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Local pattern of host plant utilization by lepidopteran larvae in the cerrado vegetation

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Abstract

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The first inventory of lepidopteran larvae associated to buds, flowers and fruits and the study of the degree of specialization on host plant species and/or plant tissues was conducted in cerrado areas (savanna like vegetation) in Federal District (Brazil). Adults of 83 species from 15 lepidopteran families were obtained on 36 plant species of 20 families. Four of the Lepidoptera families were the richest in species and included 69% of the total species: Gelechiidae (22 species), Tortricidae (17), Lycaenidae (10), and Pyralidae (8). The present results indicate three lepidopteran groups: (1) monophagous or oligophagous of a plant part from a single plant genus, 58% of the species; (2) polyphagous of plant families and plant tissues, 25% of the species; (3) oligophagous, but opportunists over the parts of the same plant species, 17% of the species.

Additional key words: Brazil, caterpillars, diet, herbivorous, host-plant, savanna.

Resumen

DINIZ IR, MORAIS HC. 2002. Patrones locales de utilización de plantas hospederas por larvas de Lepidoptera en vegetación de cerrado. Entomotropica 17(2):115-119.

En este trabajo se presentan los resultados del primer inventario de larvas de Lepidoptera asociadas a botones florales, flores y frutos, de plantas de una área de cerrado (sabana tropical) del Distrito Federal (Brasil). También fueron estudiados el grado de especialización por especie de planta y/o por los tejidos de la planta. Adultos se obtuvieron de 83 especies de 15 familias de Lepidoptera en 36 especies de plantas pertenecientes a 20 familias botánicas. Cuatro familias de Lepidoptera fueron las de mayor riqueza, reuniendo el 69% del total de especies: Gelechiidae (22 especies), Tortricidae (17), Lycaenidae (10) y Pyralidae (8). Los resultados obtenidos indican que en la región de estúdio pueden reconocerse tres grupos de Lepidoptera: (1) monófagos u oligofagos en tejidos de un sólo género de plantas, 58% de las especies; (2) polífagos a nivel de familias y tejidos de plantas, 25% de las especies; (3) oligofagos, pero oportunistas, sobre los recursos de la misma especie de plantas, 17% de las especies.

Palabras clave adicionales: Brasil, dieta, herbívoros, larvas, plantas hospederas, sabana.

Introduction

Information on host plants is used for classification systems and in the systematics of phytophagous insects, as well as in the clarification of evolutionary patterns of taxonomic lineages, besides ecological aspects such as degree of specialization in different environments (DeVries 1985; Marquis and Braker 1994). On the other hand, herbivorous insects can affect the growth and reproduction of plants, as they reduce photosynthetic area, consume reproductive structures, or alter floral characteristics, thereby reducing attractiveness for pollinators (Anderson 1988; Lehtila and Straus 1997; Mothershead and Marquis 2000).

As to date, there is a reasonable extensive body of information regarding the insect fauna associated with tropical plants (*e.g.*, Janzen 1984, DeVries 1985, 1987, Basset 1991; Marquis and Braker 1994), as well as for some herbivores associated with plants of the cerrado (*e. g.* Freitas and Oliveira 1992; Lara and Fernandes 1994, DelClaro and Mound 1996, Lopes 1996). In Brasília, studies on herbivores involving a large number of species are restricted to leaf-feeding larvae of Lepidoptera (Diniz and Morais 1995, 1997; Diniz et al. 1999).

Often, the breadth of an herbivore's diet is related to the distribution and predictability of abundance of potential host plants (Fox and Morrow 1981) and with local specialization in food plant (Pratt and Pierce 2001). Most phytophagous species, while being

specialized on certain plant species, also tend to associate with particular structures of the plants (Bernays and Chapman 1994). Flowers and fruits are more ephemeral and less predictable resources than leaves, but tend to be more nutritious and less protected against herbivores. Insects that attack reproductive structures of plants tend to specialize on those resources, synchronizing their life cycles or using these resources in a sequential manner. Such selection should favor the diversification of host plants and, in this way, promote polyphagy (Robbins and Aiello 1982, Monteiro 1990; Rodriguez et al. 1994; Fiedler 1998). Species from several butterfly families, such as Lycaenidae, and moths, such as Elachistidae, Gelechiidae, Oecophoridae, Pterophoridae and Tortricidae, can feed on flowers and developing seeds (Stehr 1987). In this paper, the first results of an inventory of lepidopteran larvae associated with buds, flowers and fruits of cerrado plants are presented as well the information regarding the diet of caterpillars and the degree of specialization on host plant species and/or plant tissues.

