foraging substrate. Juveniles, however, were relatively more abundant than adults on lilies. Adults may appear less often on lilies because they prefer other substrates (or edges) that provide better foraging or protection from predators (juveniles appear to be more cryptic than adults). Further work on behavioral interactions among age classes and foraging success in different habitats could help explain the observed distributions.

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THE EFFECTS OF CHEMICAL LEACHING OF MAGNIFERA INDICA ON UNDERSTORY PLANTS

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ABSTRACT (DML)

We observed a conspicuous absence of understory plants beneath three large Magnifera indica (mango). We hypothesized that secondary metabolites leached from mango leaves and/or fruit might impair the survival of plants beneath their canopies. However, experimental applications of mango extracts had no visible short-term effects on foliage of mango seedlings and of a locally abundant legume species. We discuss alternative explanations for the lack of understory plants beneath mango trees.

Key Words: Magnifera indica, allelopathy, Anacardiaceae, secondary plant metabolites.

INTRODUCTION (ANS)

Mangifera indica (mango) is an important economic species in Costa Rica. We observed that soils beneath large mango individuals (> 5m height) were devoid of understory vegetation. Members of the Anacardiacae family, in general, and Mangifera in particular, are notorious for their noxious secondary metabolites. Alleleopathic inhibition of understory species has been documented in the chapparal system of southern California (M. P. Ayres, personal comment).

Given the coincidence of bare area with the canopy discipline, we hypothesized that secondary metabolites in M. indica foliage might be released in the throughfall and limit the establishment of plants beneath its canopy. In this study, we evaluated the short term toxicity of mango leachates by applying them to foliage of local plants that seemingly could occur beneath M. indica.

METHODS (JLB)

We studied Magnifera indica and a member of the Mimosaceae (probably Pithocelobium sp.) southeast of the Sendero Cerros Calizos trailhead at Palo Verde National Park, Costa Rica, 10-15 January, 1994 (Figure 1).

M. indica seedlings were growing beneath mature M. indica canopies, while the legume was found only outside of the canopies. Ten individuals of each species received each of eight treatments on separate leaves.

Treatments were extracted from crushed plant material, obtained from mature M. indica at our site, and Psidium guajava, a neighboring tree whose understory species appeared healthy and diverse. We pulverized the young and old leaves and fruit with mortar and pestle, transferred the material to a large syringe containing filter paper, and added ≈15cc of either ethanol or hot water to the syringes. After 25 minutes, we depressed the syringe plungers to extract the treatments. In addition to the M. indica

and legume seedlings, we applied all eight treatments to one of the mature M. indica trees as a control. All treatments were applied with eyedroppers and paintbrushes.

Treatments were: 1) young M. indica leaves and water, 2) old M. indica leaves and water, 3) M. indica fruit and water, 4) Psidium guajava leaves and water, 5) water, 6) young M. indica leaves and ethanol, 7) M. indica fruit and ethanol, 8) ethanol.

Twenty hours after application of treatments we examined the test plants for evidence of necrosis or tissue damage. Follow-up examinations were conducted forty-eight and ninety-six hours after treatment.

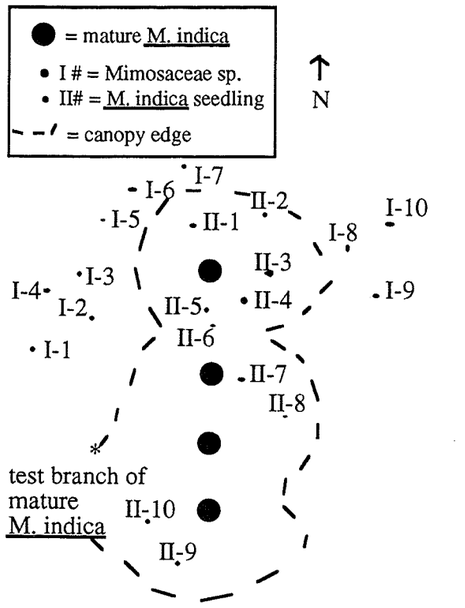

Figure 1. Location of M. indica and legume seedlings at test site, Palo Verde.

RESULTS (BME)

The plants treated with mango fruit and leaf extract showed no noticeable necrosis or tissue damage, nor did any of the controls. All fruit and leaf treatments left conspicuous residue on leaf surfaces, although the deposition caused no visible damage. Leaves did not show any tissue damage upon reexamination at 48 and 96 hours after treatment.

DISCUSSION (BME & DKS)

Our data did not support the hypothesis that chemicals leached by rainwater from leaves and fruit of M. indica inhibit the growth of understory plants. Apparently, neither water-soluble nor alcohol-soluble extracts of M. indica have acute short-term effects on the leaf tissue of our test species. Furthermore, our experiments do not exclude the possibility of some other allelopathic mechanisms. For example, chemicals leached from the leaves or fruit could accumulate underneath the tree, limiting survivorship by chemical allelopathy through root uptake, or through inhibiting germination. The possible effects of mango and fruit extract on soil allelopathy, however, need to be studied over a longer time period.

Alternatively, the absence of understory plants could be unrelated to M. indica leaf chemistry. For example, intense shading or toxic chemicals exuded by microorganism decomposers of mango leaves could inhibit understory growth. If the mechanism is shade inhibition, then a sharp discontinuty in photosynthetically effective radiation ought to correspond to the discontinuity in understory abundance. If the mechanism is microorganism chemical inhibition, then biologically active compounds not found in the leaves should be detected in the soil underneath mango trees.