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Development of a selective bait for rabbits

A preliminary report by A. J. Oliver and S. H. Wheeler, Agriculture Protection Board

It has long been recognised that a means of killing rabbits selectively in the presence of stock would be a major advance in rabbit control. It would enable a whole farm to be treated for rabbit control at one time, saving operational costs and cutting down reinfection of rabbits into treated areas from untreated areas.

A literature search and some pilot trials indicated that indandione derivatives were more toxic to rabbits than to ruminants. These compounds are anticoagulants, some of which are commonly used in human therapy and/or as commercial rodenticides. Pindone (2-pivalyl-1,3-indandione) was selected for evaluation.

Preliminary field trials showed that oat bait containing pindone, laid in furrows as in normal rabbit control practice using one shot bait, was effective in controlling rabbits. Kills of 85 to 97 per cent resulted. Other trials in the presence of sheep gave kills of 73 to 95 per cent with no apparent effects on the sheep.

Chronic dosing of sheep (carried out in conjunction with the Department of Agriculture's Animal Health Laboratories) and rabbits indicated the scale of difference in toxicity for the two animals.

All of 10 rabbits died when given 4 mg pindone in oats per kg body wt per day for seven days. Sheep fed 16 mg per kg per day for seven days showed extension of clotting time and loss of appetite. Both of these features returned to normal a few days after dosing ceased. No other effects were observed. Autopsy on sheep killed three weeks after dosing ceased revealed no macroscopic or histopathological difference from the control group.

Under normal rabbit poisoning conditions, pindone baiting could not significantly affect sheep health, not only because of its lower toxicity to sheep, but also because of physical limitations: a 40 kg sheep would have to pick up 1 kg oats per day from a thinly-laid rabbit control furrow to take 10 mg per kg per day. This effect is, of course, further exaggerated for cattle.

The effects of sub-clinical doses on sheep reproduction are being investigated in conjunction with the Department of Agriculture's Wheat and Sheep Division. The fate of radioactive pindone in the sheep body is being examined (for possible residues) in conjunction with the Plant Research Division. Further studies on the effect of pindone on wool, on unhealthy sheep, weaners, and wildlife species are projected.

Additional advantages
Because pindone is insoluble in water and is a fungicide, treated oats remain toxic and do not go mouldy. This means that it can be used in winter, unlike 1080 one shot bait. Winter trials have given good reductions of rabbit numbers.

The toxicity to humans is low (related indandiones are used in long-term anticoagulant therapy) so the bait is much safer to use than 1080 one-shot bait. There is also an effective antidote, vitamin K. Secondary poisoning hazards are virtually non-existent.

Disadvantages
There is a suggestion that the rabbits could develop genetic resistance to pindone. Investigation of this is planned.

In some situations, control by secondary poisoning from 1080 of foxes and feral cats is useful, reducing their numbers and effects on native species. This will not occur with pindone bait.

Conclusion
The data available indicates that the use of pindone in bait should be practical and worthwhile, but more work is needed before its use can be considered totally safe. Further investigations are in progress.
Plant establishment problems on salt-affected soils provided the stimulus for a recent invention. Department of Agriculture Research Officer C. V. Malcolm has found, after several years of field trials, that the only treatment which repeatedly gives good establishment of shrubs on salt land is an organic mulch.

By careful field observation and a survey of the world literature, several other aspects of establishment were also judged to be important. Natural establishment usually occurs in favoured niches created by banks, furrows, stumps and other obstructions. In these niches the seed can catch, water and wind-blown debris accumulate and the seedling is afforded some protection and added water.

Where seed collects in a large furrow, there is a danger of heavy rain drowning the seedlings. However, concentration of water in the soil near a furrow provides a good reserve for later growth. This has been shown to be very important for seedling survival in arid parts of New South Wales.

On saline soils furrow and bank shape influence the accumulation of salt in the soil, with ridge tops tending to have the highest concentrations, at least under furrow irrigation. In general, weed control is beneficial to seedling establishment.

In the field trials using a mulch, seeds of bluebush (Kochia breuijolia) and three saltbushes (Atriplex spp.) were sown on the surface of the ground and covered only with a mulch of hay. Other treatments such as covering with soil or sand and adding gypsum, lime and fertiliser did not benefit establishment.

In order to design and construct the new seeder, a co-operative project was established with Mr. R. Allen, a student with the Art and Design Section of the Western Australian Institute of Technology. Some of the construction and early testing was done on Mr. Allen's father's property at Williams. Some field testing and modification has been undertaken and the machine

The “Mallen” seeder in action (top) and a cross section to show the furrow, ridge and niche near the top of the ridge to take seed and chaff.
is shown in action north of Kununoppin in the accompanying photograph.

In one operation the ridge seeder and mulcher does the following:

1. Ploughs a furrow and forms a small ridge.
2. Presses a slope and niche near the top of the ridge on the furrow side by means of a heavy bevelled wheel.
3. Places seed covered with chaff in the niche intermittently (see diagram).

The experimental model has adjustments for quantity of seed and chaff, spacing of the planting along the niche and position of the niche on the bank. The seeder has performed well on sand at South Perth and on salt-affected morrel soil in the wheatbelt. Further testing will be continued as weather permits.

It is hoped the machine will be useful for revegetating arid pastoral areas as well as wheatbelt salt land, and that it will have application to similar areas overseas. Messrs. Malcolm and Allen have obtained provisional patents.

Cross-pollination between narrow-leafed lupin varieties

B. J. Quinlivan, Senior Adviser, Biological Services Division

The new low alkaloid white sweet-seeded varieties of narrow-leafed lupin Uniwhite, Uniharvest and Unicrep now form the basis of a significant industry in Western Australia, with some 100 000 hectares being sown in 1974.

