



Residual herbicides & no-till farming

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- Residual herbicides are essential in sustainable no-till farming systems, and knowing the properties of each is essential for the desired combination of crop safety and weed control.
- Residual herbicides *incorporated by sowing* generally allows for greater crop safety than *post-sowing pre-emergent* applications.
- *Incorporated by sowing* technique has made higher application rates possible, allowing advantages of combating stubble tie up, extended incorporation windows, increase in efficacy and broader weed spectrum, eg TriflurX®.
- Tyne machines generally allow greater crop safety than discs; and *incorporation by sowing* with discs is much safer than *post-sowing pre-emergent* applications with discs.
- Research into the use of residual herbicides in no-till farming is necessary, because many herbicide labels have not changed as our farming system has evolved.

Key terms: IBS = Incorporated by sowing. PSPE = Post-sowing pre-emergent. Residual = Herbicide that remains in the soil for a given period of time.

During the shift from conventional farming systems to no-till farming systems, the effective use of herbicides has become increasingly important. A well planned herbicide strategy can mean the difference between making no-till work or not.

Over the last five to six years, it has become apparent that the rapid change in farming systems has overtaken farmer knowledge on how to use many herbicides in conservation farming systems.

Older more traditional herbicides that were designed for use in cultivated systems can still be used very effectively in no-till systems, however they are usually used in a different manner.

In addition, many herbicide labels (especially older type or generic herbicides) still have the same content on the label today as it did 10–15 years ago. Some products with generic counterparts even have totally different label claims for the exact same active ingredient. This creates many issues for farmers and agronomists wanting to use these herbicides in modern no-till farming systems. This is especially the case in break crops such as chickpeas, lupins and fieldpeas, where we are nearly always trying to sow them into standing stubble.

Herbicide tests for no-till farming

As a response to this issue, a number of trials and demonstrations have been conducted by district agronomists in 2007, 2008 and 2009 in conjunction with local grower groups and herbicide company technical support staff, aiming to:

- educate growers on how various herbicides work in the field in no-till cropping systems, ie mode of action

- how to use each herbicide most effectively with different seeding equipment, ie knife points and harrows vs knife points and press wheels vs discs
- gain understanding on the effectiveness of each herbicide in each use situation, ie crop safety and weed control
- obtain data to support herbicide permit applications or label changes.

Knowledge gained & lessons learned

The trials and demonstrations, and the experience from conducting them, confirmed many thoughts and provided good evidence on the best ways to manage residual herbicides in no-till farming systems.

Effectiveness

Residual herbicides at sowing are very effective at controlling a wide range of weeds both in crop and well into the following summer, when applied to no-till farming systems. Some residual herbicides also have valuable knockdown properties. This is very useful because knockdown herbicide options prior to sowing are limited for hard to kill weeds.

Sometimes light rainfall after sowing is critical to maximise effectiveness of many residual herbicides.

Mode of action & herbicide mobility

Knowing the chemistry and mode of action of each herbicide is paramount to enable the best combination of crop safety and weed control.

Heavy rainfall just after sowing when combined with certain soils can lead to crop damage. Herbicides such as metribuzin, diuron, simazine, Boxer Gold® (S-Metolachlor component),

prometryn, Balance® and Spinnaker® are mobile with soil water, whilst trifluralin and pendimethalin are less mobile.

Mobility can also change with time for particular herbicides. For example with Boxer Gold, the longer it is allowed to bind to soil particles, the less chance of the herbicide becoming mobile in the soil.

Other herbicides such as Logran® are mobile regardless of binding period.

Application

Incorporated by sowing seems to be the safest application technique for most residual herbicides, as the seed furrow is left free of high concentrations of herbicide. The soil from that furrow is thrown on the inter-row, where it is needed the most.

In-furrow weed control is generally achieved by crop competition and/or small amounts of water soluble herbicides washing into the seed furrow. For this reason best results in IBS application are when water soluble herbicides are used either solely or in conjunction with a less soluble herbicide.

Because of the furrow created by most no-till seeders, *post-sowing pre-emergent* applications of many herbicides are not ideal and are usually not supported by labels, as the herbicides concentrate within the seed furrow if washed in by water and/or herbicide treated soil. Obviously for volatile herbicides that need incorporation following application, PSPE is not a viable option, eg TriflurX.

Incorporation

Tyne seeders vary greatly in their ability to effectively incorporate herbicides. There are many tyne shapes, angles of entry into the soil, breakout pressures, row spacings, and soil surface conditions. Each of these factors causes variability in soil throw, especially when combined with faster sowing speeds (greater than 8 km/h). Consequently residual herbicide incorporation is quite variable between each seeder.

There are therefore no rules of thumb for sowing speed, row spacing and soil throw. You must check each machine in each paddock.

Disc machines show similar variability in their ability to incorporate herbicides. Disc angle, number of discs, disc size, sowing speed, closer plates and press wheels all have an impact on both soil throw and also herbicide treated soil returning into the seed furrow. Some discs can throw enough soil for incorporation of herbicides such as trifluralin. A good example is the NDF swing arm and parallelogram disc seeders.

In all cases with tynes and discs, crop safety is usually enhanced by applying herbicides IBS rather than PSPE.

