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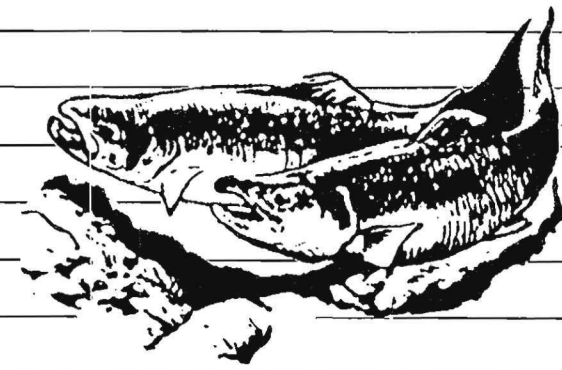

Common Salt Is Fungicidal on Trout Eggs

Malachite green, the preferred fungicide for fishery use, is no longer legal for control of fungus on fish or fish eggs. Formalin is an effective fungicide, but fishery managers are concerned about safety to the user and effects of effluent in the environment. Other antifungal agents are needed to maintain healthy fish and eggs in fish culture systems.

Salt (sodium chloride) has been widely used by the aquaculture industry as a therapeutic agent and to reduce stress to fish. Some fish farmers use salt for routine management purposes without proper knowledge of how it functions. Salt is commonly used to prevent and treat bacterial diseases, eliminate external parasites, reduce stress conditions during fish transport, and reduce toxicity of ammonia and nitrate nitrogen in fish ponds. Some reports in the literature suggest that use of seawater is effective for control of the common fungus *Saprolegnia* sp. on eggs of salmon. Others suggest that mixtures of sodium chloride and calcium chloride will control fungus on incubating eggs. We designed experiments to evaluate the effectiveness of sodium chloride for control of fungal infections on incubating eggs of rainbow trout (*Oncorhynchus mykiss*).

In Vivo Procedures

Green eggs of rainbow trout were placed in Heath incubation trays and maintained in well water with a flow rate of 1 L/min. Groups of 500 eggs were confined within 15-cm diameter acrylic rings fastened to the screen of each incubation tray. Eggs were inoculated with fungus (*Saprolegnia parasitica*) actively growing on hemp seeds suspended by tea balls in the upper tray of each duplicated treatment. Infection of eggs generally occurred within 7 days. The infection rate of about 10% in each duplicate series of trays was obtained by exchanging infected eggs between the trays. Eggs infected at the 0 and 10% level were then exposed to salt solutions for 15, 30, or 60 min every other day for 2 weeks. Treatments ceased when the eggs began to hatch. A positive control group was inoculated with fungus, but not treated with salt; a negative control group was not inoculated with fungus nor treated with salt.

Efficacy of Common Salt

The hatch rate for control groups of eggs was only 12% for those infected with fungus and 28% for those that were not infected, suggesting that the infection procedure was successful. These eggs were tested during August when trout eggs are generally smaller in size and lower in fertility. The 1.5% salt treatment was ineffective for control of fungus on infected eggs, but the hatch rate of uninfected eggs improved slightly. The 3% salt treatment was highly effective for controlling infection in the uninfected eggs; hatch rates were 65% in 15-min exposures, 66% in 30-min exposures, and 72% in 60-min exposures. These hatch rates were considerably higher than the uninfected control group (28%), confirming the therapeutic

value of prophylactic treatments. Eggs that were infected with fungus at the 10% level fared much better with 3% salt treatments; infection was controlled in 30- and 60-min exposures, and hatch rates increased over control groups to 31, 39, and 64% at the 15-, 30-, and 60-min exposures. We conclude that the 3% salt treatment is the treatment of choice because it is fungicidal and yet safe for the eggs.

Feasibility for Use of Salt

Common salt is readily available and listed as a low regulatory priority fishery chemical. We have demonstrated that 3% salt solutions are effective for control of fungal infections and improving hatch rates of treated eggs. Lower treatment rates may be useful for preventing fungal infections through prophylactic treatments. Disadvantages of using salt are the large quantities that would need to be transported, stored, and administered to static or flow-through aquaculture systems. Perhaps the solutions could be stored in tanks or ponds and reused during the egg incubation season. We believe that salt is a viable antifungal agent where it can be used in a practical manner.

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