WEED CONTROL IN AUSTRALIAN NATIVE PLANTS AND SOUTH AFRICAN PROTEAS

M. G. WEBB

Western Australian Department of Agriculture
Baron Hay Court
South Perth, Western Australia

INTRODUCTION

The flora of Western Australia is diverse and unusual, ranging from the spectacular to the seemingly mundane. Sandplain and forest areas north and south of Perth, respectively, support over 8000 plant species, with perhaps another 1000 yet to be described.

Commercial plantings of Australian native plants in a row crop situation began in the early 1980's mainly in response to increasing export demand for species not widely distributed in the bush. In Western Australia, the area of native plants under cultivation has increased from 20 ha in 1980 to approximately 1080 ha in 1988 (9).

The area of South African proteas planted in Western Australia has also increased substantially, from virtually nil in 1983 to over 200 ha in 1988 (9).

Weed control in cultivated native plants and proteas is essential for optimum plant growth and flower yield. Weed control in native plants was not required when the flowers and foliage were being harvested from the bush. However, successful intensive cultivation on both virgin and established farm land is dependent on effective weed control.

WEED CONTROL METHODS

Weeds in native plants and proteas can be controlled using one or more of the following methods:

Soil fumigation. Soil fumigation can be used pre-planting to control early weed growth in perennial plants but the cost can exceed A$4000 ha^{-1} (6). Soil fumigation has not yet been used in Western Australia to provide weed control for field grown native plants or proteas.

Synthetic mulch. Synthetic mulch has been used on less than 10 ha in Western Australia to provide weed control in proteas Synthetic mulch has also been used on some large plantings of native plants and proteas in eastern Australia The cost of synthetic mulch ranges from A$1000 to A$12,000 ha^{-1}, depending upon mulch type and row width. Synthetic mulch cannot be used for *Anigozanthos* spp. where the tops are burnt each year to reduce the incidence of leaf diseases

Inter-row weed control. Inter-row weed control can be achieved either by mechanical means, or by using non-selective herbicides. Mechanical weed control can generally only be used on young plants before they grow into the row and make tractor movement difficult. A modified sod management system has been adopted by some growers where the inter-row weed strip is kept mown over winter and weeds along the row are controlled by careful application of a non-selective herbicide. Although the mown strip dies off in late spring, the weed residue helps hold the soil together and reduces plant damage caused by strong winds and sand blasting. On some native plants, like *Chamelaucium uncinatum* or *Banksia hookeriana*, where the lower growth is removed by pruning, non-selective herbicides like diquat and paraquat can be sprayed at low pressures right up to the base of mature plants without causing any damage.

Hand weeding. Hand weeding is very expensive, costing up to A$10,000 ha^{-1}, depending upon the severity of the weed infestation (6). Hand weeding is not really an option in most plantings except for large, easily-removed weeds.

Chemical weed control. Weed control using selective pre- and post-emergent herbicides presents an economic alternative to other forms of weed control. This will be examined in more detail below.

CHEMICAL WEED CONTROL

There is a lack of information on pre- and post-emergent herbicides used for weed control in Australian native plants and South African proteas grown for cut flower and foliage production. In Western Australia, the only selective herbicides registered for use in ornamental crops are chloroxuron, oxadiazon, fluazifop-butyl, and chlorthal dimethyl.

Although there is a paucity of information on herbicides registered for use in native plants and proteas, there is considerable information on herbicides tested on native plant species used for revegetation and timber production.

Pre-emergent herbicides successfully tested on various *Eucalyptus* spp. include oryzalin (3), oxadiazon (3, 5), terbuthylazine and terbumeton (11), simazine (1,4) and nitrofen (10).

Pre-emergent herbicides successfully tested on other native plant species like *Acacia saligna* and *Casuarina cunninghamiana* include oxadiazon and propyzamide (5).

Pre-emergent herbicides successfully tested on *Protea neriifolia*, *Leucadendron* 'Safari Sunset', *Leucospermum cordifolium* and *Banksia menziesii* include oxadiazon, oryzalin and oxyfluorfen (2).

Post-emergent herbicides successfully tested on various native plant species include fluazifop-butyl (5, 8), propazine (5), and sethoxydim (8).

