence: gustavo.braga@embrapa.br

Abstract: Gamba grass (*Andropogon gayanus* Kunth) is a tussock-forming forage species adapted to acid soils of Brazilian savannas and cultivated for grazing pastures. Four decades since its release, Planaltina prevails as the most commercialized cultivar of the species, even though the new cultivar BRS Sarandi could be a better alternative for Gamba-grass-based farms by presenting a greater leaf:stem ratio. The objective of this study was to evaluate the average daily live weight gain (ADG) of Nellore bulls (*Bos indicus*) for two Gamba grass cultivars—Planaltina and Sarandi. The experiment was conducted in Planaltina, Federal District, Brazil, for 3 years, namely 2018, 2018–2019, and 2020. The experimental design was a completely randomized block design with two treatments and three replicates, each one continuously stocked at three stocking rates (SR)—1.3, 2.6, and 4 young bulls/ha. Canopy height (CH), forage mass (FM), plant-part proportion (green leaf, stem, and dead material), and nutritive value were evaluated. In 2018, mean ADG for Sarandi pastures was greater (0.690 kg/bull/d) than that of Planaltina (0.490 kg/bull/d) ($p < 0.10$). In the subsequent year (2018–2019), there was no effect of cultivar ($p > 0.10$), while in 2020 the ADG was again affected by cultivar ($p < 0.10$), confirming the advantage of Sarandi (0.790 kg/bull/d) over Planaltina (0.650 kg/bull/d). In 2018 and 2020, the percentage of stems for Sarandi was about 3–6 pp less than for Planaltina ($p < 0.10$). As well as for stems, Sarandi pastures presented a shorter CH in 2028 and 2020 (6–7%) ($p < 0.10$). The positive high correlation of leaf:stem ratio with ADG (r = 0.70) probably predisposed the superiority of Sarandi over Planaltina. The distinguishing plant-part composition of Sarandi canopy promotes increasing weight gain of beef cattle when compared to cv. Planaltina.

Keywords: *Andropogon gayanus*; cerrado; leaf; stem; Planaltina; BRS Sarandi

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1. Introduction

Livestock production in Brazilian savannas (i.e., the cerrado biome) is mainly carried out in pasture-based systems [1,2]. Even considering the strong seasonality of forage production in these areas, livestock is raised nearly exclusively in pastures of exotic warm season grasses like Palisade grass (*Urochloa brizantha* (Hochst. ex A. Rich.) R. Webster) and Guinea grass (*Urochloa maxima* (Jacq.) R. Webster) [3]. In the same way, Gamba grass (*Andropogon gayanus* Kunth) is an important forage in pasture-based farms, especially in the Brazilian states of Goiás and Tocantins. Gamba grass is an erect, tussock-forming perennial grass native to tropical Africa [4] and has lower soil nutrient requirements and greater tolerance to high levels of aluminum (Al) than Palisade and Guinea grass, so it is traditionally used in extensive cow–calf operations in savannas of South America [5,6]. On the other hand, it is considered a noxious weed in Australia [7,8].

Released in 1980, Planaltina is the first and predominant cultivar of Gamba grass in Brazil, succeeded by the cultivar Baetí in 1993 [9,10]. Farmers immediately adopted Planaltina due to its adaptation to low soil fertility and the absence of grasses resistant to spittlebugs (e.g., *Zulia entreriana*, *Deois flavopicta*) at that time. However, after the release of the spittlebug-resistant Palisade grass cv. Marandu, Planaltina became more restricted to poor soil fertility areas and low-input production systems. Gamba grass is known for presenting tall reproductive stems during flowering (April–May), reducing canopy leafiness and nutritive value [11]. Thus, the breeding of the species has focused on a greater leaf:stem ratio, but still with no documented positive impact on animal performance [12]. In 2020, the Brazilian Agricultural Research Corporation (EMBRAPA) registered the cv. BRS Sarandi, selected for greater leaf:stem ratio, tiller number, and semi-erect plant architecture. For instance, Sarandi has short and thin tillers and approximately 13% more leaves than Planaltina [13]. Therefore, it is expected that the performance of cattle grazing Sarandi will be improved due to the greater intake of more digestible leaves opposed to rank stems.

Despite the importance of Gamba grass for livestock production systems in Brazilian savannas, information about cattle weight gain under grazing in this region is limited, even for the older cultivars like Planaltina. The availability of a new Gamba grass cultivar can impact on livestock productivity in the region as long as its potential to improve animal performance is proven. The objective of this study was to evaluate the average daily live weight gain (ADG) of young Nellore bulls in Gamba grass pastures of cv. Planaltina and cv. Sarandi with their distinct canopy characteristics.

2. Material and Methods

2.1. Experimental Site

The experiment was carried out in Planaltina, FD, Brazil (15°35′ S, 47°42′ W; 993 m above sea level) in a clayey soil (Rhodic Haplustox Oxisol) during three consecutive years (2018–2020). The climate at the experimental site is a tropical dry-winter Aw, according to Köppen's classification [14]. Monthly rainfall and mean daily air temperatures were recorded 1400 m from the experimental area (Table 1). The rainy season lasts from October to April and, for the purposes of this study, the period from April to July will be named early dry season. Before planting Gamba grass pastures, the soil of the experimental area had pH ($CaCl_2$) 5.5, K concentration of 134 mg/kg, and P concentration of 4.2 mg/kg (Mehlich-I extractable P).

