

THE RELEASE OF *PINUS RADIATA* FROM BRACKEN WITH ASULAM

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SYNOPSIS

The herbicide asulam was evaluated, in a number of widely distributed trials, for releasing radiata pine seedlings from bracken. Following application to small plots, assessments over 18 months showed that asulam suppressed bracken sufficiently to allow the trees adequate growth in their first season after planting. Large-scale trials applying asulam by air confirmed that bracken can be adequately suppressed provided that treatment is applied at the correct stage of frond development — when fronds are partially unfurled in late spring-early summer. In no case was radiata pine damaged.

INTRODUCTION

The activity of the herbicide asulam against bracken (*Pteridium aquilinum*) was first reported by Holroyd *et al.* (1970). More recent work has shown that rates of asulam between 4.5 and 9.0 kg/ha give good long-term control in Britain lasting at least two years (Soper, 1972; Scragg *et al.*, 1972; Martin *et al.*, 1972).

Early in 1971 the author undertook a series of trials to find out whether asulam would control bracken (*P. aquilinum* var. *esculentum*) in New Zealand, either in the long term or, where applied to regrowth in spring-summer (after planting pines) in the short term. There are obvious advantages in obtaining long-term control by applying herbicides before planting, and results of trials to determine the value of asulam for this purpose have been published elsewhere (Wasmuth, 1973). Evaluation of asulam for short-term suppression of bracken has not previously been reported in detail.

METHODS

Phase 1: Small Plot Trials

Unreplicated plots of approximately 0.1 ha were established at six sites, four in the North Island and two in the South. Three of these sites had been planted in the winter preceding herbicide application with 1/0 *Pinus radiata* while at the fourth 1½/0 seedlings were also used. The two unplanted sites were examined purely for bracken response.

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Asulam was applied to partially unfurled bracken fronds during December 1971 at rates of 2.2, 4.5 and 9.0 kg/ha, in a volume of approximately 100 litres/ha of water, by motorized knapsack sprayer. At this stage bracken was not competing significantly with the trees. At six-monthly intervals thereafter, samples of trees were assessed to determine survival and height growth in both sprayed and unsprayed plots, the latter being controls in which bracken was hand-cut to release trees. At three-monthly intervals the effect of asulam on bracken was assessed by scoring on a six-point scale. During this period no further treatment was given.

Phase 2: Large-scale Aerial Applications

Commencing in November 1972, applications were made by air to twelve widely separated sites employing both helicopter and fixed-wing aircraft fitted with either conventional boom, or rotary atomizer spray equipment. One site was sprayed using a "Swathmaster". A standard rate of 5.6 kg/ha asulam was selected. This is 25% more than the rate found to be most effective in the small plot trials to allow for spray lost by evaporation, etc., when applied by air. This was applied

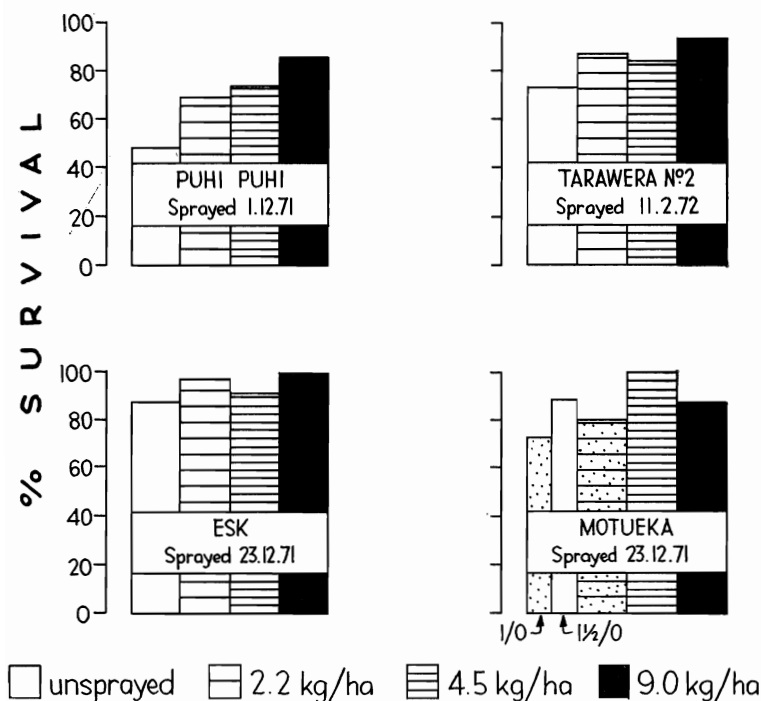


FIG. 1: Tree survival rates 1½ years after planting.

at all sites in a volume of water between 56 and 280 litres/ha. Plot size varied from 0.4 to 20.2 ha and at most sites a smaller area was double flown to assess tree tolerance at the double rate of herbicide.

