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Pit and scald of Granny Smiths

Department of Agriculture, Western Australia

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Wimmera ryegrass toxicity

Animal Division
Wimmera ryegrass toxicity has been reported for many years to affect sheep and occasionally cattle in New Zealand, South Australia and the United States of America. In Western Australia, occasional reports since 1959 and severe outbreaks of staggers in the Katanning-Gnowangerup areas over the last two years prompted the investigation reported below.

Symptoms of ryegrass toxicity appear when sheep are driven after grazing almost pure stands of Wimmera ryegrass (Lolium rigidum). Affected animals undergo convulsive spasms and stiffness of the limbs and fall down to lie with their limbs stiffened, their muscles quivering and their eyes tending to roll inwards. Most return to normal after a few minutes but the symptoms may reappear if the animals are excited again. More seriously affected animals remain on the ground having occasional spasms until they die—up until 24 hours later. In the local outbreaks up to 75 per cent. of a flock has been affected and the mortality rate has been as high as 30 per cent.

As South Australian investigations had associated ryegrass toxicity in South Australia with the presence of a nematode (Anguina agrostis) and a diphtheroid bacteria this study was done to find what organisms on ryegrass might be associated with toxicity in Western Australia.

In the study four wethers were fed non-toxic ryegrass material while four were fed suspected toxic material gathered from a paddock where many sheep had died from Wimmera ryegrass toxicity in 1971. The suspect material included ryegrass seed and stem covered with a yellow bacterial slime apparently similar to a slime associated with the disease in South Australia, and containing nematode larvae in the seed heads.

The daily consumption of ryegrass material by each sheep varied from 200 to 300g and sheep eating the suspect material displayed nervous symptoms on the sixth day. Forced exercise caused typical stagger symptoms to appear and although the affected sheep initially recovered after about 5 min, continued exercise resulted in death 24 hours later.

Laboratory examination of nematode and bacterial organisms from the suspect slime material indicated the presence of Anguina sp larvae and a Corynebacterium sp. Although both types of organism are yet to be positively identified it would appear that these are the organisms responsible for Wimmera ryegrass toxicity in this State.

Work this year will include an attempt to develop a screening test using guinea pigs to test the level of toxicity of ryegrass samples. Officers involved in the project include Dr. M. E. Nairn, M. P. Bond and R. V. Gwynn, Animal Division, Mr. P. M. Wood, Biological Services Division, and Mr. J. L. Wise, Wheat and Sheep Division.

Fumigation and rabbit control

Agriculture Protection Board
Fumigation has been a valuable tool in Australian rabbit control for over 70 years, because of its economy and efficiency compared with methods such as shooting and trapping. Even now, while it is not as economical as ‘one-shot’ baiting, fumigation remains a valuable initial control effort because it is not affected by season and does not require shifting of stock.

In spite of the long history of fumigation, so little was known of gas concentrations needed to kill rabbits in warrens, that the Agriculture Protection Board's Research Section investigated fumigation techniques in 1971. Mr. A. J. Oliver supervised the investigations.

Three fumigants (chloropicrin, phosphine and carbon monoxide) were compared for effectiveness in sealed active warrens. For comparison, several active warrens were also sealed without fumigation. The success of each fumigant was indi-
cated by the number of holes still sealed after seven days and the results, for various soil types, are summarised in the table. The results indicate that only chloropicrin performed satisfactorily in all soil conditions tested. However, phosphine was as good as chloropicrin in wet soil.

In subsequent gas concentration tests the same fumigants were used in one empty warren in heavy soil and one empty warren in sandy soil. In addition, Cymag (cyanide) and a second method of generating carbon dioxide, using the exhaust of a vehicle with the choke half out were tested. The warrens were mapped and fumigated, and gas concentrations in all parts of the warrens were monitored through one inch pipes by means of a Dräger gas sampler. In general the findings supported those of the first part of the investigations. Chloropicrin concentrations exceeded the necessary toxic level under all conditions. Phosphine was satisfactory in wet conditions and although its concentrations were lower in dry conditions they would have been high enough to kill rabbits within four hours. It was found however that placing the Phostoxin tablets on pieces of wet paper produced more rapid evolution of phosphine, resulting in higher phosphine concentrations.

