A Preliminary Study on the Optimum Concentration of Copper Sulfate and Utilization of Valisneria Plant in Controlling Green Algal Growth Under Aquarium Condition

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Introduction

Ornamental fish industry plays a considerable role in the economy of Sri Lanka since the globalization ornamental fish industry (Wijesekara and Yakupitiyage, 2001) Maintenance of aquariums with ornamental fish has become a hobby of people and aquarium owners but the controlling excessive algal bloom has become a hindrance. Green algae are the most common form of algae in the home aquarium. Excessive algal growth is a nuisance for aquarists, due to decreasing dissolved oxygen level, absorbing the nutrients. It is also hazardous to fish and plants. Aquatic plants are known to control algae and Copper Sulfate is a chemical used in aquaculture ponds to control algae (Roy, 2009). Present study attempts to develop a method to control excessive green algal blooms in aquariums combining the effects of Copper Sulfate and aquatic plant Valisnaeria.

Methodology

Complete randomized design was used as an experimental design and it was carried out at the Uva Wellassa University Animal Science laboratory setting. Thirty six tanks of 12"x 6"x 6" size were used for experiment. Five treatments (concentrations) each for Copper Sulphate, *Valisneria spiralis* plants and controls for both treatments were used in triplicate. At the beginning, algal medium was created by fertilizing water in a stock tank (4'x 1 ½'x 1 ½') and by keeping for one week. Ten ppm Copper Sulphate stock solution was prepared and *Valisneria spiralis* plants having more or less similar total biomass (1.43±0.14), shoot length (13.58±1.54) and root length (6.48±1.34) were selected for experiment.

After one week, all tanks were filled using prepared algal water (approximately 230 l) and tanks were kept under black fabric net with 60 % of illumination. Two fighter fishes were stocked in each tank. Initial Chlorophyll content in all the tanks was measured using the spectrophotometer at 630 nm. Five tanks were treated with different concentrations of Copper Sulphate (T1=0.1 ppm, T2=0.2 ppm, T3=0.3 ppm, T4=0.4 ppm and T5=0.5 ppm), five tanks were treated by having different total biomass of *Valisneria spiralis* plants (T1=1.43 g, T2=3.15 g, T3=5.25 g, T4=7.12 g, T5=8.04 g). Control tanks were devoid of Copper sulphate as well as *Valisneria spiralis* plants. Light measurements were assured that all the tanks received similar light conditions.

Results and Discussion

Chlorophyll content at the initial stage was measured as 0.12 mg/l. Mean difference in Chlorophyll content was calculated by averaging the difference between initial and final Chlorophyll contents in each replicate. The values obtained for all treatments are shown in table 1. The Mean differences in Chlorophyll content in both treatments are also shown graphically in Figure 1. As depicted by the results there is a negligible difference in control tanks while treatments have shown differences according to the treatment type. It is evident that both the methods can be used successfully in controlling algae in aquariums effectively although the effect of Copper sulphate is better on algae control than that of using *Valisneria spiralis.*

Table 1. Mean difference in Chlorophyll a (mg/l) in treatment tanks and control after 72 hrs.

Treatment with Copper sulphate		Treatment with *Valisneria spiralis* plants	
Treatment tank	Chlorophyll a Content (mg/l)	Treatment tank	Chlorophyll a Content (mg/l)
T1 (0.1 ppm $CuSO_4$)	0.0093±0.005	T1(1.43 g)	0.0053±0.0005
T2 (0.2 ppm $CuSO_4$)	0.0103±0.005	T2 (3.15 g)	0.0067±0.0005
T3 (0.3 ppm $CuSO_4$)	0.0120±0.001	T3 (5.25 g)	0.0077±0.0011
T4 (0.4 ppm $CuSO_4$)	0.0137±0.005	T4 (7.12 g)	0.0083±0.0005
T5 (0.5 ppm $CuSO_4$)	0.0143±0.005	T5 (8.04 g)	0.0097±-0.0005
Control	0.0007±0.000	Control	0.0007±0.0000

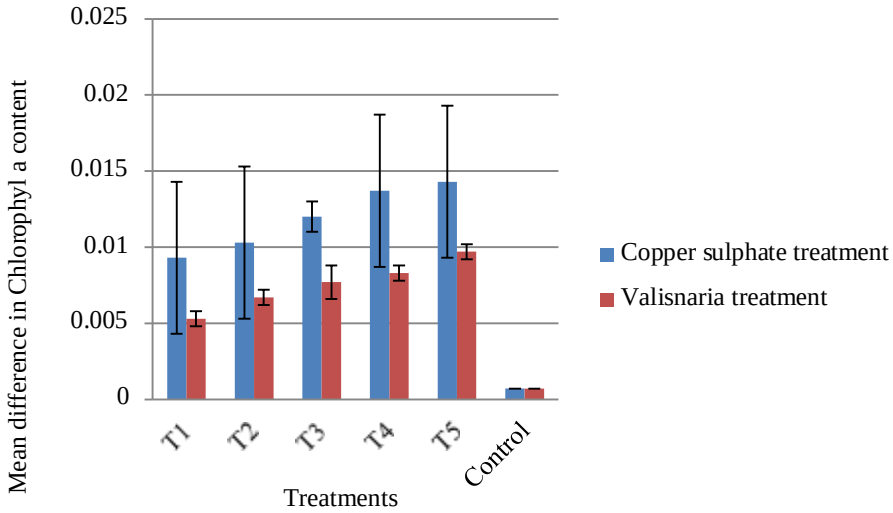

Figure 1. Mean difference in Chlorophyll a (mg/l) in treatments and control after 72 hrs.

Tukey's pairwise comparison has shown that all the treatments with Copper sulphate were significantly different from the control ($p<0.05$). However there was no significant difference among 0.3ppm (T3), 0.4 ppm (T4) and 0.5 ppm (T5) in copper sulphate treatment. The highest algal decline level was shown in 0.5 ppm significant level. However, Roy (2009) has reported that only a sufficient concentration of copper must be maintained to avoid damage to the fishes and other aquatic organisms. Therefore, according to the results, the best concentration was 0.3 ppm as the effect of that is not significantly different from that of 0.5 ppm and it is always better to use effective lower concentration of the chemicals in aquaculture. In this study even 0.5 ppm concentration of Copper sulphate also has not affected the *Betta splendens* fishes hence 0.3 could be regarded harmless.

Tukey's pairwise comparison has shown that all the treatments with *Valisneria spiralis* plants were also significantly different from the control ($p<0.05$). However, there was no significant difference between T4 (7.12) and T5 (8.04) in *Valisneria spiralis* treatment. The highest algal decline level was shown in 8.04 g biomass level in 6 l water volume. However, as there was no significant difference between T4 and T5 treatments it can be concluded that biomass of 7.12 g in 6 l of water is adequate for controlling algae in a volume of 230 l water containing 0.12 mg/l Chlorophyll a.

Conclusion

It can be concluded that both methods can be effectively used in controlling algae in aquarium tanks.

References

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