Table 1. Monthly rainfall and daily mean air temperature of the experimental site [1]. Data comprised three experimental years (2018–2020) and historical series (1974–2013) of the site. Planaltina, FD, Brazil.

Month	Rainfall (mm)				Mean Air Temperature (°C)			
	2018	2019	2020	1974–2013	2018	2019	2020	1974–2013
January	150	27	365	239	22	23	22	22
February	243	108	162	183	22	23	22	22
March	194	270	263	201	22	22	22	23
April	104	119	100	94	21	22	22	22
May	4	35	29	24	20	22	20	21
June	0	0	0	5	20	20	19	20
July	0	0	0	4	20	19	19	20
August	21	0	0	15	22	22	21	22
September	36	0	45	37	23	25	23	23
October	130	23	138	126	24	25	23	23
November	333	179	240	189	21	23	22	22
December	135	240	230	227	22	23	22	22

[1] Data collected about 1400 m from the experimental site.

After plowing and disking the experimental area, both cv. Planaltina and cv. BRS Sarandi (*Andropogon gayanus* Kunth) were seeded in a clean-tilled seedbed on 12 December 2016, each one in three experimental units of 1.5 ha. The equivalent of 50 kg of pelleted seeds per hectare (~15 kg of pure live seeds/ha) and 278 kg of simple superphosphate per hectare were mixed and spread with a pendulum spinner (Vicon®, Cotia, Brazil). Immediately after distribution, seeds were lightly pressed into the soil surface using a tire roller. Throughout 2017, paddocks were prepared with fences and water tanks, while weeds and invasive forage species (e.g., Guinea grass) were eradicated using directed application of glyphosate.

2.2. Experimental Design, Grazing Management, and Nitrogen Fertilization

Planaltina and Sarandi treatments were distributed in a completely randomized block design with three replicates. Each one of the three blocks was managed at one fixed stocking rate (SR)—1.3, 2.6, and 4 bulls/ha (2, 4, and 6 bulls per paddock), namely low, medium, and high SR, respectively. Paddocks were continuously stocked during the experiment. From April 2018 to June 2020, successive grazing periods included rainy and early dry seasons (in 2018, 2018–2019, and 2020) (Table 2). The equivalent of 50 kg N/ha/yr of ammonium sulfate was applied to the pastures after mechanical cutting at a canopy height of about 30 cm. Nitrogen fertilizer was applied every year approximately one month before the first grazing period.

Table 2. Grazing periods over three years for cv. Sarandi and cv. Planaltina (*Andropogon gayanus* Kunth) pastures. Planaltina, FD, Brazil.

Year	Grazing Period
2018	(1) 6 April–9 May (2) 9 May–5 June (3) 5 June–5 July [1]
2018–2019	(1) 27 November–3 January (2) 3 January–14 February (3) 14 February–18 March (4) 18 March–9 May [1] (5) 9 May–2 July [1]
2020	(1) 7 January–18 February (2) 18 February–7 April (3) 7 April–1 June [1,2]

[1] High stocking rate block was not evaluated. [2] Forage mass, plant-part composition, canopy height, and nutritive value samplings were not evaluated.

2.3. Animal Performance

Young Nellore bulls (*Bos taurus indicus*) aged 14–19 months were evaluated for average daily live weight gain (ADG). The mean initial live weights (LWs) (±standard deviation) of successive groups of bulls for 2018, 2018–2019, and 2020 were 331 (±38), 335 (±76), and 244 (±23) kg, respectively. A mineral salt mix containing essential macrominerals (P, Ca, Mg, S, Na, and Cl) and microminerals (Mn, Zn, Se, Cu, Co, Fe, and I) was supplied ad libitum throughout the experimental period. Bulls were weighed after a 16 h fasting time before the start of each grazing period and at the end of the corresponding grazing period. Annual live weight gain per area (GA) was calculated by multiplying ADG by the SR and by the days of grazing. The experiment met the requirements of the Ethics Committee for the Use of Animals of the Embrapa Cerrados according to protocol 818-4561-1/2020.

2.4. Canopy Attributes

Forage mass (FM) was evaluated at soil level using metallic frames of 2 × 0.5 m to delimitate the sampling points. Twelve points were distributed in three transects per paddock with four samplings per transect. Six subsamplings (each one comprising two FM samples) were taken to separate leaves (i.e., green leaf blade), stems (i.e., stem and leaf sheath), and dead material. Dead material was visually defined as senescent leaves and stems with an area of 50% or more yellow or dry tissue. All samples were dried in an air-forced oven at 55 °C for 72 h. Canopy height (CH) was evaluated in 100 sampling points per paddock in a zigzag line pattern. Pasture evaluations describing CH, FM, and plant-part composition were made every grazing period. Leaf:stem ratio, leaf bulk density (kg DM/ha/cm), and leaf allowance (LA) (kg DM/kg LW) [15] were estimated.

