# Specificity of Phytophagous Insect Guilds on *Prosopsis* (Leguminosae)*

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**Resumen:** Una evaluación de registros bibliográficos indica que en su mayoría los insectos que consumen *Prosopsis* son monófagos. El grado relativo de especialización (monofagia) varía con la parte específica de la planta utilizada. Basado en este hallazgo, se sugiere que se extiende el concepto de selección específica ("apparency") al nivel de plantas individuales.

Many theories have been developed to explain the complexities of insect-plant interactions. Bibliographic data, although available for extraction by the diligent student, are highly controversial and often contradictory, and may lead different investigators to quite different conclusions. However, these data are mandatory points of departure in our efforts to unravel many patterns in insect-plant systems, especially if we recognize that a healthy skepticism is necessary to interpret their causality. Given these reservations, I examine the concepts of apparency and specialization of phytophagous insects on one genus of the legume *Prosopsis*, a dominant, apparent (Feeny, 1976) plant of the semi-arid regions of the New World, and specifically examine the degree of specificity found in the various guilds of insects that consume differing subsets of this resource.

All of the data utilized here were taken from Ward *et al.* (1977) and include references. This reference summarizes all insects known to be associated with *Prosopsis*. However, I have included in this analysis only those families of insects that have known taxa that feed on plant parts, but I do not take responsibility for the primary data.

On any one plant, there are a finite number of structural subsets that an insect can utilize as food. For simplicity, I have divided the insect families into 5 feeding guilds (Fig. 1). A much more finer subdivision could be derived, but these subdivisions suffice for gross analysis. A trend was found toward a higher degree of specialization as the true foliage feeders and leaf-miners were approached ($x^2$ test for $H_o$: equal distribution = 8.28; $0.10 < p > 0.05$).

One may consider this trend to be in response to different chemistries of the structural subsets, although no comprehensive data on plant chemistry are available. However, Harborne *et al.* (1971) have shown that *Prosopsis* does possess the following chemical characteristics: seeds are generally high in oils and galactomannins; foliage has characteristic digestibility-reducing tryptoamine, a tryptophan-derived alkaloid, prosopinine, an alkaloid related to alkyla amine, and various "non-haemagglutining" alkaloids; and the wood, besides lignin, contains the polysaccharide hemicellulose, 4-methylglucuionoxyline, which would also tend to reduce digestibility. However, does the varying degree of specificity have an association with the concept of plant apparency (Feeny, 1976)?

Feeny (1976, and included references) argues that apparent plants demonstrate a

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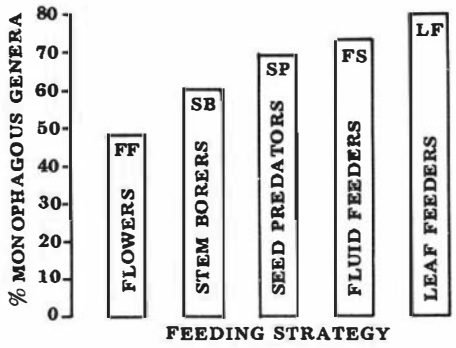


Fig. 1. The distribution of specialization with respect fo feeding guilds of insect consumers of *Prosopsis*.

higher degree of herbivore specialization than is found in non-apparent plants. Although a suitable amount of quantitative data are lacking to test this hypothesis, Futuyma (1976) presented evidence that such patterns may be due to plant allelochemics.

Reviews by Feeny (1976) and Rhodes and Cates (1976) strongly suggest that there are two basic chemical defensive systems produced by plants, and the type of system found in a plant tissue is related to its degree of apparency. Apparent plants, such as *Prosopsis*, contain high concentrations of dosage-dependent quantitative defenses, such as those listed earlier. Unapparent resources, such as ephemeral plants, are normally characterized by qualitative defenses designed to disrupt the metabolic processes of herbivores. Quantitative defenses are thought to be the most difficult for herbivores to overcome, and appear to be primarily effective against monophagous and oligophagous herbivores (Rhodes and Cates, 1976; Feeny, 1976).

Given these premises, we may deduce that all portions of an apparent plant are not of the same apparency. Flowers, seeds and leaves are much less apparent than wood, and probably roots. If we take this view, we might suspect that natural selection would be more intense for wood feeders, and that there should be fewer specialists. This type of reasoning could be applied to pairwise comparisons (Fig. 1), and in all cases a hypothesis of relative apparency could be supported. Care must be exercised in the interpretation of these data, as pointed out earlier, for it is probably much harder to sample wood and root feeders than other insect herbivores.

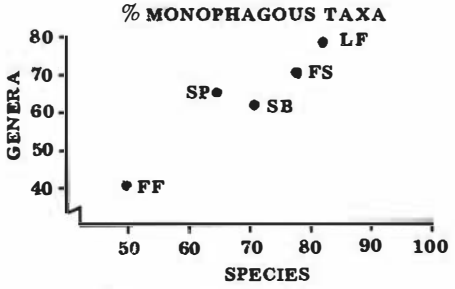


Fig. 2. Bivariate plot of monophagous genera against monophagous species of insect consumers of *Prosopsis*. Letters are the same as in Fig. 1.

Another significant, though not surprising, pattern emerges from these data. There is a strong correlation between the number of monophagous genera and monophagous species of insects consuming *Prosopsis* (Fig. 2). This indicates that initial specialization leads to further specialization, and conforms with contemporary views of coevolution. Specialization, to evolve, implies local phenomena (Fox and Morrow, 1981), and indeed many of the data employed here may only reflect local sampling efforts. Nevertheless, it is important to emphasize that specializations tend to increase over evolutionary time, and that even the generally accepted concept of apparency must be further fine-tuned to reflect subset apparency, and, hence, species-feeding patterns.

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