Material and Methods

The study was conducted in cerrado areas of the Fazenda Água Limpa (lat 15°30'S long 47°25'W) of the University of Brasília and in several other cerrado areas of the Federal District (Brazil). Most of the collections were made between 04/98 and 10/00. Reproductive structures were collected and kept in the laboratory, in plastic pots covered with light fabric, with the branches or peduncles wrapped in moist cotton, to obtain the adults. For those larvae which feed externally on buds, flowers or fruits, these items were periodically replenished in the rearing pots. The adults which were obtained were identified by Vitor O. Becker (Research Associate of the Departamento de Zoologia, Universidade de Brasília) and Keith S. Brown (Departamento de Zoologia, Universidade de Campinas).

Results and Discussion

Adults of 83 species from 15 lepidopteran families were obtained from 36 species of 20 plant families. Fifty five species were not identified, as they belong to groups needing revision: Gelechiidae (22 species), Tortricidae (15), Pyralidae (6), Blastobasidae (5), Cosmopterigidae, Crambidae, Elachistidae (two each one), and Mimallonidae (one species). Although they were not identified they are good species and they are deposited at the Entomological Collection of the Department of Zoology of the University of Brasília. Four of these families were the richest in species and included 69% of the total lepidopteran species: Gelechiidae (22 species), Tortricidae (17), Lycaenidae (10), and Pyralidae (8). Most species were found on buds and flowers and 22% were found only on fruits. Several of these species (29%) had previously been found feeding on the leaves of cerrado plants (Diniz and Morais 1995) (Table 1).

Little information regarding the biology of these lepidopteran species is available in the literature, most of which refers to those species which are considered as pests, and are summarized in the "Fourth Catalog" (Silva et al. 1968). *Neoleucinodes elegantalis* (Guénée 1854) (Cambridae) is known as a pest of tomatoes and of other solanaceans. *Phidotricha erigens* Ragonot, 1888 (= *Pococera atramentalis*, V. O. Becker, pers. comm.) (Pyralidae) attacks cotton and the leaves and beans of coffee. The genus *Heliothis* (Noctuidae) is known as a pest of cultivated plants, attacking leaves, flowers and fruits of several species. Two species of *Fundella* (Pyralidae) attack the beans of several legumes and *Cydia* (Tortricidae) species attack the fruits of several cultivated species of Rosaceae. A species of Blastobasidae attacks aged coffee beans, while several species of Gelechiidae, a taxonomically difficult group, attack flowers and fruits of several plants (Silva et al. 1968).

Fregela semiluna (Walker, 1854) (Arctiidae) is a highly polyphagous species (Diniz *et al*. 2000), while *Cerconota achatina* (Zeller, 1855) (Elachistidae) is a local specialist on species of *Byrsonima* (Malpighiaceae) (Andrade et al. 1995). *Phoebis sennae* (Linnaeus, 1758) (Pieridae) is a migratory, edge habitat species, with a wide geographical distribution that ranges from the southern United States to Argentina, with several subspecies in Antillas (DeVries 1987). In Costa Rica, their caterpillars feed on *Cassia biflora* and *C. obtusifolia* (Leguminosae) (DeVries 1987). In Brazil it has also been recorded on *Cassia* flowers in the Serra do Japi (São Paulo) (Brown 1992) and in the cerrado of Brasília. The caterpillars of *Cyanophrys herodotus* (Fabricius, 1796) are polyphagous on flowers (Brown 1992). *Thecla echion* (Linnaeus, 1767) is a polyphagous caterpillar and occurs from Mexico to southern Brazil (D'Abrera 1995), it is considered a pest of pineapple and sweetsop plantations. Two of the *Thecla* species were found in the cerrado of Brasília and their caterpillars are cryptic on the petals of open flowers: *Michaelus thordesa* (Hewitson, 1867) (Lycaenidae) on the purple flowers of *Jacaranda ulei* (Bignoniaceae) and *P. sennae* (Pieridae) on the yellow flowers of *Cassia* sp. (Leguminosae).

TABLE 1. Examples of three groups of lepidopteran species: **1.** with local specialization on flowers and fruits of their hosts (total of 48 species); **2.** generalists on a broad variety of species and plant parts as well (21 species), and **3.** monophagous and/or oligophagous on species and plant parts (14 species) in the cerrado vegetation, Brasília, Federal District, Brazil.

1. Lepidopteran specialists on buds and/or flowers	Lepidoperan family	Host plant species and families
Deuterophysa micralis Hampson, 1907	Pyralidae	*Palicourea rigida* (Rubiaceae)
Heliothis virescens (Fabricius, 1777)	Noctuidae	*Chamaecrista decrescens* (Leguminosae)
Michaelus thordesa thordesa (Hewitson, 1867)	Lycaenidae	*Jacaranda ulei* (Bignoniaceae)
Neoleucinodes elegantalis (Guénée, 1854)	Crambidae	*Solanum lycocarpum* (Solanaceae)
Olynthus punctum (?) (Herrich-Schäffer, 1868)	Lycaenidae	*Ouratea hexasperma (Ochnaceae)*
Parrhasius polibetes (Cramer, 1787)	Lycaenidae	*Vochysia elliptica* (Vochysiaceae)
Phoebis sennae (Linnaeus, 1758)	Pieridae	*Cassia* sp. (Leguminosae)
Platphalonidia fusifera (Meyrick, 1912)	Tortricidae	*Palicourea rigida*
Stenoma charitarcha Meyrick, 1915	Elachistidae	*Miconia ferruginata* (Melastomataceae)
Thecla ca. *caninius* Druce, 1907	Lycaenidae	*Byrsonima verbascifolia* (Malpighiaceae)
1. Specialist on fruit		
Neoleucinodes elegantalis (Guénée, 1854)	Crambidae	*Solanum lycocarpum*

