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Grape guards prove their worth

Department of Agriculture, Western Australia

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Shipping live sheep

Wheat and Sheep Division
A ship-board experiment conducted in November, 1972, has resulted in a number of recommendations for reducing deaths among live sheep being shipped to export markets and for other improvements which should bring considerable financial benefits for importers, shippers and producers.

The experiment was carried out by Sheep and Wool Adviser H. E. Fels and Veterinary Pathologist R. J. Higgins with Merino wethers which were being transported from Fremantle to the Middle East.

Their work included testing alternative feeding and watering methods on 400 of the sheep, and, based on the results of this and on observations on the remainder of the live cargo, making suggestions about the technology of shipping live sheep.

The project was made possible by a grant from the Australian Meat Board, and the co-operation of Amalgamated Industries and associated companies.

Apart from heat stroke the death pattern was similar to that occurring in feedlots on land. Metabolic disorders associated with loss of appetite caused 43% of non-heat stroke deaths, 14% of deaths were from accidental injury, 10% from salmonellosis and the rest from sundry other causes.

Observations suggested that the main technological problem at sea is the climate of the sheep’s pens. More air movement than is normally available appears necessary and better control of temperature is needed. The temperature was reduced by feeding hay in troughs instead of on the pen floors, presumably because less waste material was left on the floors to become wet and generate heat.

It was apparent that the design of facilities to reduce materials handling problems could be improved. These include feed and water storage, feeding and watering facilities, drainage and solid waste removal.

Oats grain appeared to be the most promising feed, although some mixtures also showed promise. Feeding concentrates also appeared to reduce the death rate.

Results from the experiment could lead to the use of cheaper and more compact feeds, allowing up to 10% more sheep to be carried. Possible benefits total about $2.20 per sheep for the Fremantle-Middle East voyage, leading to possible savings of $2 to $3 million a year at the present rate of live sheep exports from Australia.

A full report of the voyage and the experiment is being prepared.

Grape guards prove their worth

Horticulture Division
Grapes harvested for storage are now being packed and protected with “grape guards”—gas releasing generators consisting of chemically treated paper which releases small quantities of sulphur dioxide. Grape guards inserted in unventilated storage boxes are activated by the high humidity in the box to release their sulphur dioxide and prevent decay of the packaged fruit. The guards were developed in the United States two years ago.

Trials in 1972 at the Department of Agriculture’s Swan Viticultural Research Station showed that grape guards were effective in maintaining Waltham Cross and Ohanez grapes in good condition during 10 weeks’ storage at 0°C and about 90% relative humidity. The grapes were opened without mould or SO₂ injury and were considered 100% saleable. The trials were supervised by Senior Viticulturist W. R. Jamieson.
Trials in 1973 were aimed at finding the effects of fungicide sprays, applied after berry set, on the effectiveness of the grape guards. Grape and packaging materials were provided by the Export Grape Growers' Association and stored in cool rooms at the research station. Treatments in the 1973 trials were:

- Grapes not sprayed — packed with and without a grape guard.
- Grapes sprayed with Benlate*—packed with and without grape guard.
- Grapes sprayed with Benlate + Difolatan*—packed with and without a grape guard.

*Trade names.

Resistance to clover scorch

Plant Research Division

The threat of clover scorch, caused by Kabatiella caulivora, to the State's subterranean clover-based pastures occasioned an urgent search for resistant varieties which could be used in a breeding and testing programme. The search, including a field survey of 216 varieties in 1972, was led by Research Officers D. L. Chatel, C. M. Francis and A. C. Devitt.

The survey found considerable variability in disease effect, ranging from very serious (e.g., Yarlloop, which died almost completely) to not serious (e.g., Daliak, Mt. Barker and Toodyay C, which showed only occasional symptoms). The low susceptibility found for Daliak and Mt. Barker agreed with a number of farmer observations in recent years.

When tested in the glasshouse, although Daliak again demonstrated low susceptibility, Mt. Barker and Toodyay C performed no better than highly susceptible varieties such as Yarlloop. This indicated that the reactions of Mt. Barker and Toodyay C to K. caulivora may depend on environmental conditions and the method of infection, and that their disease escape in the field results from a combination of characteristics not likely to be genetically transferable.

