Validating the factors affecting clodinafop efficacy

Todd S. Andrews¹, Richard W. Medd¹, Remy van de Ven and David I. Pickering¹
Orange Agricultural Institute, Forest Road, Orange, New South Wales 2800, Australia
¹CRC for Australian Weed Management

Summary Previous analysis of industry data suggested that clodinafop efficacy on wild oat (Avena spp.) in wheat was affected by a number of quantifiable factors (Medd et al. 2001). Environmental variables that affected clodinafop efficacy included overnight minimum temperatures prior to spraying, maximum temperatures on the day of spraying and soil moisture levels. Surprisingly, this research also indicated that wild oat density and growth stage did not affect efficacy, but that spray water volume was an important factor, and interacted with temperature.

Field research to validate this model was conducted throughout the cropping regions of New South Wales in 2003. Experiments were undertaken where clodinafop was applied to wild oat infestations on six occasions at four contrasting localities. On each occasion, the herbicide was applied at four dose rates (8, 16, 21 and 32 g a.i. ha⁻¹) and in three water volumes (25, 50 and 100 L ha⁻¹). Efficacy was assessed in terms of plant mortality approximately 30 days after herbicide application and wild oat panicle density, counted around anthesis. Automated weather stations collected a comprehensive set of soil and weather data at each site. These data, along with other measurements such as wild oat leaf extension rates at the time of spraying, have been analysed across each spray time and location using multi-site mixed model statistical techniques.

Due to the dry early season conditions at each of the trial sites in 2003, planting was delayed and the colder temperatures often associated with applying post-emergent herbicides were generally not encountered. Nonetheless, results confirmed some findings of the previous research. For example, soil moisture and temperatures around the time of spraying were important factors in determining clodinafop efficacy. Wild oat densities, which varied from 50 to 1000 plants m⁻², and growth stage, which varied from Z12 to Z28, were confirmed to have no impact on efficacy. Conversely, the field trials did not support the original findings of spray water volume effects or a maximum temperature × water volume interaction, although some ambiguous effects were observed under less favourable weather conditions.

To enhance the data set, further research will be conducted in 2004, with a view to targeting additional adverse conditions of cool temperatures and soil moisture deficits. The aim of this project is to develop a functional model of the environmental effects on herbicide efficacy. This would enable advisors and users to identify the clodinafop dose needed to provide acceptable wild oat control under prevailing weather conditions and to avoid applying herbicides in adverse weather conditions. We see this work with clodinafop as a case study that will establish principles of field based factor adjustment that, after product specific analysis, could be extended to other herbicides to improve their efficiency of use.

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REFERENCES