Poisonous pimeleas on inland farming lands of Queensland and New South Wales

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Abstract

Poisonous *Pimelea* species are ephemeral in their occurrence and prefer moisture run-on areas and disturbed soil. They are most prominent in spring after sporadic winter rains on bare pastures, because stock avoid eating them and there is usually little green grass to conceal them. Since 4 different species may be toxic and they grow on different soils, farmers and cattlemen need to be able to identify which ones they have. *Pimelea elongata* has comparatively high concentrations of simplexin but is reported least as causing pimelea poisoning and thus poses a lower risk. Expanded areas of fallowed ground, buffel grass pastures and blade ploughing have encouraged thickening and spread of these native species during the past 30 years. These plants present problems in New South Wales, Queensland and South Australia for all agricultural enterprises, not solely livestock-only businesses.

Introduction

At least 4 native *Pimelea* (riceflower) species have been implicated in poisoning cattle (St George and Marree disease) in eastern Australia for over 35 years (Cantello 1969). Incidences vary from a chronic, low level in the St George and Marree districts to sporadic serious outbreaks in the Maranoa region and South Australia in recent years. Pimeleas are typical Australian subtropical, cool season-active, forb species but ones that can be toxic. Experienced livestock producers generally know about the problem and learn to live with it, but can have difficulty reliably identifying the plants responsible and thus being able to assess their current exposure to poisoning risk. What triggers serious outbreaks of poisoning is still not clear but we now have more comprehensive information about the risk factors involved (Fletcher 2008).

One constant factor is disturbed or bare ground and thus the spread of opportunistic cropping and blade ploughing in inland eastern Australia has increased that risk factor. Another is the occurrence of reasonable rainfall during the cooler months that germinates and grows the plants (Dadswell *et al.* 1994). Gaining awareness that 4 identifiable annual species of *Pimelea* may be involved is a current difficulty. All are potentially very toxic based on chemical assays but they grow in different soils and respond slightly differently to environmental triggers. To manage the situation, an understanding is needed of where each of these species might be expected to occur in inland farming areas of Australia and how they can be distinguished individually.

Methods

We conducted a series of surveys between late 2006 and early 2009 to determine where each species was growing and when they were present. We then linked those data with local rainfall and soil type features. Surveys were mostly by road traverse but were supplemented by discussions with land holders and stock inspectors plus farm visits in the course of other activities. More than 70 surface (0–10 cm) soil samples were collected using a mattock where pimelea infestations occurred and analysed for pH, bicarbonate P and electrical conductivity.

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Results

Location

Figure 1 shows the main locations east of 145°E where we found the main 4 species reported to be causing the problems:

Pimelea trichostachya (Flaxweed)
Pimelea elongata (Lakebed pimelea)
Pimelea simplex subsp. *simplex* (Desert riceflower)
Pimelea simplex subsp. *continua* (Gibber riceflower)

P. simplex without subspecies designation is also mapped because identification to sub-species level is not possible until seeds are almost fully mature. Herbarium records show that these 4 taxa have also been found at many intervening places in the past and we saw *P. trichostachya* in areas neighbouring those mapped within the central Maranoa region. *P. elongata* too was found at other sites within the region shown in Figure 1 just east of Cunnamulla.

Species descriptions

The 5 taxa mapped continue to occur as common pasture components well west and north-west of this area and into the Western Division of New South Wales (NSW) and the north-east of South Australia. All are effectively annuals with a woody stem, strong taproot and prolific seeding. As young plants, they begin with a single, very erect, red stem with small leaves, but with continuing good moisture, plants can develop into robust, multi-branched dwarf shrubs 30–60 cm tall with masses of small, terminal, hairy flowers. A number of other native forbs can be mistaken for them in the seedling stage, mostly daisies but also native linseed (*Linum marginale*) and smooth raspweed (*Halorhagis glauca*). The daisies do not have early leaves in opposite pairs, while native linseed has a distinctly wide first pair of leaves. Pimelea seedlings have leaves that are all of a very similar shape and size and the first leaves are normally well clear (>7 mm) of the soil. The stem is usually a deep red with a strong contrast to a very white, thin root beneath the soil surface.

