Long term tiller population dynamics in swards of grasses with contrasting persistence strategy

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Introduction The lifespan of individual grass tillers usually does not exceed 12-15 months, because of death of tillers after floral induction and development, or randomly from disease or other factors. Persistence of the tiller population over several years, and associated long term maintenance of the sward, thus depends on the rate of turnover of individual tillers. This study aimed to characterise seasonal and management conditions critical for tiller turnover and its components, tiller birth and tiller death. Two grasses were investigated: *Festuca arundinacea* and *Lolium multiflorum*, having high and low persistence, respectively.

Material and methods Swards of *Festuca arundinacea* (Fa) cv Florine and *Lolium multiflorum* (Lm) cv Fastyl were sown in spring 2000 and grown for 4 years under a cutting regime and under two N fertilisation treatments (not shown). Tiller density was evaluated every 6-8 weeks in 0.0375 m^2 frames. Within additional 0.0139 m^2 frames, successive cohorts of tillers were marked with coloured rings and counted every 6-8 weeks, according to the methodology followed by Matthew (1992). Relative tiller birth and death rates were calculated.

Results Tiller density for both species was higher during the winter and lower during the summer (Figure 1A). Tiller density of Lm declined progressively over the 3 years, in contrast to tiller density of Fa, reflecting a low persistence of Lm compared to Fa. Seasonal pattern of the 2 species also differed; the decline of Lm tiller density was large during the summer but recovered partially during the winter.

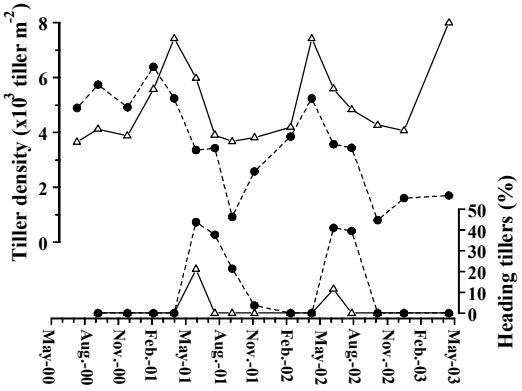

Figure 1 Evolution of tiller density (A) and proportion of heading tillers. (B) (Δ) : *Festuca a.* ; (•) : *Lolium m.*

Heading occurred in May for Fa and from May to Aug. for Lm (Figure 1B). The relative tiller birth rate of Fa was higher during winter (Dec-Mar) than the rest of the year for (Figure 2). For Lm, the winter peak occurred earlier (Oct.-Dec.) than for Fa and a second peak was observed during late spring (June). Thus for both species, tillering was active during periods of low LAI (winter and post flowering recovery period for Lm), in agreement with Simon *et al*., (1987).

The relative tiller death rate was low during the winter period (0ct.-April) and high from the end of spring (May) to late summer (Sept.) for both species. Tiller death was partly associated with heading for both species, but clearly also partly occurred independently of heading (significant death rate during summer for Fa despite no heading; significant death rate for both species in year 2000 despite no flowering).

Conclusions Winter, which could be seen as a period of rest for the sward, is in fact a period of active tillering and recovery. In contrast, loss of tillers occurs during the growing seasons, not only due to the flowering strategy of the species but also due to other factors. Presumably, summer drought is detrimental for the young tillers that have not yet developed deep roots. A major conclusion is winter tillering is an important period of recovery for grass swards in this environment, and management should be considered accordingly.

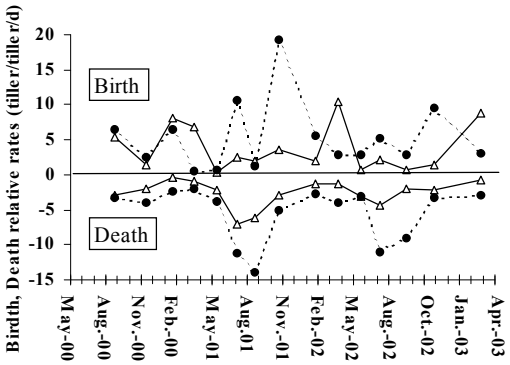

Figure 2 Relative tiller birth and death rates (Δ) : *Festuca a.* ; (•) : *Lolium m.*

References

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