

**RESPONSE OF *Acacia tortilis* AND *Acacia xanthophloea* SEEDLINGS TO
REPEATED SOIL DROUGHT STRESS**

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ABSTRACT.

In an attempt to understand how trees overcome drought stress and to establish mechanisms of stress tolerance in tropical aridland species, seedlings of *Acacia tortilis* (Forsk) Hyne and *Acacia xanthophloea* Benth. were raised under controlled glass house conditions in polythene pots of size 11cm in diameter and 18cm high at The Kenya Forestry Research Institute (KEFRI) Muguga. The controls were watered daily while the other three treatments involved withholding water for 2, 4 and 6 days respectively with one day re-hydration to container capacity after every subsequent drought for each species.

Growth measurements showed relatively higher growth rates and total leaf area in *A. xanthophloea* compared to *A. tortilis* under favourable moisture conditions. *A. tortilis* responded to increased water stress by shifting carbon allocation to the roots leading to root:shoot (r:s) ratio of about 1.5 compared to 0.5 for the controls, unlike in *A. xanthophloea*, where r:s ratio remained at 0.5 in both repeatedly stressed and control seedlings.

A. xanthophloea seedlings, consistently had lower shoot xylem water potentials than *A. tortilis* for all the treatments but exhibited adjustment in cell wall elasticity when repeatedly stressed. *A. tortilis*, with repeated stress, showed osmotic adjustment. Adjustments in cell wall elasticity as observed for *A. xanthophloea* resulted in improved membrane integrity. *A. tortilis* however, showed higher

adjustment. Adjustments in cell wall elasticity as observed for *A. xanthophloea* resulted in improved membrane integrity. *A. tortilis* however, showed higher membrane integrity at all levels of water stress likely due to inherent drought tolerance and adjustments during stress.

The study concluded that pre-conditioning could improve drought tolerance in seedlings and that growth reduction as a result of water stress is likely due to integration of several drought tolerance mechanisms which are detrimental to growth.