Carbohydrate recovery in grass species under two defoliation frequencies determined by thermal time

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Abstract

Statement of the problem: Pasture frequency of defoliation impacts plant recovery, which is a dynamic process that varies throughout the year. Much research have been focused studying the effect of defoliation frequency on plant recovery through its impact on growth. Yet, other factors affecting plant recovery including soluble carbohydrate (CHOS) reserves and the ability of the plant to mobilize these reserves are often overlooked. The purpose of this study was to determine the concentration of CHOS in *Lolium perenne* L. (Lp) and *Bromus valdivianus* Phil. (Bv) grass species, subjected to two defoliation frequencies determined by the accumulated degree-days (ADD). Methodology and Theoretical Orientation: A pasture experiment was conducted at the Universidad Austral de Chile's Austral Research Station in autumn 2017. A factorial arrangement of 2 x 2 was used, which included 2 pasture species (Lp and Bv) and 2 defoliation frequencies (135 ADD and 270 ADD post-defoliation) distributed in 3 blocks. Accumulated herbage mass (kg DM ha^{-1}), CHOS concentration in stubble and leaves (g $1000g^{-1}$) were measured every 3 days. Findings: The high defoliation frequency treatment initially replenished faster the CHOS concentration levels than the low defoliation frequency treatment. Lp leaves had a higher concentration of CHOS when defoliated at 135 ADD compared to Bv leaves defoliated at the same frequency. Accumulated herbage mass was lower for Lp and Bv when defoliated at 135 ADD compared to 270 ADD. The use of CHOS as an energy source in the plant occurred immediately after defoliation. For both grass species, laxer defoliations had closer relationship with plant recovery and persistence. Conclusion and Significance: This study has proven that ADD is a useful tool to determine frequency of defoliation based on CHOS utilization, recovery and plant growth. ADD can, therefore, be used in the design of defoliation strategies aimed to maximize the concentration of CHOS in plants so plant recovery is not negatively affected after defoliation.

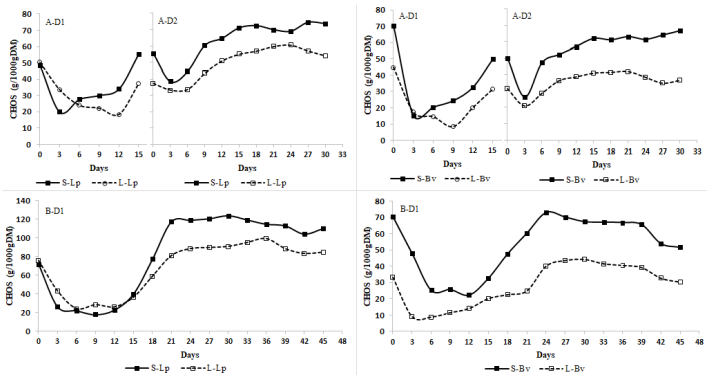


Figure 1: Evolution of CHOS concentration in stubble (S) and leaves (L) to *Lp* and *Bv* under two defoliation frequencies (A=135 ADD and B=270 ADD, D1 and D2= defoliations number).

Recent Publications

1. Donaghy D, Turner L, Adamczewski K (2008) Effect of defoliation management on water-soluble carbohydrate energy reserves, dry matter yields, and herbage quality of tall fescue. Agronomy Journal 100: 122-127.
2. Loaiza PA, Balocchi O, Bertrand A (2016) Carbohydrate and crude protein fractions in perennial ryegrass as affected by defoliation frequency and nitrogen application rate. Grass and Forage Science 72: 556-567.
3. Moscoso C, Balocchi O, (2016) Water-soluble carbohydrate and nitrogen concentrations after defoliation in perennial ryegrasses (*Lolium perenne* L.) in spring. Agro Sur (Chile) 44(3): 11-17.
4. Moot DJ, Scott WR, Roy AM, Nicholls AC, (2010) Base temperature and thermal time requirements for germination and emergence of temperate pasture species. New Zealand Journal of Agriculture Research 43-1: 15-25.
5. Wingler A, Hennessy D, 2016 Limitation of grassland productivity by low temperature and seasonality of growth. Frontier in plant science 7: 1-6.



Biography

Iván Calvache is a researcher with experience in pasture utilization, grazing management, and dairy cattle nutrition. He has performed research and teaching related to institutions such as Universidad de La Salle (Colombia), COLCIENCIAS (Colombia) and CONICYT (Chile). Ivan holds a Bachelor of Animal Science and a Master of Science in Animal Science (Animal Production) and is currently a Doctorate candidate for the Universidad Austral de Chile.

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Notes/Comments: