Forage production of elephant grass under intermittent stocking

Carla Silva Chaves(1), Carlos Augusto de Miranda Gomide(2), Karina Guimarães Ribeiro(1), Domingos Sávio Campos Paciullo(2), Francisco José da Silva Ledo(2), Igor de Almeida Costa(2) and Ludmila Lacerda Campana(3)

(1) Universidade Federal dos Vales do Jequitinhonha e Mucuri, Rodovia MG 367, n° 5.000, Alto da Jacuba, CEP 39100-00 Diamantina, MG, Brazil. E-mail: carlazootecnia@gmail.com, karina.ufvjm@yahoo.com.br (2) Embrapa Gado de Leite, Rua Eugênio do Nascimento, n° 610, CEP 36038-330 Juiz de Fora, MG, Brazil. E-mail: carlos.gomide@embrapa.br, domingos.paciullo@embrapa.br, francisco.ledo@embrapa.br, igoralmeida.costa@gmail.com (3) Universidade Federal Rural do Rio de Janeiro, BR 465, Km 7, CEP 23890-000 Seropédica, RJ, Brazil. E-mail: ludmila_llc@hotmail.com

Abstract – The objective of this work was to evaluate the dry matter production of elephant grass (Pennisetum purpureum) genotypes, managed under intermittent stocking. A completely randomized design was used, with two genotypes and three replicates. The treatments consisted of factorial combinations (2x2x2) of genotypes (‘BRS Kurumi’ and the clone CNPGL 00-1-3), two light interception levels (LI) at the onset of grazing (90 and 95%), and two post-grazing canopy heights (30 and 50 cm). A total of 24 Holstein x Zebu crossbred heifers were used. The stocking density varied in order to finish the grazing periods in two days. The interval between the defoliation, based on 95% LI, resulted in a higher leaf mass per grazing cycle. The post-grazing height of 30 cm did not affect the number of grazing cycles but provided a greater herbage accumulation rate. The cultivar BRS Kurumi has higher pasture growth, lower rest period, and greater number of grazing cycles, which results in increased forage production in the growing season.

Index terms: Pennisetum purpureum, canopy structure, grazing efficiency, leaf dry mass, rotational grazing, rest period.

Introduction

Elephant grass (Pennisetum purpureum Schumach.) has one of the highest production potentials among tropical forages used in intensive grazing, both in terms of forage production and animal performance (Carvalho et al., 2005; Lima et al., 2007). However, problems related to management have hampered its adoption by farmers. One difficulty is to maintain a proper vegetation structure due to its rapid stem elongation, which results in decreasing leaf/stem ratio, grazing efficiency, and forage nutritive value (Carvalho et al., 2005). Furthermore, the rapid increase in residual plant height requires frequent mowing, which enhances production costs. Therefore, short forage stature may allow higher grazing efficiency.

Grazing frequency and defoliation intensity affect canopy structure (Carnevalli et al., 2006; Barbosa et al., 2007; Difante et al., 2010). Barbosa et al. (2007) found higher accumulation rates of Paniceum maximum, cultivar Tanzânia, subjected to high...
grazing frequencies (90–95% of light interception) and intensities (50–25 cm post-grazing height). These authors also observed that pastures grazed to 50 cm residue produced, in average, 1,000 kg ha⁻¹ more dry matter than those grazed to 25 cm residue, with an average of 5,810 and 4,890 kg ha⁻¹ of dry matter, respectively.

Trindade et al. (2007), while studying Urochloa brizantha, cultivar Marandu, reported that the combination of 95% of light interception for regrowth interruption, associated with post-grazing height of 15 cm, provided greater proportion of leaves in the forage. For elephant grass, several studies have evaluated forage production and canopy structure (Deresz, 2001; Paciullo et al., 2003; Carvalho et al., 2005; Lima et al., 2007), but those involving management strategies based on morphological criteria for defining the defoliation interval are still incipient (Gomide et al., 2011b). Moreover, knowledge of the response of new forage accesses to variation in management represents a breakthrough in the development and future adoption of cultivars.

The objective of this work was to evaluate the dry matter production of elephant grass (Pennisetum purpureum) genotypes, managed under intermittent stocking.