2.5. Nutritive Value Attributes

Forage analyzed for nutritive value was sampled by the hand-plucking method described by Sollenberger and Cherney [16]. The samples were dried in an air-forced oven at 55 °C for 72 h and milled to a 1 mm particle size (Wiley mill). Crude protein (CP) (AOAC 1990) [17], neutral detergent fiber (NDF), acid detergent fiber (ADF) [18], and in vitro dry matter digestibility (IVDMD) [19,20] were analyzed by near-infrared spectroscopy (NIRS) (FOSS®) using calibrated models based on the mentioned methods. The models used to predict the nutritive value presented a determination coefficient (R^2) ranging from 0.87 to 0.95 [21].

2.6. Data Analysis

Data were analyzed by year using the Mixed procedure of SAS [22]. The effects of cultivar, block, grazing period, and cultivar × grazing period were assigned as fixed by analysis of repeated measures over time. The studentized residual data outside ±3 were considered outliers. Results from main effects at $p < 0.10$ by the *t*-test were presented as LSMEANS. The effects of interaction at $p > 0.10$ were not mentioned. The correlation coefficients (r) of canopy and nutritive value attributes with ADG were estimated by using the Corr procedure of SAS [22].

3. Results

In the first year of the experiment (2018), ADG was affected by cultivar ($p = 0.0839$) and grazing period ($p = 0.0003$). Bulls gained 0.670 kg/bull/d in Sarandi pastures and 0.490 kg/bull/d in Planaltina pastures (Table 3). In the second year (2018–2019), there was no effect for cultivar on ADG ($p = 0.4089$) (mean = 1.000 kg/bull/d), only for grazing period ($p < 0.0001$). In 2020, there was an effect of grazing period ($p < 0.0001$) and results also supported Sarandi as promoting more ADG (0.790 kg/bull/d) compared to Planaltina (0.650 kg/bull/d) ($p = 0.0412$). As a direct effect of ADG and weighted average of grazing days, mean GA for Sarandi pastures was 151, 492, and 276 kg/ha in 2018, 2018–2019, and 2020, respectively, while GA for Planaltina pastures was 115, 517, and 229 kg/ha for 2018, 2018–2019, and 2020, respectively.

Table 3. Average daily live weight gain (ADG) of young Nellore bulls in Gamba grass (*Andropogon gayanus* Kunth) pastures of cv. Sarandi and cv. Planaltina for three consecutive years. Planaltina, FD, Brazil.

Year	**Cultivar**		***p***
	Sarandi (Mean ± s.e.)	**Planaltina (Mean ± s.e.)**	
	kg/bull/d		
2018	0.670 ± 0.066 A	0.490 ± 0.066 B	0.0839
2018–2019	0.980 ± 0.038	1.020 ± 0.038	0.4089
2020	0.790 ± 0.045 A	0.650 ± 0.045 B	0.0412

Means followed by different capital letters in a row differ by the *t*-test ($p < 0.10$).

There was no effect of cultivar on FM ($p > 0.10$) (Table 4), only for grazing period ($p < 0.10$) (Table 5). However, morphological composition of the plant differed between Sarandi and Planaltina cultivars. In the first (2018) and third (2020) years, there was an effect of cultivar on stem percentage ($p < 0.10$) with greater values for Planaltina (Table 4). Concurrently, the dead material percentage in these same years was superior for Sarandi ($p < 0.10$), while the leaf percentage was not affected by cultivar ($p > 0.10$). All morphological components were affected by the grazing period ($p < 0.10$), except stems from 2018–2019 ($p > 0.10$) (Table 5). In general, with the advance of grazing season there was a continuous leaf decrease concomitant to the dead material increase, while stems remained more stable. As well as stem percentage, Planaltina pastures presented greater CH than Sarandi in 2018 and 2020 ($p < 0.10$). From 2018–2019, there was no effect of cultivar on plant-part composition ($p > 0.10$) and CH ($p = 0.4936$). Canopy height was affected by the grazing period in 2018 and from 2018–2019 ($p < 0.10$) (Table 5).

Table 4. Forage mass (FM), plant-part composition (leaf, stem, and dead material), canopy height (CH), crude protein (CP), in vitro dry matter digestibility (IVDMD), neutral detergent fiber (NDF), and acid detergent fiber (ADF) of Gamba grass (*Andropogon gayanus* Kunth) cv. Sarandi and cv. Planaltina for three consecutive years. Planaltina, FD, Brazil.

