

Do tropical forest leaves suffer more insect herbivory? A comparison of tropical versus temperate herbivory, estimated from leaf litter

ABSTRACT

It is generally believed that tropical forests suffer more herbivory, as a proportion of leaf area, than do temperate forests. Reviews so far have compared studies performed by different authors using very different methodologies. Here we carried out studies on 125 samples at 86 localities in eastern North America and on 75 samples taken at five localities in Malaysia and Singapore, including both mature secondary and primary forest. Samples in North America were spread over 3 years. In tropical Asia, the samples were taken at four time slices at least 8 months apart, scattered over a 4-year period. Total herbivore damage during the lifetime of tree leaves was estimated from the percentage area damaged in recently fallen, undecayed leaves from the forest floor, using scanner-linked software. In terms of percentage damage per leaf, the results suggest that lowland tropical forest has significantly higher leaf herbivory (5.82%) than temperate forest (5.48%). This is in accord with the general expectation that aseasonal tropical forests should have more herbivory damage. However, when percentage damage per unit time of growing season is calculated based on an estimate of leaf lifetime in the tropics, tropical lowland herbivory damage turns out to be a fraction (about one half) of that in the temperate zone. Thus, these results tend to put in question the widely held view that herbivore damage is markedly more intense in the tropics. Over total leaf lifetime, the intensity of damage in the tropical area is only slightly higher than temperate regions. In terms of intensity of herbivory on leaves per unit of time, the opposite seems to be the case. It is uncertain which index should be taken as more significant in interpreting the selection pressure for anti-herbivore defenses in the tropics.

Keyword: Asia; Forest; Herbivory; Malaysia; North America; Singapore; Temperate; Tropical