The role of fire in boneseed (*Chrysanthemoides monilifera* (L.) Norlindh) control in bushland

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SUMMARY

Laboratory and field trials have shown that boneseed seeds can be stimulated to germinate by a heating treatment. Exposure to temperatures of 100°C for 30 seconds is sufficient to allow seeds contained within weathered endocarps to germinate. Where plots have been burnt and the subsequent seedlings killed, boneseed has been effectively removed from areas which previously had been heavily infested.

INTRODUCTION

Boneseed, a composite shrub introduced from South Africa as a garden plant, has become established in areas of native bushland in Victoria, New South Wales, South Australia, Western Australia and Tasmania. While boneseed has been proclaimed a noxious weed in Victoria, the control of infestations has been limited by access difficulties and the high labour requirement of cutting or grubbing plants. In addition, the establishment of seedlings up to 10 years after clearing leads to the re-occurrence of boneseed in treated areas.

The proclamation of boneseed as a noxious weed in Victoria in 1969 required a control procedure to be developed with constraints that were not inherent with the weeds of agriculture. The methods had to be specific to boneseed since non-target species could not easily be replaced if they were damaged. In addition, the recognized practice of establishing competitive species to suppress regrowth was not suitable as the communities which boneseed had invaded were to be allowed to return to the natural state after the control work.

Initially, areas of boneseed were treated by hand pulling smaller plants or cutting large bushes and painting the stumps with herbicide. Spraying with 2,4-D amine was effective but accessibility for spray equipment and the damage to native trees and shrubs limited the use of spraying. Small reserves and isolated infestations were kept clear of boneseed using these techniques, however, they were impractical for large infestations.

In 1973, an area of bushland on Arthurs Seat, which had been heavily infested with boneseed for a number of years, was burnt by a bushfire. Seedlings which established after the fire were removed from plots in 1974 (before they had flowered) to compare the regeneration of boneseed and native species following spraying or hand clearing. Between 1974 and 1977 no seedlings of boneseed established on the plots and no viable seed was found in the soil, which was sampled to a depth of 7 cm with a soil auger.

Because Australian plant species are considered to be well adapted to survive or regenerate after fire, burning appeared to offer a useful approach for the control of boneseed.

MATERIALS AND METHODS

Laboratory studies

Laboratory studies of boneseed germination were carried out on seed from two samples. The first was collected at the You Yangs immediately after the fruits had ripened and fallen to the ground. The seed coats of this sample had not weathered and there was no development of the three cracks which allows the coat to split open. Weathered fruits were collected at Arthurs Seat. Many seed coats of this sample had commenced to crack.

In the germination studies, seeds were placed on moist floc in glass petri dishes in germination cabinets at 25°C with 12 hour periods of alternating light and dark.

Field trials

The field plots were located at the You Yangs and Arthurs Seat in areas heavily infested with boneseed. The burns were carried out using a flame thrower and the soil temperature recorded at one site using copper-constantin thermocouples placed at the soil surface and at depths of 1, 2 and 5 cm.

RESULTS

Laboratory studies

For germination to occur, the seed coat had to be weathered. Although seeds removed from the seed coats of the You Yangs stock could germinate without any pre-treatment, intact fruits did not germinate after heating.

The temperature necessary to stimulate the germination of boneseed seeds contained within the seed coat was between 100 and 150° C. An exposure period of 30 seconds was sufficient for germination to occur. These temperatures corresponded with the field measurements where a maximum of 124°C was measured at the soil surface during burning.

Temperatures of 150°C killed the seed after an exposure period of 8 minutes while 250°C killed the seed in 2 minutes.

The effect of heating was not obvious from the experiments, however, it permits seeds contained within weathered seed coats to germinate. Without any heat treatment, only a small percentage of seeds germinate in either the laboratory or the field over a short period.

Field trials

The effect of burning was observed on the plots over a two-year period. At the You Yangs, the plots were located in an area where no native tree or shrub species were present and virtually no grasses or herbs had survived beneath the boneseed. After the burn, annual grass species and some herbs, particularly stinkwort (*Inula graveolens*), red ink plant (*Phytolacca octandra*) and scarlet pimpernel (*Anagallis*

arvensis) established with the boneseed seedlings. Over a period of time, scattered seedlings of *Acacia mearnsii, A. armata, A. pycnantha* and *A. myrtifolia* established. At Arthurs Seat, the plots were in *Eucalyptus viminalis* woodland. Grasses again established with the boneseed seedlings but the fire did not stimulate the germination of native tree or shrub species.

DISCUSSION

The complete germination of weathered boneseed seeds in the soil following fire offers an approach to the control of this weed in bushland. Use can be made of bushfires, or controlled burns can be planned. The advantages of using fire include the removal of established plants and improved access to an area to carry out seedling control the following year.

The correct timing of a controlled burn is important. If a cool burn is desired, the fruits must have been in the soil for about six months to have initiated cracking of the seed coat. If a burn is carried out in the summer or autumn, the current season's fruits will not be stimulated to germinate and a hotter fire, which will heat kill this seed, will be necessary to achieve satisfactory control.

Techniques are available for planning the intensity of a controlled burn (Anonymous, 1976). The moister fuel in spring and early summer should permit a cool burn to be carried out.

The acceptability of fire as part of a weed control program in bushland will depend, in part, on the degree of damage to the native species. From the studies of Christensen and Kimber (1975) and Prudie and Slatyer (1976) a cool burn would allow most species to survive through vegetative regrowth, with a return to the pre-burn floristic composition after two or more years. Seeds of the native species would be unlikely to germinate following a cool burn, greater numbers establishing as the intensity of the fire increases (Christensen and Kimber, 1975). Once the boneseed has been removed however, seedlings of the native species have a greater chance of survival so a slow restoration of the native community would occur after a control program.

Control of boneseed seedlings which establish after fire can be carried out by hand pulling or with herbicides. The low, dense cover of seedlings allows a good spray cover to be achieved and the spray can be directed away from established native plants.

Although the use of fire has many practical limitations, burning is currently used for fuel reduction in some areas. In parks and reserves with dense infestations of boneseed, fire appears to offer an acceptable approach to boneseed control.

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