Variable	Cultivar (2018)		*p*
	Sarandi (mean ± s.e.)	Planaltina (mean ± s.e.)	
Canopy attributes			
FM (kg/ha)	9231 ± 315	9136 ± 315	0.8309
Leaf (%)	15 ± 0.4 A	14 ± 0.4 B	0.0558
Stem (%)	57 ± 0.8 B	60 ± 0.8 A	0.0166
Dead material (%)	28 ± 0.5 A	26 ± 0.5 B	0.0134
CH (cm)	91 ± 1.3 B	96 ± 1.3 A	0.0045
Nutritive value attributes			
CP (g/kg)	114 ± 3.4	109 ± 3.4	0.2943
IVDMD (g/kg)	540 ± 7.8	535 ± 7.8	0.6607
NDF (g/kg)	640 ± 3.5	643 ± 3.5	0.5842
ADF (g/kg)	331 ± 3.2	334 ± 3.2	0.5307
Variable	Cultivar (2018–2019)		*p*
	Sarandi (mean ± s.e.)	Planaltina (mean ± s.e.)	
Canopy attributes			
FM (kg/ha)	13,392 ± 561	13,984 ± 561	0.4494
Leaf (%)	23 ± 0.6	22 ± 0.6	0.3638
Stem (%)	40 ± 1.4	41 ± 1.4	0.8953
Dead material (%)	37 ± 1.4	37 ± 1.4	0.8271
CH (cm)	130 ± 4.4	126 ± 4.4	0.4936
Nutritive value attributes			
CP (g/kg)	132 ± 1.9	128 ± 1.9	0.2021
IVDMD (g/kg)	599 ± 3.7	592 ± 3.7	0.2032
NDF (g/kg)	622 ± 2.3	624 ± 2.3	0.5960
ADF (g/kg)	330 ± 2.7	331 ± 2.7	0.7376
Variable	Cultivar (2020)		*p*
	Sarandi (mean ± s.e.)	Planaltina (mean ± s.e.)	
Canopy attributes			
FM (kg/ha)	14,501 ± 1011	13,689 ± 968	0.3433
Leaf (%)	36 ± 7.7	35 ± 7.7	0.8602
Stem (%)	36 ± 4.6 B	42 ± 4.6 A	0.0020
Dead material (%)	28 ± 3.1 A	23 ± 3.1 B	0.0056
CH (cm)	122 ± 1.3 B	130 ± 0.9 A	0.0005
Nutritive value attributes			
CP (g/kg)	127 ± 2.8	129 ± 2.8	0.5804
IVDMD (g/kg)	515 ± 10.8	508 ± 10.8	0.4064
NDF (g/kg)	639 ± 4.8	641 ± 4.8	0.6938
ADF (g/kg)	350 ± 8.2	343 ± 8.2	0.2985

Means followed by different capital letters in a row differ by the *t*-test ($p < 0.10$).

No nutritive value attribute (e.g., CP, IVDMD, NDF, and ADF) was affected by cultivar ($p > 0.10$) (Table 4). However, these same variables were affected by the grazing period ($p < 0.10$), with decreasing values for CP and IVDMD with the advance of season and a concomitant increase in NDF and ADF, particularly for 2018 and 2018–2019 (Table 5).

Average daily gain was strongly and positively correlated ($r > |0.7|$) with leaf percentage ($r = 0.73$; $p < 0.0001$) and leaf:stem ratio ($r = 0.70$; $p < 0.0001$) while leaf bulk density ($r = 0.64$; $p < 0.0001$) and CP ($r = 0.63$; $p < 0.0001$) were moderately correlated ($|0.7| > r > |0.5|$) with ADG. Stem percentage was weakly correlated ($|0.5| > r > |0.3|$) with ADG ($r = -0.48$; $p = 0.0003$), as well as LA ($r = 0.45$; $p = 0.0008$), NDF ($r = -0.42$; $p = 0.0020$), dead material percentage ($r = -0.39$; $p = 0.0037$), and IVDMD ($r = 0.37$; $p = 0.0078$). Canopy height ($r = 0.20$; $p = 0.1490$), FM ($r = -0.10$; $p = 0.4617$), and ADF ($r = -0.04$; $p = 0.7619$) were not correlated with ADG ($r < |0.3|$). The strength and direction of these correlations highlighted the positive linear association of leaf percentage, leaf:stem ratio, leaf bulk density, and CP with ADG (Figure 1).

Table 5. Forage mass (FM), plant-part composition (leaf, stem, and dead material), canopy height (CH), crude protein (CP), in vitro dry matter digestibility (IVDMD), neutral detergent fiber (NDF), and acid detergent fiber (ADF) of Gamba grass (*Andropogon gayanus* Kunth) cv. Sarandi and cv. Planaltina for grazing periods in three consecutive years. Planaltina, FD, Brazil.

Variable	Period (2018)			*p*	Period (2018–2019)					*p*	Period (2020)		*p*
	3 May	5 June	4 July [1]		17 December	15 January	20 March	30 April [1]	24 June [1]		28 January	12 March	
Canopy attributes													
FM (kg/ha)	8469 ±351	9525 ±351	9555 ±464	•	10,151 ±788	10,874 ±788	14,638 ±788	14,353 ±1017	18,424 ±1017	***	12,735 ±554	15,343 ±480	**
Leaf (%)	27 ±0.5	11 ±0.5	5 ±0.6	***	41 ±1.0	35 ±1.0	16 ±1.0	13 ±1.2	8 ±1.0	***	46 ±1.1	25 ±1.0	***
Stem (%)	51 ±0.9	65 ±0.9	59 ±1.2	***	39 ±2.1	39 ±2.1	41 ±2.1	44 ±2.7	41 ±2.1	NS	33 ±0.3	46 ±0.3	***
Dead mat. (%)	22 ±0.6	24 ±0.6	36 ±0.7	***	20 ±2.1	26 ±2.1	43 ±2.1	43 ±2.7	51 ±2.1	***	21 ±1.0	29 ±0.8	***
CH (cm)	100 ±1.4	95 ±1.4	86 ±1.8	***	112 ±6.1	132 ±6.1	138 ±6.1	127 ±7.9	133 ±7.9	•	126 ±1.1	126 ±1.1	NS
Nutritive value attributes													
CP (g/kg)	142 ±4.2	98 ±4.2	95 ±4.2	***	144 ±2.9	146 ±2.9	143 ±2.9	105 ±2.9	112 ±3.6	***	127 ±2.5	127 ±2.5	NS
IVDMD (g/kg)	599 ±9.5	514 ±9.5	500 ±9.5	***	619 ±5.6	584 ±5.6	547 ±5.6	595 ±5.6	634 ±7.1	***	495 ±3.9	523 ±3.9	***
NDF (g/kg)	630 ±4.3	639 ±4.3	655 ±4.3	**	613 ±3.5	617 ±3.5	643 ±3.5	639 ±3.5	600 ±4.5	***	646 ±3.5	635 ±3.5	*
ADF (g/kg)	326 ±3.9	328 ±3.9	343 ±3.9	**	327 ±4.1	330 ±4.1	354 ±4.1	342 ±4.1	301 ±5.2	***	356 ±3.4	335 ±3.4	***

