REVISTA COLOMBIANA DE ENTOMOLOGIA
Vol. 10 Nos. 1-2, 1984. p. 3-33

https://doi.org/10.25100/socolen.v10i1-2.10271

The Agromyzidae (Diptera) of Colombia, including a new species attacking potato in Bolivia

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RESUMEN

Se proporcionan claves a géneros y especies de Agromyzidae conocidos de Colombia y se describen 15 especies nuevas: **Melanagromyza spilanthes; Cerodontha** sp. **Cerodontha colombiensis, C. (C.) nigra; Liriomyza chiensis, L. colombiella, L. herrerai, L. hordei, L. madridensis, L. montserratensis, L. nigra, L. robustae; Phytoliriomyza colombiana, P. medellinensis, P. sabanae, P. similis.**

Se establece una nueva sinonimia genérica con **Geratomyza** Spencer, ahora sinonimizada formalmente con **Japanagromyza** Sasakawa.

Se registran como nuevas para Colombia, cuatro especies plagas: **Melanagromyza phaseolivora, Liriomyza sativae, Phytomyza rufipes** y **Chromatomyia syngenesiae.**

Se describe una especie nueva de Bolivia, **Phytoliriomyza papae,** que se alimenta en tallos de papa.

SUMMARY*

Keys to genera and species of the Agromyzidae known in Colombia are provided and 15 new species are described: **Melanagromyza spilanthis; Cerodontha** sp. **Cerodontha colombiensis, C. (C.) nigra; Liriomyza chiensis, L. colombiella, L. herrerai, L. hordei, L. madridensis, L. montserratensis, L. nigra, L. robustae; Phytoliriomyza colombiana, P. medellinensis, P. sabanae, P. similis.**

A new generic synonymy is established, with **Geratomyza** Spencer now formally synonymised with **Japanagromyza** Sasakawa.

Four pest species are recorded as new to Colombia: **Melanagromyza phaseolivora, Liromyza sativae, Phytomyza rufipes** and **Chromatomyia syngenesiae.**

A new species from Bolivia, **Phytoliriomyza papae,** feeding in potato stalks is described.

INTRODUCTION

Agromyzidae in South and Central America are now becoming reasonably well known, following the Synopsis of Neotropical species (Spencer, 1963) and more detailed studies on individual countries by Spencer (1973c, Venezuela; 1973a and 1983a, Costa Rica; 1982, Chile). Five species from Brazil were described by Spencer (1966b), 2 species attacking tomatoes in Colombia and Ecuador were described by Steyskal (1972) and one new **Calycomyza** species in Argentina was described by Valladares (1981). A comprehensive survey of species in southern Florida and the Caribbean was given by Spencer and Stegmaier (1973).

Hitherto approximately 300 species have been recorded in the Neotropical Region, of which only 10 were known in Colombia. Following recent collecting in Colombia 15 new species are now described and 21 are recorded for the first time. It is certain that many further species await discovery, particularly in the genera **Melanagromyza** and **Calycomyza** at lower altitudes than around Bogotá where most of my collecting was undertaken.

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Of the 15 new species, five are grass-feeders, one known as a pest of barley; one feeds in the flower-heads of the weed **Spilanthes americana** and the host of the others is not known. It is reasonably certain that only **Liriomyza hordei** among these new species is of any economic importance. Potential pests recorded are **Melanagromyza phaseolivora** feeding in pods of beans, **Liriomyza sativae,** a highly polyphagous species attacking many vegetables and flowers, **Phytomyza rufipes** known as a pest of cabbage in Europe and **Chromatomyia syngenesiae,** a serious pest of Chrysanthemums in Europe.

MATERIALS AND METHODS

The present review has been based primarily on my four visits to Colombia in April, June and August, 1982 and in October/November, 1983. Intensive collecting was undertaken around many of the flower farms on the Sabana, north of Bogotá and SE of Bogotá beside the road to La Calera, at La Ceja and Rionegro (Antioquia) and at Piendamó (Cauca). Some specimens were also provided for study by ICA, Tibaitatá. In all 370 specimens have been examined and 40 genitalia preparations have been made.

