The Effects of pH on Fungicide Effectiveness

By Dr. Houston B. Couch

The pH of the spray solution can have a significant effect on the performance of certain fungicides. Therefore, it is important to monitor the pH of the spray solution.

With the benzimidazole fungicides (Tersan 1991, Fungo 50, Cleary 3336), the parent compound is not toxic to fungi. It is after you have applied the spray to the plants that these materials break down into a fungicidal compound. The process of decomposition to the fungicidal breakdown product is more rapid when the spray preparation is in the acid range.

A pH range of 7.5 to 8.5 is common in untreated water throughout North America. The pH of water treated for urban use often falls between 9.0 and 9.5.

The active ingredients of some pesticide formulations undergo hydrolysis to non-toxic compounds when the spray preparation is alkaline. Hydrolysis is an irreversible chemical reaction in which the hydroxyl ions in the water interact with the pesticide in such a manner as to break it down into a non-toxic compound.

Even in instances in which the active ingredient component of a fungicide formulation is stable under alkaline conditions, there is still the possibility that in this pH range, the general makeup of the total formulation may become altered.

Of the various pesticide groups, insecticides are more prone to alkaline hydrolysis than fungicides. The organophosphates, carbamates, and synthetic pyrethroids are particularly sensitive to breakdown when the spray solution is alkaline.

Fungicide Research

In recent years, field research has been conducted to determine the effect of acid and alkaline pH levels of spray tank preparations. Seven standard turfgrass fungicides were tested on their ability to control Sclerotinia dollar spot of 'Penneagle' bentgrass. Disease control among the various pH treatments was compared on the basis of initial reduction in disease incidence and how long the control lasted.

The fungicides tested in these trials were Vorlan, Dyrene, Rubigan, Daconil 2787, Chipco 26019, Banner and Bayleton. Additives were used to adjust the individual tank preparations to pH 3.5, 6.5 and 9.5 respectively. A portion of each spray preparation was applied to the grass immediately, and the remainder stored for 24 hours at 71 degrees F and then used. The results of these studies showed the following.

❑ The initial preparations of Chipco 26019, Vorlan, Banner and Bayleton are tank stable in the pH 3.5 to 9.5 range. Also, storage for 24 hours at these pH levels apparently does not alter the disease control effectiveness of this group of fungicides.

❑ Dyrene is alkaline sensitive. At pH 9.5, the effectiveness of the initial tank preparation drops rapidly. However, if the spray preparation is in an acid range (pH 3.5 to 6.5) and if you use it at the time it is made up, there will not be a reduction in disease control potential. If you allow Daconil 2787 to stand for 20 hours before you apply it, regardless of the pH of the preparation, it will lose a significant amount of its fungicidal properties.

❑ The pH of the spray preparation does not have an immediate effect on the disease control potential of Dyrene. However, if these preparations are held for 20 hours before use, a major drop in their disease control effectiveness can occur at both acid and alkaline pH levels.

❑ If you use Rubigan at the time you prepare it, its disease control potential will not be affected by pH. Also, spray preparations of this material that are stored for 24 hours at pHs from 6.5 to 9.5 will retain their initial disease control effectiveness. However, if you allow Rubigan to stand for 24 hours at pH 3.5, it can lose a significant amount of its potential for disease control.

Monitoring pH

A properly ordered pesticide operation is one that includes monitoring the pH levels of the spray preparations. Know the degree of pH stability of the active ingredient and the formulation as a whole for each pesticide being used in the spray program.

Determining and recording the pH should be a standard procedure for every spray preparation. Owning a pH meter is not a luxury. It is a must for you to carry out the pesticide spray program properly.

On a weekly basis, check the pH of the water you are using to prepare the spray. This information will enable the operator to assess the water's potential for hydrolyzing the various spray materials.

However, the most important pH reading is the one made on the pesticide preparation itself. The reason for this is that some formulations of pesticides contain buffering agents that offset the alkalinity that exists in water in some areas. For example, Dyrene and Daconil 2787 contain buffers. Base your decision on whether or not to acidify the preparation on the pH reading of the spray mixture, not the pH of the water alone.

If it does prove to be necessary to acidify the spray preparation, a commercially prepared adjuvant for that purpose, such as Spray-Aide (Miller Chemical Co., Hanover, PA) is preferred over the use of muriatic acid. ❑

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