THE USE OF SOIL—RESIDUAL HERBICIDES ON RECENTLY PLANTED LEUCADENDRON “SAFARI SUNSET”

A. INGLE, W. BORST and D.J. DENNIS

*Horticultural Research Centre
Ministry of Agriculture and Fisheries, Levin*

SUMMARY

Simazine, oxadiazon and dichlobenil at single rates were compared with a sawdust mulch. Applications made in December and April caused no injury or reduction in growth. Simazine gave effective weed control at both times of application. Sawdust gave control very similar to simazine in the summer and dichlobenil performed as well as simazine after an autumn application.

INTRODUCTION

There has been little work reported on weed control in establishing Proteaceous ornamentals using soil-residual herbicides despite increasing world-wide interest in these plants. Nishimoto (1975) reported little to no injury from high rates of dichlobenil and oxadiazon on trickle irrigated *Protea*, *Leucospermum* and *Banksia* planted 8 months before treatment. Slight to severe injury was reported from simazine, ametryne and diuron, especially at higher rates. Weed control from all treatments was good.

Leucadendron “Safari Sunset” is a New Zealand hybrid cut-flower selection grown for export. It has terminal mahogany-red flowers carried on long stems. It travels well and has an excellent vase-life. Currently the crop is estimated to occupy about 75 ha (Paulin 1984) but no weed control studies have been reported.

We report here a pilot experiment comparing three soil-residual herbicides and a mulching treatment.

METHODS

The experiment was established on Levin silt loam using 20 month old outdoor container-grown plants in a four replicate latin square design. Plots were 7 x 1 m and contained a row of six evenly spaced plants. Guard plants separated the plots. The crop was planted into rotary hoed strips 2.5 m apart on 22 November 1983 and irrigated 3 days later.

Three days prior to treatment application, approximately a month after planting, all emerged weeds were removed by hand within a 40 cm radius of the plant and by push hoe beyond this. The larger soil clods were broken up by raking, and the treatments (Table 1) were applied overall. Application was made following 12 mm of overnight rain. Adjacent to the experiment four similarly-sized unplanted control areas provided a weed emergence standard. These were prepared in the same manner as the experimental plots, maintained weed-free after the first scoring and cultivated at the time of the second application of herbicides.

The mulch treatment consisted of weathered pine sawdust applied to depth of 5 cm.

Initial crop measurements were taken 2 days after treatment application and consisted of maximum plant height, greatest stem diameter at 8 cm from ground level and counts of shoots with more than 10 cm of growth. The height and diameter measurements were repeated on 21 March 1984 and a count of shoots with more than 15 cm of growth recorded on 27 April 1984. The weight of prunings to a standard height above ground was recorded in August.

Weed numbers were recorded on all plots once and on the untreated control areas twice. Scores of weed growth were made several times (Table 1) to record changes in herbicide effectiveness. Careful hand weeding with a minimum of soil disturbance were made between scorings and 8 days before herbicide retreatment. Herbicides were re-applied overall on 27 April 1984 to very moist soil.

Proc. 38th N.Z. Weed and Pest Control Conf.

TABLE 1: Weed control details and record of weed occurrence.

Treatment	Rate (kg ai/ha)	Product	No./m ² 19.1.84	Score* (27.1.84)	Score* (9.4.84)	Score** (1.6.84)
simazine	1.5	Gesatop 80WP	2	2.0	3.0	1.0
oxadiazon	1.5	Ronstar 25EC	18	2.5	5.0	5.0
dichlobenil	4.0	Casoron 7.5G	9	3.5	6.0	1.0
sawdust mulch	—	—	2	1.5	3.0	4.0
LSD (5%)			5.7	0.77	0.79	1.96
Untreated	—	—	148	9.0	—	—

*0 = nil, 5 = low density, 10 = dense

**0 = nil, 5 = several small, 10 = many small

RESULTS**Crop response**

No symptoms of injury developed in any treatment following either of the applications.

Throughout the summer, growth was good. No statistically significant differences were detected and the means of the growth indices were; height increase 20.3 cm/plant, shoot increase 7.2 shoots/plant, stem diameter increase 4.7 mm/plant and prunings 79.7 g/plant.

Weed control

Table 1 shows the effect of the treatments on weeds during the course of this experiment. All four treatments gave a satisfactory level of control for several months in the summer. Populations were reduced in January to a maximum (oxadiazon) of 12% of that of the untreated area. Simazine and the sawdust mulch gave the best results both continuing to be effective into early April following a hand-weeding in mid February. Oxadiazon and dichlobenil began to decline in effectiveness from about mid-January both allowing the establishment of grass weeds particularly summer grass (*Digitaria sanguinalis*) in the case of dichlobenil (Table 3).

Following re-treatment in April, dichlobenil and simazine gave the best weed control (Table 1) with the effectiveness again diminishing after 2.5-3 months. Sawdust reduced weed numbers almost as well as simazine and better than oxadiazon, but the few weeds which established grew rapidly to a large size. Thus the mulch treatment had a score similar to oxadiazon and higher than simazine in June.

