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**Leaf morphogenesis and tillering  
behaviour in single plants and simulated  
swards of Guinea grass (*Panicum  
maximum* Jacq.) cultivars.**

A thesis presented in partial fulfilment  
of the requirements for the degree of

*Doctor of Philosophy (PhD)*

in  
Plant Science



Institute of Natural Resources  
**Massey University**  
Palmerston North, New Zealand

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2002

I dedicate this thesis 'in memoriam' of my parents,  
Lygia and Paulo Américo.  
I have made a good choice.

I also dedicate this thesis to my daughter Cintia  
and my son Gabriel.  
They have made a good choice.

And last but not least, I dedicate this thesis to  
my grandson Eric.  
My genetic contribution  
to New Zealand.

The true role of science is to understand life and comprehend creation so we can participate in it and add to it. A scientist is meant to be a steward of life forms. He is charged not just to measure and quantify data and writing papers, but to get busy fostering the whole of creation.

Luther Burbank

## ABSTRACT

**Carvalho, D. D. (2002). Leaf morphogenesis and tillering behaviour in single plants and simulated swards of Guinea grass (*Panicum maximum* Jacq.) cultivars. PhD Thesis, Institute of Natural Resources, Massey University, Palmerston North, New Zealand.**

In a series of five experiments carried out in growth cabinet and glasshouse environment, potted plants of Guinea grass (*Panicum maximum* Jacq.) cultivars were subjected to different cutting heights and environmental conditions. Herbage accumulation, leaf and tiller morphogenesis, leaf tissue turnover and tiller dynamics were evaluated. In one study three cultivars, Aruana, Mombaça and Tanzânia were grown for 18 months in miniature swards where plants were subjected to two defoliation heights (150 and 300mm), and productivity and tiller dynamics were evaluated. Cultivar and defoliation intensity effects on herbage production, leaf morphogenesis and tiller population density were observed. Herbage DM harvested from Mombaça was 32.3 and 31.7% more than Tanzânia and Aruana, respectively. There were also seasonal effects on tiller appearance rate and tiller death rate associated with flowering. A greater proportion of tillers flowered in cv. Tanzânia than cv. Mombaça. Two further experiments quantitatively described leaf turnover and associated morphogenetic characters in potted plants of the same three cultivars. One of these carried out in a growth cabinet included three defoliation regimes (50 mm, 200 mm, or uncut) and leaf turnover and the distribution of various tiller categories within the plants were measured. The other, carried out in a glass house, examined leaf turnover and site filling responses in undefoliated established plants. Higher temperature in the growth cabinet increased LAR, LER, FLL, and senescence and reduced site filling, LLS and NLL, and these effects were greater than cultivar effects. Severe defoliation (50 mm) initially resulted in increased tiller number per plant in all cultivars, but later decreased tiller number per plant through tiller death. The next experiment was established to determine limits of plasticity in potted plants of cv. Mombaça and cv.

defoliation intensities (100, 200 and 400 mm height). Herbage growth and net accumulation declined progressively, and senescence increased with increasing defoliation height in both cultivars. Treatment effects on root mass and root development were similar to those on herbage production. There was evidence of serious decline in vigour of aging tillers in both cultivars, and of substantial differences in the contribution of individual tiller cohorts to production, independent of the age effect. A final experiment using  $^{14}\text{C}$  showed that translocation of assimilates from primary tillers to daughter and secondary tillers was greater in cv. Tanzânia than cv. Mombaça. The implications of these studies to understanding of the morphogenetics and production potential of these cultivars, their relevance to management decisions, and requirements for further studies are discussed

**Keywords:** cv. Aruana, cv. Mombaça, cv. Tanzânia, defoliation intensity, Guinea grass morphogenesis, photoassimilate translocation.

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