

The effect of defoliation interval on regrowth of tall fescue

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Introduction Herbage yield, persistence and quality optimise when defoliation interval is based on physiological indicators, such as leaf regrowth stage. Examples include ryegrass (Fulkerson & Donaghy, 2001), cocksfoot (Rawnsley *et al.*, 2002), prairie grass (Fulkerson *et al.*, 2000) and kikuyu (Reeves *et al.*, 1996). Yield, persistence and quality optimise because leaf regrowth stage relates closely to plant energy reserves, which generally peak as the number of live leaves/tiller maximise. More frequent defoliation than the optimum reduces energy reserves and leads to a smaller root system, fewer tillers and retarded growth rate (Fulkerson & Donaghy, 2001). Based on plant physiological development, the optimum defoliation interval for tall fescue has not been defined.

Methods Each leaf regrowth stage ('leaf stage') was defined as the time taken to produce 1 fully expanded leaf/tiller. Treatments of tall fescue in the glasshouse were based on defoliation intervals of 1-, 2- and 4-leaf stages of regrowth, with treatments ending when the 1-leaf defoliation had been completed 4 times, the 2-leaf defoliation 2 times, and the 4-leaf defoliation once. Half of the plants was harvested destructively just after cessation of defoliation treatments (H₁) and the other half after regrowth to the next 4-leaf stage (H₂), which took 70 days. The dry matter (DM) yield was determined at each harvest event for leaves (plant material >50mm), stubble (plant material <50mm) and roots (plant material below ground).

Results Root-, leaf- and stubble- DM yield was closely related to defoliation interval. Less frequent defoliation gave a higher DM yield, not only immediately after the treatment period (H₁), but also at H₂. At H₁, plants defoliated at the 4-leaf stage had a significantly higher ($P<0.001$) root-, leaf- and stubble- DM yield than the other two treatments (Table 1). Plants defoliated at the 2-leaf stage also had a significantly higher ($P<0.001$) DM yield of all plant components than plants defoliated at the 1-leaf stage. The pattern was identical at H₂, except for root DM yield, which showed no significant difference ($P>0.05$) between defoliation treatments at the 1- or 2-leaf stage.

Conclusions Compared to more frequent defoliation at the 1- or 2-leaf stages, defoliating tall fescue plants at the 4-leaf stage maximised regrowth of all plant components. The deleterious effect on regrowth of frequent defoliation was still present 70 days after the end of treatments, most likely due to depletion of energy reserves. Roots were the only plant component that could recover in the short-term after repeated defoliation at the 1-leaf stage.

Table 1 Tall fescue leaf, root and stubble dry matter (mg/plant) immediately following defoliation treatments (H₁) or after 70 days (H₂)

	Leaf stage	H ₁	H ₂
Leaf (mg/plant)	1L	1512	1852
	2L	2654	2991
	4L	3199	3877
LSD ($P=0.05$)		351	352
Root (mg/plant)	1L	1582	2228
	2L	3537	4193
	4L	4810	8260
LSD ($P=0.05$)		299	2725
Stubble (mg/plant)	1L	390	581
	2L	752	1002
	4L	1080	1530
LSD ($P=0.05$)		41	111

References

- Fulkerson, W. J. & D. J. Donaghy (2001) Plant soluble carbohydrate reserves and senescence – key criteria for developing an effective grazing management system for ryegrass-based pastures: a review. *Australian Journal of Experimental Agriculture*, 41, 261-275.
- Fulkerson, W. J., J. F. M. Fennell & K. Slack (2000) Production and forage quality of prairie grass in comparison to perennial ryegrass and tall fescue in subtropical dairy pastures. *Australian Journal of Experimental Agriculture*, 40, 1059-1067.
- Rawnsley, R. P., D. J. Donaghy, W. J. Fulkerson & P. A. Lane (2002) Changes in the physiology and feed quality of cocksfoot during regrowth. *Grass and Forage Science*, 57, 203-211.
- Reeves, M., W. J. Fulkerson & R. C. Kellaway (1996) Forage quality of kikuyu (*Pennisetum clandestinum*): the effect of defoliation and nitrogen fertiliser application and in comparison with perennial ryegrass (*Lolium perenne*). *Australian Journal of Agricultural Research*, 47, 1349-1359.