The consistent low susceptibility of Daliak in the field and the glasshouse is encouraging and at this stage Daliak must be considered to possess genetic resistance to the disease. Preliminary work with some cross-bred material (resistant Daliak x susceptible Bacchus Marsh) supports this conclusion as some of the progeny have proved resistant.

Daliak may prove useful in long-term breeding programmes, but at this stage there is sufficient evidence from field trials and farmer experience to recommend its use in areas prone to clover scorch, particularly around Esperance. In these areas it could be included in pasture mixtures with the later maturing but susceptible Woogenellup and Seaton Park varieties.

Stocking rate and time of calving

Dairying Division

Whether to calve in autumn or winter is a management question frequently asked by manufacturing milk producers. Production differences from either calving time are often debated, but what is known is that autumn calvings produce longer lactations than winter calvings. These differences produce differences in management requirements, and there are also different requirements for feed supplements.

To clarify some of the arguments associated with time of calving, a trial at Denmark Research Station is investigating the effects of two stocking rates (1.64 cows per ha and 1.24 cows per ha) and two calving times (autumn and winter) on milk production and feed requirements. The trial is supervised by Dairy Division officers and includes 56 cows on 40 ha of dry land pasture. Forty-five per cent. of each treatment is closed for hay production.

The trial's first year, in 1971, was an adjustment period when pastures were conditioned and stocking rates tested. Preliminary results for 1972 are shown in the table, but it should be realised that the dry season produced less spring flush feed and quicker drying off than normal.

The results indicate that autumn calving was associated with higher...
cow production and higher production per hectare than winter calving, and that the lower stocking rate gave the best production per cow but the lowest production per hectare.

When considering the higher production from autumn calving, the longer lactation period, higher labour costs and extra hay requirements should be taken into account. The 1972 season was unusually dry and results could differ under more favourable conditions. The trial is continuing in 1973.

<table>
<thead>
<tr>
<th></th>
<th>Autumn calving</th>
<th>Winter calving</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.24 cows per ha</td>
<td>1.64 cows per ha</td>
</tr>
<tr>
<td></td>
<td>1.24 cows per ha</td>
<td>1.64 cows per ha</td>
</tr>
<tr>
<td>Production per cow:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk</td>
<td>2 914 kg</td>
<td>2 420 kg</td>
</tr>
<tr>
<td>Fat %</td>
<td>5.1</td>
<td>4.5</td>
</tr>
<tr>
<td>Protein %</td>
<td>3.55</td>
<td>3.22</td>
</tr>
<tr>
<td>Production per hectare:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk</td>
<td>3 629.0 kg</td>
<td>4 019.0 kg</td>
</tr>
<tr>
<td>Fat</td>
<td>186.6 kg</td>
<td>180.7 kg</td>
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<tr>
<td>Protein</td>
<td>128.9 kg</td>
<td>129.5 kg</td>
</tr>
<tr>
<td>Hay fed per cow</td>
<td>1 180.0 kg</td>
<td>1 090.0 kg</td>
</tr>
<tr>
<td>Lactation period</td>
<td>279 days</td>
<td>278 days</td>
</tr>
</tbody>
</table>

**Fleece weight selection twice as effective as hand classing**

*Animal Division*

Analysis of records collected in a flock where the owner selects sheep by traditional methods, but also records fleece weights, has shown that using fleece weights for selection is almost twice as effective as visual appraisal. The analysis was done by Animal Geneticist Dr. D. E. Robertson on records from a flock of 477 stud Bungaree Merinos carrying less than a year's wool growth.

The breeder doing the initial classing was obviously concerned with selection criteria other than fleece weight, but was also very conscious of the importance of increasing his flock's wool production. He aimed to select for heavy fleece weights while minimising culling for supposed faults. His classing, into culls (74 sheep), a middle group (260) and a selected top breeding group (143) is diagrammed below.

