

EFFECTS OF ALTERNATIVE COFFEE GROWTH METHODS ON ARTHROPOD DIVERSITY AND THE INCIDENCE OF LEAF FUNGAL INFECTIONS

JENNA M. SULLIVAN AND LIA M. CHEEK

Faculty editor: David R. Peart

Abstract: We hypothesized that arthropod diversity and abundance would increase from sun to shade to traditionally grown plants of coffee (*Coffea arabica*), and that *Mycena citricolor* fungal infections would be more prevalent in the shade. Our results did not support either hypothesis; however, *M. citricolor* may be more prevalent (marginally significant) on shade-grown coffee plants.

Keywords: Monteverde, Costa Rica, coffee plantation, *Coffea arabica*, *Mycena citricolor*

INTRODUCTION

Alternative coffee plantation methods may influence the diversity and abundance of arthropods. Arthropods, in turn, affect the diversity and abundance of higher trophic levels (Brown 1997). The fungus *Mycena citricolor* infects coffee plants and prefers cool, moist conditions (Heyner Vaula, pers. comm.). We hypothesized that 1) arthropod abundance and diversity would increase from sun to shade to traditionally grown coffee plants, and 2) there would be less fungal infection in sun grown coffee than in shade grown coffee plants.

METHODS

We conducted our study on 24-25 Jan. 8 in Monteverde, Costa Rica at the Don Juan coffee plantation, which produces sun

grown coffee with minimal pesticide use (Heyner Vaula, pers. comm.). Some plants were shaded by windbreak trees, and others grown without pesticides or pruning ("traditional method"), were no longer harvested. In each treatment (sun, shade, and traditional), we collected leaf litter in a circle of radius 40 cm, centered on the bases of six randomly chosen coffee plants. Under each plant, we installed one pitfall trap flush with the ground, using a plastic cup of diameter 7 cm. We assessed *M. citricolor* infection by randomly selecting two branches from sampled plants, counting the percentage of leaves affected by the fungus, and averaging the two estimates.

RESULTS

There was no difference in arthropod abundance or diversity

between sun, shade, and traditionally grown sample areas. (ANOVA, $F = 0.63$, $df = 2, 15$, $P = 0.54$; ANOVA for Shannon Diversity Index $F = 0.48$, $df = 2, 14$, $P = 0.63$). The percent of fungus-infected leaves grown in the shade was higher than those grown in the sun (marginally significant; Table 1; one-tailed t-test, $t=1.62$, $df=8$, $P=0.07$).

Table 1. Percent *Coffea-arabica* leaves affected by *Mycena citricolor* fungus on sun and shade grown coffee at Don Juan plantation, Monteverde, Costa Rica.

Plantation Method	Mean % Leaves Affected	Standard Error
Sun	41.8	0.074
Shade	16.5	0.137

DISCUSSION

Coffee plantation method (sun, shade, or traditional) did not affect arthropod diversity or abundance. We found low arthropod abundance in all plantation methods, possibly due to natural chemical defenses such as caffeine and tannins, present in coffee leaves. Because the sun and shade plantations were so close together, the arthropods we sampled may have been affected by both growing methods.

Our marginally significant results for fungus infected leaves suggest a higher prevalence of *M. citricolor* on shade-grown coffee plants (Table 1). Farmers in the Monteverde area may prefer to grow

coffee in the sun to better control fungal growth.

LITERATURE CITED

- Brown, S.K. 1997. Diversity, disturbance and sustainable use of neotropical forests: insects as indicators for conservation monitoring. *Insect Conservation* 1:25-42.