[1] High stocking rate block was not evaluated for canopy and nutritive value attributes in this grazing period. Means are followed by ± standard error of mean (s.e.) in italics. NS, non-significant; • $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

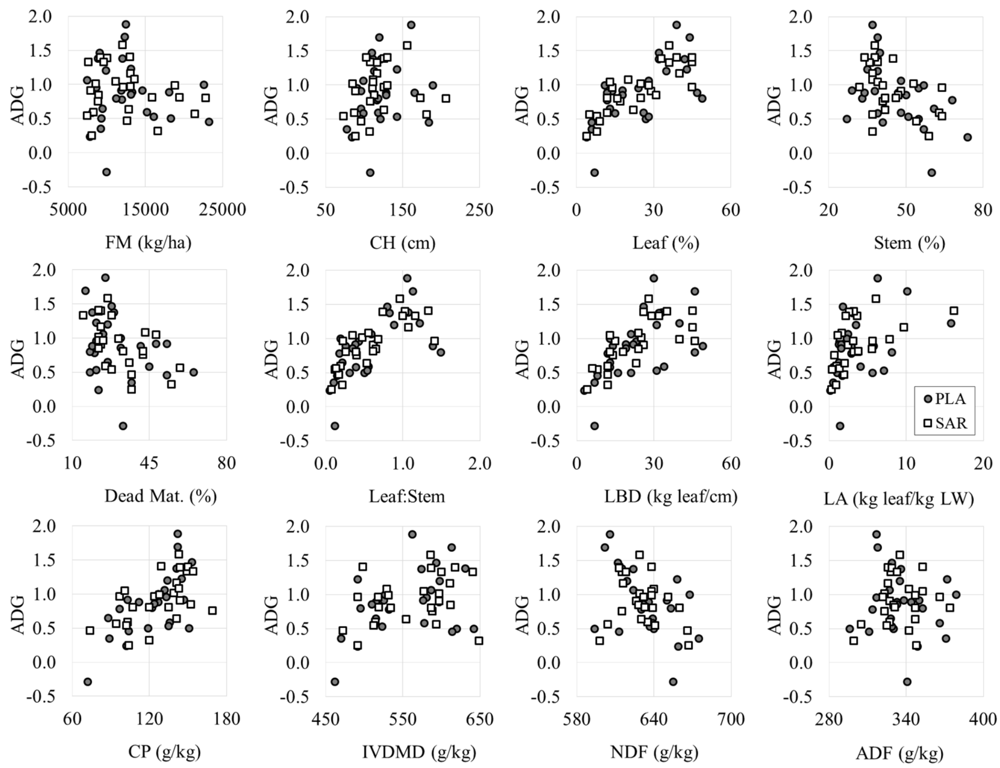

Figure 1. Scatter plots of forage mass (FM, kg MS/ha); canopy height (CH, cm); leaf (%); stem (%); dead material (%); leaf:stem ratio; leaf bulk density (kg MS/ha/cm); leaf allowance (LA, kg MS of leaves/kg live weight); crude protein (CP, g/kg); in vitro dry matter digestibility (IVDMD, g/kg); neutral detergent fiber (NDF, g/kg); and acid detergent fiber (ADF, g/kg) with average daily gain (ADG, kg/bull/d) of Nellore bulls in pastures of *Andropogon gayanus* Kunth cv. Sarandi (SAR) and cv. Planaltina (PLA), Planaltina, FD, Brazil. Each point represents the mean value of each experimental unit (paddock).

In general, ADG decreased with the advance of the rainy season (November–April) until the early dry season (April–July), when the experimental period for each year ended (Figure 2). For different blocks and their respective SRs, the ADG was greater for the low SR and lesser for the high SR, and the experimental period was shortened to avoid weight loss of bulls and pasture depletion. On the other hand, low and medium SR blocks were grazed over the entire experimental period during the three years. The ADG superiority of Sarandi over Planaltina was more or less evident depending on the grazing period, with greater evidence in the first and third years. As well as ADG, a descending trend over time occurred for the leaf:stem ratio and Sarandi excelled especially in grazing periods of the years 2018 and 2020, although this was not evident for all of them (Figure 3).