Keys have been prepared to the 9 genera now recorded in Colombia, including also **Agromyza** and **Ophiomyia** which although not so far known, are certainly present at lower elevations. For discussion of these two genera see Spencer and Stegmaier (1973). Keys are also provided to species.

A discussion of the biology, rearing methods and preservation of both adults and leaf-mines of Agromyzidae was given in Spencer and Stegmaier (1973: 7-8 and 15-17). A convenient method of preparing and mounting male genitalia was provided by Spencer (1981: 15-18).

The following abbreviations, familiar to all dipterists, have been used:

acr - acrostichal hairs
dc - dorso-central bristles
ori - lower orbital bristles
ors - upper orbital bristles

Holotypes and other material at present retained in the Author's collection (AC) will in due course be deposited in the British Museum (Natural History), London.

Acknowledgments

My primary thanks are due to the Association of Colombian Flower Growers, Asocolflores, who invited me to Colombia on three occasions to study leaf-mining pests on flower farms. This study would not have been possible without the facilities provided for collecting and I gratefully acknowledge the assistance and hospitality I was given at all times by the manager of Asocolflores, Sr. Jorge Enrique Uribe Salazar; the agronomist at Asocolflores, Sr. Germán Arbeláez Torres and the owners and agronomists at the farms I visited.

Dr. Isabel S. de Arévalo, Jefe Sección Zoología, Instituto de Ciencias Naturales - Museo de Historia Natural, Universidad Nacional de Colombia has given me valuable guidance in several meetings and has kindly read the manuscript. I greatly appreciate this assistance.

I must also thank my wife who prepared all illustrations, so essential in a taxonomic paper of this nature.

Key to genera of Colombian Agromyzidae (including **Agromyza** and **Ophiomyia** not so far known in Colombia but certainly present)

1	Subcosta developed throughout its length, coalescing with vein R1 before reaching costa (subfamily Agromyzinae)	2
–	Subcosta becoming a fold distally and ending at costa separately and basad of R1 (subfamily Phytomyzinae)	5
2 (1)	Pre-scutellars lacking	3
–	Pre-scutellars present	4
3 (2)	Mesonotum or abdomen normally with some metallic coloration, greenish or coppery, more rarely entirely black; antennae normally not separated by raised facial keel; male never with vibrissal fasciculus (cf. Spencer, 1973c: fig. 51; Spencer and Stegmaier, 1973: fig. 138);	**Melanagromyza** Hendel
–	Uniformly black species; antennae normally divided by raised facial keel; male with vibrissal fasciculus	(**Ophiomyia** Braschnikov)
4 (2)	Only 2 pairs of dorso-centrals	**Japanagromyza** Sasakawa

–	At least 3 pairs of dc	(**Agromyza** Fallén)
5 (1)	Orbital setulae erect, reclinate or absent	6
–	Orbital setulae distinctly proclinate	11
6 (5)	Vein R4+5 ending nearest wing tip	**Phytobia** Lioy
–	Vein M1+2 ending nearest wing tip	7
7 (6)	Male genitalia: sperm pump with enlarged, bowlshaped base	**Amauromyza** Hendel
–	Male genitalia: sperm pump without such enlarged base	8
8 (7)	Third antennal segment angulate (Fig. 21) or with a spine (Fig. 17), scutellum normally with only 1 pair of bristles (subgenus **Cerodontha**)	**Cerodontha** Rondani
–	Third antennal segment rarely angulate, never with spine, scutellum always with 2 pairs of bristles	9
9 (8)	No pre-sutural dc; epandrium with conspicuous patch of spines at hind-corner	**Calycomyza** Hendel
–	Pre-sutural dc present; epandrium without such spines	10
10 (9)	Male with stridulating organ, consisting of chitinized ridge on hind-femora and line of scales on side of abdomen (cf. Spencer, 1973c: Plates 1,2); frons and scutellum normally bright yellow (frons darker and scutellum black in **Liriomyza nigra** sp. n.)	**Liriomyza** Mik
–	Male never with stridulating organ; frons and scutellum variable, frons darker or bright yellow; scutellum yellow or black	**Phytoliriomyza** Hendel in part
11 (5)	Costa extending to vein M1+2 (cf. Fig. 43)	**Phytoliriomyza** Hendel in part
–	Costa extending only to vein R4+5 (Fig. 100)	12
12 (11)	Male genitalia: distal section of aedeagus simple (not bifid), lying below a lobe with supporting sclerites on dorsal side of aedeagus (cf. Spencer, 1982: figs. 109, 110); pupation in mine	**Chromatomyia** Hardy
–	Male genitalia: distal section of aedeagus bifid, without such lobe above (cf. Spencer, 1982: figs. 111, 112); pupation on ground	**Phytomyza** Fallén

