SAP INTERNATIONAL CORPORATION bvba

REACTOR

## AGRICULTURAL SPRAYING WATER TREATMENT CONDITIONER

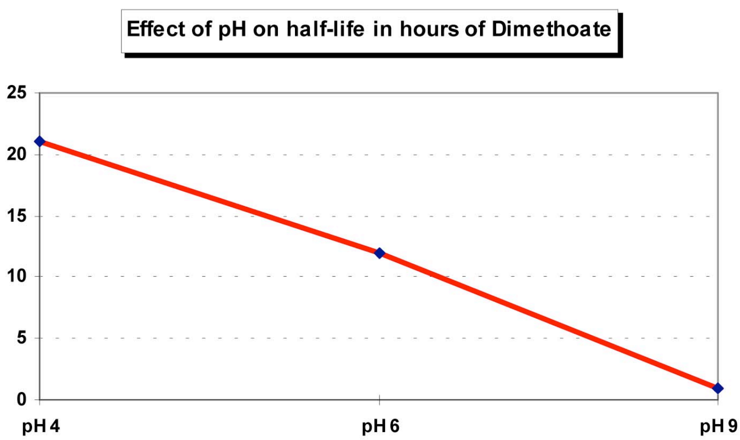
The performance of some agrochemicals and foliar applied fertilisers is impeded when mixed in water which is either Alkaline, Hard, Brackish, or contaminated with insoluble deposits.

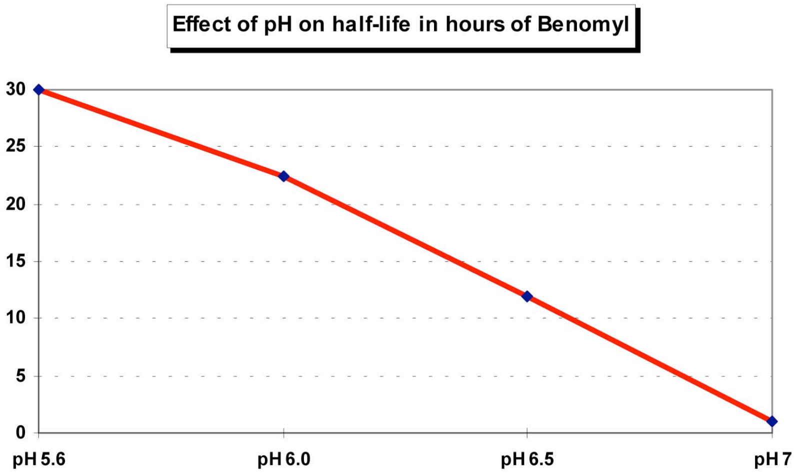
Many farms are forced to use sources of water which are either of high pH (over 7.0) or are ‘hard’, containing significant levels of Calcium, Magnesium or Bicarbonate ions. Often where water is collected from chalk or limestone rocks the water has both these characteristics but their influence is distinct and they should be considered separately.

**Effect of pH**

In such conditions, some expensive agrochemicals and fertilisers are prone to rapid hydrolysis and precipitation resulting in poor performance due to loss of active ingredients particularly when multi-product tank mixing is required.

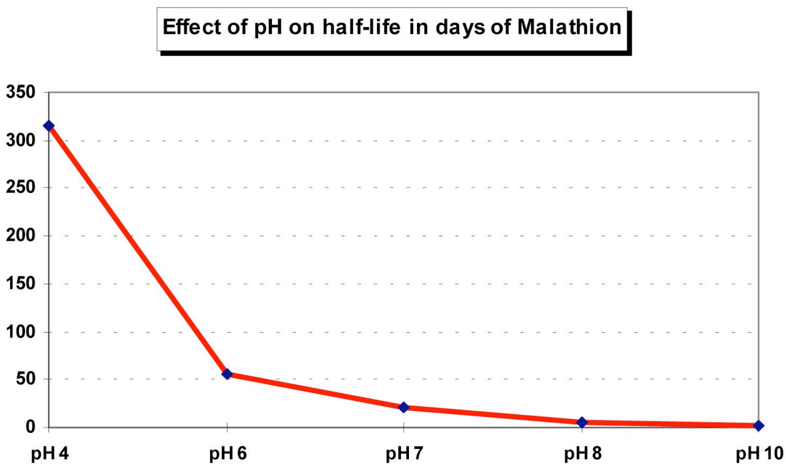
Pesticides can quickly degrade and this is measured by the time taken for 50% of the active to be broken down. It is called the ‘half-life’. Two examples where pH of the spraying water has a marked effect on activity are shown for Dimethoate and Benomyl.






