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Research on declared plants and other weeds

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Knowledge about weeds is necessary to assess their significance, devise control measures and to select those which are to be declared for the purposes of the Agriculture and Related Resources Protection Act.

Once a plant has been declared in Western Australia, all landholders must control and prevent its spread to new areas and work towards eradicating known infestations. The Act also declares plants which are prohibited from entering the State.

It is becoming more and more important to provide specific reasons for the declaration of a weed and its placement in a certain category. Such decisions require appropriate action to be taken against the weed involved. The allocation of resources to be used against one weed often means those same resources are not available for the control of another.

■ The first aerial spraying in the State was in the 1950s for water hyacinth (inset) growing on Lake Monger. (Photo: W.A. Newspapers.)

In Western Australia the first weeds were declared in 1951 when it was reasonable to use personal and public opinion to prepare the list. Now, more than 30 years later, it is appropriate to question those decisions.

Have the weeds proved to be as important as first thought?

Where it was intended to eradicate certain weeds before they became widely established, has this been accomplished?

Has the availability of effective control measures rendered some weeds less important?

The answers to these and other questions can only be given if there is adequate information about the particular weed under consideration.

Policy

The Agriculture Protection Board has always given research into weeds and their control high

priority. It has provided funds to employ research staff in the Department of Agriculture to concentrate and specialise in investigations into important agricultural and pastoral weeds.

Research has covered potentially serious weeds before and after declaration, as well as technical developments in spray application. This broad approach has provided the Agriculture Protection Board with sound technical information which is used in making decisions concerning weed declarations.

Herbicide trials

There is a continual need to test new herbicides for the control of weeds. This may result in more effective treatments being developed or a herbicide treatment becoming available for a weed previously thought to be able to tolerate all available chemicals.

In the north of the State control trials are in progress against Parkinsonia, calotrope, prickly pear and mesquite. It is hoped that more practical and therefore less costly treatments can be developed.

For declared weeds in the agricultural areas new herbicides, such as Garlon®, Glean®, and Roundup®, are being tested against blackberry, Paterson's curse, Cape tulip and saffron thistle. Trials for the control of the water weeds parrot's feather, salvinia and water hyacinth are being carried out.

Herbicide application methods

For several years the promotion by some suppliers and use of equipment for very low volumes of application for spraying herbicides has aroused considerable interest. The sale of equipment to apply herbicides in volumes of water as low as 15 litres per hectare has allowed farmers to find out fairly quickly how risky this practice is. The experience has often cost them dearly in terms of a poor kill of weeds.

Other suppliers have promoted controlled droplet application (CDA) sprayers, claiming that application rates of herbicides can be reduced by as much as 75 per cent as a result of greater efficiency.

While some experienced farmers, contractors and consultants are able to achieve excellent results with 15 L/ha, the average farmer may not achieve effective results.

Trials have been carried out by the Department of Agriculture to demonstrate the type of results which can be expected by farmers adopting such recommendations.

Volume of application boom sprayers

Tables 1 and 2 list the results of two trials obtained in applying herbicides in various volumes of water. Considerable variation in results are obtained when a large number of trials are carried out, spread over many districts. It can be generally concluded that when using 15 L/ha of water, weed control is often unsatisfactory and the results more variable. A volume of 30 L/ha is more reliable than 15 L/ha, and 60 L/ha is more reliable than 30 L/ha.

Table 1. Control of two weeds using recommended rates of application in three volumes of water.

Treatment/ha	Volume of water used (L)	Weed plant counts (1 m x 1 row) Capeweed	Radish
Diuron + MCPA 350 ml + 400 ml	15	4.9	0.7
	30	4.8	2.6
	45	1.5	0.1
Igran 850 ml	15	4.0	2.9
	30	1.5	2.5
	45	0.6	0.4

■ Rope wick applicators saturated with herbicides brush the tops of weeds.

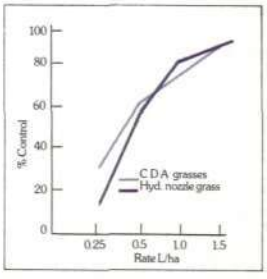

Figure 1. Comparison of CDA and hydraulic nozzle application for minimum tillage using Spray.Seed®.