GENUS Melanagromyza HENDEL

This is the largest genus known in South America, with 63 species recorded from the Caribbean and Central America south to Argentina and Chile. Twelve further species are known from Florida and it seems probable that with further collecting a number of these will be discovered in Central America or Colombia. Spencer (in Spencer and Stegmaier, 1973) gave a key to 52 Neotropical species known at that time. Surprisingly only 9 species are known in Colombia and it is certain that many more await discovery, particularlay at lower elevations.

All species are dark, with the head black and mesonotum black or greenish. Many species are difficult to identifiy on external characters but the male genitalia are well differentiated in this genus and illustrations of the genitalia are given for eight of the species discussed bellow.

The larvae of all species feed internally in stems, flowerheads or other parts of the plant. A number of species are of economic importance, weakening or even destroying young plants. Three such species in Colombia are **M. tomaterae** and **M. caucensis** feeding in tomato stems, and **M. phaseolivora** Spencer feeding in pods of beans.

Of the nine species now recorded in Colombia, four are new to Colombia and one is described as new. The new material seen clearly suggests that many species will prove to be more widespread in South America than had hitherto been believed. **M. phaseolivora** was previously only known from Ecuador, **M. setifera** from Guyana and **M. wedeliae** from southern Florida.

Key to Colombian Melanagromyza **species**

1	Squamal fringe pale, whitish	2
–	Squamal fringe dark, brownish or black	7
2 (1)	Halteres partially white	3
–	Halteres entirely dark, brown or black	4
3 (2)	Jowls narrow, 1/9 vertical height of eye; large species, wing length 3.1-3.5 mm	**colombiensis** Spencer
–	Jowls broader, 1/4 - 1/5 height of eye; wing length 2.7 - 3.2 mm	**tomaterae** Steyskal
4 (2)	Arista appearing bare	**neotropica** Spencer
–	Arista obviously pubescent	5
5 (4)	Jowls narrow, 1/10 vertical height of eye, arista with conspicuously long pubescence	**setifera** Spencer
–	Jowls broader, 1/4 to 1/6 vertical height of eye, arista with short pubescence	6
6 (5)	Eye in male bare; male genitalia: aedeagus as in Fig.1	**caucensis** Steyskal
–	Eye in male with distinct pilosity; male genitalia: aedeagus as in Figs. 5, 6	**phaseolivora** Spencer
7 (1)	Mesonotum and abdomen black	**nobilis** Spencer
–	Mesonotum and abdomen greenish	8
8 (7)	Jowls narrow, 1/10 vertical height of eye; small species, wing length 2- 2.2 mm	**wedeliae** Spencer
–	Jowls broader, 1/5 vertical height of eye; larger species, wing length 2.5 - 2.7 mm	**spilanthis** Spencer, sp.n.

Melanagromyza caucensis Steyskal. Fig. 1.
This species was obtained together with **M. tomaterae** from stems of tomato at Pradera, Valle, 28.ix.68 (I. Zenner). The two species are very similar but in **M. caucensis** the eye is bare in the male and the halteres are uniformly black. The aedeagus (Fig. 1) obviously differs from that of **tomaterae**, lacking an extended process from the upper half of the mesophallus. It seems probable that a species recorded from Ecuador as "sp. nr. **chenopodii**" by Spencer (1963: 309) may be identical with **M. caucensis**.

