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Grain hardness investigation

Department of Agriculture, Western Australia

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Grain hardness investigations

Wheat and Sheep Division

Western Australian proposals for the receival and marketing of wheat involve the handling of three distinct types; a soft biscuit type, a hard bread type and an intermediate multipurpose type. The biscuit type is grown in the southern parts of the State, the hard bread type in the eastern wheatbelt and the intermediate, f.a.q. type, over the remainder of the wheat growing areas.

Wheat type, to a large extent, depends on grain hardness which influences appearance (including translucency), millability and flour characteristics of the grain. It is because varieties vary in their hardness, as much as in their protein content, that different varieties are recommended for each wheat type. Gluclub, Pinnacle, Insignia, Bungulla and Heron are soft varieties, while Eagle, Falcon, Gambee and Gabo are hard. Gamenya, Mengavi and Kondut are intermediate.

Because of the importance of hardness as a grain characteristic, it is the subject of a number of investigations supervised by Cereal Products Adviser Mr. J. A. Parish.

In a 1972 trial at Wongan Hills, the relationship between grain hardness, translucency and protein level was examined for seven wheat varieties. These results are still being collated but one part of the work involved the determination of the range of translucency of 74 samples of Gambee taken from commercial crops planted for seed increase. The results summarised on the figure indicate that a large proportion of the Gambee wheat would be received into the hard category and confirm that Gambee is a suitable variety for this wheat type.

[Graph showing the relationship between protein content and per cent translucent kernels]
**No pruning may reduce bitter pit in export Grannys**

*Horticulture Division*

Large fruit, drought conditions, “off” crops and immaturity are among factors known to be associated with the appearance of bitter pit in early harvested Granny Smiths for export. It is also known that fruit developing pit has a much lower calcium level than fruit remaining sound, and that pit incidence can be reduced by applying calcium sprays which are absorbed into the skin of the fruit. In Western Australia, these facts have been established by a series of trials conducted by Mr. S. E. Hardisty, Fruit Adviser with the Department of Agriculture’s Horticulture Division.

Recent work has also demonstrated that the presence or absence of vigorous vegetative growth adjacent to fruit has an important effect on pit development. In trials at Stoneville Research Station in 1970, heavy pruning cuts were tagged with plastic string and fruit eventually selected from close to or distant from the pruning cuts. Other fruit was selected from unpruned laterals and from fruiting spurs. All fruit was then stored for two months and examined for calcium content and pit development.

In another trial on a commercial property, the grower’s heavy pruning technique caused upright shoot extension and vigorous leaf growth which prevented calcium nitrate sprays from saturating fruit on the trees. This fruit later developed about 40 per cent pit compared with fruit from lighter-pruned trees, similarly sprayed, which was relatively free of pit.

The results suggest that heavy pruning causes increased vegetative growth which reduces the calcium content of apples and encourages pit development during storage. Pit development may be further increased because the dense vegetative growth prevents the therapeutic calcium nitrate sprays from reaching the fruit and being absorbed by the skin. The implications for growers are that fruit should be selected from mature unpruned trees when harvesting for early export.

**Effect of near vegetative growth on pit development on fruit from a single tree harvested on March 17**

<table>
<thead>
<tr>
<th>Selection of fruit</th>
<th>Pit development % after 2 months</th>
<th>Average calcium content — fresh weight basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit from unpruned laterals and spurs with light adjacent foliage growth</td>
<td>8</td>
<td>44 ppm (Range 31—62 ppm)</td>
</tr>
<tr>
<td>Fruit adjacent to heavy foliage growth near severe pruning cuts</td>
<td>52</td>
<td>29 ppm (Range 23—37 ppm)</td>
</tr>
</tbody>
</table>

**Contour sills—a new contour farming technique**

*Soils Division*

Contour sills, a possible alternative to contour bank systems, are not yet a recommended practice but have been under investigation in the Department for three years. The sills were originated by Mr. B. a'B. Marsh an adviser with the Soils Division’s Soil Conservation Service Branch. The sills were designed to avoid some of the problems associated with contour bank systems and are considered to have potential on mildly eroded areas with moderate to gentle slopes, particularly where water disposal problems arise.

