

The Use of Bioaugmentation In Pond Management

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Bioaugmentation is the process of improving water quality by the addition of naturally occurring microorganisms. Water quality is increased by alleviating such strains as organic sludge build up, anaerobic decomposition and excessive plant and algae growth. Microorganisms such as bacteria cultures, enzymes and essential nutrients break down organic sludge, eliminate noxious by-products of anaerobic decomposition and limit plant and algae growth.

Leaves, grass, fish waste, dead aquatic plants and airborne particles all contribute to the organic load on a pond. Depending on the amount of organics deposited in a pond and the concentration of bacteria and enzymes in the water, an undesirable sticky, black sludge may result at the bottom of the water column. Enzymes, produced by bacteria, break down organics into simple nutrients which the bacteria use as nutrition. A variety of enzymes are necessary for the chemical break down of complex molecular organics. Lipase will break down animal or plant fats and greases, protease attacks proteins, cellulase degrades cellulose while amylase transforms carbohydrates and starches. The results of these reactions are increased nutrient levels which are able to sustain a healthy bacteria population and a dramatic reduction in the presence of organic sludge in the pond.

Many bacterial cultures require oxygen as well as organics to survive. These organisms are classified as aerobic bacteria. Aerobic bacteria use oxygen to digest nutrients by the following simplified reaction:

Organics + Water + Enzymes + Water Soluble
Nutrients + Oxygen + Bacteria = Water + Carbon

Dioxide.

This reaction shows the importance of oxygen and how it relates in breaking down organic waste without odorous or noxious byproducts. An additional benefit of aerobic decomposition is that it is considerably quicker than anaerobic decomposition. For this reason it is highly recommended to use bioaugmentation products in conjunction with some type of aeration equipment.

Excessive aquatic plant and weed growth in a pond is due to several factors. For plant life to flourish, the water must contain essential nutrient levels, beneficial light, carbon dioxide and be within a certain temperature range. Bacteria compete with plants for nutrients such as ammonia, nitrates, nitrites and phosphorus. Bioaugmentation converts these nutrients to nitrogen gas which evaporates to the atmosphere. Therefore our competing plants for these nutrients.

Results of one test conclude reductions in ammonia concentrations from .337 to .289 milligrams per liter, nitrate levels were reduced from .272 to .176 milligrams per liter and Kjeldahl nitrogen was reduced from 5.9 to 4.2 milligrams per liter. The significant drop in nutrient level is a clear indication of the improving water quality. Other findings conclude significant decreases of chlorophyll (75%), phenophytin concentration (85%) and turbidity (70%). The above test is representative of only one body of water and is independent of any other pond.

It is important to realize this bacteria will continue to reproduce only when the following conditions exist:

1. A water medium containing food (organic waste)
2. Dissolved oxygen levels of at least 5 parts per million
3. pH level between 6.5 and 8
4. Water temperature of at least 60°F

Bioaugmentation is one of several methods of controlling water quality. The addition of naturally occurring microorganisms increases water clarity, reduces odors and controls the population of aquatic plant life. Although this is a viable, environmentally safe means of managing a pond, it is important to consider each individual application when determining the best method for controlling water quality.

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