ABSTRACT

Forest stands may act as important carbon storage places – sinks, due to carbon allocation into both the plant biomass in the process of photosynthesis and the soil. Enhancement of CO_2 concentration affects a whole range of plant physiological processes and, thus, it is necessary to study its effect on photosynthetic apparatus - leaf anatomical structure and chloroplast ultrastructure. The first aim of the Thesis was to evaluate changes in chloroplast ultrastructure of common beech (Fagus sylvatica L.) under the effects of both elevated CO_2 concentration and different irradiance. The second aim was to evaluate if the anatomical parameters obtained from the middle part of the leaf are representative for the whole leaf blade.

The trees were grown in glass domes at the Bílý Kříž experimental site in the Beskids Mountains (Czech Republic), owned by the CzechGlobe Institute. Leaves were sampled in 2010 from juvenile trees, which were planted in 2005 being 5-year old and cultivated since then in ambient (AC; 390 micromol/mol) and elevated (EC; 700 micromol/mol) CO_2 concentrations.

The EC effect was recorded to be an increased proportion of starch grains in the chloroplast median section and decreased proportion of of intergranal thylakoids (IGT) while the ratio of granal to intergranal thylakoids (GT/IGT) increased. The effect of irradiance was observed particularly in the arrangement of thylakoid membrane system. Shade leaves exhibited higher proportion of both GT and IGT. A trend of higher proportion of plastoglobuli was observed for chloroplasts from EC-treated and sun leaves. The present results show that both studied factors have their effect on chloroplast ultrastructure.

When comparing reference sample of leaf segment with the segments sampled by systematic uniform random sampling (SUR) it was revealed that proportion of granal thylakoids in the reference sample differed from other segments. It is possible to conclude that the middle part of the leaf offers a reference value though not representative for the whole leaf blade.