Figure 1 illustrates two effects of hand classing in this flock. Within each group are to be found animals producing a wide range of wool weights. Many of the animals in the cull group produced sufficient wool to justify their selection in the top group. Certainly, many of the culls produced more wool than sheep classed into the top group.

The results indicate that the classer had achieved considerable
success in separating his flock into low, medium and high producing groups, but comparison with analysis of the whole flock shows that further improvement was possible. In Figure 2, line A cuts off the same number of culls (74) as the farmer and line B separates the remainder of the flock into middle (260) and top (143) groups of the same sizes as the farmer's middle and top groups, but in Figure 2 the separation is solely on fleece weights.

Analysis of Figure 2 gives an average wool production of 3.34 kg wool per head for the two top groups and 2.65 kg per head for the culls. Selection by fleece weight could thus have given 403 top sheep averaging 0.11 kg per head more than the unselected flock average; the 403 hand-classed sheep produced only 0.05 kg per head more than the unselected flock average. Similarly, fleece weight selection would have culled 74 sheep averaging 2.65 kg per head, or 0.58 kg per head less than flock average, compared with the hand-selected 74 which averaged 2.93 kg per head, only 0.30 kg per head less than flock average.

The analysis indicates the value of fleece weight measurement as a selection method and emphasises work of the Department's Fleece Measurement Laboratory, and the extension work of its Sheep and Wool Branch which has been promoting selection by wool weight for many years. In this example, even where a capable and experienced stud breeder was doing the classing, the rate of improvement in wool production made possible by hand classing would only have been half that possible if fleece weight was the sole selection criterion.

Some allowance must, of course, be made for other characteristics which would have influenced the breeder's selection of individual animals.

The results indicate significant increases in *Puccinellia* production following the addition of 125 kg/ha (1 cwt./acre) nitrogen fertiliser. At the Piawanning site the response to the additional 125 kg/ha fertiliser was also economic.

Further trials in 1972/73 were concerned with seed production increase and were carried out by Research Officer A. J. Clarke. The trials were at Piawanning (432 mm annual rainfall), Narrikup (737

**Puccinellia needs nitrogen**

*Soils Division*

The salt tolerant grass *puccinellia* (*Puccinellia ciliata*) is now widely grown as a pasture species on salt-affected land in Western Australia. First released some 10 years ago, the species is thought to have been planted on more than 4,000 ha; more than 30 t of seed has been produced since 1966. *P. ciliata's* success has also led to the importation and testing of other *Puccinellia* species, one of which, *P. distan*, is being tested and bulked up for possible release.

Trials in 1970/71 suggested that established stands of *Puccinellia* responded more to nitrogen fertilisers than to superphosphate. Trials in 1971/72 again demonstrated this preference, although one trial was not significant, possibly because the site had carried a legume pasture. Results for the two significant results are shown below.
mm), Bibby Springs (584 mm) and Woogenellup (635 mm), on salt-affected flats with pure stands of *Puccinellia*. Plot sizes were 21 sq m and there were several replications at each site.

Despite the dry season there were satisfactory growth increases, with rates up to 376 kg/ha (3 cwt./acre) ammonium nitrate. Seed production increased by about 22 kg/ha (20 lb./acre) at low rainfall sites and by about 44 kg/ha at wetter sites, for each 125 kg/ha fertiliser. The increase tended to flatten off at drier sites but remained uniform in wetter areas.

### Effect of nitrogen fertiliser on hay production of *Puccinellia*—kg of hay per ha

<table>
<thead>
<tr>
<th>Fertiliser rate Ammonium nitrate—kg/ha</th>
<th>0</th>
<th>63</th>
<th>125</th>
<th>251</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site—Piawanning</td>
<td>340</td>
<td>660</td>
<td>1 180</td>
<td>1 540</td>
</tr>
<tr>
<td>Narrikup</td>
<td>620</td>
<td>1 105</td>
<td>1 550</td>
<td>1 720</td>
</tr>
</tbody>
</table>

As in previous trials, there were no significant responses to superphosphate.

