



Quantitative measurements of pigments in coniferous by the method of differential optical absorption spectroscopy

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The relative concentrations of photosynthetic and photoprotective pigments provide important information about the physiological state of the plant and are determined, among other things, by the lighting regime and the presence of nutrients. Relative composition of the pigments is depending on the physiological response of the plant to external influences. In most cases, when an on-line in-situ analysis is required, only the main pigments are measured: Chla, Chlb and a rough estimate of the "total carotenoids" in higher plants, but such an estimate may not always be reliable. Differential Optical Absorption Spectroscopy (DOAS) is known for its applications for the trace gases measurements in the atmosphere sciences; however, no application has been found for the determination of color pigments for plant extracts. For the correct application of the DOAS method, it is necessary to determine the appropriate optical thickness of the sample under study, the fitting intervals for analysis, as well as a set of absorption cross sections for the target pigments.

Purpose of the work is to determine the appropriate settings for the retrieval of concentrations of colored pigments employing the DOAS method by investigating the sample of pine and spruce needles extraction. The relevance of the work consists in the development of a new method for analyzing transmission spectra, which does not require the creation of specialized software, since programs for analyzing spectra by the DOAS method are available.

For the spectra registration, Solar M150 spectrometer with Hamamatsu S7031-1006S detector has been used, the transmission spectra recorded in the 330 - 750 nm range, and pure acetone employed as a solvent. The paper presents the results of DOAS-analysis of extracts of various coniferous samples, from which it was possible to retrieve the contents of Cha, Chb, B,b-carotene, B,e-carotene, and small amounts of Phaeophytin-a, Neoxanthin. Optimal settings for the DOAS-analysis and experimental setup details for photosynthetic and photoprotective pigments retrieval are discussed.