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Response of chlorophyll fluorescence, photosynthesis and transpiration in Robinia pseudoacacia L. to drought stress

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Black locust is highly valued for the production of biomass for bioenergy and can be cultivated in short-rotation plantations on marginal arable land. As a pioneer species the tree grows under a wide range of conditions and is used for reclamation of open-cast lignite mining areas in Brandenburg (mean annual rainfall 560 mm). The native range of black locust is classified by a humid to sub- humid climate with normal annual precipitation of 1020 to 1830 mm. In Central Europe, *Robinia pseudoacacia* L. is known to be relatively drought tolerant compared to other temperate, deciduous tree species. However, the establishment of saplings in plantations is sensitive to drought in spring and early summer. In order to evaluate the growth and ecophysiological performance of Robinia to drought stress, a pot experiment was established at the Johann Heinrich von Thünen-Institut, Hamburg. We studied the photosynthetic performance with a PAM 2100 chlorophyll fluorescence system. Net CO_2 exchange and and transpiration were determined with a minicuvette system CMS 400. Mean electron transport rates ranged from 93 µmol m^{-2} s^{-1} in drought stressed plants to 118 µmol m^{-2} s^{-1} in the well-watered plants, respectively. Net photosynthesis (A= 3.65 µmol m^{-2} s^{-1}) and transpiration (Tr = 0.5 mmol m^{-2} s^{-1}) were reduced by drought due to stomatal closure compared to the well-watered control (A= 6.1 – 9.7 µmol m^{-2} s^{-1}, Tr = 0.93 – 1.25 mmol m^{-2} s^{-1}). To minimized transpiration on the plant level leaf areas was drastic reduced by drought stress.