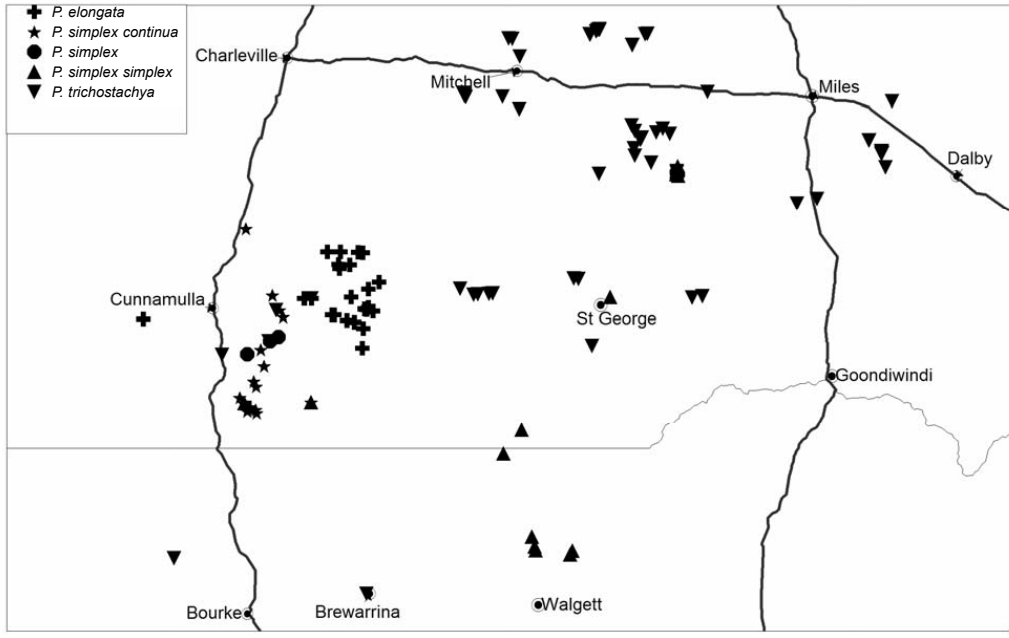

Figure 1. Distribution of poisonous *Pimelea* species collected in inland eastern Australia east of 145°E.

The preference of each species for slightly different soils and environments means that they are rarely found intermingled in the mapped area, except at the western extremities. Rainfall that germinates 1 species will often fail to induce germination of another species on a different soil type in the same district, *e.g*. on Mitchell grass (*Astrebla* spp.) clay but not on cypress pine (*Callitris glaucophylla*) sand.

P. simplex subsp. *simplex* is very common on bauhinia (*Lysiphyllum* sp.) country east of Surat and on alkaline clay and clay-loam soils between Dirranbandi and Walgett. It has also been found south of Cunnamulla on clay soils in a mix with its other subspecies. Its 'seeds' are densely hairy and clumped at the tip of each branch of a plant. The term 'seed' is used for convenience because the 'seed' as harvested or dropped is technically a diaspore (dispersal unit), and has a single dark seed encased in the dry, hairy remains of an unremarkable flower.

P. simplex subsp. *continua* has been located in our surveys only at locations south and west of Wyandra on alkaline clay soils, mostly Mitchell grass downs that is not farmed. It has a much hairier 'seed' with many hairs more than 2 mm long. It is, however, very common in central-western Queensland. Surprisingly, we did not find either of the *P. simplex* taxa on heavy brigalow (*Acacia harpophylla*) soils in Queensland or on coolibah (*Eucalyptus coolabah*) floodplain clays between Walgett and Bourke. This could be owing to insufficient, timely rain for germination but may be a real soil preference effect.