Melanagromyza colombiensis Spencer. Fig. 2.
This relatively large species, described from 4 specimens from Bogotá (exact locality not recorded), belongs to the group of greenish species with the squamal fringe pale but is distinctive in having the halteres partially white. In this character it resembles **M. tomaterae** but is larger and the male genitalia confirm that the two species are distinct. The aedeagus is shown in Fig. 2. There is no indication of the host.

Melanagromyza neotropica Spencer. Fig. 3.
This is the most widespread of the complex of greenish species with the squamal fringe pale. It was described from Mexico and Brazil and has since been recorded in Venezuela (Spencer, 1973c), Chile (Spencer, 1982) and Costa Rica (Spencer, 1983a); it is also known in Argentina (Valladares, pers. comm.). One previously confirmed host is **Bidens pilosa**, the larva feeding in the flower heads.

Two females almost certainly referable to this species were reared from flower-heads of **Spilanthes americana** together with **M. spilanthis** sp.n. at Bogotá, ix.82.

An important character of this species is the virtually bare arista. The aedeagus of a male ex **Bidens**, Argentina is shown in Fig. 3.

Melanagromyza nobilis Spencer. Fig. 4.
This is the only recorded Colombian species with the mesonotum and abdomen entirely black. The unusual form of the aedeagus (Fig. 4) confirms its isolated position. It remains known only from the unique holotype (unfortunately now lacking its head) which was collected at the foot of the Telesférico, Bogotá, 8.xii.58 (K.A.S.).

Melanogromyza phaseolivora Spencer. Fig. 5.
Head. Frons 1.5 times width of eye, not projecting above eye in profile; orbital bristles strong, the 2 ors equal,

