# Morphogenetic and structural characteristics of clones of elephant grass managed under intermittent stocking

*Carlos Augusto Brandão de Carvalho* [A], *Priscila Beligoli Fernandes* [A], *Domingos Sávio Campos Paciullo* [B] *and Carlos Augusto de Miranda Gomide* [B]

[A] Federal Rural University of Rio de Janeiro – UFRRJ, Seropédica - RJ - Brazil
[B] Embrapa Dairy Cattle, Juiz de Fora – MG - Brazil
Contact email: carloscarvalho_ufrrj@yahoo.com.br

**Keywords:** Basal and aerial tillers, morphogenesis, *Pennisetum purpureum.*

## Introduction

Morphogenetic studies of the growth dynamics of leaves and tillers of forage grasses have enabled the management strategies for grasses to be defined for various environmental conditions (Euclides *et al.* 2010). As the develop-ment of clones of *Pennisetum purpureum* is recent (Pereira e Lédo 2008), detailed information on their growth characteristic under pasture is necessary as a reference for the adoption of appropriate management practices. The objective of this study was to assess the morphogenetic and structural characteristics of basal and aerial tillers in pastures of two small-size clones of elephant grass managed under intermittent stocking for six grazing cycles in spring and summer.

## Material and Methods

The study was conducted at Embrapa Dairy Cattle in Valença, RJ, Brazil, in 14 paddocks of 900 $m^2$ each (experimental unit - EU), distributed into two treatments (two clones - BRS Kurumi and CNPGL 00-1-3) of *P. purpureum*, with seven paddocks each managed under intermittent stocking with a 24-day growth interval and four days of grazing. The experiment was conducted from November 2009 to February 2010 and four grazing cycles were assessed (from 05/11 to 16/02/2010). Variables phyllochron (PHYL); leaf elongation rate (LER) and stem (SER) and number of live leaves (NLL), were evaluated in three clumps (replications), were selected in which one aerial tiller and a basal, three days after the exit of the animals from paddocks and occurred at a week intervals, in each grazing cycle. A millimetre ruler was used to measure green leaf blade length and stem length. Analyses of variance were performed using the PROC MIXED of SAS® and the means of treatments estimated by the "LSMEANS", and compared the probability of difference ("PDIFF") at $P<0.05$.

## Results and Discussion

The PHYL was influenced by tiller class and the interaction between grazing cycle and clone (Table 1). Aerial tillers had high phyllochron values (5.5 days/leaf.tiller) than basal tillers (4.0 days/leaf.tiller). This may have been due to the low pasture canopy height observed for the clones assessed (mean of 78 cm before grazing), which allowed a greater incidence of light at the canopy base and favored a lower leaf appearance interval on basal tillers. The only difference ($P<0.05$) between clones occurred in the fourth grazing cycle with the highest value for the BRS Kurumi (Table 1). For both clones, the smallest and largest PHYL occurred during the third and fourth grazing cycles (spring and summer), respectively, which demonstrates the high demand of these plants on the rainfall as these coincided with the lower (114.6 mm) and higher (268.0 mm) rainfall, respectively.

The LER was influenced by tiller class and grazing cycles. Basal tillers had greater LER (12.8 cm/tiller.day) than aerial tillers (5.1 cm/tiller.day), due to their larger average size of leaf blades (33.5 and 20.0 cm for basal and aerial tillers, respectively), as also demonstrated by Paciullo *et al.* (2003). The variables SER and NLL varied with the interaction between clone, class tiller and grazing cycle (Table 2).

The SER of aerial tillers showed similar trends between clones during the trial period. The variation in the SER of basal tillers suggests that this determined the morphological structural canopies of dwarf elephant grass pastures, since the basal tiller SER was consistently higher than that of aerial tillers.

