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EFFECT OF AGING IN TILLERS OF *PANICUM MAXIMUM* ON LEAF ELONGATION RATE.

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Abstract

Two cultivars of Guinea grass (*P. maximum*, Jacq.), Mombaça and Tanzânia, were cultivated in five litre pots, as single plants, in a green house. Plants were subjected to three defoliation levels (100, 200 and 400 mm height) for five successive monthly harvests. The experimental design was a 3x2 randomised block with five replicates. Three types of tiller (main, primary and secondary) were selected, at random, on each plant and leaf elongation rate (LER) above cutting height was measured, weekly, between harvests. There were significant differences ($P<0.05$) in LER between tiller types in cv. Mombaça in all periods, but only in period two in cv. Tanzânia. In the last period tillers were classified, at random, as old (over four months age) mature (between two and four months) and young (between one and two months). Old tillers had a lower ($P<0.05$) LER than the other two categories in both cultivars and lower ($P<0.05$) SLA (specific leaf area) in Mombaça.

Keywords: Guinea grass cultivars, specific leaf area, tiller types.

Introduction

Dry matter flux in a pasture has been extensively evaluated through rates of tiller appearance and of leaf appearance, elongation and senescence (Davies, 1993), but there is little information on the effect of tiller age in these variables in forage species. Bos and Neuteboom (1998) found a large and significant effect of tiller type (main, primary and secondary) in wheat when evaluating specific site usage and Haun Stage-delay under different light and temperature regimes. Gomide (1997) also found differences in leaf elongation rate when comparing main and primary tillers in Guinea grass (*Panicum maximum*) cultivars. Durand et al. (1999) observed effects of temperature and developmental stage on leaf elongation rate in *Festuca arundinacea.* This paper reports the effects of tiller age on leaf elongation rate in two cultivars of Guinea grass.

Material and Methods

Established seedlings of Guinea grass cultivars, Mombaça and Tanzânia, were grown in five litre pots filled with a mixture of soil (2/3) and sand (1/3) and added lime (0.5 g/pot), and thinned to one per pot. Plants were grown in a glass house from September to March and the average maximum temperature was 35^{o} C and minimum 17 ^{o} C. Pots were watered and fertilised, daily, with 100 mL/pot of a 0.5% solution of a soluble fertiliser (20%N, 8.7%P, 16.6%K, 0.06% S) plus appropriate micronutrients. After four weeks, coloured wire rings were used to identify main and primary tillers, separately. Subsequently, every two weeks, all new tillers emerged in each pot were tagged with a different coloured ring. In week eight all plants were defoliated at 200 mm height, followed by five harvests at 28 day intervals, under three defoliation levels (100, 200 and 400 mm measured from the base of the plants). The experiment was a 3x2- randomised block design with five replicates. In each pot, three tillers (one main, one primary and one secondary) were selected, at random, to measure leaf elongation rate (LER) from weekly measurements of lamina length above cutting height for all elongating leaves, for three consecutive periods: P1 (Nov/Dec), P2 (Dec/Jan), P3 (Jan/Feb). In a subsequent period, P4 (Feb/Mar) tillers were selected, at random, in three age categories defined as old (over four months), mature (between two and four months) and young (one to two months). The LER means were compared within cultivars using Student-T test at 5% probability.

Results and Discussion

There were significant interactions between the effects of tiller category and cutting height in some periods but not in others. Results are presented for effect of tiller age and period of measurement pooled within defoliation treatments in each cultivar. Figure 1 shows LER in main, primary and secondary tillers during three consecutive periods in the growing season for Mombaça and Tanzânia. LER increased consistently across the main-primary-secondary tiller sequence in all periods for Mombaça, although not all differences were significant (Figure 1). The contrasts in Tanzânia were smaller and generally non-significant. As noted in an earlier study (Gomide, 1997) differences in LER between cultivars were limited, but these results contrast with other reports (Santos, 1997, Carvalho, 1999), in field and controlled environments, where Mombaça usually had higher LER than Tanzânia. In all the studies LER average values were twice those in the present trial. With time (from P1 to P3) a decrease in LER occurred in both cultivars in all tiller types (Figure 1). This decrease suggests an aging process with time, which was observed to result in eventual tiller death. Based on this observation, Figure 2 presents LER data in P4 from tillers designated old, mature and young. LER in mature tillers was twice that in old tillers in both cultivars ($P<0.05$) and higher than in young tillers in Mombaça ($P<0.05$). Specific leaf area (SLA), was greater ($P<0.05$) in old than in mature tillers in Mombaça (250 and 208 cm^2/g, s.e.m. ±11.1), but not in Tanzânia (average 227 cm^2/g, s.e.m. ±4.9). Taking together the age effects on LER and SLA, it is clear that leaves from old tillers contributed progressively less to herbage yield than mature tillers in Mombaça but not in Tanzânia. Reasons for this cultivar contrast remain to be investigated. These results demonstrate the important influence of tiller age on the productivity of pasture of *P.maximum*, and suggest the importance of efficient non-random sampling procedures in studies of this kind. The results also indicate that in the two cultivars studied, but especially in Mombaça, tiller death can arise from a natural aging process, first indicated by a decrease in LER and increase in SLA.