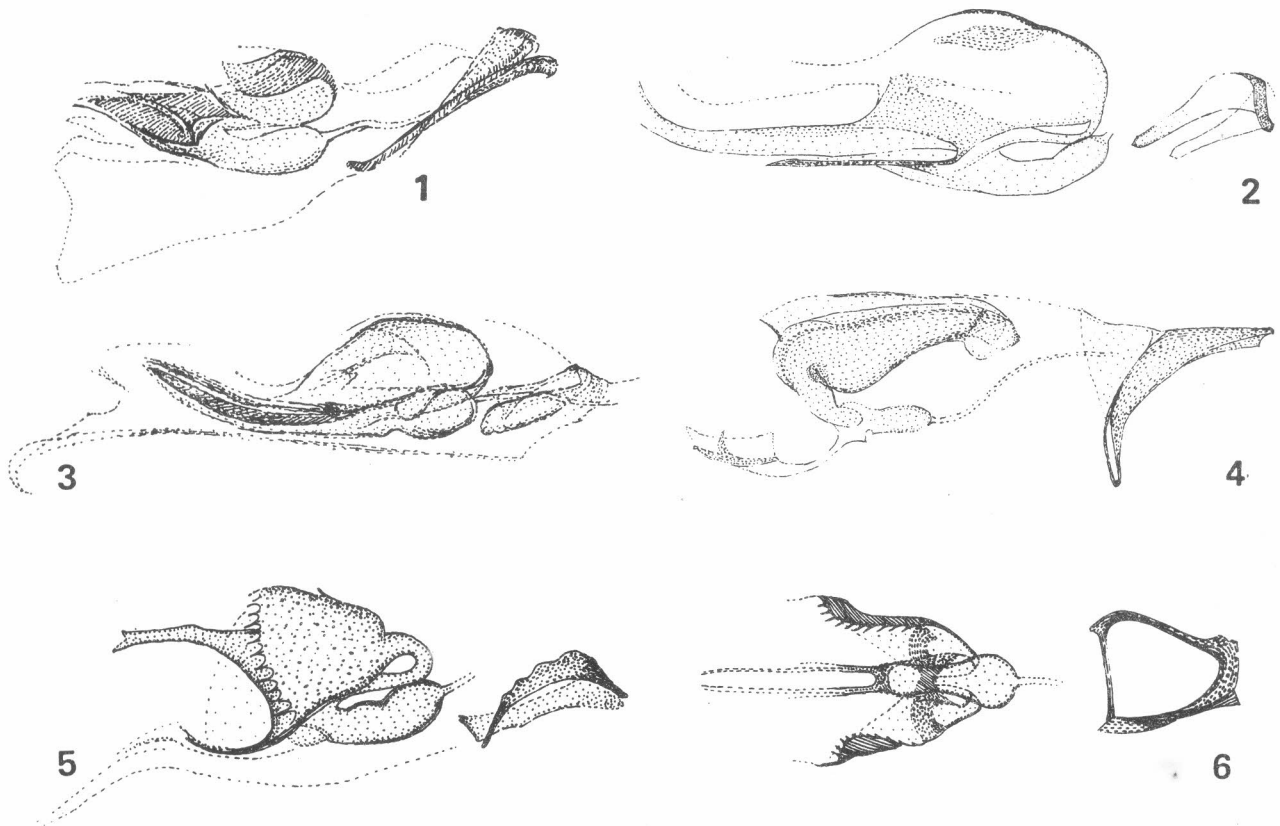


Figure 1. **Melanagromyza caucensis:** aedeagus, side view (paratype).
Figure 2. **Melanagromyza colombiensis:** aedeagus, side view.
Figure 3. **Melanagromyza neotropica:** aedeagus, side view.
Figure 4. **Melanagromyza nobilis:** aedeagus, side view.
Figures 5, 6. **Melanagromyza phaseolivora:** 5, aedeagus, side view; 6, same, ventral view.

upper ori little shorter, lower weaker and incurved; orbital setulae short, reclinate apart from a few proclinate ones in front; ocellar triangle small, apex extending only to level of upper ori, only moderately shining; jowls 1/5 height of eye, deepest in centre; eye large, upright, with cospicuous patch of white hairs at level of lower ors; third antennal segment small, round, arista weakly pubescent, long, only slightly shorter than vertical height of eye.

Mesonotum. 2 strong dc, acr in about 8 rows.

Wing. Lenght from 2.85 mm in male to 3.1 mm in female, last section of M3+4 shorter than penultimate, in ratio 25:30, inner cross-vein near midpoint of discal cell.

Colour. Frons mat black, ocellar triangle and basal pits of orbital bristles faintly grenish, lunule grey; mesonotum moderately shining green, abdomen more brilliantly greenish or coppery; squamae and fringe silvery-white, margin only slightly differentiated, pale brown.

Male genitalia- Aedeagus distintive. Figs. 5, 6.

Host. "Green beans" (fríjol verde), larva feeding and pupating internally in the pod.

Material seen. 4 ♂, 1 ♀, Anolaima (50 km NW of Bogotá), xii.82, "vaina frijol verde" (I. Zenner).

Remarks. The species is re-described from the first specimens known from Colombia. It belongs to the large group of greenish species with the squamal fringe pale but is unusual for a feeder in Leguminosae in having the eye pilose in the male. This character occurs frequently in Compositae-feeders but is rare in the Leguminosae.

The male genitalia are characteristcic of the genus but disctinctive; the presence of a line of strong bristles on each side of the epandrium is uncommon but has been noted in a

number of Neotropical species. In the author's key to Neotropical species (Spencer and Stegmaier, 1973: 151) **M. phaseolivora** runs to couplet 22 which includes **M. chenopodii** Spencer from Chile and **M. peremnis** from Dominica; however, the genitalia confirm that these species are distinct.

Pod-feeders in Leguminosae are well known in Africa and in India where they represent serious pests (Spencer, 1973b) In Florida the larva of **M. floridensis** Spencer (cf. also Spencer, 1973b) feeds within a single seed of **Desmodium tortuosum**, a leguminous plant used as green manure. However, **M. phaseolivora** is the only species in South America known to attack pods of cultivated beans and may thus represent a pest of some significance. With records now known from Ecuador and Colombia it is probably widespread at higher elevations.