Controlled droplet application

With controlled droplet application uniform spray droplets are produced and applied to weeds.

There is little doubt that this type of equipment has a valuable place in the future for application of herbicides. It is unfortunate that it is being promoted and sold before proper evaluation.

When first developed in the 1970s in the United Kingdom, initial trials demonstrated a number of problems associated with its use for broadacre crop spraying. British Petroleum (U.K.)

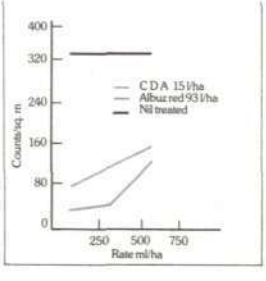

Figure 2. CDA and conventional boomspray comparison for ryegrass control in cereals using Hoegrass®.

developed a special oil (ULVAPRON) to increase the efficiency of the technique, and this has been available in the United Kingdom since 1976.

Because claims were made that rates of application could be reduced by up to 75 per cent, trials have been carried out in Western Australia to test the efficiency of a commercial controlled droplet applicator for the control of weeds with Spray.Seed® and Hoegrass®.

Figures 1 and 2 illustrate the results obtained. It can be seen that the weed control obtained with controlled droplet application is seldom superior to that with a standard boom system. At recommended rates of application the results are often similar.

The effectiveness of controlled droplet application may be improved by special oil additives. However, such changes in recommended use patterns should be thoroughly tested before being adopted for commercial use.

■ Saffron thistle (below), Paterson's curse (bottom) and prickly pear.

Weed seed ecology

The behaviour of weed seeds has a large influence on the effectiveness of control measures adopted and the long term achievements of programmes planned to eradicate or control weeds. Weeds which have little or no seed dormancy, such as annual grasses or skeleton weed, are much easier to eliminate than weeds whose seeds can remain dormant in the soil for many years.

A knowledge of seed behaviour is crucial to implementing an effective weed control programme. Weed seed research is therefore largely devoted to examination of the germination and emergence requirements of some of the major weeds in Western Australia. Research on dormancy mechanisms, factors affecting seed longevity and factors influencing seed production in terms of quantity and quality are also being investigated.

It is hoped that with the knowledge gained, weed management schemes aimed at the depletion of seed reserves in the soil and the prevention of seed production can be devised. The species being studied include brome grass, ryegrass, curled dock, fiddle dock, wild turnip, calotrope and Parkinsonia.

Some worthwhile results have been obtained with research on allelopathy (the ability of chemicals from one plant to interfere with the growth of another plant), which offers hope for control of calotrope in the pastoral areas of the North-West of Western Australia.

Table 2. Control of ryegrass and wild oats using Hoegrass® applied in four volumes of water.

Treatment* Hoegrass®	Volume of water used (L)	Ryegrass plants/sq.m	Wild oats % control
Ryegrass	15	219	85
= 0.75 L/ha	30	89	89
Wild oats	60	70	95
= 1.0 L/ha	120	42	96
Nil	—	1 043	—

*Recommended rates: Ryegrass = 1.0 L/ha Wild oats = 1.5 to 2.0 L/ha

Skeleton weed

The Agriculture Protection Board has been very successful in eliminating or at least suppressing more than 100 infestations of skeleton weed located mainly in the wheatbelt area of the State. However, it is important to have as much information available as possible in the event of an extremely large infestation of the weed becoming established.

It is also desirable to gauge more accurately how well this weed will perform as a serious weed under local conditions because such information will provide the basis for wise decisions.

Afghan thistle and pennyroyal

Investigations are being carried out with the perennial weeds Afghan thistle and pennyroyal. They involve strain identification, seed germination and vegetative regeneration and moisture requirements.

Biological control

Joint research programmes with other States and CSIRO on the biological control of some weeds are under way. Western Australian entomologists are working in Texas on control agents for Parkinsonia and mesquite, and in France on the control of docks.