2. Lepidopteran generalists on species and plant parts	Family	On reproductive structure	On leaves
Cyanophrys herodotus (Fabricius, 1796)	Lycaenidae	*O. hexasperma*, *Schefflera macrocarpum* (Araliaceae)	*Chomelia ribesioides (Rubiaceae)*
Fregela semiluna (Walker, 1854)	Arctiidae	*Byrsonima verbascifolia*	22 plant families
Phidotricha erigens Ragonot, 1888	Pyralidae	*Erythroxylum deciduum* (Erythroxylaceae), *Mimosa claussenii (Leguminosae)*, *Salacia crassifolia (Celastraceae)*, *Protium ovatum (Burseraceae)*	*E. deciduum, Qualea parviflora (Vochysiaceae)*
Platynota rostrana (Walker, 1863)	Tortricidae	*Amazonia hirta (Campanulaceae)*	14 plant families
Pleuroprucha asthenaria (Walker, 1861)	Geometridae	*M. ferruginata*, *M. claussenii*, *S. macrocarpum*, *Zeyera montana (Bignoniaceae)*	*Qualea parviflora*
Rifargia onerosa Schaus, 1905	Notodontidae	*Ouratea hexasperma*	*Caryocar brasiliense (Caryocaraceae)*
Thecla echion (Linnaeus, 1767)	Lycaenidae	*Amazonia hirta*, *O. hexasperma*	
Thecla nr. *ergina* (?) Hewitson, 1867	Lycaenidae	*Miconia albicans* (Melastomataceae)	*B. crassa, Rourea induta (Connaraceae)*
Thecla socia (Hewitson, 1868)	Lycaenidae	*Miconia albicans*	*B. verbascifolia, Q. parviflora*
Tolype poggia Schaus, 1905	Lasiocampidae	*Byrsonima crassa* (Malpighiaceae)	*Disopyros burchelli (Ebenaceae)*

3. Lepidopteran specialists or oligophagous on plant species but opportunist on plant parts	Family	On reproductive structure	On leaves
Utetheisa ornatrix (Linnaeus, 1758)	Arctiidae	*Crotalaria* sp. (Leguminosae)	*Crotalaria* sp.
Cerconota achatina (Zeller, 1855)	Elachistidae	*Byrsonima verbascifolia*	*Byrsonima* spp.
Stenoma muscula Zeller, 1877	Elachistidae	*Qualea grandiflora*	*Qualea* spp.
Heliothis planaltina Poole & Mitler, 1993	Noctuidae	*Chamaecrista adenophora* (Leguminosae)	*C. adenophora*
Eurema nise tenella (Boisduval, 1836)	Pieridae	*Chamaecrista claussenii* (Leguminosae)	*C. claussenii*

Our results indicate three lepidopteran groups: (1) monophagous or oligophagous of a resource from a single plant genus, comprised by 58% of the species; (2) polyphagous of plant families and plant tissues, comprised by 25% of the species; (3) oligophagous, but opportunists over the resources of the same plant species, comprised by 17% of the species.

Thirty eight species were found attacking flowers of only a single species or genus of host plant, like *M. thordesa*, *Deuterophysa micralis* Hampson, 1907 (Pyralidae), and *Platphalonidia fusifera* (Meyrick, 1912) (Tortricidae). Seven species were found attacking fruits of only a single species or genus of host plant, like *N. elegantalis*, and 21 other species attacking flowers and leaves of two or more plant families, like *Tolype poggia* Schaus, 1905 (Lasiocampidae), *Pleuroprucha asthenaria* (Walker, 1861) (Geometridae) and *P. erigens*. This group is adapted to a broad variety of food plants and plant parts like *Incisalia henrici* (Grote and Robinson) (Lycaenidae) in the United States (Pratt and Pierce 2001).

Fourteen species were known as leaf feeders, restricted to host plants of a single genus or family within the study area, and were found to be feeding, also, on flowers or fruits of the same plant species. For example, *Cerconota achatina* and *Stenoma muscula* Zeller, 1877 (Elachistidae), and *Heliothis planaltina* Poole and Mitler, 1993 (Noctuidae). So, we suggest that they are not dependent on flowers as food items, but use them in an opportunistic manner, enriching their diets.

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