Cyanide was completely unsatisfactory. Toxic levels of carbon dioxide throughout the warren could not be produced by the Deckson fumigator but were easily attained with the vehicle exhaust technique. The vehicle exhaust method was probably more expensive than the others tested, but the carbon dioxide rapidly penetrated the warren and would kill rabbits before they could dig their way out.

### PERFORMANCE OF THREE RABBIT FUMIGANTS

<table>
<thead>
<tr>
<th>Soil type</th>
<th>Treatment</th>
<th>No. holes sealed</th>
<th>No. holes reopened</th>
<th>% holes reopened</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandy-wet</td>
<td>Control</td>
<td>20</td>
<td>6</td>
<td>30.0</td>
</tr>
<tr>
<td></td>
<td>*Phosphine</td>
<td>59</td>
<td>1</td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td>**Chloropicrin</td>
<td>44</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>†Carbon monoxide</td>
<td>107</td>
<td>7</td>
<td>6.5</td>
</tr>
<tr>
<td>Sandy-dry</td>
<td>Control</td>
<td>161</td>
<td>16</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td>Phosphine</td>
<td>268</td>
<td>13</td>
<td>4.8</td>
</tr>
<tr>
<td></td>
<td>Chloropicrin</td>
<td>75</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Carbon monoxide</td>
<td>244</td>
<td>5</td>
<td>2.0</td>
</tr>
<tr>
<td>Heavy-wet</td>
<td>Phosphine</td>
<td>211</td>
<td>4</td>
<td>1.9</td>
</tr>
<tr>
<td></td>
<td>Chloropicrin</td>
<td>83</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Heavy-dry</td>
<td>Control</td>
<td>53</td>
<td>0</td>
<td>13.1</td>
</tr>
<tr>
<td></td>
<td>Phosphine</td>
<td>173</td>
<td>16</td>
<td>9.2</td>
</tr>
<tr>
<td></td>
<td>Chloropicrin</td>
<td>18</td>
<td>1</td>
<td>5.5</td>
</tr>
<tr>
<td></td>
<td>Carbon monoxide</td>
<td>244</td>
<td>40</td>
<td>16.6</td>
</tr>
</tbody>
</table>

*Phostoxin tablets—one per hole. **Lavacide—5ml. per hole. †Applied by a Deckson fumigator.

Nitrogen on rapeseed

**Plant Research Division**

Experiments comparing the responses of wheat and rape to nitrogenous fertilisers were planted at 26 sites from Geraldton to Esperance in 1971. In spite of hail damage and poor emergence of rape at some sites, meaningful results were obtained in 18 cases.

A comparison of the vegetative growth of rapeseed and wheat in spring indicated that rapeseed had responded to nitrogen better than wheat at 11 sites, while wheat had responded better at six sites. At seven of the sites rape responded better than wheat to the higher rates of nitrogen, but wheat responded more than rape to the higher rates at eight sites.

At harvest, rape gave a greater percentage yield response than wheat at 11 sites while wheat gave the best response at 5 sites. The most profitable rate of nitrogen was higher for rape in nine of the comparisons, but higher for wheat in the other nine comparisons harvested.

The results indicated no consistent relationship between nitrogen response by wheat or rapeseed, and no apparent correlation between response and the environment.

The responses to different rates of nitrogen by the two main varieties of rapeseed, Arlo (*Brassica campestris*) and Target (*B. napus*) were compared at two sites. Although Arlo convincingly outyielded Target in these trials there was no significant variety x nitrogen interaction and both varieties responded similarly to nitrogen fertiliser.

