

## NODDING THISTLE CONTROL: A BRIEF REVIEW OF PAST, PRESENT AND FUTURE PROGRAMS

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**Summary** Research on nodding thistle (*Carduus nutans* L. spp. *nutans*) control commenced in New South Wales in 1971.

Medd (1981) considered that although suitable control techniques were available, there had been limited success in restricting the weeds spread. Further herbicide trial research from 1983 to 1996 by NSW Agriculture has demonstrated the effectiveness of herbicides when applied under suitable conditions. Farmer experience has shown nodding thistle control requires an integrated weed management approach including the management of perennial pastures, herbicides, livestock grazing management and biological control agents.

### INTRODUCTION

Nodding thistle is a major pastoral weed of improved temperate pastures of New South Wales tablelands. In 1978 Medd (1981) found there were 50 000 km<sup>2</sup> infested with nodding thistle; approximately 3% of which was moderately to heavily infested. Medd (1981) predicted that nodding thistle would continue to spread and could infest areas to the east and west of its present distribution.

In 1978, Vere and Medd (1979) estimated nodding thistle cost New South Wales graziers \$A4 million annually in both lost production and cost of control.

Nodding thistle is a very competitive weed species. In New Zealand, Thompson *et al.* (1987) found nodding thistle infestations of 1000 plants per hectare reduced pasture herbage production by approximately 8%. Pastures weakened by thistle competition became very weedy.

### DISCUSSION

**Biology** Nodding thistle is an annual/biennial nitrophilous weed. It has an absolute requirement for vernalization before it can flower (Popay and Medd 1995). Most recruitment occurs in autumn and spring. Because of staggered recruitment, populations of nodding thistle contain mixed ages which consequently give rise to differing life cycles. These include winter and summer annuals, biennials and short lived perennials (Popay and Medd 1995).

The staggered germination and mixed populations pose a vexed question as to when to implement control; particularly if only one application of herbicide is

planned. However, a factor in favour of nodding thistle control is its soil fertility requirements (nitrophilous plant). Popay and Medd (1995) (Dellow personal observation) observed nodding thistle to commonly occur on basalt derived soils; these more fertile soils are consequently more conducive to perennial pasture improvement.

**Herbicides** In New South Wales there is a range of herbicides registered for nodding thistle control (Dellow 1995). However, one of the major factors affecting the efficacy of a herbicide is the time of application. This time of application is greatly dependent on the biology of the species. Popay and Medd (1995) observed that in the case of annual/biennials such as nodding thistle, a single application in spring was more effective than an autumn application due to winter vernalization. Plants emerging in spring remain vegetative until adequately vernalized during the following winter. Herbicide trials carried out in the Oberon district (Milne 1996) in spring 1995 demonstrated the efficacy of the relatively 'soft' herbicide MCPA (750 g a.i. ha<sup>-1</sup> applied October). The success of the control can be attributed to correct time of application, favourable seasonal conditions and correct herbicide choice. The results confirmed research conducted by NSW Agriculture on the Central and Northern Tablelands since 1983.

**Herbicide resistance** Continued use of herbicides leads to the threat of herbicide resistance. Nodding thistle herbicide resistance was reported in New Zealand in 1988 (Harrington *et al.* 1988). After 15 applications of the phenoxy herbicides, MCPA and 2,4-D, nodding thistle showed a 14 fold resistance to normal application rate. The consequence of herbicide resistance further emphasises the importance of implementing well planned integrated control programs and not relying on a single strategy such as herbicides for a sole control 'fix'.

**Livestock grazing** The technique of applying sub-lethal applications of phenoxy herbicides such as MCPA, 2,4-D amine and 2,4-DB in conjunction with heavy stocking rates of grazing livestock (sheep) has been a long accepted control method (Dellow 1995). The technique relies on grazing livestock to complete the control following the application of a sub-lethal herbicide rate. The

consequent non-target herbicide damage to the legume component of the pasture is minimized. The spray-graze technique is an important form of integrated control which does not have as wide an acceptance as it deserves. Currently, the technique is not registered for control of nodding thistle, although anecdotal evidence suggests the spray-graze technique would be effective. Continued research will investigate this technique for nodding thistle.

**Biological control** Currently the CSIRO Division of Entomology has a major project on the biological control of nodding thistle (Woodburn and Briese 1996). Since nodding thistle populations are solely dependent on seedling establishment for recruitment, the priority of the project is to limit seeding and ultimately reduce the soil seed bank. Currently, three biological control agents (insects) are being investigated on the tablelands of New South Wales.

Native plant pathogens are being investigated on a number of thistle species by NSW Agriculture (Cother *et al.* 1996) for application as a myco-herbicide. Preliminary investigations have isolated a number of fungi from diseased thistle species which may be effective in control.

The aspects of biological control are an important control strategy which require research to fit it into an overall control program.

#### CONCLUSION

One single control technique, such as herbicide application, is ineffective for long term control if not used with other control techniques and management strategies in an integrated program.

The philosophy of integrated weed control is generally little understood by many graziers and agricultural research and extension personnel. Many control programs are often unsuccessful because a single technique, such as herbicide application is used in isolation, without consideration of a long term integrated strategy.

This paper indicates that nodding thistle is a difficult weed to control because of its biology. However, because it occurs in locations and areas which are highly suitable for the establishment of competitive perennial temperate

pasture species, a strategy of perennial pasture improvement linked with all other aspects of control including herbicides, management of grazing livestock, and biological control agents needs to be further investigated and trialled.

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