

# Disc Seeding Systems & Pre-emergent Herbicides



Disc seeding system design and settings influence pre-emergent herbicide behaviour and can play a critical role in minimising crop damage.

Ideal set-up of disc seeding systems, to maximise weed control with pre-emergent herbicides whilst minimising crop damage, requires an understanding of how the products interact with the crop and the distribution of weed seeds in the seedbank, as well as knowledge of soil type, likely rainfall and surface residues. Using pre-emergent herbicides is not cut-and-dry!

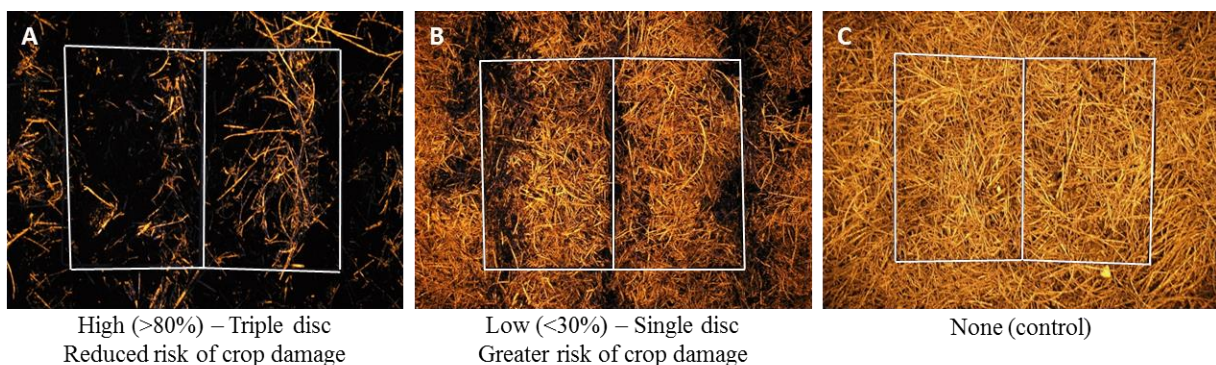
## Key Messages

- Pre-emergent herbicides need to be located at or below the weed seed, in close proximity
- Soil disturbance that removes herbicide from above the crop seed will improve crop safety
- Triple disc systems are safer than single disc systems
- Residue managers increase crop safety
- More crop damage is likely on lighter soils

Disc seeders enable growers with high stubble loads to either maintain or even narrow their crop row spacing. Disc seeder setups and their operation directly influence the extent and type of soil throw generated, which alters the risk of pre-emergent herbicide damage to crops. With low disturbance disc openers, reliable separation between seed and herbicide can be difficult and may lead to crop damage, whilst at other times compromise weed control.

## Triple discs are safer than single discs, mostly thanks to the rippled coulter

Research has shown that pre-emergent herbicides were consistently safer under triple rather than single disc systems, where sufficient soil throw and herbicide displacement were obtained from the leading coulter.



**These images show that the amount of soil surface incorporation and disturbance differs greatly between triple (A) and single disc systems alone (B).** The ground was sprayed with fluorescent pigment (blaze orange) to mimic pre-emergent herbicide application and was seeded with either a triple or single disc system, or left untouched (C: control). The fluorescent pigment viewed under UV light reveals the extent of soil surface disturbance of 3 crop rows, which are spaced 25cm apart and separated by adjacent quadrants (outlined; 25 x 40 cm in size).

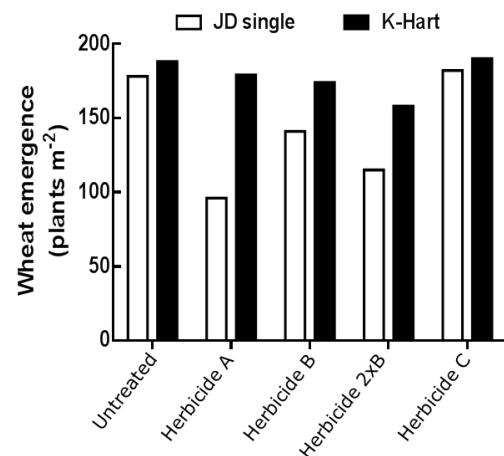
**Closing the seed furrow and achieving adequate seeding depth are critical for improved crop safety, particularly for water-soluble herbicides, which are more likely to wash and concentrate in an open seed furrow after rain.**



*KHart* triple disc opener with *Yetter 25* wave coulter (1): high surface disturbance at speed allows excellent incorporation of soil applied herbicides and lowers the risk of crop damage.

*John Deere* 90series single disc opener (2): low surface disturbance can mean poor incorporation of pre-emergent herbicides (especially volatile products) and a higher risk of crop damage.

Leading coulters can also limit the potential for stubble hairpinning; where the disc opener pushes in the residue rather than cutting through it, which risks placing germinating seeds in direct contact with herbicide treated residue and soil.



## Getting pre-emergent herbicides right

Herbicide behaviour can vary greatly between diverse environments and factors such as water solubility, binding affinity, volatility, sunlight degradation, weed uptake and longevity of herbicide persistence can all influence herbicide performance.

The following guidelines apply:

- Soils with low organic matter are more prone to crop damage
- The more water-soluble herbicides will move more readily through the soil profile
- Pre-emergent herbicides need to be located close to the weed seed for best results
- High crop residue loads on the soil surface can reduce herbicide efficacy
- Moisture is required for chemical activity
- Physical separation of the herbicide from the crop seed is essential

Pre-emergent herbicide incorporation into soil is required to maximise efficacy. Incorporation by mechanical means is most common, which typically occurs during sowing and involves the displacement and throwing of top soil over the herbicide band. Rain can adequately incorporate more soluble herbicides. Whatever the means of incorporation, physical separation of pre-emergent herbicides from crop seed is essential to avoid crop damage.

