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“Resilience of agricultural systems against crises”

Euphorbia tirucalli L. – Physiological and Genetical Characterisation of a Drought Tolerant Plant and its Potential as a Source for Bioenergy Production

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Abstract

The decrease of mineral oil supplies has induced research on biomass as an alternative source of energy. A number of plant species have been examined; however, climate change has brought problems to agriculture such as drought. To deal with those consequences, it is important to find plants for growing in non arable land. The plant should have high drought tolerance as well as be beneficial for other purposes such as phytochemical and pharmaceutical applications. *Euphorbia tirucalli* L. grows well in arid areas, has a high tolerance to drought stress and could be therefore a source of biomass. This plant contains also valuable compounds of pharmaceutical benefit and might serve as a source of rubber.

To analyse a broad variety of plants with different genetic backgrounds *E. tirucalli* genotypes collected in different countries (Burundi, India, Indonesia, Italy, Kenya, Morocco, ornamental from our greenhouse Hannover, Rwanda, Senegal, Togo, USA) have been investigated for their genetic relationship using AFLP analysis with UPGMA clustering. The different physiological responses to drought stress are determined in the genotypes from Morocco and Senegal by different parameters. The rubber content is measured using Nuclear Magnetic Resonance (NMR).

The cluster analysis shows that the genotypes are divided into two main groups, African genotypes with bootstrap value 60 % and non African genotypes (except Rwanda and Kenya) with bootstrap value 68 %. The plants respond significantly different to various levels of volumetric water content (vwc). Both genotypes from Morocco and Senegal show the same response to drought stress by different parameters. The NMR measurement shows that the rubber content per fresh weight is different between genotypes, the highest has genotype Senegal (17.33 mg g⁻¹) and the lowest genotype Burundi (1.48 mg g⁻¹).

The results show that the genotypes might be ecotypes and adapted to the respective conditions, although more samples from different regions need to be investigated. The drought tolerance in low level vwc shows that this species can grow in arid area. Different rubber content provides information to select the most beneficial genotypes; however, more research is needed to make sure whether the difference is due to genetic or environmental factors.

Keywords: Drought tolerance, milk sap