HERBICIDES FOR THE CONTROL OF GOLDEN DODDER IN AMENITY AREAS

J.A. Crocker
Department of Agriculture, Northfield Research Laboratories, GPO Box 1671
Adelaide S.A. 5001

Summary. Germination trials were conducted using golden dodder, *Cuscuta campestris* seed collected from host plants killed by the application of a mixture of amitrole/ammonium thiocyanate plus diquat. Results indicated that the mixture does not significantly influence the germinability of mature golden dodder seed. The results of post-emergence herbicide screening trials indicated that glyphosate, clopyralid, diquat and metsulfuron are potentially useful chemicals for the control of golden dodder in amenity areas.

INTRODUCTION

Golden dodder is a parasitic weed which is thought to have been introduced into S.A. from North America around 50 years ago. Dodder grows as a tangled mass of thin filament-like stems which twine around suitable host plants and invade their vascular systems through numerous haustoria. Golden dodder has the potential to parasitize a wide range of crop plant species including broad beans (1), lettuce, onion, capsicum, potato, carrot, tomato, red beet, celery, clover, tobacco, lupin (G. Pritchard pers. comm. 1986) and at least 47 native and introduced plant species commonly observed on the banks of the Murray River and associated amenity areas (C.R. Alcock pers. comm. 1986).

Within S.A. golden dodder is presently confined to the Murray River flood-plain and irrigated land adjacent to the river from the Victorian border to Morgan. A great deal of concern has been expressed regarding the possiblity of dodder spreading beyond its present range to contaminate export quality lucerne hay and lucerne seed grown in the south east of the state.

Presently, golden dodder outbreaks within amenity areas and on the riverbank below Renmark (S.A.) are treated with a mixture of 1% (v/v) amitrole/ammonium thiocyanate + 0.1% (v/v) diquat. This mixture has proven to be very effective as a relatively inexpenive means of killing golden dodder by non-selectively removing parasitized host plants and associated vegetation.

This paper reports the results of experiments designed to detect the effect of the amitrole + diquat mixture on the germination of mature golden dodder seed, and summarizes the results of herbicide trials designed to identify chemicals for selective control of golden dodder in amenity areas.

METHODS

1. The effect of herbicides on seed germination. Mature golden dodder seeds were collected in the Renmark area in 1986 from plants growing on untreated native liquorice, *Glycyrrhiza acanthocarpa* and on native liquorice killed following routine spraying with the amitrole/ammonium thiocyanate + diquat mixture.

Dodder seeds were separated from other plant matter by passage through a series of graduated sieves. The seeds were then scarified in 98% sulphuric acid for 60 minutes, and were rinsed in copious quantities of water, removing the outer seed coat and any excess acid.

The scarified seeds were positioned in sterile petri dishes on moistened filter paper, then placed in a darkened incubator under a 12:12 hour,

30:20°C temperature regime. Germinated seeds were counted and removed from the petri dishes at 24 hour intervals.

2. Herbicide evaluation in amenity areas. Following the seed germination work, a screening programme was initiated to evaluate several herbicides for efficacy on pre-flowering dodder growing on a range of host plants at a site.

A series of 30 plots, each 9 m^2, were positioned over dodder-infested vegetation located above the seasonal high water mark of the Murray River. Treatments were applied through a CO_2 powered spray gun fitted with a single OC-12 spray nozzle, delivering 3.67 L/min. at 200 kPa. Each plot received 3 L of chemical solution applied evenly to run-off. All concentrations are expressed in terms of % w/v of the active ingredients. Ten herbicide mixtures were screened throughout the area with each treatment being replicated three times.

Treatments were applied when the dodder had formed a dense mat within the host vegetation just prior to flower initiation. Visual assessments were made at regular intervals for three months. A 1.0x0.5 m quadrat was harvested from within each treated plot and in untreated vegetation adjacent to each treatment plot (controls). Dodder seeds and stems were sorted from all vegetation samples. The sorted dodder and remaining vegetation were air dried and weighed individually, giving an estimate of the reduction in dodder growth following comparison with the control samples in each case.

RESULTS AND DISCUSSION

1. The effect of herbicides on seed germination. Analysis of the data indicates that an 'in situ' application of an amitrole plus diquat mixture to mature golden dodder seeds does not significantly effect their germinability. (Mean germinability of 10 replicates each with approx. 150 seeds; untreated 73.2%; treated 72.3%).

The amitrole plus diquat mixture effectively prevents golden dodder seed formation if it is applied prior to flowering. As it does not reduce dodder seed germination, the amitrole plus diquat mixture is best used to reduce the numbers of dodder seeds produced within a given season, with the eventual aim of depleting the seed-bank.

2. Herbicide evaluation in amenity areas. At the conclusion of the herbicide screening trial, all treatments except ethofumesate (0.1%) and carbetamide (0.1%) resulted in a near complete removal of dodder from the final harvest cut. Non-selective mixtures including 0.03% glyphosate in combination with either 0.1% clopyralid or 0.6% pendimethalin, and diquat (0.02%) in combination with 0.25% amitrole 0.06% pendimethalin or 0.1% clopyralid provided rapid knockdown with excellent dodder efficacy, however an unacceptable level of damage to the local flora was observed. Clopyralid at 0.19% selectively removed all Asteraceae and Fabaceae from the treated areas, restricting the availability of preferred host plants while having no visible effect on other vegetation.

A mixture of 0.02% diquat + 0.1% clopyralid provided a rapid knockdown effect in addition to selective control of regrowth favouring the re-establishment of grasses and *Cyperus* spp. Metsulfuron at 0.00063% provided a very promising level of control by halting dodder growth within 10 days causing the eventual die-back of stems commencing at the apical bud. This subsequently resulted in the complete eradication of dodder from the metsulfuron treated plots.

Research work will be undertaken during 1987 to further refine the application rates of promising chemicals, and to screen a selection of new mixtures for efficacy on golden dodder in amenity areas.

REFERENCES

1. Wolswinkel, P. 1973. Proc. Symp. Parasitic Weeds., Malt.