RESULTS

Phase 1: Small Plot Trials

Tree survival rates and mean height measurements at 1 $\frac{3}{4}$ years after planting are seen in Figs. 1 and 2.

Scores for the suppressant effect of asulam on bracken are shown in Fig. 3.

Phase 2: Large-scale Aerial Applications

The score assessments of the degree of bracken suppression obtained at each site after 4 to 5 months are seen in Table 1.

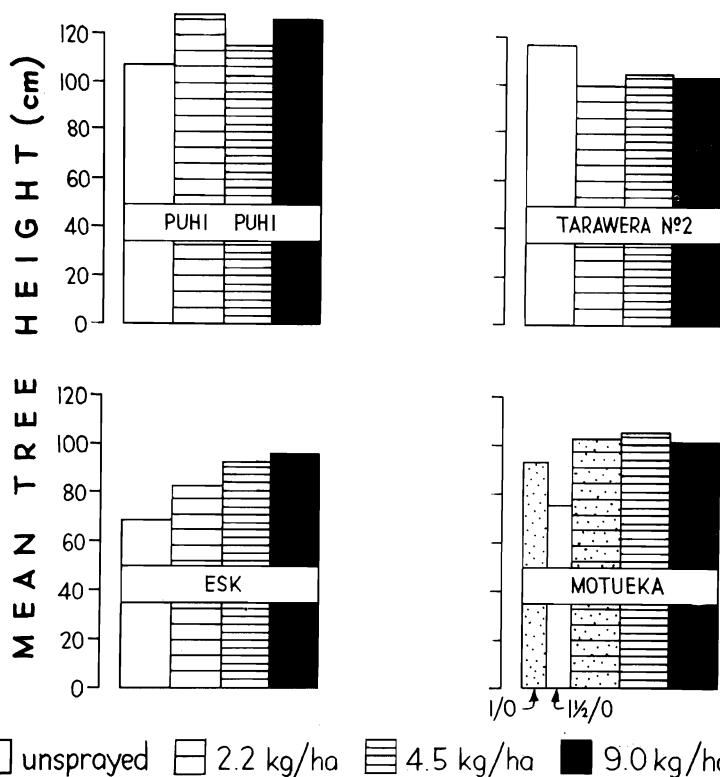


FIG. 2: Mean heights of asulam-released trees at 1 $\frac{3}{4}$ years after planting.

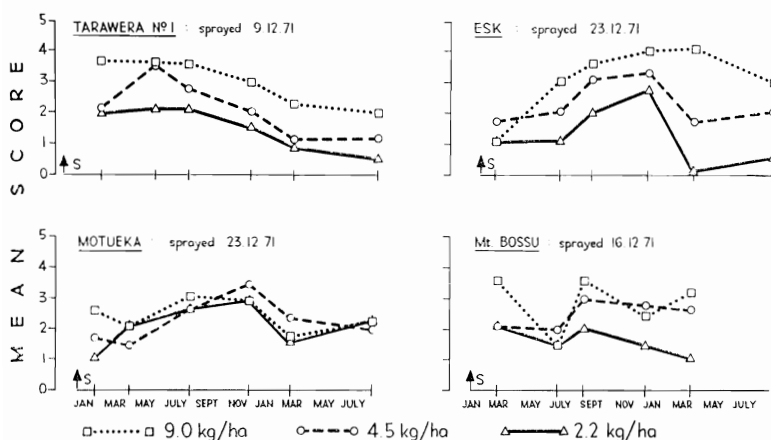


FIG. 3: The suppressant effect of asulam on bracken regrowth.

TABLE 1: SUPPRESSION OF BRACKEN REGROWTH 4 TO 5 MONTHS AFTER AERIAL APPLICATIONS OF ASULAM AT 5.6 kg/ha
Sites arranged according to date of application.

Site	Date of Application	Growth Stage at Application	Mean Score*
1972			
Tarawera	24 Nov.	Most fronds $\frac{1}{2}$ - $\frac{2}{3}$ unfurled	3.0
Rai	25 Nov.	Most fronds $\frac{1}{4}$ unfurled	4.0
Turingaturua	29 Nov.	Most fronds $\frac{1}{4}$ unfurled	4.0
Hira	1 Dec.	Most fronds $\frac{3}{4}$ unfurled	3.0
Otago Coast	5 Dec.	Most fronds $\frac{1}{2}$ - $\frac{3}{4}$ unfurled	4.0
Green Hill	11 Dec.	Most fronds $\frac{1}{2}$ - $\frac{3}{4}$ unfurled	3.5
Motueka	15 Dec.	Most fronds $\frac{3}{4}$ unfurled	3.0
Omatoroa	16 Dec.	Most fronds $\frac{2}{3}$ unfurled	3.5
1973			
Hunua	3 Jan.	85% of fronds fully unfurled	1.5
Glenbervie	4 Jan.	85% of fronds fully unfurled	1.5
Esk	9 Jan.	Most fronds fully unfurled	1.0
Tutakau	9 Jan.	Most fronds fully unfurled	0.5

*Mean score of several observers on 0 to 5 scale where 0 = no effect, 5 = complete kill of fronds.

