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Growth and Structural Damages of Trees hosting Lianas in Semi-Evergreen Tropical Forests in Northeastern Yucatan Peninsula (Mexico)

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Abstract.

Lianas (woody vines) climb upon trees and vigorously colonize abandoned crops, forest edges and tree-fall-gaps produced by logging and strong winds. Consequently, lianas are common in places like the Yucatan, Mexico, because of human activities and hurricanes there and their abundance is increasing all over the tropics. Wide vascular vessels enable many lianas to out-compete trees per water and soil resources thereby reducing the growth of trees and some tree species are demonstrated to be more affected than others. Lianas connect trees together in the canopy but it is unclear if it enhances tree-damage during strong winds by pulling them or reduces such damages by stabilizing tree-crowns. To assess all these, twelve 20×20-m plots were settled on secondary forest-stands of ≥55- and 10-18years of abandonment censusing all trees ≥10cm circumference (3.16cm diameter at breast height) and all lianas ≥1cm diameter at ground level. Trees were classified into four liana-cover categories: no-lianas, 1-25%, 25-75%, and >75% coverage of their woody area. Trees were re-measured 15-months after the first census and Hurricane Wilma stroke the area 17-months after the first census. The ≥55y-old stand was dominated by wide-xylem and non-compact-wood liana-genera *Arrabidaea, Cydista, Melloa* (Bignoniaceae) and *Serjania* (Sapindaceae) while the 10-18y-old stands were dominated by the narrow-xylem and hard-wooded *Dalbergia glabra* (Leguminosae, Papilionioideae). Trees with larger liana-cover grew slower in the ≥55y-old stand but –amazingly, trees hosting lianas grew faster than liana-free trees in the 10-18y-old stands (ANOVA, $P<0.01$ for both stands). *Pouteria campechiana* (Sapotaceae) and *Zygia stevensonii* (Leguminosae, Mimosoideae) were among the tree species following the above mentioned pattern in the ≥55y-old stand; *Bursera simarouba* (Burseraceae) and *Vitex gaumeri* (Lamiaceae) followed the pattern of better growth on the 10-18y-old stands. Thus, wide-xylem lianas delayed the growth of trees while narrow-xylem lianas did not. From them, *D.glabra* potentially favored tree-growth by means of nitrogen fixation, but it remains non-tested. Logistic binary regressions showed that crown removal during the hurricane did not depend on the number of hosted lianas in the six ≥55y-old forest plots ($P>0.05$, $n=827$ trees). On another extreme were three 10-18y-old forest plots where *D.glabra* represented about 70% of liana-basal area, where trees hosting more lianas suffered less crown removal (Odds=0.99, $P<0.00001$, $n=440$ trees). On the remaining three 10-18y-old plots dominated by a mixture of *D.glabra* and Bignoniaceae and Sapindaceae trees lost their crowns when hosting larger numbers of lianas (Odds=1.17, $P=0.05$, $n=450$ trees). Based on these, I propose that low abundances of hard lianas like *D.glabra* removed crowns by pulling them while soft-bodied lianas were too weak to avoid this, but larger numbers of *D.glabra* performed a network stabilizing canopies together reducing crown removal. Results confirm that liana-effects on trees change between tree species but also depend on liana-cover and on liana-species dominating each stand making less predictable the effects of lianas on tree-species turn-over. More studies on spatiotemporal variation of liana-effects on trees may improve decisions like liana-cutting to enhance timber production, for example by determining which lianas delay tree-growth and mechanical damage and which others do not.