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LCMSMS ANALYSIS OF THE DAPHNANE ORTHOESTER SIMPLEXIN IN POISONOUS *Pimelea* SPECIES OF AUSTRALIAN RANGELANDS

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Toxic *Pimelea* species (also known as desert riceflower) are ephemeral native plants found throughout inland regions of Queensland, New South Wales, South Australia, and the Northern Territory, extending over about one quarter of Australia's pastoral lands. Three rangeland species of *Pimelea* (*P. simplex*, *P. elongata*, and *P. trichostachya*) are poisonous to livestock and potentially fatal to cattle, with serious economic consequences through loss of production, stock deaths and the costs of agistment. The associated poisoning syndrome in cattle is unique to Australia and is characterised by loss of condition and pulmonary venule constriction leading to right ventricular dilation and subcutaneous oedema of brisket and head. Consumption of green plant material can also lead to acute diarrhoea in both cattle and sheep.

A *Pimelea* toxin analysis method has been developed using electrospray liquid chromatography/mass spectrometry/mass spectrometry (LCMSMS) to determine levels of the daphnane orthoester simplexin in *Pimelea* plant material. Development of this chemical assay has enabled toxin levels to be related to plant species, stage of growth and environmental factors. Approximately 600 *Pimelea* plant samples collected across the affected regions have been analysed in this study.

Simplexin levels in both *P. trichostachya* and *P. elongata* are higher (up to 580 and 540 ppm in flowering foliage respectively) compared with *P. simplex* with maximum recorded levels of only 230 ppm (on a dry weight basis) at the same growth stage. Whilst the toxin profile in each of the three species is similar, there are distinct differences in where the toxins are concentrated in each species. In *P. elongata*, highest levels are seen in the root and flower heads, but with significant levels also in branches, stem and leaves. In *P. simplex*, flower heads and roots contain similar toxin levels with very little detected in branches, stem and leaves. Flower heads of *P. trichostachya* contain high toxin levels with much lower levels seen in other plant parts including roots. The level of toxin detected in aerial plant parts is also dependent on the vigour of the plant, with healthy growing plants having higher levels in the foliage than less healthy, stressed plants.

Simplexin levels have been shown to be highest in pre-flowering plants and, apart from in mature seeds, decrease through flowering to post-flowering stages as these ephemeral plants die back. Weathering of cut *Pimelea* material in mesh bags at four locations has demonstrated that toxin levels diminish significantly within months for dry foliage material, but are maintained in weathered, ungerminated seed samples for more than 18 months. A comparison of toxin level with soil type showed a considerable range for each species from the same soil type at each growth stage, and no significant difference due to soil type was evident.