Mr. M. G. Mason, the officer responsible for the Department's nitrogen fertiliser programme, gave the recommendations for nitrogen on rapeseed in the recognised rapeseed areas as:

- **Light land**
  - first crop: approx. 25 kg/ha (23 lb/ac)
  - other situations: approx. 40-50 kg/ha (36-45 lb/ac)
  - Heavy land: approx. 13 kg/ha (11.5 lb/ac)

The recommendations should be used as a guide and would be modified as more information was accumulated.

Mr. Mason added that the 1971 trials had given further evidence of the detrimental effect on rapeseed establishment of nitrogen applied at seeding. This year's trials would continue to investigate methods and times of nitrogen application for rapeseed but meantime it was recommended that nitrogen application should be delayed for 3 or 4 weeks after seeding. Earlier application could seriously reduce plant numbers.
Farm grazing levels

Dairying Division

Stocking rates in many dairying areas are so low that the Division has established nine grazing level demonstrations in various areas. Their aim is to demonstrate that higher stocking rates are practical on existing farms. Currently the demonstrations are located at Tutunup, Donnybrook, Capel, Northcliffe, Young's Siding, Dardanup, Forest Grove, Jindong and Cundinup.

Essentially, each demonstration consists of running a number of the farmer's own cattle, at a higher stocking rate than usual for the farm, on portion of the farmer's property. The cattle may be steers, heifers or cows and calves and, apart from occasional weighing are subject to normal farm routine. Stocking rates have been as high as two and one half times normal for the farm.

In addition to the grazing demonstration, an aim in each case has been to increase local experience with improved pastures and fertiliser requirements. Each demonstration area is divided into two or three parts which are subject to a range of fertiliser treatments, including the treatment normal for the farm. Part of each area is also conserved for hay each year.

As most trials were commenced in 1971, few results are available. At Tutunup however, on a Kikuyu-subterranean clover pasture, 12 Friesian heifers were carried at the rate of one beast to 0.85 acres between March and December. Although this rate was more than twice the normal rate for the farm, the average weight gain on the demonstration area was 2 lb/head/day. The gain was considerably higher on that part of the trial where 540 lb/ac superphosphate had been applied than where only 180 lb/ac had been used.

In the Dardanup trial during a 164 day summer period in 1971, liveweight gain on an area treated with 400 lb nitrogen per acre was 1064 lb/ac compared with 562 lb/ac on a no-nitrogen area. Both parts of the trial area carried 3.6 yearling steers per acre on an irrigated Paspalum dominant pasture.

Progress results for the trials can be obtained by contacting the nearest Department of Agriculture office for each demonstration area.

Horticulture Division

Trials investigating storage and shipping disorders of fruit, mainly apples and pears, are conducted annually in cool rooms made available to the Department by the W.A. Meat Export Works. Although early work with the Cleopatra apple variety established the basis of pit control using calcium nitrate, work in recent years has tended to be concerned with Granny Smiths, the State's most important export fruit. Proposed trials are endorsed each year by the W.A. Fruit Advisory Council.

In 1971, two storage investigations were:

- Control of superficial scald in Granny Smith apples, including the effect of long term storage in bulk bins and poly-lined wooden boxes.
- The control of bitter pit in Granny Smith apples.

Conclusions from the trial investigating control of superficial scald on Granny Smiths were that dipping bulk bin fruit in 1500 ppm DPA (diphenylamine) was the most effective means of controlling scald in commercial lines of fruit. For instance, compared with an incidence of 99 per cent. scald on oil wrapped fruit, fruit which had been showered or dipped with 1500 ppm DPA had a 1 per cent. scald incidence in July after being picked in early April and stored at 32°F.

Other conclusions from this investigation were that apples from cool districts were less susceptible to scald than apples from warmer districts, and that fruit from vigorous trees was much more subject to scald than fruit from less vigorous trees. The vigour increased scald whether it was caused by heavy pruning or the use of a vigorous rootstock such as MM105.

