ABSTRACT

Phosphorus (P) is considered as the most frequently limiting factor for phytoplankton growth in freshwater environments. One of the ways, how to solve the lack of P in algae and cyanobacteria, is the production of extracellular phosphatases. Extracellular phosphatase activity (PA) of phytoplankton at the single cell level was investigated in three acidified mountain lakes – Čertovo, Prášilské and Plešné in the Bohemian Forest (Czech Republic) from May to September 2007. PA of phytoplankton was detected directly at the site of enzyme activity using the fluorescence labelled enzyme activity technique (FLEA) and epifluorescence microscopy. The FLEA technique is based on colourless substrate ELF phosphate (ELFP) that is converted by enzymatic hydrolysis to the insoluble fluorescent product ELF alcohol (ELFA), which marks the site of PA.

This thesis is divided into two parts. The first part (in Czech) is aimed at a general comparison of PA of phytoplankton in the three Bohemian Forest lakes. PA was characteristic for dinoflagellates *Gymnodinium uberrimum, Gymnodinium* sp. and *Peridinium umbonatum* that were ELFA labelled in all lakes almost during the whole season. Other species (e.g. *Carteria* sp., *Chlorogonium fusiforme* or *Synura* sp.) were active either in only one of lakes or in some samples. PA was also detected in two (potentially) mixotrophic genera – *Cryptomonas* and *Dinobryon*. The proportion of ELFA labelled species to the total phytoplankton biomass was very high in Čertovo and Prášilské lakes owing to the dominance of dinoflagellates. On the other hand, this proportion was rather low in Plešné Lake due to dominance of mostly non-active species *Monoraphidium dybowskii*.

The second part (in English) explores the seasonal development of species-specific PA in the three dominant dinoflagellates – *Gymnodinium uberrimum, Gymnodinium* sp. and *Peridinium umbonatum* and the influence of selected lake water characteristics on PA in these species. High seasonal, inter-lake and interspecific variability of PA indicated different strategies of these species how to cope with the lack of P, and reflected differences in the acidification status of the lakes. The redundancy analysis (RDA) identified the concentration of total aluminium as the factor explaining the best the variability in species specific PA.