Shrubs are most vulnerable to extreme drought in savannas

August 23 2021, by Zhang Nannan

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Drought is one of the most prevalent environmental stress conditions globally. It may cause sudden and widespread tree mortality. Previous studies have shown that drought-induced mortality of a given species can be predicted reasonably by hydraulic traits. However, relatively little information is available regarding the vulnerability of savanna species to extreme drought.

In a study published in *Ecology Letters*, researchers from the Xishuangbanna Tropical Botanical Garden (XTBG) of the Chinese Academy of Sciences and their collaborators showed that drought -induced branch dieback and top-kill were largely explained by plant hydraulic traits, but the prediction power largely depended on leaf habit and growth form in savanna ecosystems.

The researchers investigated 40 common woody species (including 17 trees, 16 shrubs and 7 lianas) and their potential correlations with drought response during an extreme drought event during the El Niño–Southern Oscillation in 2015 from a semi-arid savanna in the Yuanjiang Savanna Ecosystem.

They measured stem and leaf hydraulic traits and related these to a survey of branch dieback (i.e. partial terminal branch death but with living stems) and top-kill (i.e. the complete death of aboveground biomass). The top-kill survey included 22 species, and the branch dieback surveyed 29 species.

The data showed that species differing in leaf habit diverged in stem hydraulic traits related to either drought resistance or drought avoidance. Drought-induced branch dieback and top-kill were substantially different among leaf habits and among growth forms.

Moreover, semi-deciduous and shrub species showed the highest branch dieback and top-kill caused by extreme drought during the 2015 strong El Niño. The semi-deciduous species showed a higher branch dieback and top-kill than the evergreen and deciduous species, having a relatively higher embolism resistance than deciduous species.

Unlike liana and tree species, shrubs showed a strong resistance to embolism but still had the highest branch dieback and top-kill ratios among growth forms.

"These findings shed light on the importance of combining plant hydraulic traits with life history in trait-based predictions of plant responses to drought," said Chen Yajun, first author of the study.

More information: Ya-Jun Chen et al, Hydraulic prediction of drought-induced plant dieback and top-kill depends on leaf habit and growth form, *Ecology Letters* (2021). DOI: 10.1111/ele.13856

Provided by Chinese Academy of Sciences