Simazine treated plots were noted as having grasses as major weeds when the scoring was done in June but these were finally displaced by twin cress (*Coronopus didymus*) and toad rush (*Juncus bufonius*), the most prominent species germinating on the control area in winter (Table 2). On oxadiazon plots annual mouse-ear chickweed (*Cerastium glomeratum*) and chickweed (*Stellaria media*) were the most common weeds in June with pearlwort (*Sagina procumbens*) and annual poa (*Poa annua*) showing

TABLE 2: Weed species recorded on untreated area.

	Percent of total number											Total No./m ²
	CO did	SO nig	SP arv	VE per	TR spp	PO ann	JU buf	CE glo	FU mur	OW	OG	
January	40.7	24.9	8.5	5.3	5.4	4.1	nil	nil	nil	9.5	1.6	148
June	24.0	0.6	5.9	2.5	0.8	15.6	39.0	9.3	0.6	0.2	1.5	1319

CEglo = annual mouse-ear chickweed; COdid = twin cress; DIan = summer grass; FUmur = scrambling fumitory (*Fumaria muralis*); JUbuf = toad rush; OW = miscellaneous broadleaf species; OG = miscellaneous grasses; POann = annual poa; SONig = black nightshade (*Solanum nigrum*); SPArv = spurrey (*Spergula arvensis*); TRspp = clover (*Trifolium spp*); VEper = scrambling speedwell (*Veronica persica*).

TABLE 3: Relative occurrence of weed species in January (% of population on untreated area).

Treatment	PO ann	CO did	SO nig	SP arv	TR spp	VE per	DI san	OW	OG
simazine	0	0	0	0	0	0	150	3	50
oxadiazon	6	12	0	0	35	20	0	14	250
dichlobenil	0	8	5	0	10	0	50	6	0
sawdust	0	0	1	0	0	15	0	3	25

See table 3 for weed abbreviations.

lesser prominence, these latter two not being recorded on the untreated control areas. Seven months after herbicide re-application when the experiment was terminated both dichlobenil and sawdust were noted as giving adequate weed control. Unlike the oxadiazon treatment, the species on the dichlobenil and sawdust plots were similar to those found to be most prominent on the untreated area in winter.

DISCUSSION AND CONCLUSIONS

All four treatments were "safe" causing no injury or growth reduction on plants 30-40 cm high at planting. Because of the special nature of the root systems in the Proteaceae (Lamont 1983) there must however still be questions concerning crop tolerance to soil residual herbicides. In addition to the usual root system Proteaceous plants develop an ephemeral proteoid root system which is reported to markedly increase the efficiency of nutrient and moisture uptake. Since this system develops quite close to the soil surface it might also be expected to take up soil-residual herbicides easily. *Leucadendron* "Safari Sunset" is known to develop proteoid roots (Dennis 1985) and these have been regularly observed on plants grown from cuttings in containers at Levin. It might be assumed that the herbicides were either not accessible or tolerated since there were no indications of crop uptake. At higher rates of application Nishimoto (1975) showed that well established plants of other Proteaceous species can be damaged by simazine. A wider range of species and rates is therefore being explored to identify possible tolerance to higher rates of chemicals under New Zealand conditions.

As the treatments differed in the weed spectra controlled and persistence, combination treatments could be explored. Simazine and dichlobenil for instance might usefully be applied as a mixture since apparent differences in weed spectra (Table 3) and persistence could offer longer term control of a wide range of weeds. Similarly an application of dichlobenil or simazine under sawdust could be tested to see if these combinations would provide safe, long term weed control.

Simazine at 1.5 kg ai/ha could provide useful and lower cost chemical weed control in *Leucadendron* "Safari Sunset" throughout the year. Dichlobenil is as effective as simazine in winter but is more expensive.

A single application of sawdust provided effective long term control of weeds.

ACKNOWLEDGEMENTS

The assistance is acknowledged of T.I. Cox for advice on treatments, of M. Reihana in data collection and of I. Plunkett and A. Byett for biometric advice and data analysis.

REFERENCES

- Dennis, D.J., 1985. Field establishment of *Leucadendron* "Safari Sunset" grown in different potting mixtures: proteoid root observations. *International Protea Association Newsletter* 5: 32-33 (ed. J. Amos, Auckland)
- Lamont, B., 1983. Proteoid roots in the South African Proteaceae. *J. South African Bot.* 49: 103-123.

- Nishimoto, R., 1975. Weed control in established Proteaceae with soil residual herbicides. *Proc. Fourth. Protea Workshop*, Kula, December 12: 4-12. University of Hawaii Cooperative Extension Service Misc pub. 139.
- Paulin, G., 1984. Reports given by delegates to the Second International Protea Conference. *In*. "Growing and Marketing Proteas" 2 (ed P. Mathews), Proteaflora Enterprises, Melbourne.