Cotton fireweed: potential poison: research roundup

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Cotton fireweed—potential poison

The death of 21 of 124 cattle at Esperance in 1973 has led to research proving cotton fireweed (Senecio quadridentatus) to be a real danger to stock under particular environmental conditions.

Although long known as a potentially toxic species because of its content of senecionine, seneciphylline and retrorsine (toxic pyrrolizidine alkaloids), and although it is widely distributed in all Australian States, cotton fireweed has not generally been considered toxic because it is unpalatable and not usually eaten by stock. The 1973 cattle deaths occurred in a group of cattle in poor condition which had been transported 190 km from severely drought affected pastures at Ravensthorpe to relatively lush conditions at Esperance. Deaths began two to three weeks after arrival at Esperance, and nine more cattle died soon after the mob was returned to Ravensthorpe. The deaths occurred over a three month period.

Initial investigations showed that there were severe changes to the lungs of affected animals. About 70 per cent. of the mob eventually showed respiratory distress and breathed with a loud, roaring noise when forced to move. Post-mortem examinations showed a breakdown of lung tissue and collection of air and tissue fluid under membranes surrounding lung lobules. Cattle body temperatures were unaffected.

Laboratory examinations confirmed lung and liver changes associated with the toxic alkaloids present in some Senecio species.

Because of the change from poor to lush feed a tentative diagnosis of an allergic type of pneumonia had been made although there was no sign of toxic material at Esperance. Death of 16 of 156 animals at a
second Ravensthorpe property, with similar symptoms to those above, was a positive indication of the presence of a local poison plant in the Ravensthorpe area. Possibilities were a native Heliotrope or any of five local species of Senecio. S. quadridentatus (cotton fireweed) was chosen for detailed investigation because of its widespread occurrence in the area.

**Experimental work**

Fresh cotton fireweed material was fed to sheep and cattle at the Animal Health Laboratory, South Perth, in 1974, to verify the toxicity of the plant and associated animal symptoms. The material was air-dried then mixed with the usual chaff mixture laboratory feed.

Sheep receiving about 100g of cotton fireweed a day for 50 days were unaffected but a calf fed 0.5 kg a day for 37 days, then slaughtered after a further 68 days on grass and chaff, showed lung and liver changes similar to those found in the field although showing no external signs of ill-health.

Confirmatory evidence was obtained in 1976 when two six-month old steers were fed a daily, fresh supply of air-dried hammermilled cotton fireweed with their basic chaff ration. Both animals became tucked up in the flank at 40 to 50 days. The first animal died on day 69 after three days of extreme respiratory distress and when it had consumed about 20 kg of dried plant. The second animal consumed about 35 kg of cotton fireweed over 91 days and was killed on day 119 after it had been breathing noticeably faster and losing condition for about two weeks.

Lung and liver changes in both animals were similar to those of the experimental calf and field cases.

**Discussion**

While Senecio species have been widely associated with poisoning of cattle and horses, including cases in New Zealand, Victoria and New South Wales, this is the first known case for Western Australia where Senecio quadridentatus has been associated with stock losses. It is also the first case where the plant has been shown to bring about respiratory changes.

The plant must therefore be seen as a potential toxic species in situations where the lack of other feed forces cattle to eat the normally unpalatable cotton fireweed.

Recovery of many affected animals in the original outbreak suggests that many non-stressed animals could eventually recover from cotton fireweed poisoning. It remains to be seen however whether lung and liver lesions caused by the plant will continue to affect animal health and productivity once they have returned to preferred grazing materials.

Observations and other cattle deaths in the Ravensthorpe area suggest that there may be many more sub-clinical cases of cotton fireweed poisoning than is generally recognised. It is also not yet known if there is any seasonal variation in the toxicity of the plant.

It is also difficult to predict the grazing behaviour of cattle in paddocks infested with cotton fireweed but it would appear that as long as there is plenty of pasture or supplementary hay, cattle consume little of the weed. If normal feed is scarce, however, it would be wise to begin a supplementary feed programme or shift the cattle to paddocks with little or no cotton fireweed.

Farmers wishing to eradicate the plant should obtain a copy of Department of Agriculture Bulletin No. 3081, “Cotton Fireweed”, or contact the nearest Department of Agriculture office.

This article is a summary of a technical paper written by J. Dickson, Senior Veterinary Pathologist and R. Hill, Veterinary Officer, Animal Division, with further acknowledgments to the work of J. Gardner, Veterinary Officer, and D. Nelson and G. Mitchell.
Lumpy wool may increase ‘by dipping’

Lumpy wool, or mycotic dermatitis, is an infectious disease on the skin of sheep caused by the bacterium *Dermatophilus congolensis*. The organism invades the wool and hair follicles, causing formation of skin lesions producing scabby material which binds the wool fibres into a hard mass.

The disease occurs mostly in young sheep but can affect older sheep, especially under warm, wet conditions which aid the spread of the bacteria. It causes death if severe, pre-disposes the sheep to blowfly strike, makes shearing difficult, and decreases the value of shorn wool.