Melanagromyza setifera Spencer. Figs. 7, 8.
Among greenish species with the squamal fringe pale, this is distinctive in the exceptionally long pubescence of the arista. The type series was from Guyana, Mazaruni, viii. and ix.37 (Spencer, 1963).

One male and 3 females were collected at the roadside above the Intercontinental Hotel, Medellín, 18.vi.82. The aedeagus of the male is shown in Figs. 7, 8.

M. setifera superficially resembles **M. compositoides** Spencer from Jamaica, particularly in the pubescent arista but it is larger and the male genitalia of the two species are entirely distinct (cf. Spencer, 1963: fig. 20).

Melanagromyza spilanthis sp.n. Figs. 9, 10.
Head. Frons 1.5 times width of eye, not projecting above eye in profile; 4 strong orbital bristles, the 2 ors only slightly longer than the ori; orbital setulae short, in single row, reclinate; ocellar triangle sometimes ill-defined, moderately shining, apex extending, at least in outline, below level of lower ors; jowls relatively broad, about 1/5 vertical height of eye, this large, upright, in male with patch of short white pilosity at level of ors; third antennal segment small, rounded at end, arista long, bare, only slightly shorter than vertical height of eye.

Mesonotum. 2 strong dc, acr numerous, in about 10 rows between dc.

Wing. Length 2.5 - 2.7 mm in both sexes, last section of vein M3+4 only slightly more than half length of penultimate, in ratio 17:32.

Colour. Frons mat black; mesonotum appearing mat from front, moderately shining blackish-green from rear, abdomen variable, from brilliantly shining green to more blackish-green; squamae pale grey, margin and fringe black; halteres entirely black.

Male genitalia. Aedeagus distally with 2 dorsally curving tubules (Fig. 9), in ventral view narrow, symmetrical (Fig. 10); hypandrial apodeme extended, narrowly triangular; sperm pump with large blade.

Host. **Spilanthes americana**, larva feeding and pupating in flower-head, several larvae feeding together; puparium pale brown, posterior spiracles each on a more yellow conical projection surmounted by a strongly sclerotized plate with a circle of 9 pores around a short central horn.

Holotype ♂, Colombia, Bogotá, Ciudad Universitaria, emerged 16.ix.82; paratypes: 2 ♂, 8 ♂ coll. 25.viii.82, emerged Sep. 82 (all K.A.S.); 2 ♂, 1 ♀, 12.ix.80 (I. Arévalo). Holotype and paratypes in AC, further paratypes in Univ. Nac., Bogotá.

Remarks. With the dark squamae and fringe this species can be closely associated with **M. wedeliae** but it is larger and the male genitalia, although of the same general from, are more complex.

Melanagromyza tomaterae Steyskal. Figs. 11, 12.
This potentially serious pest of tomatoes appears to be widespread in the north of South America, with records from Ecuador and Colombia (Steyskal, 1972) and from Venezuela (Spencer, 1973c). Further specimens from Venezuela have recently been seen from San Cristóbal, close to the northern border with Colombia.

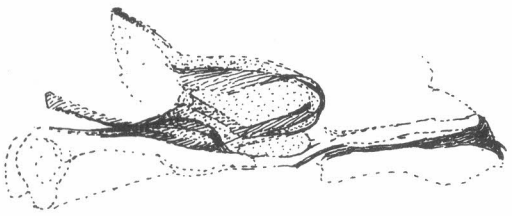
This is yet another in the complex of greenish species with the squamal fringe pale, with the following essential characters: frons up to 1.5 times width of eye, orbital setulae in single row, reclinate; ocellar triangle and orbits weakly shining; mesonotum shining, blackish-green, abdomen more conspicuously green; squamae and fringe white, squamal margin pale yellow; halteres largely black but narrowly white each side of apical sulcus (Steyskal, 1972: fig. 2B); wing length from 2.7 mm in male to 3.3 mm in female; male genitalia (Venezuela) as in Figs. 11, 12.