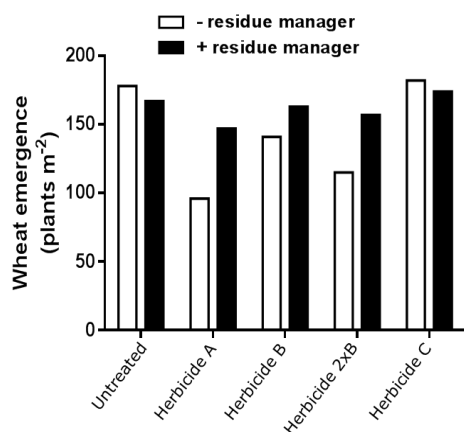
## Soil disturbance is often beneficial – but don't bring crop seed & herbicide into contact!

Care needs to be taken with product choice and set-up of disc seeding equipment, to maintain adequate seeding depth and furrow closure. Product labels will indicate if registration is not valid for disc seeders. The behaviour of pre-emergent herbicides from both a crop safety and weed control perspective can vary considerably depending on the seeding equipment used and the level and type of soil disturbance it creates.



## Residue managers increase safety

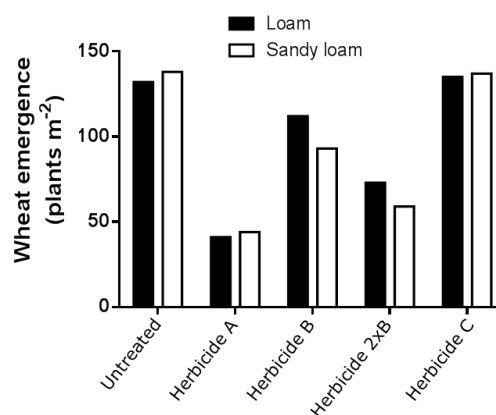
Use of residue managers fitted in front of single disc openers can significantly improve crop safety. Residue managers sweep ahead of the disc opener and displace both herbicide treated residue and soil, thereby limiting the interaction between the disc blade and/or closing furrow wheel, so reducing interaction between the herbicide and crop seed to improve crop safety. Crop damage is more likely to occur if herbicide is concentrated in close proximity to crop seed.



## More damage likely on lighter soils

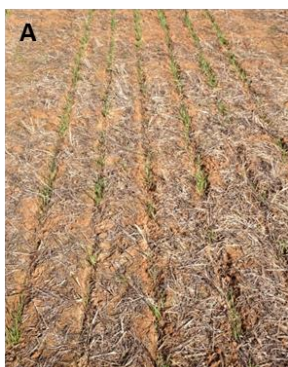
Water-solubility and binding strength to soil organic matter govern the mobility of a herbicide through the soil profile. Herbicide movement into the crop row can damage a germinating crop by concentrating in the root zone. This is particularly a problem on light textured soils as water is able to move more easily in these more porous soils.

- Greater water solubility can cause excessive herbicide movement in soil after heavy rainfall, increasing the risk of crop damage after sowing.
- When strongly bound to organic matter herbicides don't move far from the application zone.



**Choose the right herbicide for the job! Not all pre-emts behave the same, so be aware & follow labels closely.**

## What can go wrong



A: Crop damage. Result from applying a highly mobile pre-emergent herbicide in combination with a single disc opener (JD90).



B: Good crop safety but poor weed control due to failure to adequately incorporate herbicide.



### Ideal outcome

C: Crop safety + weed control. Result from using a triple disc opener (KHart, Yetter 25 wave coulters), at the same site with the same herbicide as photo A.

## Other considerations for pre-emergent herbicide use

High crop residue loads on the soil surface are not conducive to pre-emergent herbicides working well. Crop residues can act as a physical barrier, preventing herbicides from reaching the soil and tying up immobile herbicides, making them unavailable for weed control. Suitable stubble management is crucial to the success of pre-emergent herbicides so preparation starts at harvest; leave stubble standing and maximise residue spreading from the header.

Pre-emergent herbicides should be used as part of an integrated weed management (IWM) plan that incorporates chemical, mechanical and cultural tactics to help delay onset of herbicide resistance – cutting herbicide rates and/or relying on only a few products is risky!

## Further information and resources

“Soil behaviour of pre-emergent herbicides in Australian farming systems: a reference manual for agronomic advisers.” Mark Congreve and John Cameron, 2015.

<https://grdc.com.au/SoilBehaviourPreEmergentHerbicides>

“Seeding systems and pre emergence herbicides Coonabarabran.” Sam Kleemann, Jack Desbiolles, Gurjeet Gill and Chris Preston, 2015.

<https://www.grdc.com.au/Research-and-Development/GRDC-Update-Papers/2015/02/Seeding-systems-and-pre-emergence-herbicides-Coonabarabran>

“Using pre-emergent herbicides in conservation farming systems.” Barry Haskins, 2012.

[https://www.dpi.nsw.gov.au/\\_data/assets/pdf\\_file/0003/431247/Using-pre-emergent-herbicides-in-conservation-farming-systems.pdf](https://www.dpi.nsw.gov.au/_data/assets/pdf_file/0003/431247/Using-pre-emergent-herbicides-in-conservation-farming-systems.pdf)

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