Traits related to drought resistance in Tamarind (*Tamarindus indica* L.)

Siamak Ghaffaripour[1], Nina Van den Bilcke[1], Karen Wuyts[1], and Roeland Samson[1]

[1]-Research group Environmental Ecology and Applied Microbiology (ENdEMIC), Department of Bioscience Engineering, Faculty of Science, University of Antwerp, Groenenborgerlaan 171, 2020 Antwerpen, Belgium

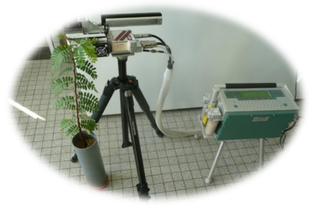
Roeland.samson@uantwerpen.be

Objectives

We evaluated the association of biomass, biomass allocation, gas exchange and some important plant traits to drought in eight provenances of tamarind.

We measured the biomass variability under drought stress and non-stress conditions.

Materials and Methods



Seeds were collected from eight provenances:
(i) two provenances from Iran (Bahokalat and Chabahar), (ii) one provenance from Thailand, (iii) three provenances from Mali (Faragouaran, Kenioroba and Hombori), (iv) one provenance from Senegal (Thies) and (v) one provenance from Cuba (Granma).

Seedlings from each provenance were randomly allocated to one of tree treatments: control (CD), moderate water stress (MD), high water stressed (HD).

Geometric mean plant biomass (GM), drought intensity index (DII), and susceptibility index (S) were calculated as follows: GM = (Yd Yp)1/2; DII = 1 - Yd/Yp; S =(1 – Yd / Yp) / DII, where Yd and Yp are plant biomass performance under stress and non-stress, respectively (Fischer & Maurer, 1978).

Results

Plant biomass under drought correlated positively with Yp (r=0.481** DII= 0.26 in moderate water stress level; r=0.71**, DII=0.30 at the high water stress level).

There were no significant correlation between differential biomass reduction (Yp-Yd) and Yd on both level of stress.

Traits did not tend to correlate with S at both level of drought stress, whereas GM generally correlated with most traits of biomass and biomass allocation such as LDM, RDM, SDM, TPDM, LMR, LAR and RMR.

Notably, in high water stress level of drought, traits tended to be consistent and correlated to GM with the same pattern of moderate water stress level.

Table 1. Correlation coefficients between drought susceptibility index (*S*), geometric mean (GM) with traits in tamarind under moderate water stress and high water stress of drought term.

	Moderate water stress level (MD)		High water stress level (HD)	
Traits	Drought susceptibility index	Geometric mean yield	Drought susceptibility index	Geometric mean yield
LA	0.646^{ns}	0.933**	-0.166^{ns}	0.961**
NL	0.577^{ns}	0.800**	-0.202^{ns}	0.775*
ST	0.303^{ns}	0.792*	-0.413^{ns}	0.824*
V	0.408^{ns}	0.944**	-0.346^{ns}	0.953**
LSH	0.339^{ns}	0.782*	-0.372^{ns}	0.812*
LV	0.452^{ns}	0.903**	-0.268^{ns}	0.919**
H:D	-0.082^{ns}	0.182^{ns}	-0.536^{ns}	0.200^{ns}
Photo	-0.142^{ns}	0.224^{ns}	-0.364^{ns}	-0.119^{ns}
SD	0.505^{ns}	0.963**	-0.213^{ns}	0.972**
RD	0.464^{ns}	0.945**	-0.278^{ns}	0.967**
LDM	0.477^{ns}	0.712*	-0.300^{ns}	0.832*
SDM	0.441^{ns}	0.983**	-0.340^{ns}	0.985**
RDM	0.657^{ns}	0.760*	0.006^{ns}	0.922**
LFM	0.647^{ns}	0.884**	-0.196^{ns}	0.919**
SFM	0.448^{ns}	0.980**	-0.347^{ns}	0.979**
RFM	0.455^{ns}	0.804*	0.017^{ns}	0.932**
TPDM	0.571^{ns}	0.983**	-0.207^{ns}	0.991**
LMR	-0.287^{ns}	-0.775*	0.367^{ns}	-0.899**
SMR	-0.392^{ns}	-0.565^{ns}	-0.113^{ns}	-0.594^{ns}
RMR	-0.309^{ns}	-0.853*	0.352^{ns}	-0.876**
SLA	0.141^{ns}	0.136^{ns}	0.613^{ns}	0.095**
LAR	0.367^{ns}	0.918**	-0.341^{ns}	0.930**

Leaf area (LA), number of leaves (NL), stem length (SL), Stem volume (V), Log Stem height (LSV), Log volume (LV), height:diameter (H:D), total plant dry mass (TPDM), leaf dry mass (LDM), stem dry mass (SDM), root dry mass (RDM), stem diameter (SD), root diameter (RD), leaf mass ratio (LMR), stem mass ratio (SMR), root mass ratio (RMR), specific leaf area (SLA), leaf area ratio (LAR).

Conclusions

Total plant biomass reduction is not a useful predictor of drought resistance in tamarind seedlings.
Limitations in the use of the S index have been observed in this species.
Traits, which play a critical role in managing water supply, were only correlated with GM. Selection based on GM index may provide a more useful criterion for improving drought resistance of tamarind.