DISCUSSION

Time and Method of Application

It should be noted that applications were made in a range of carrier volumes of water, the lowest being 56.00 litres/ha. All aircraft and spray equipment gave satisfactory results except for the "Swathmaster" employed at one site. This resulted in a typical banding effect due to uneven distribution of spray across the swath width. Detailed meteorological

of treatment. The low percentage survival at Puhipuhi was due to subsequent gorse growth.

It should also be noted that at Tarawera and Esk only one hand-release of the unsprayed controls was necessary, whereas at Puhipuhi and Motueka at least two hand-releasings were required.

No significant crop phytotoxicity was observed and the tolerance of radiata pine to asulam is illustrated in part by the tree height measurements. The quality of tree seedlings in plots treated with asulam was good, except that, at Puhipuhi and Esk, in the plots treated at 2.2 kg/ha (and in those released by hand), there was some etiolation.

Tree tolerance trials at the Forest Research Institute, Rotorua, have also established the tolerance of *Pinus radiata* to rates of asulam up to 9.0 kg/ha (C. G. R. Chavassee and N. A. Davenport, pers. comm.)

CONCLUSION

It is apparent that adequate short-term suppression of bracken can be achieved by applying asulam at the correct stage of bracken frond development to release radiata pine seedlings from competition during the first year after planting. It is thus a suitable substitute for hand-releasing. In cooler parts of the country, where radiata pine growth is rather slow (such as Canterbury and Southland) and where hand-releasing over two growing seasons is normally required, a further application of asulam may be needed in the second year.

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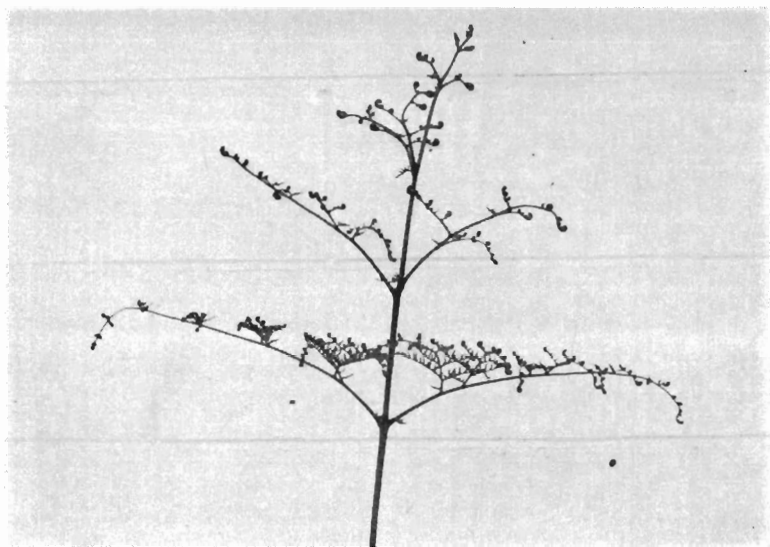


FIG. 4: *Bracken frond at optimum stage of development for releasing with asulam.*

records were kept both during and subsequent to application at each site and it was found that the asulam performed reliably under the general conditions associated with satisfactory air application of herbicides.

The most effective time of application for bracken releasing appears to be when the majority of the bracken fronds are partially unfurled and still soft, as is shown in Fig. 4. This normally occurs in the late November-early December period. The optimum stage of frond development for bracken releasing appears to be different from that for long-term bracken control. It has been found that, if long-term control is required, applications should be made to soft but fully expanded fronds (Wasmuth, 1973).

At four sites — *i.e.*, Glenbervie, Hunua, Tutukau and Esk — a low score was awarded. When the dates of application for these four sites are examined, it is noted that each was sprayed in January when the majority of the bracken fronds were fully unfurled; however, each of the eight successful applications was sprayed in the November-December period while the bracken fronds were still only partially unfurled.

Effect on Trees

It is clear, from survival assessments and growth measurements of young radiata pine over a period of 18 months, that asulam has controlled bracken sufficiently to release the trees from competition. The final stocking rate in treated plots exceeds 80%, with losses randomly distributed, which is quite acceptable. There appears to be little difference due to rates