

# EFFECTS OF ENVIRONMENTAL GRADIENTS ON PLANT-HERBIVORE SYSTEMS OF WOODY PLANTS BELONGING TO THE FAGACEAE FAMILY

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# 2002 Fiscal Year Final Research Report Summary

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Research Project

### Project/Area Number

12440216

### Research Category

Grant-in-Aid for Scientific Research (B)

### Allocation Type

Single-year Grants

### Section

一般

### Research Field

生態

### Research Institution

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### Project Period (FY)

2000 – 2002

### Keywords

Fagaceae / Defense against herbivory / Tannins / nitrogen / Soil nutrient availability / light / carbon / cotyledon

### Research Abstract

Induced defense of plants, increase in phenolics and decrease in nitrogen following herbivory, is a widely recognized phenomenon in various plants. Influence of environmental clines on constitutive and induced defense of four species of Fagaceae species were studied. We tested a hypothesis that altitudinal-dependent outbreaks of the folivorous insects were caused by foliage properties in relation to environment clines along with altitude. Our results suggest that the foliage quality is one of the possible causes of site-dependent outbreaks of *S. punctatella*: During an increasing period, high quality food at outbreak sites promotes population growth of this insect.

When beech trees suffer heavy defoliation in the non-outbreak areas, foliage quality deteriorates, which slows down *S. punctatella* population growth. In contrast, in outbreak areas, quality increases in the year following heavy defoliation, and this may promote population growth and outbreaks. A positive feedback process thus may operate among nutrient cycling, foliage quality and insect population growth. A fertilizing effect from herbivory was a proximate factor causing higher soil nitrogen availability in the outbreak area. Results of our experiment suggested that the amount of defensive compounds was controlled by the carbon-nutrient balance at a leaf level. The C/N balance is an important factor for biomass allocation and chemical defense. However, the effect of defoliation on the C/N balance in a plant is variable between species, probably leading to a species variability in herbivory responses.

## Research Products (51 results)

All Other  
All Publications

- [Publications] Hikosaka K, Hirose T: "Photosynthetic nitrogen-use efficiency in species coexisting in a warm-temperate evergreen forest" *Tree Physiology*. 20. 1249-1254 (2000) ▼
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- [Publications] Oguchi R<sup>^\*</sup>, Hikosaka K, Hirose T: "Does the photosynthetic light-acclimation need change in anatomical leaf structure?" *Plant, Cell and Environment*. (in press). (2003) ▼
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