The larva feeds and pupates in stems of tomato. The puparium is pale brownish or, when empty, straw-coloured, with the posterior spiracular plates separated by their own diameter, each with an ellipse of from 11 to 17 well defined pores around the short central horn.

Damage to tomatoes in Colombia has not been properly assessed but in Venezuela young plants suffer severely and it seems probable that the yield is reduced.

Melanagromyza wedeliae Spencer.

This species closely resembles **M. spilanthis** sp.n. but the jowls are narrower and it is distinctly smaller, with wing length of 2 - 2.2 mm; the male genitalia are more simple,



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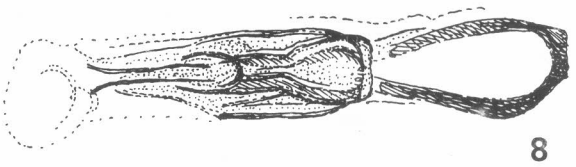

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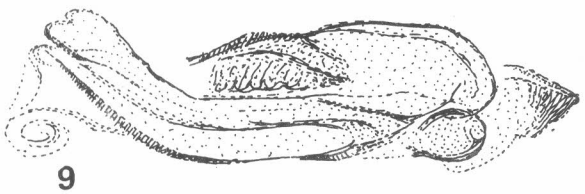

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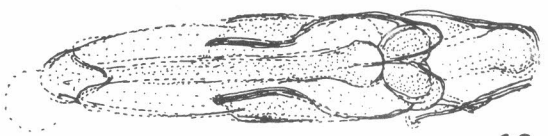

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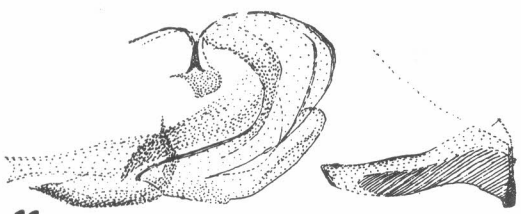

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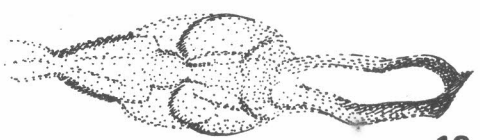

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Figures 7, 8. **Melanagromyza setifera:** 7, aedeagus, side view; 8, same, ventral view.
Figures 9, 10. **Malanagromyza spilanthis:** 9, aedeagus, side view; 10, same, ventral view.
Figures 11, 12. **Melanagromyza tomaterae:** 11, aedeagus, side view; 12, same, ventral view.

although of the same general form (cf. Spencer and Stegmaier, 1973; figs. 117, 118). Both mesonotum and abdomen are greenish, with the squamae grey and the margin blackish.

It has hitherto only been known in Florida where it is widespread, with **Wedelia paludosa** and **Senecio confusus** as known hosts (Spencer and Stegmaier, 1973:54). Two males and 1 female were reared from flower-heads of **Bidens pilosa,** 25.vi.82, coll. 18.vi.82 at the roadside above the Intercontinental Hotel, Medellin.

GENUS Japanagromyza SASAKAWA

Japanagromyza Sasakawa, 1958:140. Type-species: **Agromyza duchesneae** Sasakawa, 1954:106, designated by Sasakawa, 1958.

Geratomyza Spencer, in Spencer and Stegmaier, 1973: 140, new synonymy. Type-species **Geratomyza maculata** Spencer, 1973 by original designation.

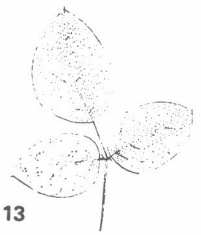
The majority of species in this genus are dark, black or greenish. The larvae form large blotch mines (Figs. 13, 16), the favourite host family being the Papilionaceae.

The genus is well represented in South America and Spencer in Spencer and Stegmaier (1973) gave a key to 19 species known at that time, and **J. phaseoli** has recently been described from Costa Rica, Venezuela and Perú (Spencer, 1983a). No adults are known in Colombia but a leaf mine found on **Desmodium campylocladum** (Fig. 13) at the Tequendama Falls near Bogotá, 10.xii.58 (K.A.S.) certainly represents a species in this genus, possibly **J. desmodii** Spencer, 1973 (in Spencer and Stegmaier, 1973) described from southern Florida.

