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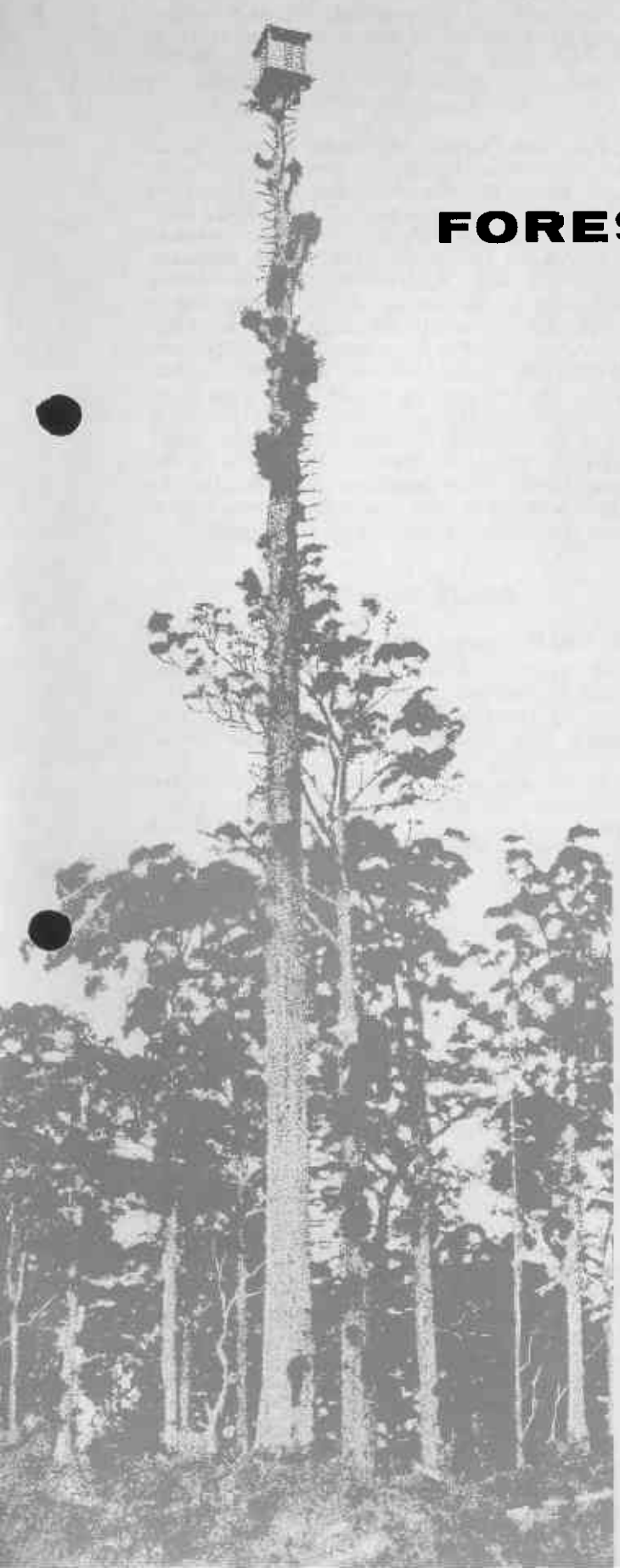

CONTROL OF HERBACEOUS WEEDS IN BLACKWOOD VALLEY PINE PLANTATIONS.

by

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SUMMARY

Vorox AA (40% atrazine, 40% amitrole) gave very effective control of annual grasses and broadleaf weeds at levels of 2.2 kg/ha and above. There was no adverse effect on radiata pine of pre-planting or post-planting levels up to 8.8 kg/ha. Application of the weedicide was fully effective in late October, again without harm to the pines. Data are presented showing the benefit to survival and early growth from control of the weed competition.

INTRODUCTION

It is well known that competition from herbaceous weeds has a detrimental influence on the establishment of pine seedlings. In addition to retarding early growth, competition may greatly reduce survival of the pines under drought conditions in their first year.

Vorox AA, which contains 40% atrazine (2-chloro-4-ethylamino-6-isopropyl amino 1, 3, 5-triazine) and 40% amitrole (3-amino-1, 2, 4-triazole), applied at 2.2 kg/ha has proved highly effective for the control of annual grasses and broadleaf weeds. It has proved especially effective against capeweed (*Cryptostemma calendula* (L.) Druce) in the establishment of radiata pine (*Pinus radiata* D.Don) on former pasture sites in the Blackwood Valley area, 220 km south of Perth, Western Australia, For convenience, the commercial name Vorox will be used in this paper, but the same results would apply to any other product of the same chemical composition.

The chemical is usually applied pre-planting in May by boom-spray, mistblower or aircraft. The field trials described here were designed to provide information on tolerance of radiata pine to increased levels of Vorox application both pre-planting and post-planting, so that treatment could be varied for particular situations. In addition, the trials were intended to provide comparative data on the yield and economic advantages of weed control. This paper reports first year results.

METHODS AND PROCEDURES

The treatments prescribed were as follows: Vorox AA at 1.1, 2.2, 4.4 and 8.8 kg/ha to be applied pre-planting and post-planting in each case, together with an untreated control and an additional treatment where the weeds were removed by hand chipping for a radius of about 0.6 m around each plant. The treated plot area in each case was 0.04 ha and there were three replicates of each treatment, laid out in a randomised block design. The experimental site had a particularly heavy sward of capeweed, Wimmera rye grass (*Lolium rigidum* Gaud.), oats (*Avena* spp.) and clovers (*Trifolium* spp.).

