SCIENTIFIC NOTE

# New Host-Plant Records for Neotropical Agromyzids (Diptera: Agromyzidae) from Asteraceae Flower Heads

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Novos Registros de Plantas Hospedeiras para Agromizídeos (Diptera: Agromyzidae) Neotropicais Endófagos de Capítulos de Asteráceas

RESUMO - A família Agromyzidae contém aproximadamente 2.500 espécies fitófagas conhecidas. Aqui são apresentados 22 novos registros de associação entre agromizídeos e suas plantas hospedeiras. Foram realizadas coletas entre 2002 e 2005 em remanescentes de cerrado no estado de São Paulo. As oito espécies de agromizídeos registradas pertencem ao gênero *Melanagromyza* Hendel e foram coletadas em 18 espécies de Asteraceae. Este é o primeiro estudo detalhado sobre associações entre agromizídeos não-minadores e suas plantas hospedeiras no Brasil.

PALAVRAS-CHAVE: Cerrado, endofagia, interação inseto-planta, *Melanagromyza*

ABSTRACT - Agromyzidae is a large and cosmopolitan fly family with approximately 2,500 known species. Here we present 22 new records of agromyzid-host plant associations. Plants were sampled from 2002 to 2005 in São Paulo state, Brazil. A total of eight agromyzid species were reared from 18 Asteraceae host species. The genus *Melanagromyza* Hendel was the commonest. This is the first detailed study reporting associations between non-leafmining Agromyzidae and their host plants in Brazil.

KEY WORDS: Cerrado, endophagy, herbivory, insect-plant interaction, *Melanagromyza*

Agromyzidae is a large and worldwide fly family with approximately 2,500 known species (Spencer 1996). The agromyzid family is comprised exclusively by phytophagous flies whose larvae develop inside host-plant organs, as strictly endophagous herbivores (Spencer 1990). Agromyzids are frequently called "leaf miner flies" because circa 80% of known agromyzid species feed within the leaf lamina in their larval stage (Spencer 1990). Among non-leaf miners, larvae feed and develop in other plant organs, such as roots, stems, and flower heads (Spencer & Steyskal 1986); these other habits are likely to be under-represented because they are less conspicuous than mines.

Host plant records of agromyzids are well documented for plants of economic importance (Spencer 1973a, 1990) but far less known for non-commercial plants, especially in tropical countries. However, the latter can be natural repositories for both potential weed control and pest agromyzid species and for their natural enemies (Schuster *et al.* 1991). Moreover, every record of interaction between herbivores and their host plants (i.e., the diversity of interactions) is itself important in representing community biodiversity (Lewinsohn 1991, Lewinsohn *et al.* 2005). In addition to the information bias towards economically important plants, association records between Agromyzidae and their host plants are naturally most frequent for those species whose larvae leave external marks on the plant, such as mines (Chen *et al.* 2003, Andersen *et al.* 2004). Probably for this reason, host plant records of agromyzids in flower heads of Asteraceae are uncommon in the literature (but see Spencer 1973b, Lewinsohn 1991, Spencer *et al.* 1992). In fact, asteracean flower heads are food resources of a speciose fauna of endophagous insects (Zwölfer 1988, Gagné 1994, Almeida *et al.* 2005).

In North America, extensive compilations of agromyzid occurrences list 13 species associated with Asteraceae flower heads, all of them belonging to the genus *Melanagromyza* Hendel (Spencer 1969, Spencer & Stegmaier 1973, Spencer & Steyskal 1986). In the Neotropics, Lewinsohn (1991) found 14 agromyzid species feeding on flower heads in montane and coastal localities of southern Brazil. Eleven of these species belonged to the genus *Melanagromyza* and three to *Liriomyza* Mik., the latter being recorded for the first time feeding on New World Asteraceae flower heads.

Recently, Benavent-Corai *et al.* (2005) published a revision of the world Agromyzidae host-plant interactions. Following this revision, our paper presents six new host-genus records (*Aspilia, Campuloclinium, Hoehnephytum,*

*Trixis, Vernonanthura, Wulffia*) which represent an important increase in the host-plant feeding knowledge for this insect family.

Here we present new records of associations with host plants (Asteraceae) for agromyzid species found in the Brazilian Cerrado. Plant-agromyzid associations were recorded in samples obtained from 2000 to 2005 in 12 counties in the state of São Paulo, Brazil (see Table 1). The sampled areas were located in different Cerrado physiognomies that vary from dense woodlands to open grassland formations (Eiten 1972). For further details on study sites see Almeida *et al.* (2005) and Fonseca *et al.* (2005).

