

Variations in polyphenol oxidase in red clover (*Trifolium pratense*) leaves and roots

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Introduction: Red clover contains relatively high concentrations of polyphenol oxidase (PPO). It has been suggested that these PPOs protect lipids and proteins from degradation through the generation of highly reactive quinones that covalently bind with nucleophilic sites, leading to cross-linking of protein polymers. This process could have a positive effect on the silage quality of red clover when fed to ruminants. If roots of red clover also contain these PPOs this could potentially affect the degradation of roots and influence the soil microbial community, and subsequent soil processes. The objective of this research was to determine if roots of red clover, like the leaves, also contain PPOs, and if this varies between cultivars.

Material and methods: The PPO concentration of roots and leaves of eight red clover cultivars (four Mattenklee and four Ackerklee types) was measured in November 2012 in an existing experiment (for more details see Hoekstra *et al.*, 2017). Swiss landraces of red clover are also called Mattenklee as opposed to the traditional Ackerklee or European field clover cultivars. PPO activity was analysed according to the protocol of Lee *et al.*, (2009).

Results and conclusions: The red clover variety Lemmon exhibited significantly higher PPO activity than the other varieties (Figure 1). There was also a significant effect of clover type, with Ackerklee varieties exhibiting significantly higher PPO activity than Mattenklee varieties. Roots of red clover also contain PPOs but there was no significant difference in PPO activity in the roots of the varieties examined. This could be due to a flaw in the method for extraction of PPO from roots, as this protocol has not been extensively researched.

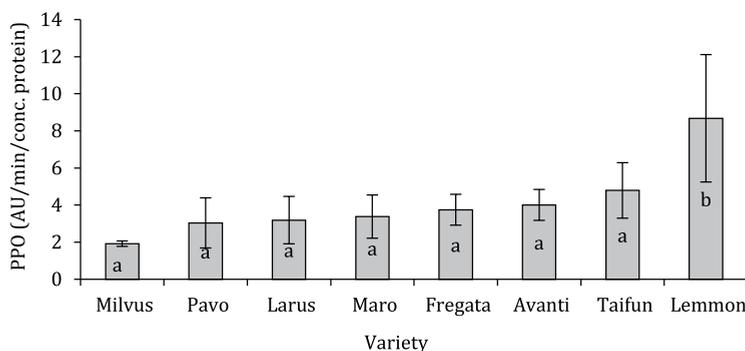


Figure 1. Active PPO in red clover leaves ($P=0.042$). Mattenklee types (cv. Fregata, Larus, Milvus and Pavo), Ackerklee types (cv. Avanti, Lemmon, Maro and Taifun).

Hoekstra N.J., De Deyn G.B., Xu Y., Prinsen R. and Van Eekeren N. (2018) Red clover varieties of Mattenklee type have higher production, protein yield and persistence than Ackerklee types in grass-clover mixtures. *Grass and Forage Science* 73(2), 297-308.

Lee M.R.F., Tweed J.K.S., Minchin F.R. and Winters A.L. (2009) Red clover polyphenol oxidase: Activation, activity and efficacy under grazing. *Animal Feed Science and Technology* 149(3-4), 250-264.

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