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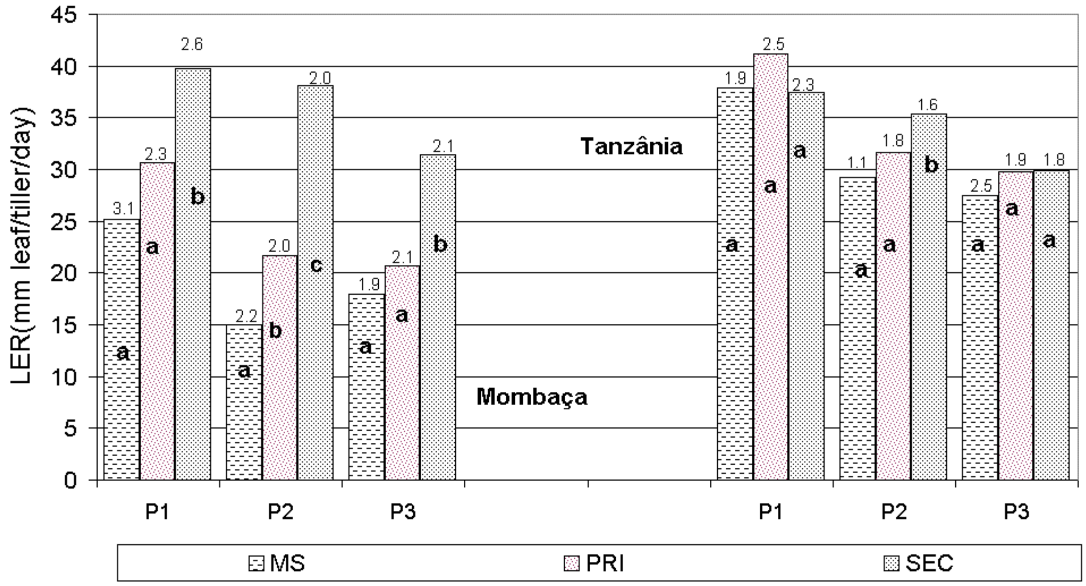

Figure 1 - Leaf elongation rate (mm leaf/ tiller/day) in main, primary and secondary tiller, in two Guinea grass cultivars (Mombaça and Tanzânia), in three consecutive periods P1 (Nov/Dec), P2 (Dec/Jan) and P3 (Jan/Feb).
s.e.m.are shown as numbers above columns.
Columns with different letters are statistically ($P<0.05$) different within each cultivar and period.

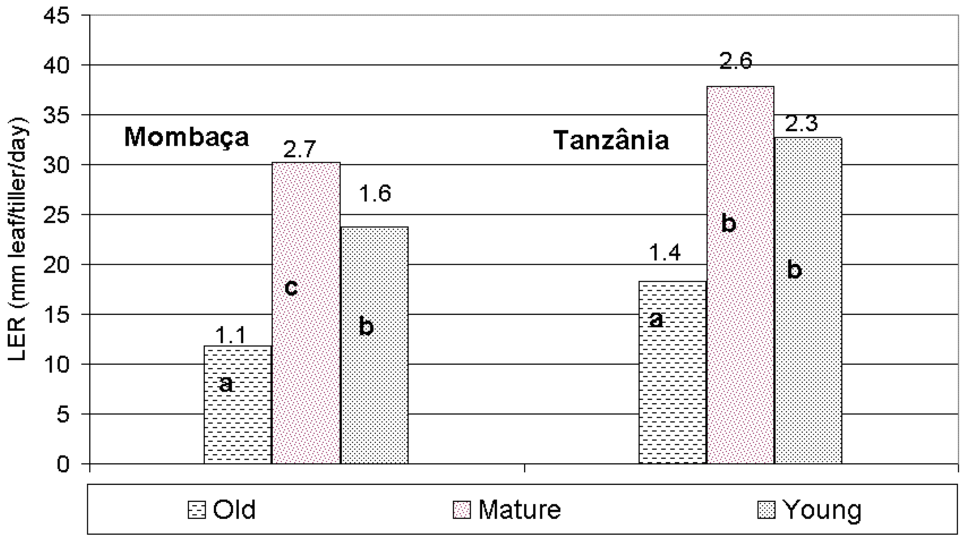

Figure 2 - Leaf elongation rate in old, mature and young tillers, in two Guinea grass cultivars (Mombaça and Tanzânia) during period P4 (Feb/Mar).
s.e.m. are shown as number above columns
Columns with different letters are statistically different $P<0.05$, within each cultivar