In the laboratory, flower head samples from each local population were kept separated in plastic containers covered with a mesh lid. Samples were checked for the presence of emerged adult insects at least once per week. Each sample was followed for two months or until emergence rates became insignificant. We have no indication of diapause in tropical agromyzids. The insects were pinned, labeled and identified based on the available literature (e.g., Spencer 1990, Spencer *et al.* 1992) and by comparison with specimens deposited at the Museu de Zoologia da Universidade de São Paulo and borrowed from the Natural History Museum, London. Voucher specimens were deposited at Museu de História Natural da Universidade Estadual de Campinas (ZUEC).

A total of eight species of agromyzids were reared from samples of Cerrado plants in São Paulo. The genus *Melanagromyza* was the commonest (n = 691 specimens). In fact, this is considered the largest genus of Agromyzidae in the Neotropics, with more than 280 described species (Spencer & Stegmaier 1973) (Table 1).

Agromyzid species were reared from 18 Asteraceae species distributed in ten genera and five tribes (Table 1). We recorded 23 agromyzid-asteracean associations, of which 22 are totally new. To our knowledge, the only previously published association was that between *Melanagromyza erechtitidis*

Table 1. New Asteraceae host plant species recorded for Neotropical agromyzid species in this study. All plants were sampled in Cerrado remnants in the state of São Paulo, Brazil. (Tribes: E = Eupatorieae, V = Vernonieae, M = Mutisieae, S = Senecioneae, H = Heliantheae. Obs.: K & R stands for King & H. Robinson).

| Agromyzidae species | Host plants | Plant tribes | Counties in São Paulo state |
|---|---|---|---|
| *Melanagromyza bidentis* Spencer | *Chromolaena chaseae* (B. Robinson) K&R | E | Ibaté, São Carlos |
| | *Chromolaena odorata* (L.) K&R | E | Águas Sta. Bárbara, Itirapina, São Carlos |
| | *Chromolaena pedunculosa* (Hook & Arn.) K&R | E | Águas Sta. Bárbara, Agudos, Ibaté, Itirapina, Mogi Guaçu, São Carlos |
| | *Chromolaena pungens* (Gardner) K&R | E | Águas Sta. Bárbara, Ibaté, Itirapina, Pedregulho, São Carlos, Sta. R. P. Quatro |
| | *Chromolaena squalida* (DC.) K&R | E | Itirapina, Pedregulho, São Carlos, Sta. R. P. Quatro |
| | *Chromolaena verbenacea* (DC.) K&R | E | Bauru |
| | *Vernonanthura ferruginea* (Less.) H. Rob. | V | Itirapina, São Carlos |
| | *Vernonanthura membranacea* (Gardn.) H. Rob | V | Assis, Bauru, Itirapina, Pedregulho, Rifania, São Carlos |
| | *Vernonanthura phosphorica* (Vell.) H. Rob. | V | Itirapina |
| *M. chaptaliae* Spencer | *Chaptalia integerrima* (Vell.) Burkart | M | São Carlos |
| *M. erechtitidis* Spencer | *Hoehnephytum trixoides* (Gardn.) Cabrera | S | Itirapina |
| *M. floris* Spencer | *Aspilia* sp. | H | Pedregulho |
| | *Bidens gardneri* Baker | H | Águas Sta. Bárbara, Agudos, Assis, Itirapina, Martinópolis, Pedregulho, São Carlos |
| *M. minima* Malloch | *Bidens gardneri* Baker | H | Itirapina, Martinópolis, Pedregulho, São Carlos |
| | *Viguiera arenaria* Baker | H | Itirapina, São Carlos |
| | *Viguiera robusta* Gardn. | H | Ibaté, São Carlos |
| *M. minimoides* Spencer | *Bidens gardneri* Baker | H | Itirapina |
| | *Wulffia stenoglossa* (Cass.) DC. | H | Itirapina |
| *M. neotropica* Spencer | *Campuloclinium chlorolepis* (Baker) K&R | E | São Carlos |
| | *Chromolaena odorata* (L.) K&R | E | Mogi Guaçu |
| | *Chromolaena pedunculosa* (Hook & Arn.) K&R | E | Itirapina |
| *M. wedeliae* Spencer | *Trixis vauthieri* DC. | M | Martinópolis |

Spencer and *Erechtites hieracifolius* (L.) Raf. (Senecioneae), known from Spencer (1966). All other agromyzids were reared from plants species that, until now, had never been recorded as hosts for this insect family (see Table 1).

A large proportion of agromyzids tend to be associated with phylogenetically closely related plants (Spencer 1990). For instance, *Melanagromyza bidentis* Spencer was recorded by Spencer (1966, 1973) feeding on plants of the tribe Heliantheae, and here it was found in host plants of the Eupatorieae, which is considered a sister tribe of the former (Bremer 1994). However, we also recorded this species in host plants of the tribe Vernonieae, which is not phylogenetically close to the above mentioned tribes (Bremer 1994). *M. bidentis* may warrant further investigation on its taxonomic status.

