Low chemical input for weed management in stubble retention farming systems of south eastern Australia

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Summary Low disturbance and stubble retention cropping systems offer benefits of improved soil quality, conservation of soil moisture, sometimes enhanced crop yields, and reduced soil erosion. It is probable that stubble retention will increase in the future as burning becomes less acceptable, especially close to towns. Most farmers want to reduce tillage and herbicide inputs. However, there are fears that herbicide dependence will increase, especially when stubble is retained, leading to acceleration in the selection for herbicide resistance.

The move toward reduced tillage has also allowed previously minor weeds such as brome grass (Bromus spp.), small flowered mallow (Malva parviflora L.), prickly lettuce (Lactuca serriola L.) and silver grass (Vulpia bromoides L.) to become more common creating new challenges for farmers. The move to wider row spacing for stubble handling and the increased reliance on herbicides means farmers need to look at non-chemical alternatives for problem weed control.

An experiment at the Wagga Wagga Agricultural Institute in southern New South Wales was conducted on a red-brown earth. In 2000, Janz wheat was grown over the whole experimental area. The site was surveyed for weeds during the 2000 growing season, and was uniformly infested with diclofop-resistant annual ryegrass, and patches of wild radish and wild oats, as well as a wider range of minor weeds. The wheat yielded 6 t ha\(^{-1}\) at 12% protein. The stubble was mulched using a Mason Stubble Mulcher in early 2001. The plots were marked out prior to sowing in early 2001 and these were 9 m wide × 40 m long.

In 2001, annual ryegrass numbers were reduced from 120 plants m\(^{-2}\) to less than 20 plants m\(^{-2}\). A two pronged approach to resistant annual ryegrass combining strategic burning with brown manuring was a cost-effective method of reducing annual ryegrass. Brown manuring of low input plots with 2 L ha\(^{-1}\) of glyphosate sterilized weed seeds and prevented addition to the weed seedbank. The brown manured plots were cut and the forage removed from the plots. This is producing a shift toward wild oats (Avena fatua L.).

The adoption of Integrated Weed Management (IWM) strategies such as brown manuring combined with forage removal has reduced the weed seedbank especially after the first year.

Problem weeds such as wild radish (Raphanus raphanistrum L.) and fumitory (Fumaria spp.) were more prevalent in narrow row treatments and are emerging within the crop row in the wider row spacing. This suggests that soil disturbance is a trigger for these weeds. Weed biomass was lowest in the normal herbicide treatments with little impact on herbicide efficacy from retained stubble.

Crop establishment showed no impact from the retained stubble except in canola treatments where large stubble loads from previous wheat crops reduced seedling emergence. Stubble retention had no impact on yields in all crops across all seasons due to dry conditions which produced low yielding crops.

A strategic stubble burn has the potential to significantly reduce the weed seedbank of problem weeds such as annual ryegrass, (Lolium rigidum Gaud.) By combining low input weed control measures such as forage removal with conservation farming practices viable economic returns can still be achieved, without impacting on the long term sustainability of weed management.

Keywords Stubble retention, reduced tillage, IWM.

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REFERENCES