For the post-planting treatments, pines were planted in mid-June 1971 and sprayed the next day using a tractor-mounted boom-spray, no attempt being made to avoid the pine plants. All Vorox plots were sprayed that day and the pines for the pre-planting treatments were planted about 10 days later. It was necessary to carry out the hand chipping operation twice, in September and again in November.

A supplementary trial was also laid out late in October to determine whether very late spraying still offered any benefit and whether Vorox could damage pines in active growth. The chemical was applied at three levels, 2.2, 4.4, and 6.6 kg/ha, in three parallel strips approximately 20 m x 100 m.

In a normal growing season, spraying in October would probably be wasted, but the 1971-72 season was unusual in that rains persisted until late November and grass did not dry off until early December. From December to mid-April there was almost no effective rainfall. These were ideal conditions for demonstrating the survival value of competition control.

Two further factors complicated the results of the main experiment. Firstly, late germination of variegated thistle (*Silybum marianum* (L.) J. Gaertn) covered two plots completely and killed all the pines on them. To enable analysis of the data, mean values of height and survival percentage of the remaining two plots in each of the treatments concerned were substituted for the missing values. Secondly, rabbits entered the experimental area in spite of fencing and frequent poisoning in the vicinity with 1080 (sodium fluoracetate). Several plots were damaged by rabbits causing death of some plants and loss of parts of the stems of others. The net result of the rabbit activity was a reduction in the survival and mean height figures for the higher levels of Vorox and for the hand chipping. This is explained by the fact that the rabbits attacked the more easily found pines in open areas, rather than the pines amongst dense grass.

RESULTS AND DISCUSSION

The Main Experiment

All levels of Vorox from 2.2 kg/ha upwards achieved virtually complete kill of weeds. The lowest level, 1.1 kg/ha, was almost completely ineffective, causing only a temporary setback to the weeds.

All effective levels of Vorox and hand chipping had a beneficial effect on height growth at year 1 (Table 1), although only 4.4 and 8.8 kg/ha produced a statistically significant response.

TABLE 1

Mean Height (cm) of Pines at Year 1.

(Spraying carried out in June)

Control	Hand Chip		Vorox AA (kg/ha)			
			1.1	2.2	4.4	8.8
42.4	53.6	Pre-plant	43.2	54.0	57.7*	62.9**
		Post-plant	36.5	52.8	56.6*	55.3*

* Significantly different from control at P = 0.05

** Significantly different from control at P = 0.01

Table 1 does not, however, fully reflect the differences in development of the pines in the various treatments. The plants on all effective Vorox plots were much more bushy and a darker green colour than on the hand chipping plots and appeared to be in much better condition to resume vigorous growth in their second year (Figures 1, 2, 3). These differences may be due to improved availability of nitrogen.

FIGURE 1: *Unsprayed pines 12 months after planting.*

FIGURE 2: *Weeds removed by hand chipping twice during year 1.*

Vorox has been shown to improve soil nitrate status in Tasmania (de Boer 1970), probably through stimulation of nitrifying bacteria (Cvetkova 1966). Will (1971) has demonstrated increased branch development in *Pinus radiata* with improved nitrogen supply.

FIGURE 3: *Vorox AA applied at 4.4 kg/ha, 12 months previously.*

Table 1 indicates a small but consistent detrimental effect of post-planting application of Vorox on height growth of the pines, but the differences are of no statistical or practical significance. Apart from some slight needle chlorosis at levels of 4.4 kg/ha and higher, there were no adverse effects of the post-planting spraying operation.

Survival of the pines was dramatically improved by all effective Vorox treatments and by hand chipping (Table 2). Little importance should be attached to the differences between hand chipping and the higher levels of Vorox, since rabbit damage influenced the data. For all practical purposes there was no difference in survival between these treatments. The plant survival in the control and the ineffective 1.1 kg/ha Vorox treatment was, however, lower than was achieved elsewhere in the 1971 planting season; this was due to the particularly dense development of weeds on the experimental site.

TABLE 2

Mean Survival Percentage at Year 1

(Spraying carried out in June.
Analysis made on arcsin values)

Control	Hand Chip		Vorox AA (kg/ha)			
			1.1	2.2	4.4	8.8
19	55*	Pre-plant	22	64**	85**	73**
		Post-plant	9	65**	86**	72**

Asterisks have same connotation as in Table 1.

A further interesting aspect of the main experiment was the complete lack of residual effect of the Vorox (Figure 3), even when applied at 8.8 kg/ha. When the photographs were taken in July 1972, all previously bare Vorox plots carried a very dense growth of capeweed. This is in contrast to the results obtained by de Boer (op. cit.), where grass was effectively controlled for two years.

The Late Spraying Trial

Table 3 presents data from a total count of all trees on the sprayed strips and from a count of an equivalent total number of trees in the unsprayed area surrounding the strips. No height measurements were taken, but observation suggested a similar relationship to that shown in Table 1.

TABLE 3

Effect of Late Vorox Spraying (October) on Survival of *P. radiata* after 12 Months in the Field.

Level of Vorox Applied (kg/ha)	No. Trees Counted	Survival %
2.2	311	76
4.4.	361	77
6.6	325	74
Nil – control	1000	44

Survival in the strips treated with Vorox was very good, varying between 74 and 76 per cent, compared with 44 per cent where there was no spraying. These data are more typical of the results obtainable from competition control, as there was very little rabbit damage. Again, there was no adverse effect of the Vorox on the pines.

There was a strong residual effect of the Vorox from the October treatment. In July 1972 there was almost no regrowth of grass or capeweed, even where Vorox had been applied at only 2.2 kg/ha. Clearly, further work is required to determine the optimum timing of weedicide treatment.

LITERATURE CITED

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