PRELIMINARY STUDY ON ALGAL DEVELOPMENT IN INDOOR FISH TANKS

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Introduction

Keeping an indoor fish tank with aquatic plants and animals provides an aesthetic value to mankind. In addition, such systems important as a medication to reduce the patient's stress level (Cole and Gawlinski, 2000). Value and the beauty of an aquarium system is decided by a combination of factors including fish, plants, water quality, algae and other microbial assemblages inside the tank. Algae and other microbial colonization in the tank are greatly decided by the physical and physicochemical properties of rearing water. Particularly, nitrate and phosphate are essential nutrients for algal growth which are released to aquarium water via feeds and fish fecal matters. Accumulation of nutrients provide a suitable environment for algal colonization and different types of algae and other microbes grow on the walls and other available substrates in the tank (Brabrand *et al.*, 1990; Trudeau and Rasmusse, 2003). As the algal densities increase with the time, water turns into greenish colour after few days and proper water management strategies are needed to maintain the water quality. However less attention has been paid to study on the algal development, density and their colonization in ornamental fish tanks. But proper knowledge on algal development in fish tank is important to impose control measures. Therefore, this preliminary study was designed to identify and to quantify the algal development in fish tanks in an indoor aquarium.

Methodology

This experiment was conducted at the indoor aquarium of the Faculty of Fisheries and Marine Sciences and Technology, University of Ruhuna, Sri Lanka. Six glass tanks (30x20x20 cm) placed in the indoor aquarium were used as the experimental units. There were two treatments; TR1 (control) treatment had no fish in the tank while TR2 treatment had 10 Zebra fish (*Danio rerio*) per tank. Each treatment (TR1 & TR2) with three replicates was randomly allocated into six tanks. All tanks were filled with de-chlorinated tap water and fish were fed *ad libitum* twice a day using a commercial fish feed (Prima diet).

A glass slide (75x25 mm) consisting 144 small squares (2x2 mm) in the middle part was used as the substrate to attach algae. Six glass slides were vertically fixed to a plastic frame and one frame was inserted into each tank. One slide from each tank was observed under the light microscope once a week. Algal species were identified using the algal identification manuals (Bellinger and Sigee, 2010). Identified species were counted in 12 squares alone the diagonal axis of the slide to quantify the number of cells or colonies per cm^2. Nitrate, nitrite, ammonia, pH and temperature were monitored fortnightly using the test kits (Aquarium pharmaceuticals. INC) and using a digital portable pH meter (Adwa: AD 110) respectively. Experiment was lasted for 35 days and number of algal cells or colonies in each week was compared. As data normally distributed, it was subjected to one-way ANOVA, followed by Turkey's Multiple Range Tests to evaluate the mean differences among treatments at 0.05 significant levels. Statistical analysis was done by using SPSS 16 version.

Discussion and Conclusion

Variation of algal density in TR1 and TR2 throughout the experimental period is given in Fig. 1 and 2 respectively. Algae were observed in TR2 after 7 days, while algae species did not record in TR1 until 21 days. Four species was identified in control (TR1) treatment where desmids and *Microcystis* dominant after 21 days. In the same treatment, density of *Cladophora* and *Oscillatoria* were very few (approximately 10 cells cm^{-2}) compared to that of desmids.

Microcystis density of TR1 was 66 cells/cm^2 at day 21. But the density of former species decreased with time and disappeared at the end of the experiment. Desmids were the dominant group covering large area of the substrate of same treatment. Relatively lower density of *Cladophora* (10 colonies/cm^2) was recorded after 28 days in TR1 while their density was significantly less (p< 0.05) than that of TR2.

Five major species have identified in TR2 where *Fragilaria* was the dominant species recorded. There was no any significant difference in algal density among different species observed in TR2 at day 7. In the same treatment (TR2), number of *Fragilaria* and *Pseudanabaena* cells were significantly higher (P<0.05) than that of other species at the 14th day. *Oscillatoria* and *Pseudanabaena* disappeared after 21 days. At the end of the experiment, the substrates become yellowish brown in colour as *Fragilaria* totally covered the substrates.
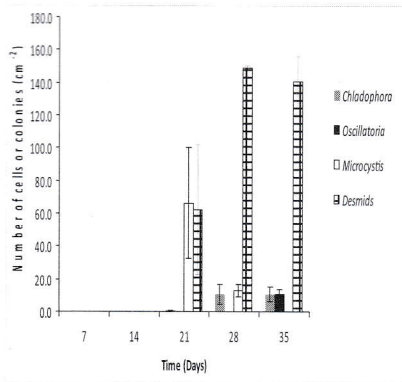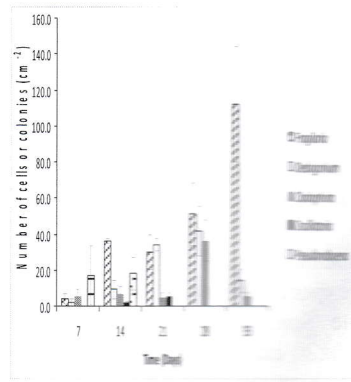

Figure 1. Algae species recorded in TR1   Figure 2. Algae species recorded in TR2

Trudeau and Rasmusse (2003) also observed *Cladophora* and pinnate diatoms on glass slides under laboratory conditions similar to that of present study. Fish feed provides suitable nutritional environment for the algal growth, and present findings agree with findings in the literature (Hansson *et al.*, 1989; Brabrand *et al.*, 1990; Drenner *et al.*, 1990). This study revealed that the taxon diversity of experimental group rich in nutrients is higher than that of control treatment. Pringle (1991) also observed higher density and higher taxon diversity of stream algae under high nutrient condition similar to present study. Water quality parameters remained within the optimum range for fish (Table 1). Although ammonia was not detected at the beginning, TR2 reached to 0.25ppm after 14 days and remained constant. This may probably be due to fish excretions.

Table1. Water quality parameters of raring water

Parameter	TR1				TR2			
	initial	14 days	28 days	35 days	initial	14 days	28 days	35 days
NO_3^- (ppm)	12.5	12.5	12.5	12.5	12.5	100	100	100
NH_4^+ (ppm)	0	0	0	0	0	0.25	0.25	0.25
pH	7.8	7.8	7.8	7.8	7.8	7.3	7.4	7.4
Temp (^0C)	27	26	27	27	27	26	27	26

Nitrate concentration of TR2 increased with the time while it was constant in TR1 throughout the experiment. Temperature and pH remained similar in both treatments. Sufficient sunlight with the other factors particularly nutrient inputs accelerates the algal growth in fish tanks especially in tropical countries. Therefore, managing water quality in aquarium is a crucial problem and both mechanical and chemical methods with repeated water changes could be adopted to minimize algal growth in fish tanks. Under this context, identification and quantification of algal growth is important to find the proper control measures to control algae in fish tanks. Although present study conducted identification and quantification, further studies are needed to find the proper control measures to minimize algal development in small indoor aquaria.

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