Knife points and harrows cause a lot of herbicide treated soil to return into the seed furrow, and are therefore not ideally used in IBS application. Knife points and press wheels do a much better job.

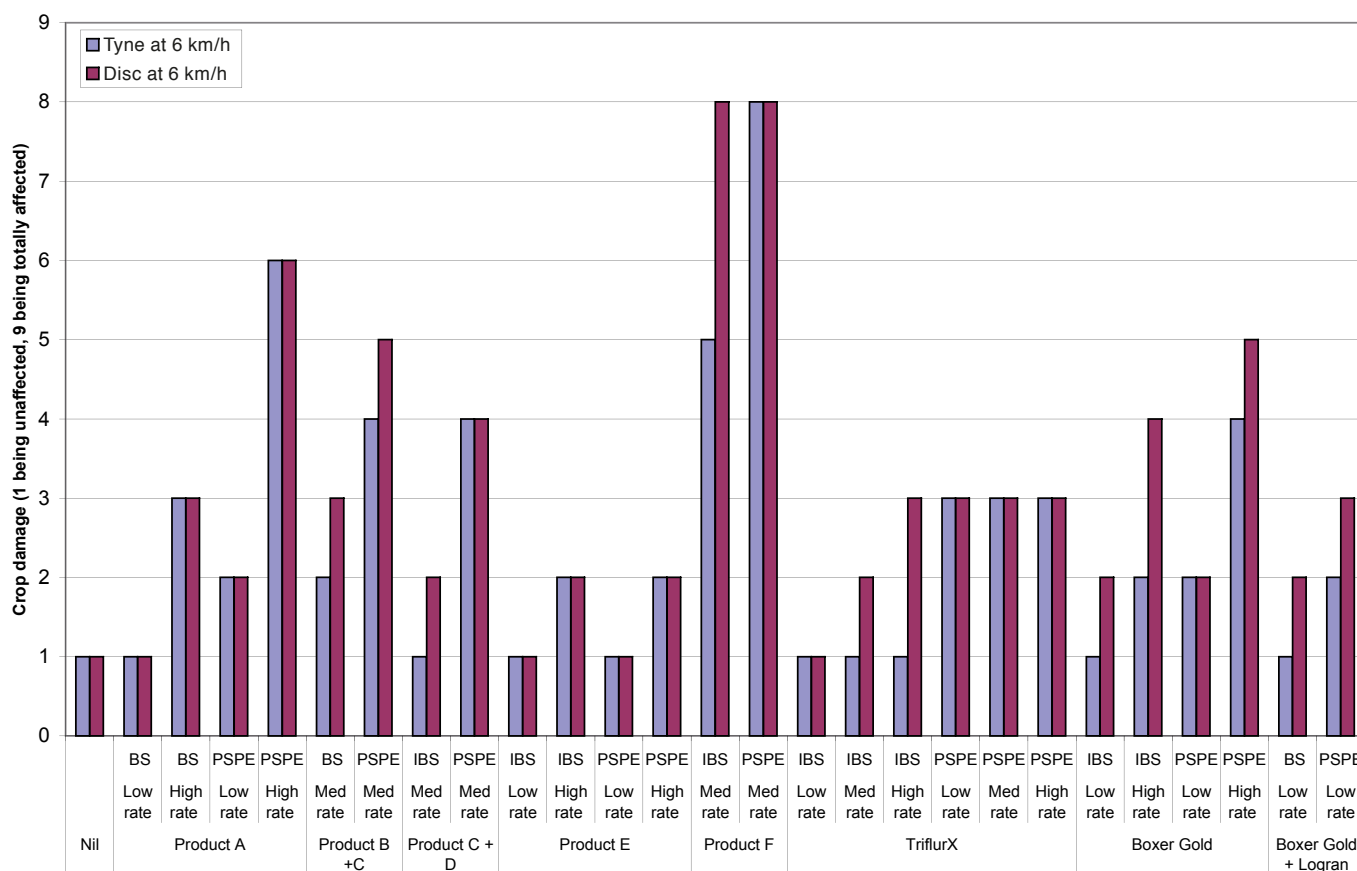



Figure 1. Comparison of crop safety in Ventura wheat using an NDF swing arm disc (27.3 cm rows) vs Morris Contour drill tyne (25 cm rows) on red sandy loam soils at Rankins Springs, 2009. This trial had 15 mm of rain just after sowing, and another 15 mm just before emergence.

*Note that Products A to F are **not registered** for this use pattern and cause significant damage to wheat, and hence aren't named. These herbicides were added to the demonstration to highlight crop safety differences between IBS, PSPE and seeding equipment.

Useful guidelines

This work provides useful guidelines for the application of residual herbicides in no-till farming systems, and more intensive trials are being conducted in 2010.

In summary, understand the mode of action and effectiveness on various weed types of each herbicide, it's solubility in water, and the weed spectrum that you are chasing.

Just as important, understand the soil throw characteristics of your seeder, and check soil throw in every paddock. 

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Further information

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Wheat sown with knife points and presswheels with 1.8 L/ha TriflurX®. Note that ryegrass has only emerged where the soil has been thrown from the furrow. In this case a better result may have been obtained by mixing TriflurX with a mobile herbicide such as Boxer Gold®.