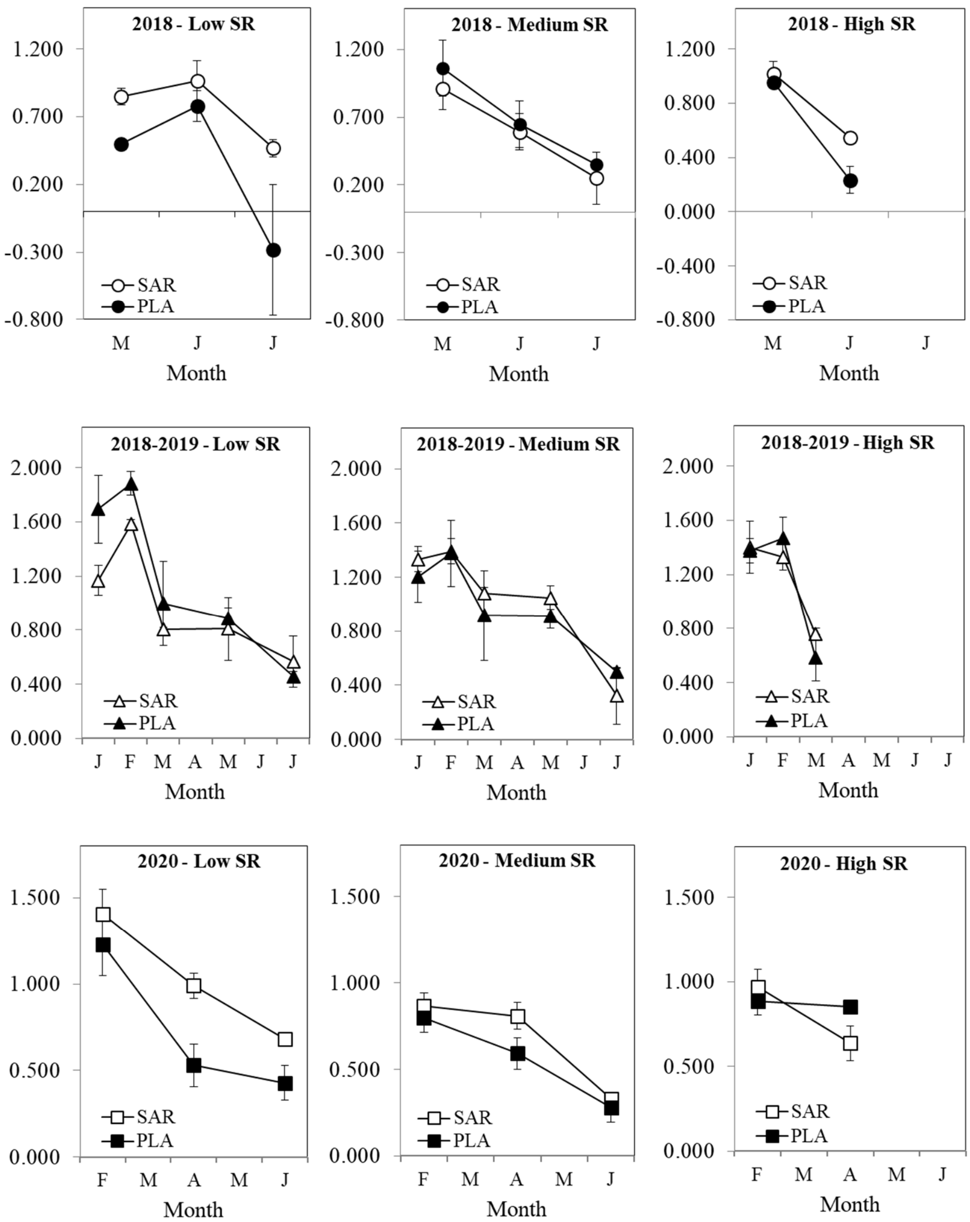

Figure 2. Average daily live weight gain (ADG, kg/bull/d) of Nellore bulls in *Andropogon gayanus* Kunth pastures of cv. Sarandi (SAR) and cv. Planaltina (PLA) for low, medium, and high stocking rates (SRs) during three years (2018, 2018–2019, and 2020). Bars represent ± standard error of the mean (s.e.).

