Preliminary investigations of the effect of pollen competition on gene flow in the wind pollinated species annual ryegrass (*Lolium rigidum* Gaud.)

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Summary Annual ryegrass (*Lolium rigidum* Gaud.) is a serious weed in southern Australian cropping, infesting all crops. Annual ryegrass is a wind pollinated, outcrossing species and essential data on pollen movement and gene flow is required in order to understand the risks associated with the dispersal of herbicide resistance genes carried by pollen among populations of annual ryegrass.

Gene flow is affected by the distance between the donor and acceptor plants and the density of acceptor plants (Rognli *et al.* 2000, Watrud *et al.* 2004), but little work on annual ryegrass has been undertaken. This preliminary study examines the effect of the density of acceptor plants on the gene flow between biotypes susceptible and resistant to aryloxyphenoxypropanoate herbicides.

A replicated experiment examined four treatments in which a single resistant *L. rigidum* biotype was placed in immediate proximity to 1, 5, 10, or 20 susceptible plants. Treatments were isolated from each other by a minimum of 5 m. Seed from the susceptible plants was harvested and planted on seedling trays. Seedling numbers were counted prior to spraying with field rate of fluazifop-p-butyl. Surviving seedlings were counted 14 days after spraying and trays were re-sprayed to ensure survivors were resistant to the herbicide.

As the number of susceptible acceptor plants in proximity to a single resistant plant increased the level of gene flow from the single resistant plant decreased rapidly (Figure 1). The relationship best describing this was:

\[ \text{% survival} = 148.4 \times \exp(-0.77 \times \text{no. of susceptible plants}) \]

This indicates that weed patches containing at least six susceptible plants in close proximity to each other can effectively flood the area with enough pollen to reduce gene flow from a single resistant plant to extremely low levels.

Additional studies are underway to determine the effect of fewer susceptible plants in association with a resistant plant on gene flow. The influence of increasing the number of resistant plants in small patches of susceptible plants on gene flow will also be investigated. Information to determine the extent to which introgression of resistance genes will occur and whether this will influence the ecological fitness of progeny is also being determined. The data will be used to create a risk assessment model for gene flow in a wind pollinated outcrossing grass species.

Keywords *Lolium rigidum*, pollen competition, gene flow, herbicide resistance, plant density.

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REFERENCES