Fluazifop-butyl has also been successfully tested against a range of *Banksia* spp., *Protea* spp. and *Leucospermum cordifolium* (2).

Table 1. Plant species tested by herbicide. Number is maximum [b] kg ha^{-1} a.i. applied with nil or very slight damage.

Species or Cultivars[a]	bromoxynil	chloroxuron	chlorthal dimethyl	diflufenican	linuron	methabenzthiazuron	metribuzin	nitrobenzoic acid	oryzalin	ozadiazon	oxyfluorfen	phenmedipham	prometryn	sethoxydim	simazine
Anigozanthos manglesii cv. FMB	0.2	-	-	S	1.1	-	VS	0.22 +	4.5	-	S +	-	0.55	-	1 +
A. pulcherrimus	0.4	S	13	S	0.55	1.4	VS	0.22 +	4.5	8	S	0.8	0.55 +	0.36	S +
A. rufus	-	VS	13	-	0.55 +	1.4	VS	-	4.5	8	-	1.6	-	0.36	1 +
Boronia heterophylla	0.2	-	-	0.1 +	1.1	-	S	0.22	4.5	-	S	-	1.1	-	2
Chamelaucium axillare	-	-	-	-	-	-	0.7	-	4.5	8	-	-	-	0.36	-
c. uncinatum cv. Alba	0.4	-	-	0.1	1.1	-	0.7	0.44	4.5	8	0.24	-	1.1	0.36	1 +
C. uncinatum cv. Mullering Brook	0.4	-	-	0.1	1.1	-	0.7	0.44	4.5	8	0.24	-	1.1	-	1 +
C. uncinatum cv. Purple Pride	0.2	-	-	0.05	1.1	-	0.7	0.44	4.5	8	0.12	-	1.1	0.36	1 +
Helichrysum cordatum	VS	-	-	0.1	0.55	-	VS	0.44	4.5	-	0.24	-	1.1	-	VS
Hypocalymma angustifolium	VS	-	-	0.1	1.1	-	S	0.44	4.5	-	0.12	-	1.1	-	VS
H. xanthopetalum	-	-	-	-	-	-	S	-	4.5	8	-	-	-	0.36	1 +
Ixodia achilleoides	0.2	-	-	0.1	0.55	-	VS	0.44	4.5	8	0.24	-	1.1	0.36	1 +
Macropidia fuliginosa	-	2.25	13	-	1.1	1.4	-	-	-	-	-	1.6	-	-	-
Scholtzia oligandra	-	-	-	-	-	-	0.24	-	4.5	8	-	-	-	0.36	1 +
Thryptomene denticulata	0.4	-	-	0.1	1.1	-	0.7	0.44	4.5	8	0.24	-	1.1	0.36	1
Verticordia monadelpha	-	-	-	-	-	-	0.48	-	4.5	8	-	-	-	0.36	2 +
V. plumosa	0.2	-	-	S +	1.1	-	-	0.22	4.5	-	0.12 +	-	1.1	-	1
V. sp. cv. Coolamia	0.4	-	-	0.1	1.1	-	0.35	0.44	4.5	-	S +	-	1.1	-	1
Leucadendron sp. cv. Silvan Red	0.4	-	-	0.1	1.1	-	S	0.44	4.5	-	0.24	-	1.1	-	2
Protea cynaroides	0.4	-	-	0.05	0.55	-	S	0.44	4.5	-	0.24	-	1.1	-	1
Protea neriifolia	0.4	-	-	0.1	1.1	-	0.35	0.22	4.5	-	0.24	-	1.1	-	2 +

Note: [a] Plants established as rooted cuttings in 140 mm pots with 1:1 coarse sand and composted pine bark mix.
[b] Maximum of rates tested.
S Sensitive
VS Very Sensitive.
+ Variable results obtained. Test rates indicated with caution.
- Not tested.

HERBICIDE EXPERIMENTS IN WESTERN AUSTRALIA

Three pot experiments were conducted in Western Australia from 1988 to 1990 to examine the effects of 21 pre- and post-emergent herbicides on a range of Australian native plant species and three protea species. A summary of the maximum herbicide rate tolerated by a range of plant species is provided in Table 1.

Field research on Australian native plants is being conducted in 1990 to further examine promising herbicides identified in the initial pot experiments.

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