Materials and Methods

The experiment was carried out at the experimental farm of Embrapa Gado de Leite, located in Coronel Pacheco, MG, Brazil (21°33'S and 43°16'W, at 435 m altitude), from December 2009 to April 2010. The climate, according to Köppen classification, is Cwa (mesothermal), with a tropical rainy summer and a dry winter from June to September (Peel et al., 2007).

The soil of the experimental area is classified as a Typic Udifluent (Neossolo Flúvico distrófico, in the Brazilian classification – Santos et al., 2006), with the following chemical characteristics: pH (H₂O) 5.8; 10.5 mg dm⁻³ P; 77 mg dm⁻³ K; 2.3 cmolₑ dm⁻³ Ca; 1.0 cmolₑ dm⁻³ Mg; 0.0 cmolₑ dm⁻³ Al; 3.50 cmolₑ dm⁻³ H + Al; sum of bases of 3.50 cmolₑ dm⁻³; cation exchange capacity of 6.21 cmolₑ dm⁻³; and soil base saturation (V%) of 45%.

Due to the values found in the soil analysis, liming was not performed prior to planting. Only phosphate was applied at pasture establishment, placed in the furrow at an equivalent of 100 kg ha⁻¹ P₂O₅. N-P-K (20-05-20) maintenance fertilization was performed during the rainy season, after each grazing, at equivalents of 50 kg ha⁻¹ N and K₂O, and 12.5 kg ha⁻¹ P₂O₅.

Pasture was established at the beginning of the rainy season of 2008 (September–October) by planting mature culms, with 80 cm spacing between rows. During the first year, the pasture was managed under intermittent stocking, with grazing periods of two days and grazing interval of 28 days. In December 2009, a pre-experimental grazing period was performed in order to adjust the swards according to the treatments.

Treatments consisted of a factorial combination (2x2x2) of two genotypes (cultivar BRS Kurumi, a dwarf grass; and clone CNPGL 00-1-3, a medium-sized grass), two light interceptions levels at the onset of grazing (90 and 95%), and two post-grazing canopy heights (30 and 50 cm), arranged in a completely randomized design, with three replicates.

It was used 24 Holstein x Zebu crossbred heifers, weighing 190 kg. The number of animals per paddock, in order to achieve the desired post-grazing canopy height, varied from three to four heifers. The “mob grazing” technique was used to simulate the condition of rotational grazing. The experimental units (paddocks) had dimensions of 15x20 m, and the number of animals was adjusted to achieve the predetermined residue heights, considering two days of occupancy per paddock. The pre-grazing forage mass estimate was used to define the number of animals that would be placed in each paddock. After grazing on the experimental plots, the animals were maintained on another elephant grass pasture until the subsequent grazing cycle. In each grazing cycle, the order of the grazing paddocks in each treatment followed the sequence of the replicates.

The group of animals used was as uniform as possible regarding age, body weight, and score. Despite this, in each grazing cycle, the group of animals for each treatment was randomly selected to avoid possible interferences due to the inherent differences in animals. During the grazing period, canopy height was measured to determine the amount of material removed from pasture, observing the pre-established height of the residue. The measurements were made using a ruler graduated in centimeters, collecting 20 random readings in each paddock. These canopy measurements were also performed before the animals entered the pastures.
paddock, in order to characterize the pasture at the end
of the rest period (pre-grazing).

Evaluations of the light interception (LI) levels by
the canopy were performed weekly, at the removal
of the animals from the paddock and during the rest
period, using a canopy analyzer equipment, Accupar
LP 80, (Decagon Devices, Pullman, WA, USA),
with ten random readings per paddock. The dates
of the entry and exit of the animals in each paddock
were recorded to calculate the rest periods (days) and
number of grazing cycles.

Before grazing onset, two samples of the forage mass
close to the ground were harvested using a rectangular
1.0x0.5 m frame. The sampling sites represented the
average condition of the pasture in terms of vegetation
height and cover. The samples were subsampled,
separated into leaf, stem (culm + leaf sheath) and dead
material, and dried in a forced-circulation oven at
55°C, for 72 hours to determine total dry matter mass.

Forage accumulation rate (FAR) was estimated for each
grazing cycle in each treatment through the difference
between pre-grazing forage mass and residual forage
mass in the previous grazing cycle, divided by the
number of days necessary for the recovery of the
pasture (rest period).