As can be seen from this chart while the pH is low the rate of degradation is relatively slow. However once the pH starts to increase the timescale becomes more critical so that at pH 7, 50% of the active is lost within 1 hour.

In practical terms, once the chemical is in the sprayer, a 1 hour delay will lead to half the activity, whilst a two hour delay will result in a further halving, to 25% of the initial potential effectiveness.




**A similar situation exist for Malathion.**

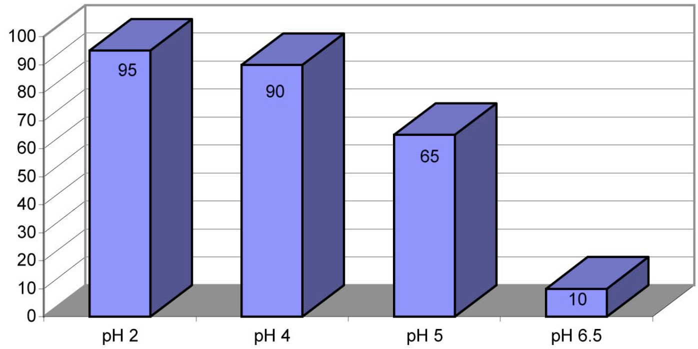
Not only can pH have an effect on the stability of products but it can also influence their uptake by the plant through the leaf. Most foliar nutrients are taken into the plant more rapidly using a spray water of lower pH.

A number of research workers have looked at the rate of absorption using radioactively labelled nutrients (Swanton and Whitney, American Journal of Botany Vol. 40) in this particular case phosphate was used.

Measurements were taken after a predetermined time to record how much phosphate had been absorbed by the leaves and translocated away from the initial site of application.

The effect of lowering the pH can clearly be seen and it can be argued that using reducing the pH to below 4 is not of practical significance.

**Relative leaf absortion of Phosphate for differing pH of spraying solution**

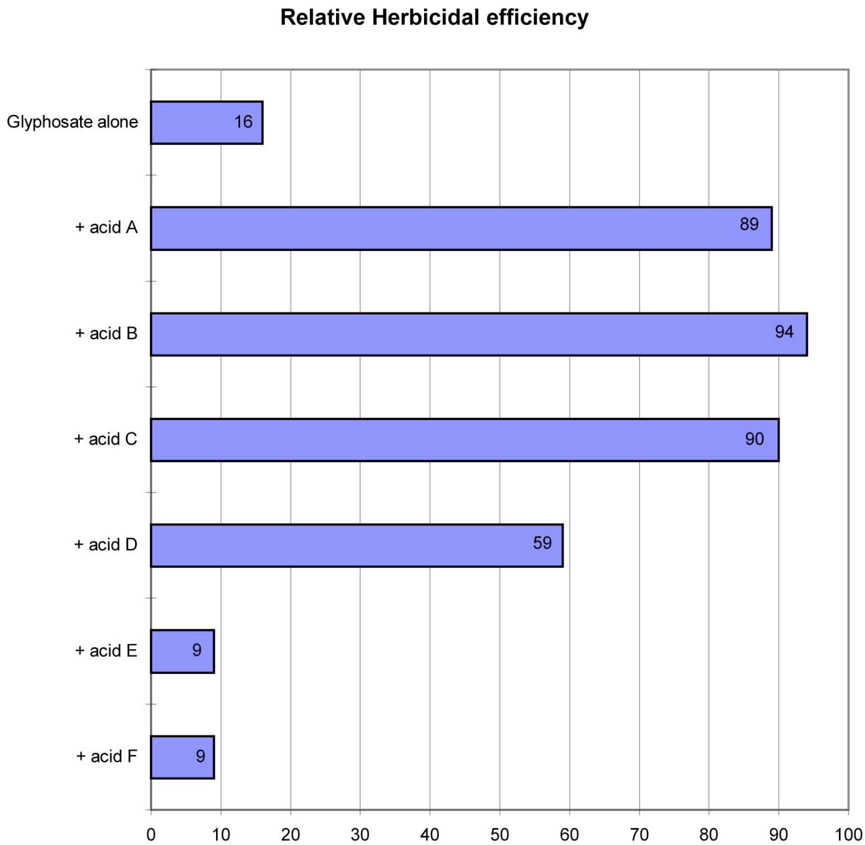



## The effect of Cations

It is important to appreciate that the activity of some agrochemicals is affected by the presence of Calcium, Magnesium and Bicarbonate ions associated with hard water. Whilst the pH may also be high it is not enough to just acidify the solution and many acids such as Proprionic acid reduce the pH but do not isolate these unwanted ions. As a result they are ineffective as water treatment chemicals.

The herbicide Glyphosate is a case in point.

