

CHAPTER 1

INTRODUCTION

Cyanobacteria or blue-green algae is a group of prokaryotic microorganisms which have been living as autotrophs on earth since the pre-cambrian period. Generally, cyanobacteria can quickly proliferate (bloom) in rich nutrient water conditions known as eutrophication in which many other groups and species were also observed e.g., green algae, euglenoids and dinoflagellates. Research on phytoplankton composition could be useful for gaining important knowledge for ecological studies. The phytoplankton diversity and abundance have the role as principal organisms and are used as bioindicators of water environments, which is a more preferred method over using physico-chemical methods which require both significant amount of funds for chemicals and high technological instruments for monitoring and determining water properties. However, the natural mechanisms forcing variation in phytoplankton composition may differ as regions of the world vary. So that, the investigation of diversity and abundance of phytoplankton in a specific region possibly results in different data in comparison with other studies because specific environmental factors in each region of the world have the specific influence on each organism in that zone. This study focuses on limnology in the tropical area which would be very useful for other future research to investigate the phytoplankton diversity and abundance including the influence or relations between phytoplankton composition and environmental factors.

Many species of cyanobacteria may influence the aquatic ecosystem, and food chain including the water consumption of humans and animals because they can produce toxic substances affecting human and animal organs and tissues such as livers, intestines, the neurosystem, or also may cause eye and skin irritation. One cyanobacterial toxin, microcystins are produced and stored in various species of cyanobacterial cells and contaminate the water body after cyanobacterial cells were lysed or died.

In Thailand, about nine years ago, the blooming of colony cyanobacteria named *Microcystis* occurred in many of the large and small water resources around the country.

This blooming phenomenon had called for more attention and realization of the toxic effect of cyanobacterial toxins from many academic institutes and governmental organizations which are concerned with public health and water pollutions. This has resulted in their contributions of collected information regarding toxic cyanobacteria. Previously, the information of toxic cyanobacteria in Thailand was very rare. Much research was done by many scientists focusing on taxonomy, ecology, toxicology and molecular genetics of toxic cyanobacteria, particularly on the effect of growth factors, and environmental conditions causing the blooming and toxicity on other organisms. However, the studies of the influence of water and sediments on cyanobacterial growth and toxin quantities including the determination of microcystins in the sediments collected from water resources, which show the blooming have still not been investigated.

This research area is very interesting because in the sediments, there are many compounds acting as the nutrients influencing cyanobacterial growth. Actually, the conditions and ingredients of sediment at the bottom of the water resources are different from those of the water body. Some compounds including cyanobacterial toxins and microcystins, may appear in small amounts in water but accumulate in high amounts in the sediment. Furthermore, the understanding of the characterisation of microcystins in sediment at the lake bottom would be useful for understanding the actual dynamic and the reaction among substances in the aquatic ecosystem which can be applied as the alternative choice for toxin removal and water treatment.

Many research projects have been done in the laboratory with the culture isolated from the field sites to investigate the effects of the potential parameters to the growth rate and changing in the production of metabolites. The results will be applied to solve the environmental problems and their prevention. The scientific results could be obtained from the laboratory experiments with controllable conditions giving results of direct relations between the phytoplankton species and some physico-chemical parameters. However, in the actual natural conditions of the water resource, there is not only one single parameter which can affect the phytoplankton composition, but rather there are

many uncontrollable parameters in the environmental condition which can influence the phytoplankton composition in terms of a combination of effects. The analysis of multiple correlations among all environmental factors and phytoplankton composition would present the actual influence of potential parameters under natural conditions. Thus, it is important to understand the correlations between some parameters of phytoplankton including cyanobacterial growth, microcystins, water and sediment qualities particularly in the natural conditions of the environment of water resources.

1.1 Objectives

1.1.1 To study the diversity, biovolume and fluctuation of cyanobacterial species and phytoplankton compositions in the studied water resources.

1.1.2 To study correlations between some parameters of cyanobacterial and phytoplankton growth, microcystin quantity, water and sediment qualities.