P. elongata has been found only in the far west of the mapped region, beyond current farming land and is mainly on ephemeral lakebeds and run-on areas. Soils on which it occurred ranged from acidic grey clays to red earths. The grey clays support a bluish-leafed type, while the red earths and loams have a yellowish-green leafed type with thinner 'seeds'. Seeds of both are covered with very short, crinkled hairs and do not give an immediate appearance of hairiness. More detailed descriptions of these plants and their seeds can be found in Silcock *et al.* (2008a).

P. trichostachya is the species most commonly found throughout the mapped region and particularly in sown pastures or fallowed cropping land. It grows on acidic sands, red earths and hard-setting poplar box (*Eucalyptus populnea*) soils and has been found as far east as Chinchilla and Leyburn, while extending west into south-west Queensland and western NSW. Like *P. elongata*, *P. trichostachya* has a much elongated flowering head when well grown (often 10 cm long) but has many long hairs (>2 mm) on the pear-shaped 'seed'. Its ability to form dense stands on fallowed ground means it is a high-risk plant that may be inadvertently encouraged by numerous enterprises that farm or clear country at some stage. It is very common in healthy buffel grass (*Cenchrus ciliaris*) pastures, probably because, in winter when *Pimelea* grows well, there is a lot of exposed soil between the strongly perennial, well grazed buffel grass plants.

All plants described above are commonly found along graded roadsides, firebreaks and new fencelines and are most obvious in late winter. They are also obvious in heavily grazed pastures because stock avoid eating them and they have a very erect growth habit. However, because they can grow intermingled with other ephemeral pasture and preferentially establish in wetter, low spots (Silcock *et al.* 2008b), they are easily consumed accidentally by hungry stock preferentially grazing green pick. They are rarely seen in dense woodland or shrubland and have yet to be seen on classical brigalow and belah (*Casuarina cristata*) country.

P. microcephala is also common in the same region, usually as a straggly shrub under eucalypt trees. It has not been linked to serious poisonings and assays indicate only low levels (3 ppm) of the toxin simplexin. Other shrubby *Pimelea* species such as *P. penicillaris* are occasionally found in this region but are very uncommon and in restricted habitats.

Discussion

Currently there is no definitive explanation of how some stock fall victim to pimelea poisoning while others that have eaten it show no symptoms. The decline in sheep numbers and the associated increase in cattle and opportunistic cropping have raised the likelihood of more frequent cases of pimelea poisoning in inland eastern Australia. Sheep do develop similar dark diarrhoea from consuming *Pimelea* but not the oedema and pulsating jugular vein symptoms that cattle can exhibit. Observations show that normal cropping practices suppress in-crop growth of *Pimelea*. However, dense stands can emerge and grow in the subsequent fallow, especially from

autumn rain after a summer sorghum crop. Hence control of *Pimelea* spp. on farming land seems dependent on fallow management and can be achieved with herbicides (Silcock *et al.* 2008a). Control would be unlikely to happen using strategic sheep grazing alone.

There have been regular instances of misidentification by producers of green pussy-tails, foxtails or Prince of Wales feathers (*Ptilotus polystachyus*) as *Pimelea*. *Ptilotus* has a much bigger 'seed' (>10 mm long), much larger and wider leaves (>5 mm) and grows initially as a flat, leafy rosette compared with the very erect, pink-stemmed, small-leaved plants of all the toxic pimeleas.

All species can grow vigorously from early autumn through to early summer and thus can potentially cause poisoning during that time. Reported poisonings tend to peak in late spring to early summer (Dadswell *et al.* 1994), when all species are likely to be setting seed and their ephemeral biomass is at a peak. Current information suggests that the seeds and roots carry the greatest concentration of simplexin (Silcock *et al.* 2008b) and that the peak incidence of poisonings occurs when seeding is prolific. Districts where *P. simplex* is endemic are less likely to experience mid-summer cases of poisoning because the species rarely survives to mid-summer. However, both *P. elongata* and *P. trichostachya* can remain green, continue flowering and grow weakly throughout summer under favourable rainfall conditions, thus presenting potential poisoning risk.

Acknowledgements

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