Verhandlungen der **Gesellschaft für Ökologie** - Band 42

GfÖ 2012

ISSN 0171-1113

From Basic Ecology to the
Challenges of Modern Society

LEUPHANA
UNIVERSITÄT LÜNEBURG

O5 – Water use efficiency of bioenergy crops - a comparison between black locust and giant knotweed

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The cultivation of fast-growing plants for energetic usage is a significant alternative in marginal lands in Europe. As the availability of water influences the primary production and therefore the biomass production significantly, a central role is played by the optimization of these processes through the species selection. Consequently, the introduction of new bioenergy crops requires additional physiological and ecological details about their water use efficiency.
The tree species black locust (*Robinia pseudoacacia* L.) and the new cultivar of giant knotweed, trademarked with the name "IGNISCUM basic" (*Fallopia sachalinensis* var. `Igniscum´, Fam. *Polygonaceae*), that preferably can be used in burning units, have the potential to be cropped for bioenergy production.
Black locust is planted in Lusatia for the production of biomass in short-rotation plantations and agroforestry systems. Igniscum is a potential new bioenergy crop, which is characterized by a high annual biomass production. It can be harvested up to two times during the growing season.
In a lysimeter experiment under semi-controlled growth condition we compared the transpiration and biomass production of both species (black locust and IGNISCUM Basic). The water was supplied solely by an automatic irrigation system in relation to the volumetric soil water content (7%, 10%, and 14%) and water use efficiency at whole plant level is evaluated during the vegetation period.
The study encompasses ecophysiological investigations of the gas exchange on single leaves to evaluate the influence of the stomata regulation on the transpiration. We determined the biomass-transpiration relation and formulated the equation that describes the interaction between water use and biomass production. The calculated mean cumulative transpiration during the vegetation period for black locust, which was 240 (7%), 385 (10%) and 587 liters (14%), with a WUE of 2.41kg of dry biomass for each m^{-3} of water transpired.