

Relationships between Defensive Characteristics of *Fagus crenata* Galls and the Timing of Gall Fall

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Abstract Plant galls usually contain defensive chemicals, such as tannins. We measured levels of physical and chemical defenses of galls and of galled leaves of *Fagus crenata*, which were induced by six species of gall midges. Relationships between these defensive features and the timing of the fall of galls from host plants were determined. Ecological significance of defensive features of galls and galled leaves were discussed with respect to manipulation by gall inducers. We collected galled and ungalled leaves with six species of gall midges from current year shoots, in which leaves had received no damage from folivores. Dry leaf mass per area (LMA) was used as a measure of physical defense. The concentration of total phenolics and that of condensed tannins were also determined for galls and leaves. The timing of gall drop was determined from litter samples collected every month using litter traps. The LMA of galled leaves were generally greater than those of ungalled leaves. In contrast, levels of chemical defenses in galls varied greatly among gall midge species. However, levels of chemical defenses even tended to be higher in galls that fell later in a season. These results suggest that higher levels of chemical defenses were related to longer periods of exposure to folivores. Results also appear to support the hypothesis of manipulation by gall-inducers, in which a gall-inducer manipulates the defensive traits of its gall or galled leaf to reduce the risk of mortality caused by folivores.