Cluster analysis to tiller age categories in continuously stocked marandu palisade grass fertilized with nitrogen

Adenilson José Paiva[1]; Lilian Elgalise Techio Pereira[1] ; Sila Carneiro da Silva[2*]
[1] PhD student of University of São Paulo USP/ESALQ ; [2] Professor of University of São Paulo USP/ESALQ
*Corresponding author - siladasilva@usp.br

Introduction

✓ Tiller age influences the turnover of leaves on individual tillers

✓ Studies regarding the effect of plant age on the tissue turnover in tropical forage grasses are scarce and the few existing use arbitrary criteria for defining tiller age categories to be evaluated

✓ On a tiller level, leaf appearance and elongation as well as leaf lifespan are important

✓ Use of morphological characters associated with multivariate analysis techniques have been used for determining similarities or differences between groups of interest

Objective

✓ Identify classes of tiller age with similar morphogenetic characteristics on continuously stocked marandu palisade grass fertilised with nitrogen using the multivariate procedure of cluster analysis

Materials and Methods

✓ The experiment was carried out at Escola Superior de Agricultura "Luiz de Queiroz", Universidade de São Paulo, Piracicaba, SP, Brazil

✓ Application of 0, 150, 300 and 450 kg/ha of N (using pure ammonium nitrate)

✓ Were allocated to experimental units according to a complete randomised block design with four replications

✓ Three 30 cm PVC rings were used to evaluate tillering dynamics

✓ All tillers within each ring were counted and tagged with plastic coated wires of a single color

✓ All previously tagged tillers still alive were counted and new ones marked with other color every four weeks

✓ In February 2008 all live tillers within the rings were classified into six age categories :
- less than 30 days of age
- 31 and 60 days
- 61 to 90 days
- 91 to 120 days
- 121 to 150 days
- more than 150 days

✓ Leaves were identified, their lamina length measured and new leaves counted

✓ Data was used to calculate rates of leaf appearance (LAR) and elongation (LER) and leaf lifespan (LLS)

✓ A multivariate model was used to discriminate tiller age categories based on the three characteristics – LAR, LER and LLS – as indicators, isolating the block effect to identify groups according to tiller age

✓ In the sequence, using the means of the studied characteristics, the Euclidean distance between groups was estimated

Results

✓ The cluster analysis performed with the marandu palisade grass data resulted in three groups (Figure 1), defined in terms of tiller age categories:
- tillers under 60 days of age
- tillers between 60 and 120 days of age
- tiller over 120 days of age
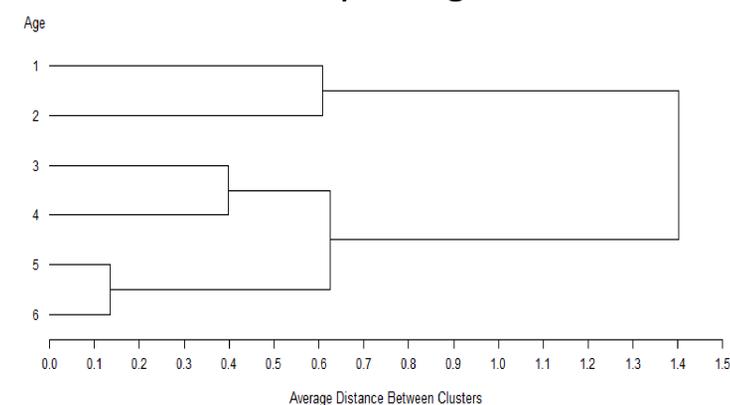
1: tillers under 30 days of age; 2: tillers between 30 and 60 days of age; 3: tillers between 60 and 90 days of age; 4: tillers between 90 and 120 days of age; 5: tillers between 120 and 150 days of age; 6: tillers over 150 days of age

Figure 1 – Dendogram based on the results of the cluster analysis of morphogenetic responses of continuously stocked marandu palisade grass
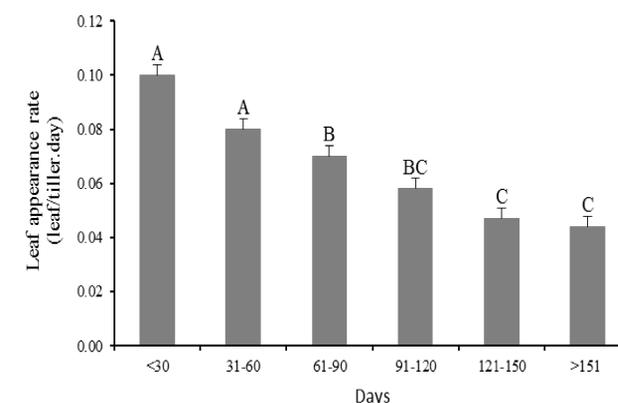

Figure 2 – Leaf appearance rate (leaf/tiller.day) in tiller age categories of continuously stocked marandu palisade grass fertilised with nitrogen

Conclusion

✓ The cluster analysis demonstrated that there are differences in plant morphogenetic responses depending on tiller age category, and that those could be well represented by three age groups as follows: young (under 60 days old), mature (between 60 and 120 days old) and old (more than 120 days old).