For other *Melanagromyza* species (e.g., *M. chaptaliae* Spencer, *M. erechtitidis*, *M. floris* Spencer, *M. minima* Spencer, *M. minimoides* Spencer) the new records do not represent novel host tribes. Although a polyphagous feeding pattern has been found within this genus. Similar results were found for *M. neotropica* Spencer, whose new records point to a specialized feeding pattern.

To the best of our knowledge, this is the first paper reporting associations between non-leafmining Agromyzidae and their host plants in Brazil.

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## References

Almeida, A.M., C.R. Fonsceca, P.I. Prado, M. Almeida Neto, S. Diniz, U. Kubota, M.R. Braun, R.L.G. Raimundo, L.A. Anjos, T.G. Mendonça, S.M. Futada & T.M. Lewinsohn. 2005. Diversidade e ocorrência de Asteraceae em cerrados de São Paulo. Biota Neotrop. 5: http://www.biotaneotropica.org.br/v5n2/pt/abstract?article +BN00105022005 . ISSN 1676-0603.

Andersen, A., H. Sjursen & T. Rafoss. 2004. Biodiversity of Agromizydae (Diptera) and biologically and conventionally grown spring barley and grass field. Biol. Agric. Hortic. 22: 143-155.

Benavent-Corai, J., M. Martinez & R. Jimenez Peydró. 2005. Catalogue of the host-plants of the world Agromyzidae (Diptera). Boll. Zool. Agrar. Bachic. Serie II. 37: 1-97.

Bremer, K. 1994. Asteraceae: Cladistics and classification. Timber Press, Portland, 752p.

Chen, X, F. Lang, Z. Xu, J. He & Y. Ma. 2003. The occurrence of leafminers and their parasitoids on vegetables and weeds in Hangzhou area, Southeast China. BioControl 48: 515-527.

Eiten, G. 1972. Cerrado vegetation of Brazil. Bot. Rev. 38: 201-341.

Fonseca, C.R., P.I. Prado, M. Almeida Neto, U. Kubota & T.M. Lewinsohn. 2005. Flower heads, herbivores, and their parasitoids: Food web structure along a fertility gradient. Ecol. Entomol. 30: 36-46.

Gagné, R.J. 1994. The gall midges of the Neotropical region. Cornell Univ. Press, Ithaca, 352p.

Lewinsohn, T.M. 1991. Insects in flower heads of Asteraceae in southeast Brazil: a case study on tropical species richness, p.525-560. In P.W. Price, T.M. Lewinsohn, G.W. Fernandes & W.W. Benson (eds.). Plant-animal interactions: Evolutionary ecology in tropical and temperate regions. John Wiley & Sons, Inc., New York, 639p.

Lewinsohn, T.M., V. Novotny & Y. Basset. 2005. Insects on plants: Diversity of herbivore assemblages revisited. Annu. Rev. Ecol. Syst. 36: 597-620.

Schuster, D.J., J.P. Gilreath, R.A. Wharton & P.R. Seymour. 1991. Agromyzidae (Diptera) leafminers and their parasitoids in weeds associated with potato in Florida. Environ. Entomol. 20: 720-723.

Spencer, K.A. 1966. Notes on the Neotropical Agromyzidae (Diptera). Pap. Avulsos Zool. 19: 142-150.

Spencer, K.A. 1969. The Agromyzidae of Canada and Alaska. Mem. Entomol. Soc. Can. 64: 1-311.

Spencer, K.A. 1973a. Agromyzidae (Diptera) of economic importance. Dr. W. Junk B. V. The Hague, Serie Entomologica, 418p.

Spencer, K.A. 1973b. The Agromyzidae (Diptera) of Venezuela. Rev. Fac. Agrom. Mar. VIII: 5-107.

Spencer, K.A. 1990. Host specialization in the world Agromyzidae (Diptera). Kluwer Academic Publishers, Dordrecht, 444p.

Spencer, K.A. 1996. Australasian/Oceanian Diptera Catalog - Web Version. URL: http://hbs.bishopmuseum.org/aocat/agromyzidae.html. Accessed in 12/09/2006.

Spencer, K.A. & C.E. Stegmaier. 1973. Arthropods of Florida (EUA) and neighboring land areas, v. 7. Agromyzidae of Florida (USA) with a Supplement on Species from the Caribbean. Fla. Dep. Agri. Cons. Serv., Gainesville, 205p.

Spencer, K.A. & G.C. Steyskal. 1986. Manual of the Agromyzidae (Diptera) of the United States. U. S. Department of Agriculture, Agriculture Handbook. n. 638. Washington, U.S.A.

Spencer, K.A., M. Martinez & J. Etienne. 1992. Les Agromyzidae (Diptera) de Guadeloupe. Ann. Soc. Entomol. Fr. 28: 251-302.

Zwölfer, H. 1988. Species richness, species packing, and evolution in insect-plant systems, p.301-319. In E.D. Schulze & H. Zwölfer (eds.), Potentials and limitations of ecosystem analysis. Springer-Verlag. Berlin, 435p.

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