Spray Solution pH

"Protecting Your Investment"

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Every time you load your sprayer with pesticides, fertilizer and/or auxiliary products, you make a substantial investment in product, time and performance towards the management of your turf. Are you doing everything possible to maximize the return on your investment? The answer is no if you have not considered measuring and adjusting the pH of your spray solution.

Many, if not most pesticides and fertilizers, maintain the highest solubility and availability when prepared in acidic pH solutions. Yet the water you use to fill your spray tank, either domestic water supply or well water, is probably well above 7.0 pH and quite alkaline. This is especially the case when using domestic water supplies as the pH climbs quite high throughout the summer months due to increased treatment levels of chlorine to keep microbial levels in check. It has been noted that pH of 9 and above was detected from a number of municipal sources throughout the U.S. Even if your water supply has a pH within the acceptable range, the materials that you add to your tank may also dramatically impact the pH of your spray solution.

The problem with high pH levels is that hydrolysis can occur with certain pesticides and render them ineffective (See Table 1). This occurs when chemical reactions begin to take place with many pesticides once the pH moves above 7.0. The result of these reactions can negatively affect the active ingredient's effectiveness. Many examples have been provided for insecticides but there is some evidence that the same is true for fungicides and herbicides. There are only a few pesticides that actually perform better at a higher spray solution pH. Sulfonylurea urea herbicides are a good example. As the pH becomes more acidic, the stability of these materials decrease. In the case of tank mixing sulfonylurea urea herbicides, a spray solution pH of 7 allows for stability of the sulfonylureas, yet provides the ability to add materials that must avoid alkaline conditions. To be sure as to the pH that a pesticide requires, always refer to the label.

In addition to pesticide activity, there are some compelling examples of the impact of pH spray solution on nutrient availability. Generally, spray solutions in the 4-7 range maintain to greatest availability of nutrients for uptake by plants. Not only does an acidic spray solution show an increase in nutrient uptake by the plant, but there are also studies that show an increase in nutrient utilization as a result of lowering the internal plant tissue pH. An increase in iron utilization was demonstrated in studies in which citric acid or sulfuric acid alone (no nutrients) was applied to the plant.

Table 1. Spray Solutions pH Effects On Pesticide Half-life

Pesticide Material	Spray Solution pH	Half-life At Specified pH Values
Acephate (Orthene)	3	65 days
	9	16 days
Carbaryl (Sevin)	6	125 days
	7	27 days
	8	2-3 days
	9	1-3 days
Chlorpyrifos (Dursban)	5	60 days
	7	35 days
	8	22 days
	10	7 days
Trichlorfon (Dylox)	6	4 days
	7	6 hours
	8	1 hour

So what is the best way to check and adjust your spray solution pH? The first step is to use a good quality portable pH meter and do an initial test of the water going into the spray tank. If the pH is out of range (above 7.0) then add a spray solution acidifier/buffer. There are numerous good quality spray solution buffers on the market that will perform to adjust the pH downward and hold it there as other materials are added. Follow the directions on the label of the acidifier/buffer to properly adjust your spray solution. Once your solution is in the proper range, begin adding the materials that you plan to apply. Always follow the proper mixing order, especially when you have materials of differing formulation types. A good way to remember the mixing order is to follow the "W-A-L-E" approach.

Fill the spray tank half full of water and get the agitation going until the water in the tank is rolling. Test and adjust, if necessary, the pH.

Now begin the W-A-L-E sequence:

1. Add wettable powders and water dispersible granules first. (W)
2. Agitate until the Ws are uniformly dispersed, meanwhile adding water until the tank is 90% full. (A)
3. Add flowable liquids. (L)
4. Emulsifiable concentrates go in last. (E)
5. Now you can add any liquids (true solutions) such as liquid fertilizers and surfactants.

Now top off the tank, continue agitation and the pesticides are properly mixed. Check the pH one last time and adjust as necessary. This will ensure the maximum longevity in response.

It is better to mix liquids with liquids or wettable powders with wettable powders, rather than a liquid with a wettable powder. Small quantities of wettable powders often mix easier if slurry is made first.

There is a lot of work that needs to be done to determine the extent of the effects that spray solution pH has on many fungicides, herbicides and fertilizers that are available in the marketplace. Still there is plenty of evidence that monitoring and adjusting your spray solution pH when necessary can provide the opportunity to get much more out of your investment. One way to begin assessing the impact of correcting spray solution pH is by recording pH in a notebook along with the longevity and degree of performance that you get from the corresponding application. In the end you may find that a minor investment in time could return substantial performance increases in your spray programs.