

Scientific Paper:

Plant and Soil 270, 311-320, 2004

Effects of *Carex rostrata* on soil oxygen in relation to soil moisture

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Abstract:

Many wetland plants are faced with severe edaphic problems. Long term flooding effects a sequence of chemical processes that result in soil anoxia and production of several phytotoxic compounds. In order to maintain an aerobic root respiration wetland plants produce aerenchymas that enable oxygen conduction through the plant body to underground organs. Moreover wetland plants are able to release oxygen into the soil. This aeration effect of wetland plants in turn can influence soil chemistry considerably and protects roots by an aerobic rhizosphere. Oxygen release by underground organs of aerenchymous plants has been well documented in laboratory investigations but not under field conditions. In this study, dynamics of oxygen saturation were measured together with soil water content and microclimatic parameters. Measurements were carried out on some lowland peat covered by *Carex rostrata* Stokes from July to October 2001. Oxygen saturation was quantified using novel optical sensors (microoptrodes). The presence of *C. rostrata* significantly increased oxygen content in the soil. Mean oxygen saturation under *Carex rostrata* (56.0%) was significantly higher than in a control plot without vegetation (26.6%). Due to fluctuating water content, oxygen saturation in both plots was characterized by pronounced time variation. Increasing soil water content caused an extreme decline of oxygen saturation in both plots and led to anoxia in the control plot. In the presence of *C. rostrata*, the decline in soil oxygen took place at significantly higher water content (68.5% compared to 67.5% in the control plot) which is substantial as the mean water contents varied between 67 and 69% during the measurement period.

Key-words: Aerenchyma, microclimate, microoptrodes, oxygenation, soil water, wetlands