An experimental approach to study fitness penalty in trifluralin resistant biotypes of *Lolium rigidum*

Benjamin J. Fleet1,3, Gurjeet S. Gill1,3, Christopher Preston2,3 and David R. Coventry1
1The University of Adelaide, Roseworthy Campus, Roseworthy, South Australia 5371, Australia
2The University of Adelaide, Waite Campus, PMB 1, Glen Osmond, South Australia 5064, Australia
3CRC for Australian Weed Management, PMB 1 Glen Osmond, South Australia 5064, Australia

Summary Mutations conferring herbicide resistance may result in a fitness penalty in resistant (R) individuals in weed populations. Previous studies have often assessed fitness by comparing growth and reproduction in different resistant and susceptible (S) populations. However, background genetic differences between the populations could influence the conclusions drawn from such studies. This problem could be overcome if R and S biotypes could be identified within the same population (Vila-Aiub et al. 2005). A methodology based on cloning and screening the clones for resistance to trifluralin using a root bioassay has been developed. The methodology combines the cloning concept used by Vila-Aiub et al. (2005) with a dinitroaniline resistance screening technique used in goosegrass (*Eleusine indica* (L.) Gaertn.) by Zeng and Baird (1997). The method allows S clones unexposed to the herbicide to grow and produce seed.

A number of annual ryegrass (*Lolium rigidum* Gaudin) plants from a known trifluralin resistant population were propagated and allowed to tiller. Five clones from each plant were placed in a different concentration of trifluralin in agar (0.6% w/v). Measurement of root growth of the clones allowed determination of the dose response for each individual plant as indicated in Figure 1. Based on this study, trifluralin at 0.08 mg L⁻¹ agar was chosen as the concentration that could select S individuals in annual ryegrass populations. Plants showing ≥80% inhibition in root growth at trifluralin rate of 0.08 mg L⁻¹ were classified as S. At this herbicide concentration, in one of the studies, inhibition in root growth of R individuals was only 10%. Using this technique, S plants (16%) were identified from SLR31 and another recently confirmed trifluralin resistant annual ryegrass population.

Plants that were identified as either S or R have been crossed within types and seed collected. These S and R lines will be used for fitness studies in the field.

**Keywords** Fitness penalty, trifluralin, herbicide resistance, cloning, screening.

REFERENCES