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Morphogenetic and structural characterization of seven tropical forage grasses

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INTRODUCTION

Analysis of the growth and development of forage plants is an important strategy for characterizing their production potential.

Morphogenesis is a key concept for this type of assessment.

Contribute to the planning and adoption of efficient management practices for each type of forage plant (Silveira *et al*, 2010).

Used in the evaluation of the material produced by the breeding and introduction grass program.

The objective of this experiment was to characterize the developmental patterns of tropical forage grasses by means of morphogenetic and structural characteristics.

MATERIALS AND METHODS

Place: Animal Science Department of the Universidade Federal de Vicosa, in Vicosa, Minas Gerais, Brazil.

Experimental period: November 2006 to May 2007.

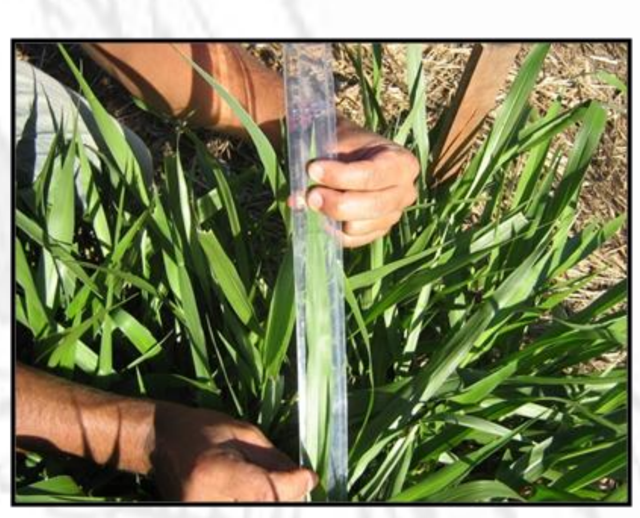
Treatments: Three cultivars of *Panicum maximum* (Mombaca, Massai and Aruana grasses), two cultivars of *Brachiaria brizantha* (Marandu and Xaraes grasses), molasses grass (*Melinis minutiflora*) and jaragua grass (*Hyparrhenia rufa*).

Experimental Desing: Completely randomized blocks with three replicates.

Experimental unit: Plots of 1,0 m² with twenty-four plants eath.

Evaluated :

Morphogenetic and structural variables



The rates of leaf appearance and elongation, stem elongation and leaf senescence were measured.

Leaf appearance (LAR, leaves tiller^{-1} day^{-1}), elongation (LER, cm tiller^{-1} day^{-1}) and senescence rates (LSR, cm tiller^{-1} day^{-1}), stem elongation rate (SER, cm tiller^{-1} day^{-1}), number of living leaves per tiller (NLL), leaf lifespan (LLS, days) and final leaf length (FLL, cm) were calculated based on field data.

Tillering

The number of dead tillers per generation was also recorded to calculate the appearance rates of basal and aerial tiller (BTAR and ATAR), mortality rates of aerial and basal tillers (ATMR and BTMR) and rates of mortality and appearance of all tillers (TAR and TMR).

Statistic analysis: The morphogenetic and structural variables related to tillering were subjected to multivariate analysis by employing factor analysis using the Varimax rotation method and orthogonalization factor (Johnson and Wichern, 1998). The analysis was performed on subsets of data corresponding to summer and autumn.

RESULTS AND DISCUSSION

Summer

Molasses, xaraes, jaragua and massai grasses promoted MsDev primarily through LAR, BTAR and TAR. Mombaca, aruana and marandu grasses primarily promoted MsDev through LER and NLL.

The TiMor factor was negative for the majority of grasses, with the exception of jaragua grass.

The DevSt factor was positive for mombaça, xaraes, jaragua and massai grasses during the summer due to elevated LER and FLL values, which are characteristic of plants with longer vegetative periods. For molasses and aruana grasses, the values were negative due to elevated SER and ATAR values. Marandu grass also presented a negative value; however, this behavior was due to SER because this grass did not present aerial tillers during the summer.

LeLon factor, mombaca, molasses, jaragua and aruana grasses presented positive values due to elevated LSR. Xaraes, marandu and massai grasses presented negative values because they exhibited elevated LLS.

Autumn

All grasses presented negative values of MsDev. Because morphogenetic characteristics are affected by ambient conditions (Lemaire and Chapman, 1996).

Molasses, aruana and marandu grasses presented positive TiMor factors, probably due to the greater mortality of aerial tillers. Mombaca, xaraes, jaragua and massai grasses presented negative values due to the absence of aerial tillers and late flowering.

Only molasses and jaragua grasses presented positive values. Jaragua grass presented the highest value due to its greater LSR, which may have been caused by the absence of new tillers during autumn.

Table 1 – Summer and autumn means of four factors that describe the morphogenetic and structural characteristics of seven forage grass species: 'mass development' (MsDev), 'tiller mortality' (TiMor), 'developmental stage' (DevSt) and 'leaf longevity' (LeLon)

Class	MsDev	TiMor	DevSt	LeLon
		Summer		
Mombaça	-0.0383	-0.3514	1.5992	0.1855
Molasses	1.6691	-0.4867	-1.8420	0.4707
Xaraes	0.3663	-0.3517	1.0971	-0.7607
Jaragua	2.3421	0.1191	1.0651	0.8472
Aruana	-0.6150	-0.7196	-1.2601	0.9253
Marandu	-0.2797	-1.3073	-0.4004	-1.1981
Massai	0.6216	-0.0467	0.4762	-0.1547
		Autumn		
Mombaça	-0.7657	-0.2660	0.5555	-0.5128
Molasses	-0.3080	1.8267	-0.7315	0.0261
Xaraes	-0.8781	-0.9161	-0.1449	-0.4367
Jaragua	-1.0614	-0.2217	0.4207	1.9000
Aruana	-0.2451	2.3731	-0.1274	-0.4791
Marandu	-0.6471	0.0909	-0.8379	-0.1654
Massai	-0.6599	-0.2160	0.1614	-0.8055

CONCLUSIONS

Morphogenetic and structural characteristics facilitate description of the developmental pattern of the grasses studied, indicating that they use available resources differently for growth and development. Our results indicate that some morphogenetics measurements could be added at final stages of tropical grasses evaluation programs. The variables to be measured would depend on which plant traits the researcher are looking for.

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