FACTSHEET
Algae prevention & control

How to control and prevent algae bloom

Action points

- ✓ Determine the severity of the algal bloom before choosing the most appropriate method/s of control for your system
- ✓ Consider physical control options first before implementing biological or chemical control
- ✓ Check regulations in your country carefully before implementing methods listed here

Introduction

Classic algal bloom

When water is stagnant an algae bloom might occur. The algae bloom will be more severe at higher temperatures or high concentrations of nitrates and phosphates. Although some blue-green algae could contain toxins harmful to humans, it is highly unlikely that the toxins will come into contact with vegetables produced in fertigated systems. The main problem associated with algae-contaminated water is the blocking of irrigation equipment including: pipes, filters, sprinklers, micro-outlets etc. reducing irrigation system efficiency.

Solutions can be divided into three categories:

- Physical
- Biological
- Chemical

Fixed cover stretched over a water silo

Physical control

Covering of the storage basin

Covering the storage basin is an effective method of control since algae need light to grow. No chemicals or residual dead algae will be present in the water. By covering the basin with a roof or a 100% shade cloth algae growth is prevented. In some cases this is not practical due to the size of the basin. In such cases a floating cover made of hexagon-shaped floaters will ensure sufficient covering of the basin to obtain algae control.

Ultrasound

Ultrasonic sound waves create an ultrasonic pressure in the top layer of the water. This ultrasonic sound barrier prevents the algae from rising to the surface and absorbing light for photosynthesis, preventing their growth.

In this way, the algae will die while the cell wall remains intact, preventing the release of toxins from the algae into the water. The algae will sink to the bottom of the water reservoir and are degraded by bacteria.

Care should be taken when selecting the devices as only a few have shown to be effective. High-power devices might release toxins (blue-green algae) or might harm fish and zooplankton due to cell destruction.

Water movement and aeration

Algae growth is inhibited when they are moved to darker areas since they depend on photosynthesis. Increasing the dissolved oxygen levels in the water provides a natural control of the nitrogen and phosphate levels and the existing beneficial aerobic bacteria can also thrive and are better able to compete with algae for nutrients. However, this technique has low efficiency and the moving particles can clog filters.

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Biological control

By use of Daphnia spp.

Daphnia feed on small algae, which includes some species of cyanobacteria (blue-green) algae. By eating the algae, the water is cleared. The water temperature has to be high enough for the daphnids to stay active and reproduce (16°C). Daphnids are sensitive to chemicals and metal ions in the water. They can be found at specialised aquarium shops or can be collected from natural ponds, lakes or rivers and introduced into water storage.

Picture of Daphnia with the cyanobacterium Mycrocystis. Algae cells are too large to be consumed by Daphnia (www.ag.auburn.edu)

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By fish

Using fish in ponds is an environmentally friendly method of controlling algae in water for irrigation. The use of grass carp (*Ctenopharyngodon idella*) is the most common method used in the purification of the ponds, mainly due to the fact that it can purify the most contaminated tanks.

Silver carps or common nase (*Chondrostoma nasus*) can also be used. Undesired species are *Cyprinus carpio*, *Carassius carassius* and *Tinca tinca* because they dig at the bottom of the pond and stir up mud while eating.

By bacteria and enzymes

Bacteria and enzymes reduce the algal activity by decomposition of the algae. Enzymes (cellulases and proteases) dissolve the organic molecules from algae, rotting leaves, and organic sediments. Once settled at the bottom of the pond or lake, the bacteria begin to mineralize the organic matter. The effect is visible only after 2-3 weeks. There is reduced efficiency between late July and August because the bacteria do not succeed in competing with the algae at this time of the year.

By use of straw bales

When straw bales are submerged in the water storage, the degradation or rotting process exudates algae-toxics that kill the algae. The straw is also a good shelter for water fleas (Daphnia) and amoebas that suppress algae. Results are seen after 6-8 weeks and optimal functioning after 6 months. It can reduce water pH and additives may be needed

By submerged aquatic plants

A lot of submerged aquatic plants species have developed mechanisms of competition for light against microalgae, being capable of producing allelopathic[1] substances which inhibit the development of algae. In addition, submerged aquatic plants serves as a refuge to algae-eating zooplankton (e.g., Daphnia) against potential predators. Larvae of insects, snails and crustaceans find food and refuge on the leaves submerged aquatic plants consuming microalgae stuck to the surface.

Picture of Chara. (Photo Credit: Melchor Juan Cazorla)

[1] Allelopathy is a biological phenomenon by which an organism produces one or more biochemicals that influence the germination, growth, survival, and reproduction of other organisms.

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Chemical control

Before applying chemicals, one must first check the legislation, safety rules and side effects on fauna and flora concerning these products.

Below some examples are provided:

- **FeCl addition and Al addition for P fixation.** Presence of phosphorus (P) is a key element for the development of algae. If P is fixed, algae growth will be reduced. At very high levels of phosphorus, other nutrients or light may limit the growth of algae. Iron chloride (FeCl) or aluminium (Al) products will fix phosphorus and it will no longer be available for algae.
- **Copper** is absorbed by the algae which kills them.
- **Hydrogen peroxide** (H_2O_2) and Cl are strong oxidants that are effective against algae.
- **Quaternary ammonium** compounds damage the cell walls of algae resulting in them dying off.
- **Blue dye** (normally used in food) keeps sunlight out, preventing photosynthesis and therefore algae growth.
- **Hydrated lime** (calcium hydroxide) is mixed into the pond water and allowed to settle. Phosphate precipitation will result in less algae growth over the following season.

Blue dye being dispersed into the water via a pump, picture from www.dyofix.co.uk

For more information please refer to the Fertigation Bible from page 5-1 to 5-100 at https://www.fertinnowa.com/the-fertigation-bible/