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Leaf Age Effect on Intrinsic Water Use Efficiency of *Jatropha curcas*

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Introduction

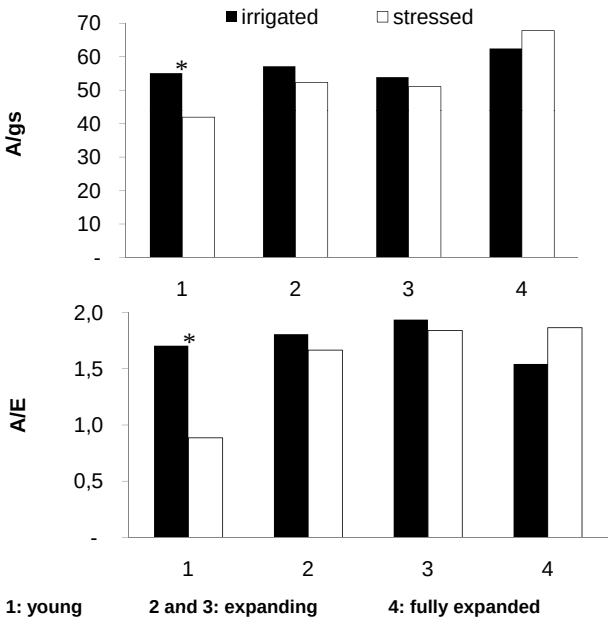
Jatropha curcas L. (Physic nut) is a drought-resistant shrub, increasingly cultivated in arid and semi-arid area for biofuel production and is claimed to grow profitably on marginal land. While yield and physical properties of the oil have been assessed in several studies, nutrient and water demand of Physic nut are not well characterized, as well as the adaptation of Jatropha to grow on marginal land. Taking those marginal sites as one of the dominant target environments in which Jatropha will be cultivated, an improved understanding of leaf activity and resource use is required. Water scarcity is one of the major growth constraints on these sites and water availability has been proved to have positive effects on plant growth. The assessment of carbon gain versus water loss on the field scale has been performed by measuring instantaneous water-use efficiency at the leaf level in Fenoarivo, South-West Madagascar. The response of intrinsic WUE to leaf age and water supply was evaluated in this study.

Conclusions and Outlook

- Effects of leaf age and water supply indicate that stomatal conductance is not regulated in a way to fully adjust to assimilatory capacity of Jatropha leaves.
- This information should be considered in approaches which aim at quantifying leaf activity of field-grown bushes which are characterized by spatially highly divers conditions in terms of microclimatic parameters.
- Instantaneous WUE was interactively affected by leaf age and water supply level.

Results

Intrinsic WUE – effects of water supply



Intrinsic WUE – effects of leaf age effects

		A/gs	A/E	E	gs	A
+ w	1	55.08 **a**	1.70 **a**	5.63 **b**	0.18 **b**	9.80 **b**
	2	57.19 **a**	1.81 **a**	7.81 **ab**	0.25 **b**	13.51 **b**
	3	53.90 **a**	1.94 **a**	8.26 **a**	0.30 **a**	15.48 **a**
	4	62.47 **a**	1.54 **a**	5.24 **b**	0.15 **ac**	8.38 **c**
- w	1	41.95 **ab**	0.89 **b**	6.17 **b**	0.13 **b**	5.42 **c**
	2	52.35 **ab**	1.66 **a**	6.22 **b**	0.20 **b**	10.22 **b**
	3	51.08 **b**	1.84 **a**	7.74 **a**	0.29 **a**	13.94 **a**
	4	67.82 **b**	1.86 **a**	4.52 **b**	0.15 **b**	8.69 **cb**

- **WUE of young leaves was lower in rainfed than in irrigated plants, whereas the opposite trend was observed in fully-expanded leaves.**
- **A, E and gs of expanding irrigated and rainfed leaves were significantly higher than those of the young and fully expanded leaves.**
- **A/E of young rainfed leaves was lower than that of other leaf age classes**

Materials and Methods

- Monitoring of leaf area development and definition of the 4 age classes by sigmoidal growth analysis.
- Regular measurement of leaf gas exchange on irrigated and rainfed plants.
- Scheduling of irrigation according to Eto on half of the plants in order to investigate water supply effects on leaf gas exchange.

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