

Effect of Herbivores on Pothomorphe umbellata (Piperaceae)

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Introduction

Pothomorphe umbellata is a fairly common plant in both forest understory and open areas in the community of Monteverde. This plant displays large surfaces in its leaves and no apparent mechanical anti-herbivore defense mechanisms. In comparison with other plants, P. umbellata has few leaves, and although the commonest height is between 50-100 cm, it can grow to nearly 300 cm. It can grow either isolated in space or in clumps.

The main goal of this field problem was to determine the differences of herbivore effect on isolated and clumped individuals of P. umbellata in both understory and open spaces, as well as the determination of the kinds of herbivores for this species.

Methods

Two different sites were chosen where P. umbellata could be found in clumps and as isolated individuals, in the two environments previously mentioned. Both locations were close to the Pension Quetzal and the distance between them was about 1.0 km. The total number of plants studied in both places was 18 (6 in clumps in open spaces, and four isolated plants in the understory, four isolated plants in the open area, and four plants in clumps in the understory). All the plants studied were at least 50 cm in height, the tallest being 260 cm. In each plant up to 6 leaves were taken for study. Only well developed leaves (completely flat) were considered. The total leaf surface area as well as the area of damage were determined using plastic transparent sheets with squares and 100 points per square labelled on them. An account of the invertebrates on the different portions of the plant (upper leaf surface, lower leaf surface, stem, petioles, and fruits) was made, and these invertebrates were collected whenever possible.

Results

An average amount of leaf damage was obtained for each plant and the results are presented below as mean percentage of leaf missing.

	Shade	Sun
Isolated	3.12% n=4	1.74% n=4
Clumped	4.15% n=4	0.86% n=6

Differences among these categories were tested for using an ANOVA. No significant differences were found.

The invertebrates obtained and/or collected from Pothomorphe leaves were as follows:

I. Leafeaters			
A. Mollusca:	Gastropoda		1
B. Insecta:	Orthoptera		7
	Coleoptera		6
	Lepidoptera (larvae)		2
II. Phloemivores			
A. Insecta:	Homoptera: Cercopidae		13
	Cicadellidae		3
	Coleoptera: Curculionidae		23
	Hemiptera		2
III. Carnivores			
A. Arachnida:	Opiliones: Phalangidae		1
	Aranae		8
IV. Others			
A. Insecta:	Hymenoptera		6
	Diptera		11
	Unidentified		1

Nocturnal observations revealed a high number of leafeaters, orthopterans, and gastropods eating leaves.

Discussion

The first problem that is evident from the data is the long amount of time necessary to survey herbivory in these plants. Our original intent was to obtain at least ten plants in each of the four categories, which would have allowed appropriate statistics to be applied to the data. We actually found extreme differences in the mean damage to plants between isolated and clumped plants in the shade vs. those in the sun, yet the results were not significant largely because the sample size was too small. The use of an electronic surface area meter would have allowed many more plants to be surveyed.

The nocturnal observations confirmed that there is differential herbivory depending on the time of day. Consequently, in order to obtain a better representation of the herbivores that feed on P. umbellata (and many other plants as well), sampling should span at the least a 24 hr. period.

The greatest weakness in the design of this study was that plants in the understory were considered as equivalent to the ones in open areas that receive direct sunlight. Since architecture and development in plants is strongly related to the availability of water and sunlight, there are differential growing rates under different conditions. One must be cautious when making this kind of comparison. Differences in the amount of herbivory may reflect the behavior of the herbivores or these vast differences among the plants.