

Investigating the effect of water quality on 'dim' efficacy

The aim of this trial was to investigate the effect of water quality on the efficacy of Cyclohexandiones or 'dim' herbicides in controlling ryegrass

Summary

Lack of rain water available for spraying during the past few seasons has meant many growers have been using dam water. In this trial Aramo® appeared to be slightly more active than Select®, but also slightly more sensitive to hard water. When using Aramo in very hard water (1300ppm) the hardness was not effectively ameliorated with ammonium sulphate, used as Liase at 2% of spray volume.

It is strongly recommended that growers test their water source for hardness.

Background

It is now well understood that the Group A 'dim' herbicides are one of the last lines of defence in the battle against group A 'fop' herbicide resistant ryegrass. It is very important that this chemistry is used under conditions that promote the best possible chance of controlling the target, in this case ryegrass. Little is known about 'dim' herbicide sensitivity to varying levels of water quality but observations commonly show that dims perform better in rainwater as opposed to dam water, which is often hard (high in Calcium and/or Magnesium ions). Observations in Australia concur with work done in Canada which suggests that dim herbicides are more sensitive to hard water compared to fop herbicides. Similarly, a BCG trial carried out in 2003 suggested that Select was sensitive to hard water. Ammonium Sulphate based products (eg. Liase) are commonly used to ameliorate hard water.

Methods

This trial was established in Beacon canola north of St Arnaud, Victoria. Ryegrass density was approximately 45plants/m² and at 2-4 leaf stage. Treatments were applied on August 4, with XR11002 nozzles at 3 bar pressure at a water rate of 80L/ha. Chemical rates were Select (clethodim) 250ml/ha + 1% hasten and Aramo (tepraloxydim) 300ml/ha + 1% hasten.

Herbicide damage scores were taken 24 days after spraying using the European Weed Research Council scoring method (see below for details).

Table 1 shows the test results for hardness of water used, very hard water (>1000ppm) is difficult to ameliorate. Liase as ammonium sulphate (417g/L) was used at 2% spray volume to ameliorate hard water in some of the treatments.

Table 1. Water test results.

Sample	Total hardness (ppm CaCO ₃)	Evaluation
Hard water	1300	Very Hard
Rain water	20	Very Soft

Results

The ryegrass damage scores assessed 24 days post spraying are reported in Table 2.

Table 2. Damage to ryegrass plants as a result of treatments measured 24 days after spraying.

Herbicide	Rate ml/ha	Water used	Damage scores
Select + 1% hasten	250	Rain	7.00
Select + 1% hasten	250	Very Hard	7.25
Aramo + 1% hasten	300	Rain	8.25
Aramo + 1% hasten	300	Very Hard	7.25
Aramo + 1% hasten + 2% Liase	300	Rain	7.50
Aramo + 1% hasten + 2% Liase	300	Very Hard	6.75
LSD 5%			1.15

EWRC phyto-toxicity scoring system: 1 = no symptoms, 3 = slight damage effects reversible, 5 = severe discoloration and stunting, 7 = heavy damage, some plants killed and 9 = complete loss of plants.

Interpretation

Quality of spray water has the potential to influence herbicide efficacy, so it is important to be aware of the quality status of the water being used. Hydrolysis, the breakdown of chemical in contact with water, is dependant on: water quality, pesticide formulation, type, and also time and temperature. Dim's are sensitive to calcium and magnesium ions in water, this can result in antagonism, causing less than acceptable results.

There were some significant differences in the level of ryegrass control between the treatments applied in this trial:

- When used with rainwater - Aramo performed better than Select
- When used in hard water – Aramo and Select performed the same
- Adding Liase to hardwater did not ameliorate the water quality sufficiently to overcome a low level of antagonism

The distribution of ryegrass in this trial was too sporadic to usefully measure density at flowering, this means that we cannot confidently say that one or more of the treatments used in this trial resulted in a reduction of ryegrass heads at flowering. Counts taken at the site at flowering October 24 showed that ryegrass ranged from 0 – 35 heads/m².

Commercial Practice

The addition of ammonium sulphate to spray mixes when using pesticides which are sensitive to hard water is good practice, exactly how much ammonium sulphate is added is governed by levels of hardness. Order of tank mixing products is critical in this situation because the Ammonium Sulphate reacts with the ions that cause hard water before the herbicide enters the tank. Ammonium Sulphate must go into the tank first. Further trial work will include investigating levels of ammonium sulphate to ameliorate different levels of hard water.