Many workers have established that the potential activity of Glyphosate is reduced in the presence of Calcium ions. Turner and Loader (1978) showed that where antagonistic Calcium ions were present Glyphosate was only 16% efficient from its theoretical 100%. As the Calcium ions were immobilised the potential activity returned. Only certain acids were capable of immobilising the unwanted ions. Acid A forms part of the formulation of Reactor whist the poorly performing Acid F is the often used Proprionic acid.
Reactor also contains specific sequestering agents which will further immobilise the unwanted ions and so protect the potential herbicidal activity.




Unlike adjuvants, Reactor **does not** increase the activity of the various agrochemicals with which it is mixed.

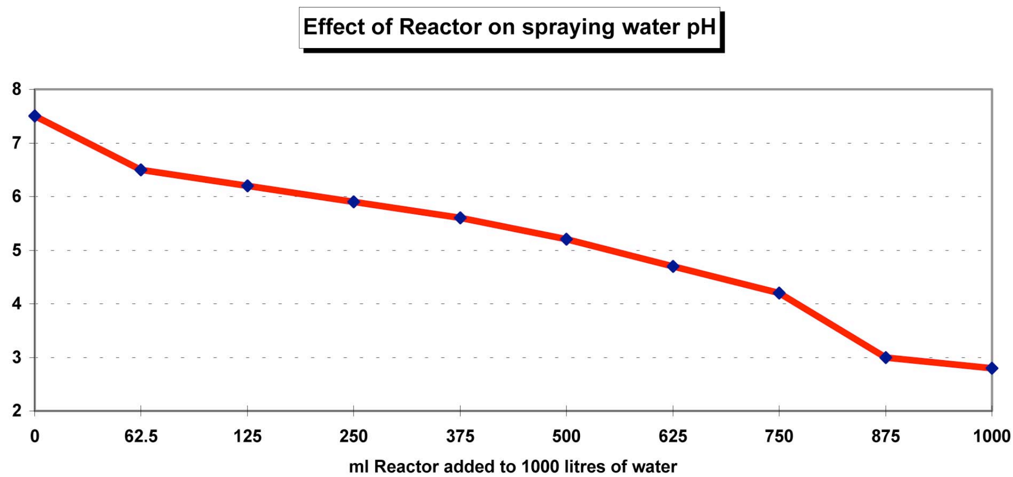
By treating the water, it ensures that any antagonistic constituents that may be present are removed or neutralised **before** the agrochemical is added to the spray tank.

In this way it enables the agrochemical to reach it full potential activity.

**Reactor is a low cost spray treatment water additive which contains:**

1. Complexed acidifiers to reduce pH and hydrolysis.
2. A long chain polymer based water softener.
3. A sequestering agent to isolate Cationic contaminants.
4. Buffering agents to improve tank mixing compatibility.
5. A pH colour reagent to indicate the actual pH of the spraying water which enables the appropriate addition to be calculated.

The amount of Reactor required will depend on a number of factors including the starting pH, the hardness of the water and the desired finishing pH. The table below shows the typical amounts required for a medium hardness water with a starting pH of 7.5.




It is not always possible for a farmer to access to such complete data so Reactor has been formulated with its built in pH indicator which will give colour changes at a number of defined pH values. These colour changes can either be observed in the spray tank itself, as the Reactor is gradually added to the water, or test kits can be supplied so that small samples can be checked prior to spraying. All assessments should be made before any agrochemicals are added as they may mask colour changes.

**Reactor : Test Kit Instructions**

1. Take a 1 litre sample from the water supply.
2. Add 1 or 2 drops of Reactor to the water to obtain an initial colour change and pH indication. Using the pipette supplied add 0.5ml of the red coloured Reactor to the water.
3. Continue to added measured quantities of Reactor to the water sample until the required final colour change is reached.

- At pH 7.0 and above the water colour will change to **BLUE.**
- At pH 5.2 and below the colour will change to **GREEN.**
- At pH 3.6 and below the colour will change to **YELLOW.**

The optimum pH of the final mix (including agrochemicals) should be 4.5-5.5 for improved tank mixing and foliar penetration.

**Typical application rates**

Each 1ml of Reactor required to obtain a PALE GREEN/YELLOW in the sample water equates to 1l of Reactor in 1000 l of spray water.

| | **Soft Water** | **Medium/Hard Water** | **Hard Water** |
|---|---|---|---|
| Test Sample: | 0.5ml per l | 1ml per l | 2ml per l |
| Spray Water: | 50ml / 100 l | 100ml / 100 l | 200ml + / 100l |
| Volumes: | 0.5l / 1000l | 1l / 1000 l | 2 l / 1000 l |

N.B. Check samples of the water regularly as pH of water sources can vary frequently. Always add Reactor to spraying water before adding agrochemicals and fertilisers.

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