Contour sill systems have a similar layout to contour bank systems but require no waterways. Also, the channel need not be continuous so that gaps can be left in the line for farm tracks, or for rock heaps and clumps of trees. The diagram indicates that the sill is a vee channel with no above ground bank, and with its downhill edge bordered by a stable undisturbed strip about one metre wide. Soil from the excavation is spread uphill so that overland water flow is unimpeded. The channel must be surveyed very accurately.

Contour sills can act as guidelines for contour cultivation but their main function is to intercept runoff before damaging quantities of water accumulate. Water is given the chance of spreading laterally in the sills and overflowing onto the land surface as a wide, safe and shallow flow. Sills could also help maintain a shallow water depth during very heavy rain so that serious erosion would be less likely to occur.

Incidental advantages were thought to include increased infiltration resulting from the slower runoff, improved access around the farm, less need to re-locate fences, no need for waterways and no danger of breaches releasing dangerous quantities of water.

Numerous difficulties were foreseen with contour sills but investigations on more than a dozen farms have made it possible to make some favourable conclusions about the system.

- The accurate construction necessary causes surveying to take 50 per cent. longer than for contour banks.
- Inaccurate sill construction is not necessarily dangerous unless the low point is wide enough to release a lot of water and cause rilling. Such inaccuracies are more likely on steeper slopes so sill systems should be restricted to slopes of less than 5 per cent.
- Siltation effects have not been severe and spoil spread uphill has not washed back into the sills. Localised siltation can occur but can be anticipated and guarded against by building a
Contour sills intercept water and allow it to spread laterally before it can concentrate in hollows and cause erosion.

- Short stop bank to divert concentrated inflow laterally along the sill.
- Mature sills develop a rounded lower edge because of stock trampling but stabilise after re-vegetation.
- Parts of sills can fill completely with windblown soils, but a whole system is unlikely to be seriously affected. If breaching of the sills occurs, overflow is at ground level and flow is usually insufficient to cause scouring.
- Maintenance is as necessary as with other types of soil conservation earthworks. If concentrated outflows occur a stop bank is necessary at the outflow point, or the sill channel needs blocking on either side of the hazard. If maintenance is not carried out it is expected that some rilling problems would occur but that serious gullying would not result because the sills do not collect, lead and concentrate runoff.
- Ploughbuilt banks eventually develop each side of the sill because of normal cropping operations, but it is likely that it would take several years before the banks became noticeable or caused trouble. They could then be removed with a fast run of a disc plough or grader.
- Although the sills have only been observed in action during moderate winter rains, it is thought that they will reduce erosion though perhaps allowing some rilling in very heavy rain.

Contour sills cannot yet be recommended, but Soil Conservation Service Staff would be happy to discuss them for situations where waterways might not be convenient or where a normal contour bank system is not completely justified.
Narrogin cattle worm burdens

Animal Division

A survey of young cattle slaughtered in the Narrogin area has indicated that worms are present in potentially significant numbers in about 20 per cent of healthy yearling cattle. The brown stomach worm (*Ostertagia* spp.) and the stomach hair worm (*Trichostrongylus* spp.) proved to be the commonest worms present.

Veterinary parasitologist Mr. G. de Chaneet and veterinary surgeon Mr. R. McKay, who conducted the survey, collected the viscera of 138 cattle slaughtered at a Narrogin abattoir from December 1970 to December 1971. Specimen material of the abomasum, the small intestine and the faeces was examined for worms, and worm incidence was monitored month by month. The cattle came from at least 35 different properties and their ages ranged from 12 to 16 months. All animals were clinically normal at slaughter and had reached acceptable slaughter weight. No animals were slaughtered in September and October.

Although no results are available for September and October, the graph indicates that adult worm numbers are high during autumn-early winter, and the numbers of immatures, or worm larvae, are highest during summer. The apparent rise in immatures seen to occur in winter probably results from the autumn adult worm populations, and it is larvae ingested during spring which show up as worm burdens in summer and autumn.

In spite of the apparent high worm numbers shown on the graph, the worm burdens were considered low relative to burdens found in other cattle raising countries. However, it should be realised that 20

![](image1)

![Brown stomach worm, natural size](image2)

![Stomach hair worm, natural size](image3)

Average monthly worm count of cattle abomasas in the Narrogin area

- Immatures
- Ostertagia
- Trichostrongylus
per cent. of the animals did have worm counts of more than 10,000 and that the animals surveyed would have been relatively healthy animals purchased by the local abattoirs for slaughter. Some of the animals may also have been drenched for worms before local sale.