The effect of time of harvest on the development of superficial scald is shown in the table.

Bulk bins totally enclosed in polythene sheeting (0.038mm = 0.0015 in.) kept Granny Smith apples in as good a condition as apples in controlled atmosphere storage. It appears that it will be possible to store in this manner using calcium nitrate and a fungicide in the DPA dip.

<table>
<thead>
<tr>
<th>Harvest date</th>
<th>Severe</th>
<th>Medium</th>
<th>Slight</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 10, 1971</td>
<td>98</td>
<td>16</td>
<td>5</td>
<td>119</td>
<td>95</td>
</tr>
<tr>
<td>March 17, 1971</td>
<td>74</td>
<td>31</td>
<td>20</td>
<td>125</td>
<td>100</td>
</tr>
<tr>
<td>March 24, 1971</td>
<td>48</td>
<td>38</td>
<td>26</td>
<td>112</td>
<td>89</td>
</tr>
<tr>
<td>April 8, 1971</td>
<td>44</td>
<td>29</td>
<td>34</td>
<td>107</td>
<td>85</td>
</tr>
<tr>
<td>April 15, 1971</td>
<td>21</td>
<td>40</td>
<td>20</td>
<td>81</td>
<td>65</td>
</tr>
<tr>
<td>April 23, 1971</td>
<td>3</td>
<td>14</td>
<td>28</td>
<td>45</td>
<td>36</td>
</tr>
</tbody>
</table>

* Fruit stored in oil wrapped cartons at 32°F
In the trial dealing with pit development in Granny Smiths it was seen that low calcium levels in individual fruit affected pit development. However, calcium levels of bulk fruit could not be correlated to pit susceptibility in storage.

Severe pruning was shown to increase the amount of pit not only because pruning causes strong shooting which robs calcium from the fruit, but because the thicker foliage prevents a thorough wetting of the fruit by calcium sprays. The application of three calcium sprays between December and January reduced the level of pit appearing in fruit from 16.2 to 4.7 per cent. over three months storage and a fourth preharvest calcium spray reduced pit to as low as 1.1 per cent.

Other trials in 1971 included control of storage rots in Yates apples and Packham pears, and the beginning of a long term survey into the seasonal incidence of bitter pit in export Granny Smith apples. The officer in charge of the project is Mr. S. E. Hardisty.

Glume blotch of wheat

Biological Services Division

Glume blotch on wheat crops is seen frequently in some areas of Western Australia and was particularly severe in the West Midlands in 1971. The disease is caused by the fungus *Septoria nodorum* which infects the leaves, stems and heads of the wheat plant.

Glume blotch has long been suspected of reducing wheat yields and has been investigated for several years as part of the Department's research into wheat diseases in this State.

In a trial at Badgingarra Research Station in 1971, yields from wheat sprayed with the fungicide Maneb were compared with yields from unsprayed wheat where glume blotch was left to follow its natural course. The spray was applied with a tractor drawn boom spray, at 10 day intervals, from the 3-leaf stage until haying off.

Assessments throughout the season indicated that glume blotch had been reduced, but not controlled completely by the treatment. Measured on a 0-6 unit scale the flag leaves on sprayed plots averaged a moderate 3.65 level of infection compared with a severe 5.03 level on the leaves of unsprayed plots. The effect on yield is summarised in the table.

It is emphasised that the spraying treatment is quite uneconomic, but that the purpose of the series of investigations are to provide information on the effects of disease on yield. Such information is helpful when deciding priorities in cereal breeding programmes.

The officer responsible for these investigations is Dr. A. G. P. Brown, of the Plant Pathology Branch.