Incidence of lumpy wool under Western Australian 460 to 650 mm rainfall conditions was clearly demonstrated in a survey conducted in 1976, on 23 weaner flocks examined three to nine months after dipping. Of 10 553 sheep dipped in either organophosphate or arsenical materials, 4 846 were inspected with the results shown in Table 1.

Another important finding of the survey was a series of relationships between dip materials and occurrence of lumpy wool. Organophosphate dips were associated with 90.7 per cent of active lesions compared with 9.3 per cent for arsenical dips; 32 per cent of sheep dipped in organophosphate dips had active lesions compared with 6 per cent for sheep dipped in arsenic.

The effect of dip type on the incidence and severity of lumpy wool in sheep was further tested in a trial started at Mt. Barker research station in December, 1975.

Effects on sheep dipped in water, in diazinon, or in powdered arsenic at 24 hours and at 10 days after shearing were compared with sheep that were not dipped. Dipping was in a conventional shower dip for 10 minutes, with the sheep then run as one flock until the next shearing.

The 384 Merino weaners used in the trial were divided into the eight treatment groups listed in Table 2.

<table>
<thead>
<tr>
<th>Group</th>
<th>Day shorn</th>
<th>Treatment on day 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Nil</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Water</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>Arsenic</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>Diazinon</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
<td>Nil</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
<td>Water</td>
</tr>
<tr>
<td>7</td>
<td>10</td>
<td>Arsenic</td>
</tr>
<tr>
<td>8</td>
<td>10</td>
<td>Diazinon</td>
</tr>
</tbody>
</table>

Results

Results in Table 3 indicate that dipping had little immediate effect on the incidence of lumpy wool, except that there was less lumpy wool in all groups than was present before dipping.

Following 57 mm of rain which fell between the 38th and 42nd days after dipping however, lumpy wool was seriously present by day 72 and brought about deaths in diazinon and water-dipped groups.

By 120 days after dipping, many lumpy wool lesions had healed, but there was still considerably more lumpy wool in sheep dipped in water or diazinon than in other groups.

While arsenic dips did not prevent occurrence of lumpy wool, lesions forming on arsenic-dipped sheep healed more rapidly and were less attractive to blowfly strike than lesions formed on sheep dipped in other materials. By shearing, 18 of the 192 sheep dipped in water or diazinon had died compared with none of the 96 sheep dipped in arsenic. Fifteen of the 18 deaths were among sheep dipped immediately off-shears rather than 10 days after shearing.

Wool losses

Total wool production at the second shearing was 377 kg for undipped sheep compared with 326, 354 and 322 kg respectively for sheep dipped in water, arsenic and diazinon. With wool at 140c per kilo, these figures suggest an income reduction of some $60 per 100 weaners, plus $10 per 100 weaners for the actual cost of dipping. To these losses must be added the cost of deaths at $5 per head.

Conclusions

The findings show that dipping can dramatically increase the presence of lumpy wool in weaner sheep, so causing a serious loss of income. When weaner sheep have to be dipped it seems that dipping should be left until any shearing cuts have healed, and that an arsenical dip should be used in preference to diazinon.

<table>
<thead>
<tr>
<th>Type of lesion</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheep without lesions</td>
<td>3 270</td>
<td>67.5</td>
</tr>
<tr>
<td>Sheep with lesions</td>
<td>1 576</td>
<td>32.5</td>
</tr>
<tr>
<td>Generalised inactive lesions*</td>
<td>771</td>
<td>15.9</td>
</tr>
<tr>
<td>Generalised active lesions</td>
<td>202</td>
<td>4.2</td>
</tr>
<tr>
<td>Localised inactive lesions†</td>
<td>454</td>
<td>9.4</td>
</tr>
<tr>
<td>Localised active lesions</td>
<td>139</td>
<td>2.9</td>
</tr>
</tbody>
</table>

* Generalised inactive lesions refers to multiple, but healed, lesions, usually distributed along the back and sides.
† Localised inactive lesions refers to a single, but healed, lesion, at any point along the back.
External symptoms of lumpy wool: matted furrows in the wool on the back and flanks, and wool readily detached from the skin. Dipping can dramatically increase the incidence.

Typical scabs in wool resulting from severe lumpy wool

Table 3. Effect of dip type on sheep deaths and lumpy wool

<table>
<thead>
<tr>
<th>No dip</th>
<th>Water dip only</th>
<th>Arsenical dip</th>
<th>Diazinon dip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deaths associated with severe lumpy wool:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>to 9 days after dipping</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>to 72 days after dipping</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>to 120 days after dipping</td>
<td>0</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>to next shearing</td>
<td>2</td>
<td>8</td>
<td>0</td>
</tr>
</tbody>
</table>

Sheep with lumpy wool lesions at various times—%:
- Just before dipping | 37 | 40 | 37 | 42 |
- 9 days after dipping | 10 | 13 | 17 | 12 |
- 72 days after dipping | 14 | 43 | 42 | 43 |
- 120 days after dipping | 5 | 14 | 9 | 22 |
- at next shearing | 1 | 5 | 3 | 4 |