

MANAGEMENT OF AQUATIC WEEDS AND ALGAE USING AQUATIC BLUE

Literature Review

By Dilini Eriyagama

Monash University

Bachelor of Chemical Engineering (Honours) and Bachelor of Actuarial Science

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Uncontrolled growth of aquatic plants and algae interferes with biodiversity, irrigation use, recreational activities, fishing and can also create health problems. Therefore, the control of aquatic plants and algae is a major consideration in water management [1]. One approach to manage aquatic plant and algae growth is to use dyes to reduce light penetration into the water [2]. Dyes are easy to apply, safe to use and relatively inexpensive [3]

AQUATIC BLUE

- Aquatic Blue is water-soluble mixture of food grade blue (Acid Blue 9) and food grade yellow (Food Yellow 4) dyes
- It can be used as a non-selective herbicide to control algae and young aquatic plants growing at the bottom of contained lakes and ponds [4]
- The addition of aquatic blue limits light availability to aquatic plants (shading action) [5]
- It is most effective in ponds with depths of two feet (60 cm) or greater [4]
- Use of Aquatic Blue in conjunction with other herbicides enables effective year-round control and maintenance of aquatic weed species at various stages of their development [6]
- Over time, the dye is removed from a water body through a combination of dilution, photodegradation, and some biodegradation [6]

BENEFITS OF USING A DYE

- ✓ Easy to apply [7]
- ✓ Inexpensive [3]
- ✓ Keeps algae under control [3]
- ✓ Non-toxic, does not harm wildlife [7, 8]
- ✓ Impairs aquatic plant growth without increasing turbidity [8]
- ✓ Degrades naturally over time [8]
- ✓ Does not restrict swimming [7]
- ✓ Is a non-herbicidal alternative [9]
- ✓ Enhanced aesthetic appearance of still waters [10, 11]
- ✓ Can achieve control of rooted aquatic plants [11]
- ✓ Creates illusion of greater depth [11]

HOW IT WORKS

- Aquatic plants and algae, like all plants, require sunlight and nutrients to grow [3]
- Plant pigment molecules absorb light in the wavelength range of 400-700nm for photosynthetic process [12]
- Aquatic Blue competes with photosystem II (chlorophyll-containing) pigments by filtering out the red-orange (590-750 nm) and blue-violet (380-495 nm) wavelengths of light. This interferes with the photosynthetic process in aquatic plants and algae [2, 6]
- The uppermost layer of the water that receives sufficient light for aquatic plants and algae is referred to as the photic zone [13]
- Factors including algae concentration, water colour, turbidity affect the depth of the photic zone [3]
- Aquatic Blue stains the water by colouring it dark, resulting in a shallower the photic zone [3]

STUDIES

Numerous studies on the use of dyes to reduce aquatic plant and algae growth in bodies of water have been conducted.

- The first reported study on use of the dye was conducted by Eicher in 1947. Nigrosine (a bluish black dye) was effective in controlling curly leaf pondweed (*Potamogeton crispus*) [14]
- In 1972, Buglewicz identified that various brown and blue dyes eliminated pondweed and green algae species [15]
- In a study done by White, in 1975, an aquatic dye composed of blue and yellow dyes demonstrated the ability to reduce the growth of four submerged aquatic plants species (*Elodea canadensis*, *Najas minor*, *Potamogeton crispus* and *Potamogeton pectinatus*) [16]
- Osborne in 1979 exhibited that a blue-yellow dye combination prevented regrowth of *Hydrilla* when applied following application of another herbicide or another treatment [17]
- Manker and Martin – 1984 recognised the main mode of action of blue-yellow dyes. It was shown that aquatic plants treated with this combination grew 30.8% on average compared to aquatic plants without the dye treatment which grew 62.0% [18, 19]
- Evidence that blue-yellow dyes are effective against microalgae was presented in a study done by Spencer. The experiment found a 50% reduction in the photosynthetic rate of algal cultures exposed to 1-3 ppm of the blue-yellow dye mixture [4] [20]

MANAGEMENT PERIOD

- Aquatic dyes should be applied in spring or summer to be effective for aquatic plant and algae control [3, 7]
- The best time to apply the dye is at the beginning of the growth period since the dye prevents germination and limits early season growth [3]
- Aquatic plants which have already emerged will continue to grow since there is sufficient sunlight reaching the top of the plants [3, 6]
- Sunlight eventually breaks down the dye, limiting its effectiveness to between 6 and 10 weeks [7]

ADDITIONAL EFFECTS ON WATER

- **Temperature:** the shading effect of the dye may result in a slight reduction in water temperature [21]
- **pH:** Aquatic Blue does not change the pH of the water therefore there is no risk of extreme pH levels that could threaten other aquatic organisms [22]
- **Survival rate of fish:** A study has shown an increase in survival and yield of yearling channel catfish in ponds receiving dye treatment [21]

FACTORS FAVOURING TREATMENT WITH AQUATIC BLUE

- Aquatic Blue is suitable for areas with dense growths of undesirable aquatic weed species which require a lot of light [11]
- Aquatic Blue is very effective in excavated ponds [3]
- Target water body does not have any active outflows [11]
- Water body is located in an area shielded from high winds or waves [11]
- The target area does not contain muddy water [23]

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