Adjuvant

Tip of the Month

May 2020

CATION ANTAGONISM IN SPRAY SOLUTIONS

Many herbicides are antagonized by dissolved cations in spray water. These include glyphosate, cyclohexanediones (e.g. clethodim) and certain members of the sulfonylurea and phenoxy herbicide groups, etc. When these herbicides are in solution, they dissociate and are prone to complexing with cations. This complexing normally only occurs during droplet drying on the leaf, when the water becomes limited for solubility. The complexed herbicide e.g. Na- or Ca-glyphosate is absorbed poorly by weeds and the control is reduced.

One of the oldest and the most effective methods to overcome this antagonism, is to use a quality ammonium sulphate adjuvant. During droplet drying, the sulphate ion binds to the antagonistic cation before the cation can bind to the glyphosate. The ammonium cation then plays a crucial role in the absorption process of the herbicides.

Many water sources in South Africa contain these antagonistic cations in excessive amounts and it is important to know which water sources could potentially be antagonistic.

The most important antagonistic cations

It is widely believed that hard water (high calcium and/or magnesium) is the major antagonist of herbicides. It is true that hard water is highly antagonistic to glyphosate, for the simple reason that both these cations have a double positive (divalent) charge and can deactivate more herbicide.

However, sodium can be just as devastating because of the extremely high concentrations that are found in water from certain areas. It is also the primary antagonist of herbicides such as clethodim and certain sulfonylureas. Sodium is particularly antagonistic to these herbicides when bicarbonate is also present at elevated levels.

By how much is weed control reduced?

There is really no accurate method to predict how much efficacy will be lost by a given level of antagonistic cations. The degree of antagonism is highly dependent on the weather conditions during and after herbicide application. Low humidity will increase the antagonism potential of cations as the absorption rate is decreased, exposing the herbicide on the leaf surface. Optimal conditions, on the other hand will decrease the antagonism potential, as herbicides can be absorbed over an extended period.

Obviously, factors like herbicide rate and water volume will also have a major influence on the degree of antagonism. However, what can be calculated is the rate of ammonium sulphate adjuvant that will be needed to overcome specific cationic levels.

Villa's stance

It is important to note that it is not only hard water that antagonizes herbicides, but that sodium is just as important because of the high levels found in various South African water sources. The influence of antagonistic cations in spray water can be devastating, but with the correct use of adjuvants the problem can be controlled.

Cation antagonism should therefore not be seen as a limiting factor as long as the adjuvant management tools are used effectively.

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