The results indicate that superphosphate is only needed during the first years of establishment of *Puccinellia* on new land. Where there is a history of superphosphate applications further super is probably unnecessary. Nitrogenous fertilisers, on the other hand, are strongly recommended, particularly where the stands are good and even. It is suggested that the equivalent of 125 kg/ha (1 cwt./acre) ammonium nitrate be applied early in winter, and it may be economic to apply up to 250 kg/ha in wetter areas.

### Parrot research

**Agriculture Protection Board**

Western Australia is relatively free of bird species which damage crops. However, for many years producers have complained of damage to fruit and grain crops by the smaller parrots in the South West of the State. The Agriculture Protection Board is investigating the ecology and pest status of four of these: The red-capped or king parrot, the Port Lincoln or twenty-eight, the regent or smoker parrot and the western rosella. Each is declared vermin in one or more shire areas.

The investigations include foods and feeding habits, movements, reproductive potential and damage assessments. They are being carried out by Research Technician J. L. Long.

So far it appears that these parrots feed on a wide variety of seeds, parts of weeds, herbs, eucalyptus and other plants, insect larvae and fruits—including commercially grown fruit. Their seasonal dependence on the various dietary items is still unknown.

Bird movements are being traced by banding and wing tagging nestlings and trapped adult birds in conjunction with the CSIRO’s Australian Bird Banding Scheme. The Scheme will indicate if, how far and when birds move, and will provide the information needed if control measures ever need to be adopted. Persons finding or shooting banded birds are asked to return the band to the CSIRO in Canberra, or to the Agriculture Protection Board in South Perth.

Nest studies have already shown that the parrots produce large numbers of young which add to local bird populations shortly before commercial fruit crops ripen, at a time when natural food supplies may be limited. Damage assessments in the 1973 fruit season were very low, however, possibly because of prolific flowering by jarrah and marri.

### Seed dormancy in annual ryegrass

**Biological Services Division**

Annual ryegrasses are valuable pasture plants in Western Australia, but they are also often a major crop weed problem compared with other annual grasses such as barley, silver and brome grasses. The other annual grasses can be problems if pre-seeding cultivation is inadequate, but crops are often choked with annual ryegrass despite the most thorough pre-seeding cultivation. Further, once annual ryegrass is present in a crop, there is no herbicide which can selectively control it.

Reasons for the different behaviour of annual grasses after cultivation are associated with dormant seeds, and the effects of temperature and light on the rate and speed of germination. These factors are being investigated in a laboratory and field research study being conducted by B. J. Quinlivan and G. A. Pearce, Advisers with the Biological Services Division.
Dormancy is a seed characteristic essential for the survival of naturalised plants under Australian conditions. A high proportion of the seed remains dormant, and will not germinate after maturity in spring until a sufficient time has elapsed. The dormancy mechanism prevents abortive germinations after summer thunderstorms and, with the silver, brome and barley grasses, allows the seed to germinate with an assured moisture situation in April or early May. Thorough cultivation after this almost complete germination then prevents these grasses from appearing in the crop.

Annual ryegrass seed follows a similar pattern except that in many districts the seeds do not all germinate with the first rains. Most seed germinates by autumn but further germinations occur during winter. Figure 1 shows of the 10 to 12 per cent. viable dormant seed in May, there is still 2 to 4 per cent. surviving in an ungerminated condition in November.

Temperature has also been shown to affect the rate or speed of germination of annual ryegrass seed. In inland districts, where late opening rains causing germination are usually associated with low temperatures (as low as 3 to 5°C at night and 10 to 15°C during the day), germination is often slow and early cultivation is complete before much of the seed has germinated. By contrast, early openings in the northern wheatbelt are associated with temperatures in the range of 15 to 25°C. Such temperatures cause rapid germinations and lead to relatively few weed problems (Figure 2).

Annual ryegrass seed has also been shown to be light sensitive. If light is present, germination is slowed considerably during the first 10 to 14 days after opening rains—a critical period for weed control. Figure 3 indicates that this sensitivity to light is reduced by about the twentieth day.

The newest discovery of light sensitivity suggests the possibility of shallow cultivation immediately after the opening rains. This buries the seed and speeds germination by reducing the amount of light affecting the seed. Field tests of this technique have given promising results.