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Arable Update

Maize: Issue 90

Maize pre-emergence herbicides and how best to use them

Introduction

Pre-emergence herbicides have been the mainstay of maize weed management. There are several effective pre-emergence herbicide combinations. One that is widely used is a mixture of a triazine herbicides, such as atrazine (Group 5) or terbuthylazine (Group 5), for broadleaf weed control, and a chloroacetanilide such as acetochlor (Group 15) or metolachlor (Group 15) for the control of grass weeds. However, this combination has led to widespread resistance of fathen to atrazine. For these and other difficult to manage broadleaf weeds the triazines have been successfully replaced by saflufenacil (Group 14 (Sharpen®)).

Full details of this FAR Update are published in the FAR Focus 17, Maize weed management, available on the FAR website www.far.org.nz

Key points

Your pre-emergence herbicide programme should consider the following:

- Time of planting.
- The weed spectrum present including herbicide resistant weeds.
- Tilth and organic matter levels.
- Soil temperature.

Factors affecting pre-emergence success

A number of factors will impact on the success of your pre-emergence herbicide programme. These include:

- Planting time - early maize crops are more likely to need a follow-up post-emergent herbicide.
- The weed spectrum: atrazine-resistant fathen (*Chenopodium album*) and nicosulfuron-resistant summergrass (*Digitaria sanguinalis*) are common and widespread in Waikato and Bay of Plenty and to an extent in Hawke's Bay.
- Late emerging summer weeds may germinate after the herbicides have dissipated.
- Soil characteristics - tilth and organic matter levels can affect the adsorption of the herbicide.
- Rainfall - adequate moisture is required to activate the herbicides or else they must be incorporated into the soil mechanically.
- Soil temperature and moisture - herbicides break down faster under warm, moist soil conditions.
- Premature breakdown of the herbicide's active ingredient - can be caused by chemical degradation (faster in acid), or herbicide volatilisation from wet soils.
- Enhanced microbial degradation - some herbicide active ingredients can be more rapidly broken down to non-herbicidal by-products by soil microbes after several years of use in the same location.
- Crop residues - these can act as a barrier preventing the herbicide reaching the soil surface.
- Side-dressing fertilisers may disrupt the action of soil-applied herbicides.

Timing

Maize is most sensitive to competition two to eight weeks after emergence. Weeds emerging during this period should be controlled with post-emergence herbicides before they become well established and set seed.
The pre-emergence herbicide mixture is applied to soil where it must be activated before it can be taken up by the emerging weed seedlings. Activation is achieved by one of three means:

1. Soil incorporation to a depth of 7-10 cm as soon as possible after application.
2. Rain or irrigation.
3. A wet soil surface (if soil surface is wet at the time of application, activation will occur without 1 or 2).

Modes of action

Herbicides that control broadleaf weeds are mostly absorbed through the roots and therefore must be distributed in the root-zone. Grass weed herbicides are absorbed through the emerging coleoptile and therefore need to be concentrated near the soil surface. With rainfall this is achieved naturally, as the grass weed herbicides are less soluble than the broadleaf herbicides so remain closer to the surface while the broadleaf herbicides move down into the root zone. If the herbicides need to be incorporated for activation, incorporation depth is critical. Incorporating too deep will place the herbicides below the weeds' germination depth (waste of product) and their dilution through too much incorporation will reduce their efficacy.

Both grass and broadleaf weed herbicide groups require moisture for activation, so soil moisture levels should be good or the application should be timed when rain is likely. Use irrigation where available.

In reduced tillage crops, the crop residue may act as a mulch to suppress weeds. If herbicides are required, their efficacy may be reduced by the amount of crop debris on the soil surface. This debris is a physical barrier to the herbicide, preventing good contact with the soil. A post-emergent herbicide programme may be a better option in this situation.

After the pre-emergence herbicide programme, it is important to assess how well weeds are being controlled, so post-emergent herbicides can be applied if necessary. Early sown crops are more likely to need follow-up post-emergent treatments because their time until canopy closure is longer than in a later sown crop.

Table 1 lists the selective pre-emergent herbicides registered for use in both maize silage and grain crops.

Interactions with the soil

The effectiveness of a herbicide after it has been applied depends on its concentration and persistence in the soil. These factors are affected by the properties of the herbicide, weather conditions, and soil factors such as texture, pH, moisture and organic matter.

Herbicides have electrical charges that cause them to bind to the positive or negative charges on soil and organic matter particles. This process is called adsorption and it varies with soil pH, soil organic matter content, and climate. Soils with high cation exchange capacities (CEC), high levels of organic matter and/or clay are the most adsorptive. These soils may require higher rates or more frequent herbicide applications than sandy and coarse soils. Coarse, sandy soils are less adsorptive and herbicides will be more effective. However, their persistence might be reduced during heavy rain. Herbicide efficacy may be reduced in cloddy and in light fluffy soils.

Herbicides can be lost from the soil profile by leaching and surface run-off. Soil structure and texture and the solubility of the herbicide affects the risk of leaching losses and care must be taken to prevent the contamination of ground-water by leached herbicides.

Table 1. Selective pre-emergent herbicides registered for use in both maize silage and grain crops at September 2024. As new products come to market and existing products can be withdrawn it is essential to check current regulations.

Mode of Action Group Number	Active ingredient	Type	Products	Primary weed target
3	pendimethalin	pre- and post-emergence	AGPRO pendimethalin, Stomp® Xtra, Strada®	Broadleaf + grasses
5	terbuthylazine	pre- and post-emergence	Assett™, AGPRO terbuthylazine, Magneto®, Terb 500™, Terbaflo, Timberwolf	Broadleaf
14	saflufenacil	pre-emergence	Sharpen®	Broadleaf
15	acetochlor	pre-emergence	Ace™, Acetoken, Acierto®, Agcare® acetochlor, AGPRO acetochlor, Donaghys acetochlor, Joker®, Maize Guard®, Roustabout®, Smart acetochlor, Sylon®	Broadleaf + grasses
	alachlor	pre-emergence	Alaken, Corral®, Cyclone®, Encaps®, Merit®, Taipan®	Broadleaf + grasses
	dimethenamid	pre-emergence	Frontier®	Broadleaf + grasses
	metolachlor	pre-emergence	Guvnor™ Gold, Metoken Gold, Super Maestro	Annual grasses
	propachlor	pre-emergence	Ramrod®	Broadleaf + grasses
27	mesotrione	pre- and post-emergence	AGPRO Mesotrione, Dominator®, Donaghys Lektor, Mesoflex®, Primiera®	Broadleaf

Acknowledgements and further information

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