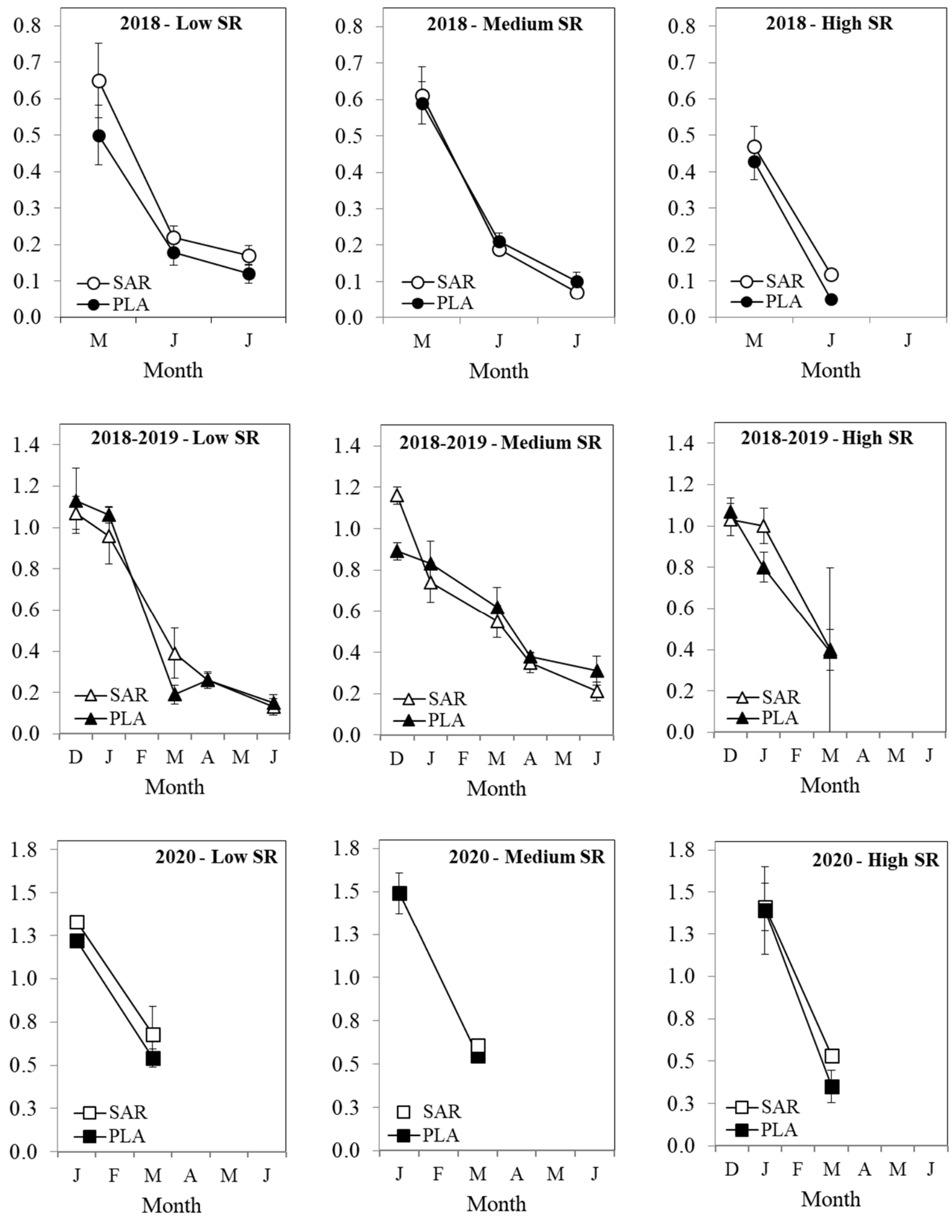

Figure 3. Leaf:stem ratio of *Andropogon gayanus* Kunth cv. Sarandi (SAR) and cv. Planaltina (PLA) for low, medium, and high stocking rates (SRs) during three years (2018, 2018–2019, and 2020). Bars represent ± standard error of the mean (s.e.).

4. Discussion

Average daily gain over the three years of the current study was considerably greater than the mean observed in Gamba grass pastures grazed for 6 months in the well-drained savannas of Colombia, with daily live weight gains of 0.570 kg/head/d [9]. When limited to the rainy season (November–April), ADG was within the range observed for Nellore cattle in fertilized Palisade and Guinea grass pastures grazed in this same season in central Brazil (0.750 to 1 kg/head/d) [23–25]. Actually, ADG even reached above 1 kg/bull/d, especially for low and medium SR (Figure 2), demonstrating an unexplored potential of Gamba grass for finishing beef cattle in more intensive pasture-based systems. The preceding mechanical cut eliminated the old rank tussocks, favoring the leaf intake, as well as the high forage CP concentration, within the range observed in N-fertilized Gamba grass leaves at different regrowth ages (70–180 g/kg) [12] and very close to observed in N-fertilized Palisade grass in the rainy season (136–168 g/kg) [23]. In Palisade and Guinea grass pastures in Araguaína, TO, Brazil, Nellore bulls gained 0.360 kg/head/d in the early dry season (April to June) with 2 animal units per ha (1 animal unit = 450 kg LW) [26]. It was less than the mean ADG observed in the current study in this same season. As a likely cause for this, mean CP of Gamba grass during early dry season was considerably greater than observed by Feitosa et al. [26] (82 g/kg) when Gamba grass begins its reproductive phase.

Green leaf percentage dropped with the advance of the season, reaching values between 5 and 8%, less than observed in Signal grass (*Urochloa decumbens*) and Palisade grass pastures (13–21%) grazed at continuous stocking in Campo Grande, MS, Brazil [27,28]. Bönert et al. [29] also observed a smaller proportion of green leaves in the canopy during the dry season (10%), even though the exclusive Gamba grass diet contained 37% leaves. Since green leaf percentage was unexpectedly similar for Planaltina and Sarandi, the greater proportion of stems for Planaltina seems to have negatively influenced the ADG, probably due to their effects on cattle foraging behavior and on nutritive value [30,31]. The advantages of a lower stem proportion of Sarandi may have had consequences on ADG precisely in the two years (2018 and 2020) where this effect was more evident, while the well below average rainfall may have influenced the lack of cultivar effect from 2018–2019 (Table 1). As seen, the smaller proportion of stems of Sarandi did not result in a greater proportion of green leaves, but essentially of dead material (mainly dead leaves), demanding more precise and efficient grazing targets (e.g., CH, FM, etc.) to maximize this advantage.

