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Trouble follows the needy: more severe leaf herbivory in the resource-poorer temperate oak forest than in the birch forest

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Plant-insect herbivore interactions are essential in shaping forest ecosystem health. The resource availability hypothesis (RAH) and the leaf economics spectrum (LES) theory predict that species in high-resource environments tend to adopt a "fast" strategy but are more susceptible to herbivory. However, this contradicts reports of increased insect herbivory in the context of global drought intensification, and hinders accurate prediction about how different plant species respond to herbivorous insect feeding.

To fill this knowledge gap, we conducted an observational study in two temperate forests dominated by *Quercus mongolica* and *Betula platyphylla* in eastern China to compare their leaf herbivory patterns and explore possible mechanisms. We measured three leaf herbivory proxies (consumed leaf area, percent consumed, and herbivory frequency), some leaf traits (leaf area, specific leaf area, leaf water content, leaf nitrogen, phosphorus and non-structural carbohydrate contents), and soil properties (pH, soil water content, soil organic carbon content, soil nitrogen and phosphorus contents).

We found that *Q. mongolica,* growing in poorer soil environments with lower water and nutrient contents, experienced higher leaf herbivory than *B. platyphylla*. Regarding leaf traits, *Q. mongolica* had a higher leaf area and non-structural carbohydrate content, but lower specific leaf area, leaf nutrient and water contents than *B. platyphylla*. At the leaf level, leaf area, rather than specific leaf area, of both tree species was positively correlated with leaf herbivory. At the tree level, species-specific patterns emerged, i.e., leaf herbivory of *B. platyphylla* was positively related to leaf area and negatively related to leaf nitrogen and water contents and soil phosphorus content, whereas that of *Q. mongolica* was only positively affected by soil phosphorus content.

These findings challenge the predictions of RAH and LES theory, as *Q. mongolica* that grows in resource-poorer soil environments with a conservative strategy suffers higher leaf herbivory than *B. platyphylla*, shedding some light on the proverb that trouble follows the needy. Moreover, water-related factors (i.e., leaf and soil water contents) and leaf area showed an important effect on driving interspecific and intraspecific leaf herbivory variations here, implying that climate-induced droughts may exacerbate herbivore pressure in temperate forests.