CHAPTER 1
INTRODUCTION

A frequent consequence of eutrophication in fresh waters is the mass development of blue green algae (cyanobacteria). The occurrence of these blooms can create a significant water quality problem, as certain species of blue green algae are capable of producing toxins. Some blue green algal genera, such as *Microcystis*, *Anabaena*, *Nostoc* and *Aphanizomenon*, can produce a wide range of potent toxins, including a family of hepatotoxins called microcystins in freshwater (Harada 1996; Chorus and Bartram, 1999; Codd *et al.*, 2005).

Microcystins can be accumulated in the tissues of fish (Tencalla *et al*., 1994; Magalhaes *et al.*, 2001; Soares *et al*., 2004), mussels (Vasconcelos, 1995; Amorim and Vasconcelos, 1999) and aquatic macrophytes (Pflugmacher *et al*., 1998) and also transferred from crab larva to salmons through food chain (Williams *et al*, 1997). The microcystins could be accumulated in fish through food chain and could be a threat to human food safety. (Magalhaes *et al.*, 2001).

As the World Health Organization (WHO) progresses with provisional Drinking Water Guidelines of 1 $\mu g.L^{-1}$ and Tolerable Daily Intake (TDI) value of 0.04 $\mu g.kg^{-1}$ of body weight day^{-1} for microcystin-LR. Efficient treatment strategies are needed to prevent this toxin from reaching consumers. There are various ways to eliminate microcystins, depend on water quality requirement. Most of them are physical and chemical methods. Although the methods are effective but also expensive. Moreover, several chemical treatments of water are proposed, it is possible that the chemical treatments sometimes should produce carcinogenic substances (Ishii *et al*., 2004). Some biological methods such as utilization of cyanophage, microcystin-degrading bacteria and phytoplanktivorous fish were alternative ways for elimination of blue green algael toxin in waterbodies.

There are many aquaculture ponds throughout Thailand. In the traditional cultivation of Nile tilapia and giant freshwater prawn, farmers usually establish green water by adding organic or inorganic fertilizer or loading of nutrients from fish waste

to promote phytoplankton growth. These ponds typically experience blue green algal bloom (Whangchai *et al*., 2008). An occurrence of *Microcystis aeruginosa* and microcystins in prawn ponds had been studied by Prommana *et al.* (2006). They found high amount of *M. aeruginosa* and microcystins in water. However, the accumulation of microcystins in prawn was not studied. Therefore, the incidence of toxic blue green algae especially *M. aeruginosa* and microcystins in aquatic farms were investigated. Furthermore, using EM for improvement of water quality and elimination of microcystins in ponds were conducted. The data would be useful for food safety aspect and public health to avoid the damaging effect of blue green algae and their toxins.

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Objectives

1. To investigate the distribution of *Microcystis aeruginosa* and microcystins in prawn and fish farms in selected ponds of Chiang Rai and Chiang Mai provinces.

2. To study on the accumulation of microcystins in water, prawn and fish samples in selected and demonstrated ponds.

3. To study on the controlling of *Microcystis aeruginosa* and microcystins by Effective Microorganisms (EM).