Herbicide efficacy in retained stubble systems

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Background

The GRDC Maintaining profitable farming systems with retained stubble - upper Eyre Peninsula project aims to improve farm profitability while retaining stubble in farming systems on upper Eyre Peninsula (EP). Weed control in stubble retained systems can be compromised when stubbles and organic residues intercept the herbicide and prevent it from reaching the desired target, or the herbicide is tightly bound to organic matter. Reduced herbicide efficacy in the presence of higher stubble loads is a particular issue for pre-emergence herbicides. Current farming practices have also changed weed behaviour with a shift in dormancy in barley grass genotypes now confirmed in many paddocks on Minnipa Agricultural Centre (MAC) (B Fleet, EPFS Summary 2011, p 177). As a part of the stubble project this trial was undertaken to assess herbicide efficacy in different stubble management systems

Why was the project done?

To understand how herbicides preform it is important to know the properties of the herbicide, the soil type and how the herbicide is broken down in the environment. The availability of a herbicide is an interaction between the solubility of a herbicide, how tightly it is bound to soil particles and organic matter, soil structure, cation exchange capacity and pH, herbicide volatility, soil water content and the rate of herbicide applied (Congreve and Cameron, 2014).

Stubble, existing weed cover and crop cover (for post sowing applications) in a zero or minimal till system will intercept some of the herbicide before it reaches the soil. The amount of herbicide intercepted will be proportionate to the percentage of ground cover. Interception can have two negative effects; herbicide can be tied up on the stubble or in the canopy and will not be available for weed control; and it can lead to uneven coverage on the soil surface lowering herbicide effectiveness and increasing potential weed escapes (Congreve and Cameron, 2014).

The paddock S7 was sown to Mace wheat on the 10 May 2014 and yielded 3.2 t/ha with 9.1% protein. Two different wheat stubble management strategies were implemented at harvest with traditional spread stubble and harvest windrows. The third stubble management strategy was implemented on 15 April 2015 with total stubble removal by burning and the harvest windrows within the trial area were also burnt on the same day.

The fifteen chemical treatments, mostly pre-emergent (applied on the 11 and 12 May) and some post emergent were individually mixed in small pressure containers and applied using a shrouded boom spray at 100 L/ha of water. Treatments included different rates and mixes of Trifluralin, Metribuzin, Diuron, Avadex, Monza, Sukura and Boxer Gold. The trial was sown with Mace wheat @ 60 kg/ha and DAP @ 60 kg/ha on 11-12 May in dry seeding conditions.

When choosing the most appropriate pre-emergent herbicide for use in stubble retained systems, it is important to consider;

- the likely rainfall pattern and soil moisture conditions post application,
- the susceptibility of the crop to the herbicide
- the position of the weed and crop seeds in the soil profile
- the mobility of the herbicide in soil water,
- and the persistence of the herbicide activity relative to the germination pattern of the target weeds.

Key Messages

- In 2015 the drier start to the season and low soil moisture resulted in lower herbicide efficacy and less chemical damage than expected
- In different stubble management systems, the activity and resulting weed control of specific herbicides will be influenced by the solubility index (movement through the soil profile with rainfall events) of that herbicide. Soil texture and soil chemical properties can affect chemical movement and availability in the soil profile
- Herbicide performance will vary seasonally due to soil moisture levels, rainfall pattern post application, timing of weed germination, position and number of weed seeds in the profile, etc. Understanding how the various herbicides work can reduce the likelihood of failures
- Herbicides are only one tool for weed control – always adopt an integrated weed control package that includes non-chemical control, and where possible, consecutive seasons of total weed control
- Consider the whole farming systems when making chemical decisions as the impact may last for several seasons (e.g. effects on medic germination and medic seed bank).

References

GRDC Pre-emergent herbicide Manual, M Congreve and J Cameron, 2014

Acknowledgements

GRDC Maintaining profitable farming systems with retained stubble - upper Eyre Peninsula.
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