Drought stress elicits heritable herbicide resistance in the grass weed

Alopecurus myosuroides (blackgrass)

Vian H. Mohammad, Colin P. Osborne & Robert P. Freckleton

Department of Animal and Plant Sciences, University of Sheffield, Sheffield, S10 2TN, UK
Objectives

- whether exposure to stresses such as drought tends to promote the evolution of herbicide resistance;

- how rapidly herbicide resistance can be selected in populations with different exposure histories; and

- whether such evolution is mediated through inherited genetic change or via non-genetic mechanisms.
**Drought stress experiment**

- Alopecurus myosuroides
  - Five different populations
  - Seeds of all populations planted
  - Plants exposed to different levels of drought stress (30DAG): None, Medium drought, High drought
  - Growth and survival recorded
  - Seeds of first generation collected

**Herbicide treatment experiment**

- Seeds of first generation of droughted parental plants planted
  - Plants exposed to a dose of fenoxaprop-p-ethyl herbicide (at 3-4 tiller stage)
    - Lethal dose: 40 g a.i. h⁻¹
    - Sublethal dose: 20 g a.i. h⁻¹
  - 4 weeks after the herbicide application: survival, damaged, and dead plants recorded
Results

Alopecurus myosuroides (blackgrass)

- Drought stress led to herbicide resistance in black grass.
- Resistance was heritable and evolved in a single generation.