Canopy attributes like green leaf percentage, leaf:stem ratio, and leaf bulk density presented a clear association with ADG over the experimental period (Figure 1). Average daily gain was more associated with canopy attributes derived from leaves than CH, FM, stems, and nutritive value. Garay et al. [32] verified in Stargrass pastures that ADG presented a quadratic fit with FM and forage allowance ($R^2 > 0.75$). On the other hand, for high-tufted Guinea grass, ADG appears more correlated with leaves [33,34], similar to Gamba grass. When FM becomes excessive, there may be no relationship between canopy attributes and ADG, but nutritive value may explain more than 50% of the variation in ADG [35]. In this context, the high-tufted Guinea grass cv. Zuri managed constantly at 8 kg DM/100 kg LW/d of forage allowance presented a leaf:stem ratio moderately correlated with ADG (0.64), while CP and IVDMD correlated strongly ($r > 0.72$) [24]. For tropical grasses, the live weight gain seems to be more correlated with LA than forage allowance [36], although LA correlated weakly with ADG due to a ceiling response (Figure 1) as already observed for forage allowance [37,38]. A steady-state canopy by controlling CH has been recommended for grazing management of tropical grasses [39], and the occurrence of very tall canopies (>150 cm) in the current study had a negative impact on ADG (Figure 1) because of the simultaneous decrease in the leaf:stem ratio and leaf bulk density and the negative effects on forage intake. In a plot cut experiment oriented to minimize the growth of stems, it was recommended that CH of cv. Planaltina not exceed 50 cm when there is about 95% canopy light interception [11], although no data from grazing experiments have been obtained yet.

The expected deficit in rainfall from April onwards (Table 1) along with the reproductive phase of Gamba grass increased stem and dead material percentage to the detriment of more nutritive green leaves [11,40]. In a similar way, arranging SR in the blocks produced distinct canopies, affecting the plant-part composition of Gamba grass differently and providing a wider perspective about the potential advantages of Sarandi over Planaltina in terms of canopy leafiness (Figure 2). The leaf:stem ratio emerged as one of the causes of the advantage of Sarandi over Planaltina, in terms of individual weight gain of bulls. Regardless of the SR and its consequences on the canopy, the bulls in Sarandi pastures had access to a canopy that favored forage intake and their greater performance (Figure 3). In addition to the leaf:stem ratio, a more homogeneous canopy provided by Sarandi may also have contributed to this advantage. Moreover, the CH in Sarandi pastures was shorter compared to Planaltina, at least in 2018 and 2020. The shorter the CH, the greater the leaf bulk density, that probably affected the ingestive behavior (e.g., bite weight and bite rate) of the bulls, with positive consequences on ADG [41].

According to Thomas et al. [9], Planaltina pastures produced 457 kg LW/ha/yr in the Colombian savannas grazed with 3.6 head/ha, less than the mean GA observed in the current study in the longest grazing year (2018–2019) for Sarandi and Planaltina pasture. Pasture carrying capacity is influenced by the grazing days, and the grazing year had to be abbreviated for the high-SR block of the current study, negatively affecting the weighted average GA. In Palisade grass pastures fertilized with 200 kg N/ha/yr, mean GA was 565 kg LW/ha/yr [25], while in Guinea grass pastures with 100 kg N/ha/yr, mean GA was 324 kg LW/ha/yr according to Braga et al. [42] and 399 kg LW/ha/yr according to Canto et al. [43]. Considering the minor N fertilization of 50 kg N/ha/yr, cattle production for Gamba grass pastures in the current study can be considered remarkable since it is predominantly destined for low-input production systems by presenting lesser forage yield potential than Guinea grass pastures, for example.

Cattle performance observed in the current study revealed Sarandi as a promising Gamba grass cultivar due to the advantages over Planaltina observed in at least two of the three years. As Sarandi maintains the adaptive advantages of Planaltina in Brazilian savannas (i.e., Al tolerance), it may also be recommended for low soil fertility areas and extensive cow–calf grazing systems. Calf weaning takes place from March–April in Brazilian savannas [44], and the Sarandi cultivar may improve this weaning weight performance, resulting in a shorter livestock cycle until slaughter. Results obtained in the current study, however, indicated the great productive potential of Gamba grass when mechanical cutting of ungrazed leftover tussocks and nitrogen fertilization are combined, giving the opportunity for raising and finishing beef cattle. The smaller proportion of stems supports Sarandi as a more suitable cultivar to minimize the undesirable effects of flowering and mismanagement on canopy and cattle performance, even when leaves are not the main plant component of the diet. Even so, Sarandi preserves characteristics of the species that make grazing management more difficult, such as the fast growth of the stems during flowering from April onwards, a condition that prevents its use as stockpiled forage for the dry season.

5. Conclusions

Gamba grass BRS Sarandi provides greater live weight gain for young Nellore bulls compared to the predominant cv. Planaltina. This advantage is a consequence of the smaller proportion of stems, characteristic of this cultivar, affecting the quality of the grazed diet, especially when nutritive value and canopy structure deteriorate quickly. More effort must be made to define grazing management targets for Gamba grass, both for Sarandi and for Planaltina.

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