PRODUCT INFORMATION BULLETIN

The effectiveness and efficiency of pesticides can be influenced by a number of factors, including sprayer calibration, label rate, timing, temperature and suitability of the pesticide to its purpose. Unfortunately, poor performance of pesticides caused by the negative effects of high pH in the spray solution are often overlooked.

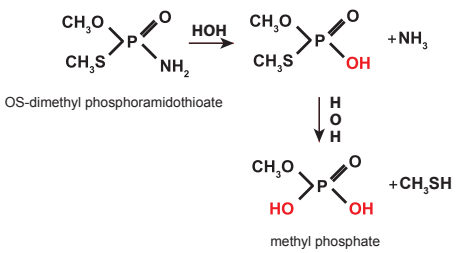
Alkaline Hydrolysis

Water with mild to moderate pH values of 7.5 – 8.5 are much more common in the U.S. than water with acid values (<7.0). In the presence of alkaline water (above pH 7.0), a number of insecticides, fungicides and herbicides become unstable and are susceptible to a chemical degradation process called alkaline hydrolysis.

Pesticide alkaline hydrolysis is an irreversible reaction where molecules are cleaved into smaller components by hydroxide ions (OH^-) present in water. These newly formed fragments of the pesticide may not have any pesticide activity and can reduce the effectiveness of the pesticide spray.

With sensitive pesticide compounds, alkaline hydrolysis can occur so rapidly that substantial breakdown occurs between the time of mixing and the time of application. For example, Flumioxazin is a herbicide that at pH 5, is very stable and will persist for several days in water. However at pH 9, its half-life is reduced to approximately 15 minutes! In pH 9 water, its herbicidal activity will probably be lost before it is even applied.

Alkaline Hydrolysis (Degradation) of Monitor® Insecticide



OS-dimethyl phosphoramidothioate

methyl phosphate

Illustration of breakdown of Monitor Insecticide by alkaline hydrolysis. Cleavage and hydroxide substitution sites are indicated in red.

For most compounds, the rate of alkaline hydrolysis decomposition is much slower. However, even slower rates of decay can result in some loss of activity. Performance may unknowingly degrade to the point where crop production or pest management programs are seriously compromised.

Preventing Alkaline Hydrolysis

1. The first step in preventing alkaline hydrolysis is to test the pH of your spray solution. **Measuring your spray water pH before mixing can produce erroneous results because the pesticides you add to the spray water can lower or increase the pH of the spray solution**. Because of variation in pH of water sources, this procedure should be repeated several times during the growing season. A good rule of thumb is to retest the pH of your spray solution whenever you make changes to the tank mix or if anything is different from the last time a spray solution pH test was performed.
2. Always read the label for each chemical used to see if there are any warnings or recommendations regarding pH ranges or the use of acidifiers.
3. In subsequent tanks of the same spray solution, add the acidifying agent first (before any other chemicals). This will correct the pH before your chemicals can be impacted by alkaline water.
4. Apply the spray solution as soon as possible after mixing. If a lengthy delay occurs, you may wish to retest and adjust the pH of your spray solution.

Note: There are a few pesticides that should not be acidified under any circumstances due to their phytotoxic nature at low pH. Sprays containing fixed copper fungicides (including Bordeaux mixture, copper oxide, basic copper sulfate, copper hydroxide, etc.) should not be acidified as the acid solution may make the metal soluble and produce a phytotoxic effect when sprayed on plants.

BING

SPRAY ADJUVANT ACIDIFIER

BING is a non-corrosive and biodegradable spray adjuvant used to correct alkaline conditions in spray solutions. BING safely replaces and outperforms phosphoric, sulfuric, hydrochloric, "urea-based" and other acid functioning agents. BING is a novel spray tank acidifier technology that is suitable for both ground and aerial applications and should be used with most pesticides that require a low water pH to slow down alkaline hydrolysis or breakdown of products.

Amending Water

In most cases, labels on pesticides that are susceptible to alkaline hydrolysis will normally show a requirement of a separate acidifying agent (such as BING) to lower the pH of alkaline water used in spray tanks to a range of pH 4 to pH 6 (slightly acidic).

If your water source has a pH above 7.0, the addition of BING to the spray tank will provide an easy-to-use and economical means to optimize the results from your pesticide application. BING is a novel spray tank acidifier technology that is suitable for both ground and aerial application.

BING's combination of a proprietary acidifying agent and a high molecular weight surfactant offers the following features:

- Prevents alkaline hydrolysis and performance decay of susceptible pesticides
- A non-corrosive, non-fuming and non-skin irritant formulation – safe for use in all spray equipment
- Provides an in-solution indicator (spray solution changes color to indicate pH range)
- Neutralizes the negative effect of high bicarbonate and carbonate levels in spray solution
- Improves the compatibility of pesticide mixes in spray tanks

Use Directions

Turf, Ornamentals and other Non-Crop Uses

Mix BING into the spray tank before adding pesticides and/or fertilizers. Determine the desired pH from the Bar Graphs, and then add enough BING to achieve the correct pH color desired.

When the spray tank water turns red, the pH is between 4.5 and 5.5 (SEE indicator bar below).

When the spray tank water is golden yellow, the pH is between 6.0 and 6.5 (SEE indicator bar below).

When the spray tank water is a pale yellow, the pH is 7.0 (neutral) (SEE indicator bar below).

The general rate range for BING is 4-8 oz. (120-240 ml.) per 100 gallons (400 liters) of water. This rate range will normally decrease the pH from 8.5 to 5.0.

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