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

Prepared for Aquatic Technologies

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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 ll (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, Potamageton 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 die 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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