The authors are not convinced that the survey has indicated the degree of worm parasitism occurring in cattle in the Narrogin area, but the results do demonstrate that quite significant numbers of worms may be present in cattle grazing in relatively dry and hot areas in this State.

**Grain feeding for milk production**

*Dairying Division*

The profitability of grain supplements for dairy cows is a common discussion topic between dairy farmers and advisers. There is no question about the need for supplements for summer quota production on dry land farms, but there is doubt as to their necessity where adequate good quality pasture is available.

One time when grain supplements may be necessary is when feed is scarce just before and after calving. A reduced food intake during this period is likely to reduce milk yield throughout the whole lactation.

In Western Australia, where calving usually takes place in April-May when green feed is often scarce, the freshly calved cows lose considerable weight. Such weight losses could be affecting the subsequent lactation and four trials have been established to examine this possibility. The trials are being supervised by Senior Dairy Husbandry Adviser Mr. R. A. Bettaney and will last for two years.

For each trial, 40 cows calving in autumn were paired into two groups. The two groups, on a single commercial property, were treated alike except that one was fed a crushed barley supplement in addition to hay and pasture. The trials began in autumn 1972.

Supplementary feeding started two weeks before the anticipated calving date when the cows were given 2.7 kg (6 lb.) of crushed barley per day. This was increased, after calving, to 4.5 kg (10 lb.) per head per day to 60 days when it was reduced to 2.3 kg (5 lb.) per head for 7 days before being discontinued. Each cow therefore received about 326 kg (720 lb.) of barley.

At the end of the trial's first year, results on three properties indicated that returns from additional butterfat or milk at manufacturing prices was sufficient to pay the cost of the barley delivered and crushed on the property. On the fourth property barley feeding was carried through to a single final date instead of stopping individually with each cow 67 days after calving. For the very unfavourable season of 1972, the results justified the feeding of the barley supplement and there would have been additional benefit by way of saving of pasture.

The trials are to be repeated on three properties during 1973 with the paired cows placed in the opposite treatment groups to reverse production and check that the original pairing was accurate. When available, the two years' results should enable Department advisers to have sounder arguments for the conditions under which grain supplementation of dairy cows is profitable.

**Tomato ‘Curly Top’ cause traced**

*Plant Research Division*

The Department of Agriculture, Victoria and Dow Chemical have concluded that an impurity in a coccidiostat used in poultry feeds, was the precursor of a phytotoxic agent previously found in broiler litter and causing ‘curly top’ in tomatoes. In Western Australia, curly top has been subjected to investigations since 1966, before it first caused serious economic losses in tomato crops in March 1967. In these early stages, occurrences were sporadic and causes were suggested as trace element deficiency, herbicide drift, or mite or virus attack.

The relationship between curly top and applications of deep litter fowl manure was established by Mr. W. Kooyman, Horticulture Division, in January 1969. Subsequently, a series of pot trials by Messrs L. T. Jones and R. N. Weir of the Plant Research Division confirmed that broiler litter caused curly top, but failed to demonstrate that particular growth regulators in the litter were responsible for curly top. The possibilities tested were Coyden 25, Payzone, 3 Nitro phenyl arsonic acid and Iodophar—all feed additives used in poultry feeds for prophylactic purposes.

The Victorian and New South Wales Departments of Agriculture had simultaneously been investigating the disease and the Victorians successfully identified the causative impurity in mid-1971. Dow Chemical made a simultaneous identification during work being done in Japan.

It appears that the impurity, 4 amino-3,5 dichloro lutidine, associated with the coccidiostat was metabolised by the birds to produce a similar chemical, 4 amino-3,5 dichloro picolinic acid. This is similar in chemical composition to the herbicide Tordon and when passed into the manure produced a hormone-like distortion in susceptible plants. Tomatoes were particularly susceptible.

The identification of the impurity has led to poultry feed manufacturers either removing the coccidiostat from their additives, or using pure sources of the material. This will stop the production of phytotoxic fowl manure in deep litter sheds and should guarantee that fowl manure used by home or market gardeners produces no ill effects on plants.