Based on the values of total forage mass (TFM)
in the pre- and post-grazed pasture, the forage-use
efficiency (FUE) was estimated using the formula:
FUE = \[
\frac{\{(TFM_{Pre} - TFM_{Post}) - Losses\} \times 100}{TFM_{Pre}}
\]

Forage loss was estimated based on the forage
deposited on the ground during the grazing period,
according to Carnevalli et al. (2006), considering
the samples from two 1.0x0.50 m rectangular frames
per paddock. Sampling points were defined prior to
grazing, by choosing sites that represented the average
condition of the pasture; all of the plant material lying
on the ground (stems and fallen green leaves, even if
still attached to the plants) was collected. This material
was processed using the same methodology described
for forage samples collected pre- and post-grazing.

The results obtained for the structural and productive
traits of the pasture were subjected to analysis of
variance, and treatment means were compared by
the Tukey test, at 10% probability. The values were
expressed as the average of grazing cycles during the
rainy season. The entire data set was tested to ensure
that the basic prerogatives of the analysis of variance
were met. All the evaluated factors and their interactions
were considered as a fixed effect. These procedures
were performed using the statistical package Sisvar.

Results and Discussion

A significant interaction was observed between
treatments of light interception level and post-grazing
height for total forage mass (Table 1). Under 90% LI,
forage mass did not vary between residue heights,
whereas under 95% LI, greater forage mass was
observed with 50-cm post-grazing height. Carnevalli
et al. (2006) and Barbosa et al. (2007), however,
reported higher production of forage mass with the
association of lower residue (30 cm) and 95% light
interception.

Increasing light interception levels only affected
forage mass when associated with residual height of
50 cm (Table 1), most likely due to an increase in stem
elongation. Stem elongation is usually associated with
the shading level to which the plants are subjected.
According to Parsons & Penning (1988), the average
rate of grass growth is maximized at 95% LI, and,
therefore, this criterion has been suggested to control
stem elongation in tropical grasses (Da Silva &
Nascimento Júnior, 2007). However, in grasses with
early stem elongation, such as elephant grass, stem
elongation seems to start even in the absence of light
competition. In this sense, Carvalho et al. (2007)
observed a high stem elongation in elephant grass
cultivar Napier with light interception levels much
lower than 95%.

The amount of forage mass produced was similar
to that obtained for elephant grass cultivar Napier,
managed with different residue height and rest periods
of 24 or 30 days (Deresz et al., 2001; Carvalho et al.,
2005).

The post-grazing residue had no effect on the
pre-grazing green forage mass; however, it was observed
interaction between genotype and LI (Table 2). For the

<table>
<thead>
<tr>
<th>Light interception (%)</th>
<th>Residual height (cm)</th>
<th>CV (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td>30</td>
<td>7.475aA</td>
</tr>
<tr>
<td>95</td>
<td>50</td>
<td>7.447bB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>21.9</td>
</tr>
</tbody>
</table>

(1) Means followed by equal letters, lowercase in the rows and uppercase in the columns, do not differ by the Tukey test, at 10% probability.

Table 1. Total forage mass averages (kg ha⁻¹ per cycle) of
elephant grass pasture according to light interception and
residual height(1).
cultivar BRS Kurumi, higher green forage mass was found under 95% LI, whereas clone CNPGL 00-1-3 showed no difference in this variable as LI varied.

When managed under 90% LI, the clone CNPGL 00-1-3 had higher green forage mass than cultivar Kurumi, but the genotypes did not differ under 95% LI (Table 2). The smaller production of green forage mass by the cultivar BRS Kurumi was offset by its lower rest period (Table 3), which confers a higher number of grazing cycles (Table 4) and resulted in higher forage production of this cultivar during the rainy season.

Gomide et al. (2007), working with different rest periods, based on the number of green leaves per tiller in Mombaça grass, also observed that the greater number of cycles with shorter rest periods (appearance of 2.5 leaves per tiller) offsets the lower production of pre-grazing forage mass. Furthermore, the authors reported higher forage accumulation rates and a better leaf/stem ratio for this shorter rest period.

Only genotype had influence on the number of grazing cycles. Carnevalli et al. (2006) reported that this variable was not affected by the residual height of Mombaça grass, but it was higher at 95% LI than at 100%.

