

## Cover cropping as a weed management tool in southern Australian farming systems

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**Summary** Control options are limited for weeds developing herbicide resistance. Alternative management strategies are needed for improved control.

A cover crop is defined as a crop grown to provide soil cover and to prevent soil erosion, regardless of whether it is later incorporated. Cover crops have been shown to possess multiple benefits to farming systems as a result of protecting soil from erosion, increasing water infiltration, improving soil structure and fertility, contributing to carbon sequestration and improving soil health (Yenish *et al.* 1996, Sainju and Singh 1997). Cover crops can also immobilise available nitrogen after harvest and reduce the amount of nitrogen leached (Brandi-Dohrn *et al.* 1997). Cover crops have been extensively studied for weed management in North America, but such information is scarce in Australia.

Cover crops have potential impact on weeds through competition, physical suppression, chemical suppression via allelopathy, and improved soil biological activity. Cover crops suppress weeds during the growing season by competing for light, moisture and nutrients. Mulching of cover crop residue can also smother weeds. Cover crops reduce soil temperature and light transmission to the soil surface, resulting in slowed or reduced emergence of weeds (Teasdale *et al.* 1991, Teasdale and Mohler 1993). Allelochemicals released by the cover crop may impose a continuous 'chemical stress' on weeds. For example, DIBOA (2,4-dihydroxy-1,4-benzoxazin-3(4H)-one) an allelochemical isolated from the cover crop rye (*Secale cereale* L.) suppresses a range of weed species (Barnes and Putnam 1987). Enhanced soil biological activity may increase seed predation and seed loss, thereby accelerating the seedbank decline.

Research from the northern hemisphere has predominantly focused on the weed suppressive effects of a short-term cover crop in winter prior to summer cropping, such as corn (*Zea mays* L.) (Johnson *et al.* 1993), cotton (*Gossypium hirsutum* L.) (Varco *et al.* 1999) or soybean (*Glycine max* L.) (Ateh and Doll 1996). This cropping system involving cover crops in winter followed by summer crops is applicable to the northern grain region of Australia. However, the feasibility of

introducing cover cropping into the southern farming systems deserves further investigation. In addition to the cost associated with cover crops (seed, planting and desiccation or mechanical kill), sacrifice of a growing season and associated income could discourage adoption by growers unless compensated by increased yield of the following crop, reduced herbicide costs as well as other environmental benefits. It is not clear if a dual-purpose cover crop can be grown in the southern cropping region. The vigorous growth of cover crops could potentially be cut for hay or silage and allows sufficient re-growth to provide the normal cover crop functions, including weed suppression.

Overseas research has shown the inconsistency in weed suppression by various cover crops (Teasdale and Mohler 1993). In general, cover crop alone does not provide sufficient weed control. Herbicides used at a 'below-label' rate in cover crops have been used to improve the consistency of weed control (Burgos and Talbert 1996).

Our current research is evaluating the suitability of cover cropping for southern Australian farming systems and their impact on weed population dynamics. The research is: a) to determine if cover cropping is a viable weed management option and provide yield benefit to the following crop; b) to identify the most suitable cover crop in this southern region; and c) to determine if cover cropping improves seed predation activities. A range of different winter species, including cereals, legumes, brassicas alone and in mixtures, are being assessed for their suppressive effects on weeds. Different cover crop management options will be compared, such as cutting for hay or silage, mulching. Long-term trials are currently being conducted at Wellington and Yanco Agricultural Institute across multiple years. Experimental data are being collected on cover crop biomass, weed emergence and biomass, weed seed predators, soil moisture prior to the sowing of the following wheat crop, wheat emergence and yield. Detailed research results will be reported in the near future once the experiments are completed.

**Keywords** Cover crop, weed suppression, soil moisture conservation.

ACKNOWLEDGMENTS

The authors wish to thank the Grains Research and Development Corporation of Australia for the financial support for this research.

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