

Influence of photoperiod during seed development on duration of seed dormancy in *Avena fatua* L.

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Previous studies of *Avena fatua* populations have demonstrated that a wide range of variability in duration of seed dormancy commonly exists in natural populations. Estimates of heritability have shown that about half of this variability is due to genetic heterogeneity (Jana and Naylor 1980) and half reflects phenotypic plasticity induced by diverse environmental causes. In an effort to achieve a better understanding of the control of germination behaviour of field populations, we have investigated the extent to which the dormancy phenotype can be influenced by particular components of the environment. We have found previously that temperature experienced by maternal plants during growth strongly affects the expression of seed dormancy (Adkins *et al.* 1987), while similar responses to soil moisture have also been described (Sawhney and Naylor 1980). In the present study, we have investigated the response to photoperiod, another highly variable component in the natural range of this plant species.

Plants from 10 genetically pure lines of *Avena fatua* from a wide range of latitudes, Tasmania to Central Queensland, were grown in environmental chambers under photoperiods of 10, 14 and 16 hours (20°C). All lines were facultative long day plants flowering earliest under the longest photoperiod. The shorter life cycle at 16 h photoperiod was associated with a reduction in plant height, seed production and in the duration of primary seed dormancy and an increase in tiller number and seed size. Some variation was shown in the photoperiod sensitivity between Central Queensland and Southern latitude lines (eg. Tasmania) in both aspects of phenology and the duration of primary seed dormancy. Those lines from southern latitudes take longer to flower under short photoperiods (10 h) than lines from Central Queensland. The maternal photoperiod influenced the duration of seed dormancy in all lines except the Tasmanian line.

It is concluded that populations of *Avena fatua* are adapted to flower and produce seeds under local photoperiod regimes. In any one population there is a range in photoperiod sensitivity so seed will be produced throughout the growing season. The changing photoperiod experienced by the plant through the season may influence not only the plant habit and seed production but, in the majority of cases, the duration of primary seed dormancy.

References

- Jana, S. & Naylor J.M. 1980. *Can. J. Bot.* 58:91-93.
Adkins, S.W., Loewen M. & Symons, S.J. 1987. *Weed Sci.* 35:169-172.
Sawhney, R. & Naylor, J.M. 1980. *Can. J. Bot.* 57:59-63.