PRACTICAL METHODS FOR CONTROLLING HERBICIDE RESISTANT ANNUAL RYEGRASS, *LOLIUM RIGIDUM*

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Abstract. The occurrence of herbicide resistant biotypes of annual ryegrass, *Lolium rigidum*, across Southern Australia has increased markedly since the initial report in 1982 (1). Infestations are most frequently encountered in agricultural regimes with intensive cropping rotations, which involve frequent applications of herbicides that have similar modes of action. Resistant biotypes of annual ryegrass do not show resistance to the non-selective herbicides paraquat or glyphosate, but often display cross-resistance to a range of grass selective herbicides and other selective herbicides to which they had not been exposed (2). Consequently, post-emergent selective herbicidal control of resistant annual ryegrass in cereal and grain legume crops is difficult and crop production can become unprofitable due to excessive ryegrass competition

The appearance of herbicide resistant annual ryegrass means that control will therefore depend upon an integrated approach (Integrated Weed Management) to reduce the population. Such a program may involve stimulation of germination by cultivation and weed control by non-selective herbicide application prior to crop establishment. Other aspects of Integrated Weed Management include cutting or herbicide application at anthesis to minimize seed-set, (spray topping or hay freezing) or high grazing pressure by sheep in the pasture phase to minimize the seed burden entering the soil. Burning grass or crop residue may also reduce weed seed numbers.

Cessation of herbicide application will stabilize, but may not reduce the level of resistance of the population. Prevention of seed-set for a number of years, will reduce the seed population in the soil to a very low level. Unless total elimination of resistant ryegrass seed from the soil can be achieved, it can be anticipated that the frequency of herbicide resistant ryegrass will again rapidly increase upon resumption of cropping.

The re-introduction of susceptible ryegrass to the infested area may provide the best option for control of herbicide resistant ryegrass. Mortality of resistant plants by density dependent competition due to the difference in fitness between susceptible and resistant biotypes may reduce the frequency of resistant plants. Also the "dilution" of resistance genes in the population by greater numbers of susceptibles and the reduction of the level of resistance by interbreeding, are all of potential benefit in the control of resistant ryegrass. The replacement of resistant ryegrass by susceptible ryegrass will allow normal weed control techniques to be utilized again, thus enabling a return to normal land use.

An experiment to test the above hypothesis was established in 1989. A replicated random block design field experiment with a constant population of 50 resistant ryegrass seeds per sq. metre and various rates of susceptible ryegrass was set up at a site adjacent to fields infested with resistant ryegrass. The ratios of resistant to susceptible ryegrass established were 1:0, 1:1, 1:10, 1:100, 1:500. The results from the first year will be presented and the likely outcome for control of resistance will be discussed.

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