A rapid recovery of the pasture after defoliation avoids the appearance of invasive plants and increases forage production throughout the growing season (Gomide & Paciullo, 2012). In addition, a longer rest period may influence the canopy structure and forage nutritional value, since it enables a higher accumulation of stem and dead material (Da Silva & Nascimento Júnior, 2007). The cultivar BRS Kurumi had a shorter rest period (22.5 days) than CNPGL 00-1-3 (50 days). Indeed, when studying morphogenesis, Gomide et al. (2011b) found high rates of elongation and leaf appearance for the cultivar BRS Kurumi after defoliation, in summer. This favors a rapid canopy closure and, consequently, a rapid recovery (range of LI) for the next grazing period. The effects of the morphogenetic and structural characteristics of the canopy were described by Chapman & Lemaire (1993) for temperate grasses and confirmed in tropical grasses (Gomide et al., 2006).

The genotypes and the residual heights did not cause differences as to pre-grazing leaf mass (Table 3). However, greater leaf mass was found with 95% LI. The lower leaf mass under 90% LI can be attributed to growth limitations. In this sense, Parsons et al. (1983) reported that net forage production increases until the death of older leaves is intensified, which normally coincide with the level of 95% LI. It should be noted that the appropriate contribution of leaves to forage mass, comprising 50% of the forage, revealed a good adaptation of these genotypes to the management under rotational stocking.

### Table 2. Pre-grazing green forage mass averages (kg ha⁻¹ per cycle) of elephant grass pasture according to genotypes and light interception levels(1).

<table>
<thead>
<tr>
<th>Genotype</th>
<th>Light interception (%)</th>
<th>CV (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>90</td>
<td>95</td>
</tr>
<tr>
<td>BRS Kurumi</td>
<td>5.762bB</td>
<td>8.158aA</td>
</tr>
<tr>
<td>CNPGL 00-1-3</td>
<td>8.016aA</td>
<td>7.962aA</td>
</tr>
</tbody>
</table>

(1) Means followed by equal letters, lowercase in the rows and uppercase in columns, do not differ by the Tukey test, at 10% probability.

### Table 3. Rest period (days) for the two elephant grass genotypes according to the light interception and rest period interaction(1).

<table>
<thead>
<tr>
<th>Residue (cm)</th>
<th>Light interception (%)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>90</td>
<td>95</td>
</tr>
<tr>
<td>BRS Kurumi</td>
<td>21.3aA</td>
<td>24.5aA</td>
</tr>
<tr>
<td>30</td>
<td>17.3bB</td>
<td>27.2aA</td>
</tr>
<tr>
<td>CNPGL 00-1-3</td>
<td>52.5bA</td>
<td>59.4aA</td>
</tr>
<tr>
<td>30</td>
<td>43.3aB</td>
<td>45.0aB</td>
</tr>
<tr>
<td>CV (%)</td>
<td></td>
<td>11.5</td>
</tr>
</tbody>
</table>

(1) Means followed by equal letters, lowercase in the rows and uppercase in columns, do not differ by the Tukey test, at 10% probability.

### Table 4. Pre-grazing leaf mass, forage accumulation rate, and number of grazing cycles according to elephant grass genotypes, light interception levels, and residual heights(1).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Leaf mass (kg ha⁻¹ per cycle)</th>
<th>Accumulation rate (kg ha⁻¹ per day)</th>
<th>Grazing cycles(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genotype</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BRS Kurumi</td>
<td>3,438a</td>
<td>177a</td>
<td>6a</td>
</tr>
<tr>
<td>CNPGL 00-1-3</td>
<td>3,651a</td>
<td>114b</td>
<td>3b</td>
</tr>
<tr>
<td>Light interception (%)</td>
<td>90</td>
<td>1,159b</td>
<td>120b</td>
</tr>
<tr>
<td>95</td>
<td>3,929a</td>
<td>171a</td>
<td>151a</td>
</tr>
<tr>
<td>Residue (cm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>3,582a</td>
<td>157a</td>
<td>4a</td>
</tr>
<tr>
<td>50</td>
<td>3,507a</td>
<td>134b</td>
<td>4a</td>
</tr>
<tr>
<td>CV (%)</td>
<td>21.3</td>
<td>46.6</td>
<td>15.4</td>
</tr>
</tbody>
</table>

(1) Means followed by equal letters in columns do not differ by the Tukey test, at 10% probability. (2) Considering the period between December (establishment of grazing) and April, and the average rest period.
Gomide et al. (2011a) observed higher leaf percentage (82%) in pre-grazing forage mass.

