

A Plant-Insect Association for Enhancing Survival of an Ecosystem Engineer Termite Species in a Semi-Arid Savanna

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Abstract : Mutualistic relationships amongst organisms drive diversity in terrestrial ecosystems. Yet, few mutual associations have been documented in the semi-arid savannas of Africa. The levels and benefits of association between *Carissa bispinosa*, a medium-sized evergreen thorny shrub, and *Trinervitermes trinervoides*, an ecosystem engineer termite species, were studied at a semi-arid savanna setting in Nylsvley nature reserve, South Africa. It was hypothesized that there would be a close plant-insect association since termite mounds provide nutrients for plant growth and, in return, the thorny shrubs protect mounds from predation and also provide a temperature buffer. Comparative plant and mounds measurements were taken from associated and isolated occurrences seasonally. Soil particle size, macro- and micronutrients were also evaluated from mounds and the adjacent topsoil matrix. General Additive Mixed Models were used to assess internal mound temperatures in relation to prevailing ambient and plant shade temperatures. Findings revealed that plants growing on mounds were significantly taller with a wider canopy and remained greener in the dry season with more fruits. On the other hand, termite mounds under plants were less prone to be damaged by aardvarks and pangolins and had a significantly wider diameter than exposed mounds. All soil macronutrients except for calcium and phosphorous were enriched in mounds relative to the matrix. Only Manganese was enriched in mounds while the other micronutrients (Cu, Fe, Zn and B) were not. Termite mounds under plants maintained a better constant and higher mean internal temperature during winter compared to exposed mounds. To our best knowledge, the study has revealed a previously undocumented survival mechanism that termites use to escape extreme temperatures and predation in semi-arid savannas.

Keywords : mound, mutualism, soil nutrients, termites, thermoregulation

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