PHOTOPERIOD CONTROL OF REPRODUCTIVE BIOLOGY IN WILD OATS (*AVENA FATUA* L.)

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Abstract. The success of the wild oat (*A. fatua*) as a major weed of most cereal growing areas of the world is largely due to its ability to accumulate large banks of dormant seeds within the soil. Sporadic germination over a period of a few days to several years, results in the need for annual control. Present control methods are based on the use of pre- and post-emergence herbicides.

A new and cheaper method of control would be one which depletes the large seed bank and eradicates the weed problem in just one season. For such a method to be developed a good understanding of seed dormancy and how the parent plant environment can control reproductive biology is required. Research is underway at a number of overseas laboratories into the effects of temperature and soil water level on dormancy and seed production. These studies are using isogenic wild oat lines produced by single seed descent. However, to date little research has been undertaken on the role of light in the control of dormancy development and other aspects of the reproductive biology of *A. fatua*.

An examination of how photoperiod can influence the reproductive biology of a range of isogenic lines with know differences in primary dormancy is underway at the University of Queensland. Plants from these isogenic lines have been grown in a series of controlled-environment growth cabinets under photoperiods of 12, 14, 16, 18 hours.

The photoperiod experienced by the parent plant was found to control many aspects of plant phenology, seed production and seed dormancy. All of the isogenic lines studied were found to be facultative long day plants with a reduction in time to floral initiation and anthesis under long days (greater than 16 hours). This reduction in development time was associated with an increase in seed production, seed size and seed water content and a reduction in plant height and seed dormancy. However a great deal of variation existed amongst the isogenic lines. For example, those isogenic lines which are genetically programmed for low seed dormancy were less photoperiod sensitive than those which were genetically programmed for deep dormancy.

These results suggest that the wild oat lines studied (from the northern hemisphere) are best adapted to flower and reproduce in good growing environments with long days (summer season). Any movement of seed from this environment to a growing environment of shorter photoperiods (winter season) will require a shift in the photoperiod sensitivity of the population before the weed will become widespread in this new environment. The variation in photosensitivity amongst the isogenic lines studied may allow a natural population to produce seeds throughout the course of the growing season. Thus, allowing the natural population to escape some of the agronomic practices used to eradicate the weed.