The bitter-seeded blue-flowered New Zealand blue variety has been grown mainly in the South-West for many years, where it is used for sheep feed and as a green manure crop. Recently the non-shedding bitter blue-flowered variety Fest was released. It is hoped that this variety will open up a substantial seed export market to Europe, where seed lupins for green manure are in strong demand.

When five varieties of the one species are being grown, cross-pollination is always a possibility, so experiments were undertaken in 1971, 1972 and 1973 at the Mount Barker and Badgingarra Research Stations to determine the extent of the possible problem and define isolation distances.

The Uniwhite and New Zealand blue cultivars were used in the experiments. The cross-pollinated F1 seeds inherited the seed coat colour of the mother plant (in this case, Uniwhite). The cotyledons of these F1 seeds, when germinated, were purple (compared with the green cotyledons of pure Uniwhite) and the flower colour of the subsequent mature plant was blue.

In the F2 generation segregation took place in the normal Mendelian pattern of nine bitter-seeded blue-flowered plants, three bitter whites, three sweet blues and one sweet white.

There have been some unexpected and surprising results from these experiments in terms of when and how crossing takes place.

No crossing occurred at either site in 1971. In the following two years there was about 2 per cent crossing in adjacent plants at Mount Barker and again virtually none at Badgingarra. There is thus a strong site and seasonal effect.

Another unexpected result was that all crossing which did take place occurred with flowers on the central spikelet. No crossing occurred at any site or in any season on the laterals.

The proportion of crossing fell rapidly as the plants were separated and at distances of 5 metres was non-existent at Badgingarra and 0.1 per cent at Mount Barker.

At both sites and in each year wild honey bees were seen to work the experimental area but the striking site and seasonal differences suggest that perhaps other unknown insects may be the main pollinators.

There is obviously much more to be learned about crossing between narrow-leafed lupin varieties.

There are many interesting aspects to be investigated including the role of the various climatic parameters responsible for site and seasonal differences and the identification and *modus operandi* of the insect pollinators. However, there is sufficient knowledge to suggest that in a crop situation crossing would take place mainly on the boundaries and then only with a small proportion of flowers on the central spikelet. Thus there does not appear to be a major risk. However, separation is still advisable.

For many reasons, including the possibility of the evolution of a bitter white-seeded variety which would be difficult to detect, and the problems of marketing mixed lines of seed, blue-flowered bitter varieties should be kept well separated (by at least 50 metres) from white-flowered sweet varieties.
Madden—a new rust resistant wheat variety

The main disadvantage of stem rust-resistant wheat varieties grown in Western Australia has been that they do not yield as well as susceptible varieties, particularly the standard variety Gamenya.

The main resistant variety recommended over the past few years, Eagle, yields 85 to 90 per cent of Gamenya and because of this it is estimated that only about 10 per cent of the area of wheat grown in rust-prone areas is sown to resistant varieties.

The development of a new, high yielding, good quality rust-resistant variety is therefore a major advance for the West Australian wheat industry. The new variety, Madden, yields some 15 per cent more than Eagle in rust-prone districts of the northern and south-eastern wheatbelt.

Madden was developed in Western Australia by Department of Agriculture plant breeder J. T. Reeves, from unselected crossbred seed obtained from Sydney University in 1963. The initial cross, in 1959, was Gabo/Khapstein and the final pedigree of Madden is Gamenya/Gabo*3/Khapstein.

The seed was planted for rust resistance testing and initial selection at Esperance Downs Research Station in 1963 and the resulting seed grown in rows at Merredin Research Station in 1964. Selection and yield and quality tests were carried out at Merredin from 1965 to 1968.

Further yield and quality tests were carried out in 1969 and the crossbred (known as M145) was included in variety trials at eight research stations in the same year.

From 1970 to 1973 it was grown in large-scale variety trials on research stations and commercial farms. In 1973 its rust resistance was confirmed and it was given the name Madden, after a locality in the rust-prone south-eastern wheat growing area.

The first pedigree seed was sold to farmers early in 1974.

Madden is an early-maturing variety similar in appearance to Gamenya. It is resistant to all strains of rust now known in Australia, with a type of resistance different to that of Eagle. Its grain produces flour of high quality for bread making.

In variety trials throughout the wheat growing areas it has yielded 98 per cent of Gamenya over 113 trials and 113 per cent of Eagle in 41 trials.

Madden is expected to become the major variety grown in the northern and south-eastern rust-prone areas where some 610,000 hectares of wheat, more than a fifth of the State's wheat crop, are grown.

Obvious advantages of Madden wheat are:
- Up to 20 per cent better yield than present rust-resistant varieties: This is estimated to increase individual farmers' profits by more than 50 per cent for the part of their crop which is sown to rust-resistant varieties. In the south-east particularly, this would cover a substantial proportion, if not all, of many individual farmers' crops. If the total area sown to rust-resistant varieties is sown to Madden the wheat industry would gain about $500,000 a year.
- Greater protection of the wheat industry against rust: Rust is not normally a serious problem in W.A. but in some years epidemics cause considerable loss over wide areas. It occurs frequently in the northern and south-eastern wheatbelt and if conditions remain suitable, spreads to other areas. Because Madden yields almost as well as Gamenya, it is likely that the great majority of the wheat sown in rust-prone areas will be this rust-resistant variety. This would lessen the likelihood of build-up of rust in these areas.
- Improvement in grain quality in specific areas: In the rust-prone areas, replacement of Eagle and Timgalen with Madden should result in a less hard grain type, which would be more suitable for delivery in the F.A.Q. category. In other areas, Madden could be useful as a variety for the special hard grade, providing better quality than the present varieties.