The average forage accumulation rate for the cultivar BRS Kurumi was more than 60 kg of dry matter per day, higher than the one found for the clone CNPGL 00-1-3, representing a significantly higher forage production during the rainy season (Table 3). Increasing light interception from 90 to 95% also increased the accumulation rates. This result is in agreement with several studies, which show higher average growth rate of the pasture when the incident light interception is around 95% (Mello & Pedreira, 2004; Cândido et al., 2005; Carnevalli et al., 2006; Barbosa et al., 2007; Gomide et al., 2007).

The lower post-grazing residue (30 cm) provided a greater forage accumulation rate (Table 3). In this regard, Korte et al. (1982) demonstrated that light and frequent grazing reduce forage accumulation in ryegrass-dominant pasture, mainly due to increased respiratory demands for higher residues.

Significant interaction was observed between light interception level and residual height as to the rest periods, in both genotypes (Table 4). In general, the higher residue amount the lowest rest period, i.e., the time necessary to achieve the condition of light interception required for the next grazing. The cultivar BRS Kurumi was an exception, since no difference was observed between the residues of 30 and 50 cm, at 95% LI. This can be explained by changes in canopy structure attributed to stem elongation (Gomide et al., 2007) and leaf angle (Mello & Pedreira, 2004) in response to different combinations of frequency and intensity of grazing, altering light penetration in the canopy and, consequently, light interception.

For the clone CNPGL 00-1-3, a clear effect of the residual height was observed in the rest period. In both light interception levels, a lower rest period was found with the higher residue (50 cm). This finding is supported by the literature, with shorter intervals at lower grazing intensities (Korte et al., 1982; Fulkerson & Slack, 1995; Barbosa et al., 2007). This response is associated with the higher height of the genotype CNPGL 00-1-3, which was reflected in a greater canopy height. Therefore, the use of 50 cm residue for this genotype favors its fastest recovery. Likewise, under the residue of 50 cm no difference was observed in the rest period between 90 and 95% LI, reinforcing the idea that this residue is suitable for that genotype.

By analogy, the smallest variation in rest periods observed for the cultivar BRS Kurumi, under different combinations of frequency and intensity of grazing, suggests easier management or greater versatility.

The genotypes differed as to pre-grazing canopy heights, with an average height of 75 cm for the cultivar BRS Kurumi and of 127 cm for the clone CNPGL 00-1-3. A significant interaction between LI and residual height was also evident for this variable (Table 5). No difference in pre-grazing canopy height between residues of 30 and 50 cm was observed under 90% LI. However, under 95% LI, the residual height of 50 cm increased the pre-grazing canopy height. This result corroborates the findings of Barbosa et al. (2007) and Gomide & Paciullo (2012), who reported that the intensity and frequency of grazing are the two management factors that influence the structural and productive characteristics of tropical pasture grasses. Based on the recommendation of 95% LI for the management of tropical grasses under rotational stocking (Da Silva & Nascimento Júnior, 2007), these results indicate a first guideline for the management of these genotypes: a pre-grazing height of 75–80 cm for the cultivar BRS Kurumi and of 100 cm for the clone CNPGL 00-1-3.

The residual forage mass varied according to the interaction between genotypes and post-grazing heights (Table 5). For the cultivar BRS Kurumi, taller residues resulted in a doubled residual mass, an expected result because higher residual mass is associated with taller plants (Mello & Pedreira, 2004). Another factor that probably contributes to this effect is the significant shoot elongation, a consequence of a higher residue

