



## Use of Copper in Aquaculture and Farm Ponds<sup>1</sup>

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Copper has been used for many years as a chemical tool in farm ponds and aquaculture operations. It is both an effective algacide and a parasite treatment. The problem with the use of copper is that there is a very thin line that separates effective treatment levels from overdoses, which can kill fish. This fact sheet is designed to explain when copper is used, how it is used, and some precautions to take before using it.

Copper can be used to control algae in ponds, including filamentous and higher algae such as *Chara* ("Stink weed"). There have been some recent efforts to use copper to reduce the abundance of algae that cause off-flavor in catfish, but not enough is known yet to make any definite recommendations. Copper will also control most external parasites of fish, including "Ich" (see Extension Circular 716, Introduction to Fish Parasites and Diseases and their Treatments).

Copper comes in several forms which can be used in water. The cheapest and most commonly used form is copper sulfate, which is available either as a crystal or powder (often known as "Bluestone" or "Blue powder"). Copper sulfate is water soluble, and dissolves fairly easily when mixed with water.

Several companies market copper in liquid and crystal forms that are chelated. Chelated coppers stay in solution longer than copper sulfate, tend to give better algae control, and appear to be safer to fish. When buying a commercially manufactured form of copper, attention should be paid to the percentage of copper in the formula.

Before you use any form of copper treatment, you need to measure the total alkalinity of your water (NOT HARDNESS OR pH), since the toxicity of copper to fish increases as the total alkalinity decreases (see Equation 1). A good rule of thumb is to divide the total alkalinity (in parts per million) by 100 to get the concentration of copper sulfate to use in parts per million.

$$\frac{\text{Total Alkalinity (ppm)}}{100} = \text{Copper Sulfate Needed (ppm)}$$

If your total alkalinity is less than 50 ppm, copper treatments are not recommended because of the high risk of killing fish. Florida's waters are extremely variable in alkalinity, so if you don't know your concentration, find out before you treat with copper. In the literature you will see many different values for copper dosages, but experience shows that the above formula is best for determining your dosage rate.

To use copper sulfate, it should be first dissolved in water. After weighing the amount of copper sulfate needed to treat the volume of your water, mix it in water, making sure that it all dissolves. Copper sulfate is much heavier than water, and if you just throw the crystals or powder into the pond, it will sink to the bottom where pond muds will chemically bind with it, locking it up. It is recommended that you dilute the copper sulfate as much as possible and take great care when distributing it, avoiding

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the creation of "hot spots," areas with higher concentrations.

When using a commercially formulated copper, follow the label instructions for dosage rates. The liquid forms can be applied directly to the water, but it is recommended that you first mix them with the water to dilute them. As with copper sulfate, great care should be taken to evenly disperse commercial formulations over the entire pond area, avoiding the creation of "hot spots".

You can create your own chelated copper by using two parts citric acid to one - copper sulfate, by weight. Combine both in water and dissolve them together. It is important to remember that you will be treating with the copper sulfate not the citric acid, so when weighing the formula, use only the weight of your copper sulfate in calculating dosages.

### **Precautions**

In a pond with algae, copper treatments can cause oxygen concentrations to drop, and may result in fish kills. Pond algae is a major source of oxygen production, and by removing it, we also remove this source of oxygen. In addition, oxygen will be consumed as the algae decomposes. If you are treating to kill algae, either treat in a series of smaller doses over time or have emergency aeration available.

Copper is also toxic to most of the zooplankton in a (daphnia, rotifers, etc.), and if you are relying on the zooplankton as a food source (i.e. fry ponds), you may not want to use copper.

The use of copper in indoor tanks, where algae and zooplankton are absent, does not present the same problems. However you still need an accurate measure of your total alkalinity before sale treatments can be performed.

In conclusion, copper treatments are very effective for certain situations, and are relatively inexpensive compared with other treatments. Caution must be exercised due to its effects on fish and other life in the water. For all of its uses there are alternative treatments which can be used. If your water is low in alkalinity, or if you have a heavy algae bloom and no aeration, copper treatments are not recommended.