



Tropentag, September 14-16, 2010, Zurich

“World Food System —  
A Contribution from Europe”

## Photosynthesis of *Jatropha curcas* and *J. mollissima* under Drought Stress

MARTIN WORBES<sup>1</sup>, TOBIAS GEBAUER<sup>2</sup>, JAN KOKEMOR<sup>1</sup>

<sup>1</sup>Georg-August-Universität Göttingen, Department of Crop Sciences - Tropical Agronomy, Germany

<sup>2</sup>University of Illinois at Chicago, Department of Biological Sciences, United States

### Abstract

*Jatropha curcas* recently is highly promoted to become an important source for biofuel production in tropical regions. The often mentioned advantage of the species is its assumed adaptation to drought stress and the possibility to cultivate plantations on marginal land under arid climate conditions. Little is known, however, on the productivity under these conditions and the mechanisms of drought tolerance.

To test the response of photosynthesis of different *Jatropha* species to water limitations as a measure of adaptation and productivity we combined a green house experiment with measurements under natural conditions. In all cases we estimated photosynthetic rates and stomatal conductance from light response curves in relation to soil moisture.

The green house experiment was performed in Göttingen with *Jatropha curcas* and the field trials on a farm in the vicinity of Patos, Paraíba in the north-east of Brazil with *Jatropha mollissima* as a natural element of the regional dry forests. Some other woody species from this site were also included as a control.

Both *Jatropha* species showed very similar responses to light under wet conditions with a maximal photosynthesis rate (A) of about  $25 \mu\text{mol m}^{-2} \text{s}^{-1}$  at a light intensity of  $600 \mu\text{mol m}^{-2} \text{s}^{-1}$ . Under dry conditions with  $0.05\text{--}0.10 \text{ m}^3 \text{ m}^{-3}$  soil moisture A was reduced to maximum values between 5 and  $10 \mu\text{mol m}^{-2} \text{s}^{-1}$  at a light intensity of  $400 \mu\text{mol m}^{-2} \text{s}^{-1}$ . In comparison with control species at the field site, *Jatropha* shows a higher reduction of photosynthesis under stress conditions.

The results show that the measured physiological response of *Jatropha* species to water stress is a typical behaviour within the genus. Their tolerance to drought is not related to high productivity under dry conditions but an expression of adaptation to and survival during extended periods without sufficient soil moisture.

**Keywords:** Drought stress, *Jatropha*, photosynthesis, soil moisture