### Table 5. Pre-grazing canopy height according to light interception and residual height, and post-grazing green forage mass according to genotype and residual height of elephant grass genotypes(1).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Residual height (cm)</th>
<th>30</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light interception (%)</td>
<td>Pre-grazing height (cm)</td>
<td>98.7aA</td>
<td>96.0aB</td>
</tr>
<tr>
<td>90</td>
<td>95.5bA</td>
<td>116.5aA</td>
<td></td>
</tr>
<tr>
<td>CV (%)</td>
<td>15.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Genotype</td>
<td>Post-grazing green forage mass (kg ha⁻¹)</td>
<td>1,917bB</td>
<td>4,132aA</td>
</tr>
<tr>
<td>BRS Kurumi</td>
<td>1,917bB</td>
<td>4,132aA</td>
<td></td>
</tr>
<tr>
<td>CNPGL 00-1-3</td>
<td>3,154aA</td>
<td>3,515aA</td>
<td></td>
</tr>
<tr>
<td>CV (%)</td>
<td>31.55</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1)Means followed by equal letters, lowercase in the rows and uppercase in columns, do not differ by the Tukey test, at 10% probability.
Forage production of elephant grass under intermittent grazing intensity. In this sense, Gomide et al. (2011b) found higher stem elongation rate at the 45 cm residue, when compared to the 25 cm residue. The genotype CNPGL 00-1-3 showed no difference as to residual mass in response to residual height, and these similar results are due to the greater difficulty in achieving the desired residue height, mainly under the lower residue, leaving around 40 cm.

Managing pastures with a residual height of 30 cm provided higher residual mass for the genotype CNPGL 00-1-3 in comparison to the cultivar BRS Kurumi (Table 5). There was no difference between the genotypes with 50 cm residue height.

The post-grazing leaf mass, or residual leaf mass, varied between genotypes and between residual heights, but not with LI (Table 6). The cultivar BRS Kurumi had a higher residual leaf mass than CNPGL 00-1-3, resulting in larger leaf proportion and rapid regrowth, and, therefore, in a shorter grazing interval. Residual height also influenced residual leaf mass, with higher values under lower intensity of defoliation (50 cm). Therefore, a higher residue after grazing should be maintained to speed the recovery of CNPGL 00-1-3 after defoliation. However, this procedure was reflected in an increased canopy height at the end of the rest period, mostly under 95% IL, with a consequent damage to its structure.

Neither forage-use efficiency nor forage loss was influenced by management factors and genotypes (Table 6). Cunha et al. (2007) found forage losses ranging from 3 to 5% of the total biomass, when working with different elephant grass genotypes managed under a fixed rest period (44 days). In the present study, the forage loss did not reach 1% of the total biomass. This low forage loss represents a good adaptation of these genotypes to grazing and shows that the use of adapted grasses and good management strategies allows overcoming previous limitations reported for elephant grass used for grazing.

**Conclusions**

1. The cultivar BRS Kurumi has higher pasture growth, lower rest period, and greater number of grazing cycles, resulting in increased forage production in the growing season.
2. The use of the light interception of 90% for regrowth interruption compromises the leaf production and forage accumulation rate in elephant grass.
3. The post-grazing canopy height of 30 cm provides a greater forage accumulation rate and increases the use-efficiency of the forage produced; however, for the genotype CNPGL 00-1-3 this residue delays regrowth.

**Acknowledgements**

To Fundação de Amparo à Pesquisa do Estado de Minas Gerais (Fapemig) and to Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), for financial support and grants.

**References**


**Table 6.** Forage-use efficiency, forage loss, and post-grazing leaf mass according to elephant grass genotypes, light interception level, and residual height(1).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Forage use efficiency (%)</th>
<th>Forage loss (kg ha⁻¹)</th>
<th>Residue leaf mass (kg ha⁻¹ per cycle)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genotype</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BRS Kurumi</td>
<td>53.7a</td>
<td>4.4a</td>
<td>745.5a</td>
</tr>
<tr>
<td>CNPGL 00-1-3</td>
<td>57.6a</td>
<td>4.6a</td>
<td>260.9b</td>
</tr>
<tr>
<td>Light interception (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>50.4a</td>
<td>4.7a</td>
<td>466.4a</td>
</tr>
<tr>
<td>95</td>
<td>63.1a</td>
<td>4.3a</td>
<td>540.0a</td>
</tr>
<tr>
<td>Residue (cm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>61.4a</td>
<td>3.8a</td>
<td>324.0b</td>
</tr>
<tr>
<td>50</td>
<td>52.7a</td>
<td>4.9a</td>
<td>664.5a</td>
</tr>
<tr>
<td>CV (%)</td>
<td>25.6</td>
<td>35.4</td>
<td>21.3</td>
</tr>
</tbody>
</table>

1Means followed by equal letters in columns do not differ by the Tukey test, at 10% probability. 2Forage loss, average of each two-day grazing period.