**Table 1. Phyllochron (days/leaf.tiller) of two clones of dwarf elephant grass during four grazing cycles.**

| Cycles Grazing | Clones of dwarf elephant grass (1) | | SEM(2) |
|---|---|---|---|
| | BRS KURUMI | CNPGL 00-1-3 | |
| C1 (from 05/11/09 to 01/12/09) | 5.03 Aa | 4.03 BCa | 0.3 |
| C2 (from 01/12/09 to 29/12/09) | 4.64 Aba | 5.49 Aa | 0.4 |
| C3 (from 29/12/09 to 22/01/10) | 3.90 Ba | 4.08 Ca | 0.2 |
| C4 (from 22/01/10 to 16/02/10) | 6.18 Aa | 4.85 ABb | 0.1 |

(1) Means followed by the same lowercase letter on the line and by the same capital letter in the column do not differ ($P<0.05$) by "t" test of "Student" ("PDIFF"). (2) Standard error of mean.

**Table 2. Stem elongation rate and number of live leaves, of basal and aerial tillers of two clones of dwarf elephant grass during four grazing cycles.**

| Cycles Grazing | Clones of dwarf elephant grass (1) | | | | SEM(2) |
|---|---|---|---|---|---|
| | BRS Kurumi | | CNPGL 00-1-3 | | |
| | Basal Tillers | Aerial Tillers | Basal Tillers | Aerial Tillers | |
| | SER (cm/tiller.day) | | | | |
| C1 (from 05/11/09 to 01/12/09) | 0.34AaX | 0.15AaXY | 0.42AaX | 0.21AaX | 0.07 |
| C2 (from 01/12/09 to 29/12/09) | 0.48AaX | 0.22BaX | 0.55AaX | 0.17BaX | 0.08 |
| C3 (from 29/12/09 to 22/01/10) | 0.51AaX | 0.16BaXY | 0.28AbY | 0.14AaY | 0.05 |
| C4 (from 22/01/10 to 16/02/10) | 0.18AbY | 0.13AaY | 0.31AaX | 0.13BaY | 0.02 |
| | NLL (number/tiller) | | | | |
| C1 (from 05/11/09 to 01/12/09) | 7.4AaY | 4.6BbY | 6.7AaXY | 6.8AaX | 0.5 |
| C2 (from 01/12/09 to 29/12/09) | 7.1AaY | 5.6AaXY | 7.9AaY | 5.0BaY | 0.6 |
| C3 (from 29/12/09 to 22/01/10) | 9.0AaX | 6.1BaX | 7.7AaY | 6.9AaX | 0.9 |
| C4 (from 22/01/10 to 16/02/10) | 7.3AbY | 5.7BaXY | 9.0AaX | 6.0BaX | 0.5 |

(1) A> B compares class of tillers within the combination clone/grazing cycles; a> b compares clones in combination class of tillers/grazing cycles; X> Y compares grazing cycles within the combination clone/class tiller by "t" test of "Student" (“PDIFF”). (2) Standard error of mean.

Higher values of NLL for basal tillers were observed for the BRS Kurumi in the first, third and fourth cycles and for clone CNPGL 00-1-3, in the second and fourth cycles. The structural difference of NLL was linked to variation for clones and grazing cycles in the class of tillers produced. Therefore, the changes imposed on the class of tillers via pasture management can increase the proportion of photosynthetic components and/or primary productivity in pastures clones of dwarf elephant grass, with advantage to the BRS Kurumi in spring, and the CNPGL 00-1-3 by summer, under the management used.

## Conclusions

The high leaf elongation rate associated with the high number of leaves per tiller, indicate the high leaf dry matter production potential, and the restoration of leaf area after grazing clones of dwarf elephant grass. Basal tillers have greater variation in their morphogenetic and structural characteristics than aerial tillers for the forage plants evaluated.

## References

Euclides VPB, Valle CBdo, Macedo MCM, Almeida RGde, Montagner DB, Barbosa MA (2010) Brazilian scientific progress in pasture research during the first decade of XXI centure. Revista Brasileira de Zootecnia **39**, 151-168.

Paciullo DSC, Deresz F, Aroeira LJM, Morenz MJF (2003) Morfogênese e acúmulo de biomassa foliar em pastagem de capim-elefante avaliada em diferentes épocas do ano. Pesquisa Agropecuária Brasileira **38**, 881-887.

Pereira AV, Lédo FJS (2008). Melhoramento genético de Pennisetum purpureum. In: 'Melhoramento de forrageiras tropicais'. (Eds RMS Resende, CB Valle, L Jank) p.89-116 (Embrapa Gado de Corte: Campo Grande).