<table>
<thead>
<tr>
<th>Plots sprayed with Maneb</th>
<th>Plots unsprayed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grain passing through a 2mm. sieve (%)</td>
<td>7.9</td>
</tr>
<tr>
<td>Total yield (kg/ha)</td>
<td>1158</td>
</tr>
<tr>
<td>Increased yield (%)</td>
<td>17.2</td>
</tr>
<tr>
<td></td>
<td>53.5</td>
</tr>
</tbody>
</table>

Sheep meat production trial

Wheat and Sheep Division

Better understanding of Middle-East, European and Asian market requirements for Australian sheep has influenced the design of a large meat production trial at Avondale Research Station. The trial will supply basic information on sheep meat production and involves examples of breed types available in Western Australia and capable of supplying young, lean animals all the year round. Objectives of the trial include examination of:

- The effect of time of lambing on lamb growth rates.
- The effect of breed of sire on lamb growth rates.
- The effect of any interaction between time of lambing and breed of sire on lamb growth rates.
- The influence of two types of summer supplements on summer growth.
- The value of the various types of progeny at different growth stages.

Included in the trial are four times of joining (Nov., Dec., Jan. and Mar.), three breeds of ram (Dorset Horn, Border Leicester and Merino), two slaughter dates (post-summer and the end of the second growing season), both sexes (the males will be epididyectomised) and two major kinds of summer feed treatment (pasture only, or pasture plus a grain supplement).

Currently the trial contains 1200 Merino ewes, some 50 rams and about 650 acres of land. By December 1972 it will have grown to 850 acres and will include 800 lambs.

The sheep meat production trial is virtually an expansion of a Meat Production Trial for Northern Agricultural areas which was conducted at Chapman Research Station until late 1971. Results from this trial, and for much of the other research dealing with sheep meat production are available from a number of Department of Agriculture publications. The trial is jointly financed by the Australian Meat Research Committee and the Department of Agriculture. It is supervised by Mr. R. J. Suiter of the Department's Sheep and Wool Branch.
Plant cover for bare and salt affected land

Soils Division
The contributions made by this State to land reclamation were recognised at an international level last year. Mr. C. V. Malcolm, a research officer with the Soils Division, presented a paper entitled “Establishing Shrubs in Saline Environments” at a symposium on Useful Wildland Shrubs, Their Biology and Utilisation, at Utah State University, Logan, Utah. The conclusion to Mr. Malcolm’s review, set out below, summarises much of what is known about shrub establishment in saline areas.

- Plants adapted to both establishment and long term growth must be found for the sites to be planted.
- Seed from such plants must be of good quality and must be well matured and carefully stored.
- Any seed treatment used must have been thoroughly field tested.
- The seed bed must be well prepared. Preparation would probably include cultivation and could include soil ameliorants to reduce salinity and other toxic factors or crusting, and methods for the control of pests and weeds.
- The seed should be sown at the rate, and at that time of the season known to be most satisfactory for establishment. Due regard to possible rainfall events must be considered because of their influence on germination and survival. The seed should probably be pressed into the soil and may or may not be given a loose covering of soil.
- Treatments including fertilisers, cover crops, soil amendments and mulch should be used if they have been proved beneficial. Expensive spot treatments such as grass mulch may also be justified.
- The use of supplementary irrigation and seed soaking may be justified.
- Control of flooding and wind erosion may be necessary.
- Control of insects, rodents and grazing animals is essential.

Although it was recognised that there were gaps in the knowledge needed to apply the above steps, it was considered that by following them most of the factors influencing shrub establishment and persistence would have been taken into account. It was also considered that mechanised seedling planting might be the most satisfactory method of establishing plants in saline areas.

STOCK BRANDS REGULATIONS—SHEEP EARTAGS

Under the new Stock Brands and Movement Act Regulations, to be in force shortly, sheep eartags used as a registered brand must be placed in the ear opposite to the compulsory registered earmark.

When an eartag is chosen as the means of displaying the registered brand, it must be placed in the off or right ear of female sheep and the near or left ear of male sheep.

If a tattoo is used as a registered brand it must also be on the ear opposite to the compulsory earmark. Private reference marks and tags may only be placed on the opposite ear to the earmark.