Volatile plant secondary metabolites in *Eremophila glabra* and their influence on animal foraging preference

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Introduction

One response to global climate change effects on Australia is to investigate the use in sustainable farming systems of native plants, which have evolved to cope in their harsh environment (Monjardino 2009). The Enrich™ project has screened many Australian native plants for their potential use as methane reducers in ruminants, as anthelmintics, and as nutrition sources systems (Revell 2010). *Eremophila glabra* is one plant that shows promise in this regard, but first the foraging animal must want to eat it. This decision is assisted by the animal's assessment of the emitted volatile plant secondary metabolites (PSM) (Provenza 2007).

In this paper we investigate the relationship between volatile PSM in leaf material and animal preference for a number of *E. glabra* accessions.

Methods

Measuring Animal Preference

Preference scores on trial plots of six different *E. glabra* accessions were measured in the field by observation of edible biomass removed during grazing on a scale from 5 (most preferred) to 1 (least preferred).

Measuring Plant Volatiles

Volatile PSM in the leaf material collected from plants in the trial plots were measured in the laboratory using purge and trap gas chromatography-mass spectrometry (P&T GC-MS).

Results

We found a direct inverse relationship (r^2 = 0.9597) between total volatiles and preference, as shown in Figure 1. In our results, the main class of compounds negatively affecting preference appears to be the terpenes.

This information will assist in foraging plant selection, which can now be done on the basis of relatively inexpensive analytical testing rather than more complex animal preference trials. The specific PSM information will help to more clearly understand the preference profiles of the many other Australian native plants yet to be investigated.

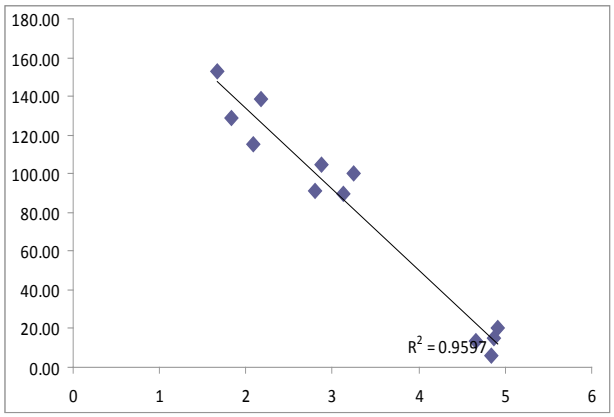

Figure 1. The inverse relationship between plant leaf volatiles (y-axis, volatiles concentration, mg/kg fresh weight) and animal preference (x-axis, 5=most preferred, 1=least preferred) for a number of *E. glabra* accessions. Foraging sheep clearly preferred the *E. glabra* accessions with the lowest volatiles content.

Conclusion

There is a negative relationship for *E. glabra*, between volatile PSM and preferences, showing foraging animals tend to avoid volatile PSM rather than be attracted to them. Nevertheless, the results show we can select future foraging plant accessions on the basis of a laboratory test rather than rely on the more expensive field trials of animal preference.

References

Monjardino M, Revell D, Pannell DJ (2009) "The potential contribution of forage shrubs to economic returns and environmental management in Australian dryland agricultural systems." International Association of Agricultural Economists Conference, Beijing, China August 16-22(2009): 23.

Provenza F, Villalba JJ, Haskell JW, MacAdam W, Griggs TC, Wiedmeier RD (2007) The value to herbivores of plant physical and chemical diversity in time and space. *Crop Science* **47**, 382-398.

Revell D (2010) Perennial forage shrubs providing profitable and sustainable grazing - Key practical findings from the Enrich project. Future Farm Industries CRC Ltd.