J. phaseoli is a pest on cultivated beans of some economic significance and, with records from Costa Rica, Venezuela and Perú, is certainly present in Colombia. The head has the eye large, with strong orbital bristles (Fig. 14) and the long, coiled aedeagus is very distinctive (Fig. 15). Blotch mines on **Phaseolus** are shown in Fig. 16.

Geratomyza was described for two species from Grand Cayman, Jamaica, Bahamas and Guyana with the head and abdomen partially yellow. The similarity with **Japanagromyza** was noted but it seemed justified to erect a new genus on the basis of the striking pale colouration. A further undescribed largely yellow species definitely referable to

Japanagromyza was collected by Dr. M. von Tschirnhaus in rain forest in Perú 350 km NE of Lima, 9°.3'S,74°.56'W and I therefore now feel it correct to synonymise **Geratomyza** with **Japanagromyza** herewith.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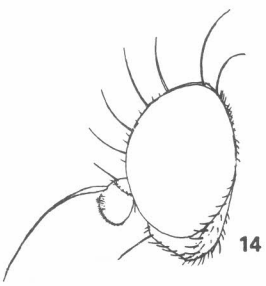
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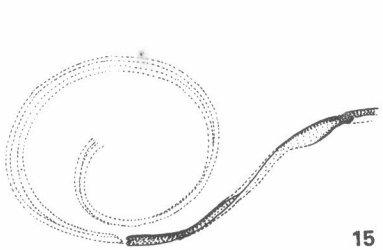
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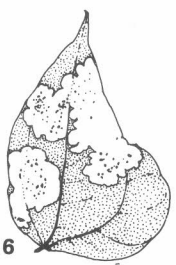
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Figure 13. **Japanagromyza** sp. **(? desmodii)**: leaf-mine on Desmodium.
Figures 14, 16. **Japanagromyza phaseoli:** 14, head; 15, aedeagus, side view; 16, leaf-mine on **Phaseolus vulgaris.**

GENUS Phytobia LIOY

This genus consists of relatively large species, the larvae feeding in the cambium of growing trees, either in the main stem or lateral branches. It is of virtually cosmopolitan distribution and is well represented in South America. Four species are known in Brazil (Spencer, 1966b), one in Perú (Spencer, 1977) and five in Costa Rica (Spencer, 1983a). Von Tschirnhaus (pers. comm.) caught up to 20 different species using bait traps in one area of rain forest in Perú 350 km NE of Lima in 1981. Spencer in Spencer and Stegmaier (1973) gave a key to the 11 Neotropical species known at that time.

No adults are known in Colombia but I have seen two immature larvae collected from stems of **Solanum quitoensis** ("lulo") at San Bernardo, Cundinamarca, vi.82 (L. Cobo). These larvae, as normal in the genus, are exceptionally long and narrow, measuring 11 mm x 0.7 mm.

Serious damage to wood used for industrial purpose can be caused by the long feeding tracks of the larvae (Spencer, 1973b) and the origin of these unsightly brown marks in sawn timber is frequently not understood. In the Netherlands an increased incidence of **P. cambii** (Hendel) feeding in **Populus** and **Salix** has recently been noted, possibly due to parasites being killed by agricultural insecticides.

GENUS Amauromyza HENDEL

Forty species are known in this somewhat diverse genus, of which only 4 have been recorded in the Neotropical Region (Spencer and Stegmaier, 1973: 18b; Spencer, 1973c: 70).

The single species **A. maculosa** (Malloch) can now be recorded in Colombia. This shining black species is distinctive in having the halteres largely white but partially black below. The larvae form large blotch mines and the species has been recorded as a pest on lettuce in Venezuela and Trinidad. Hosts are exclusively in the compositae and many genera are attacked, including also occasionally **Chrysanthemum** but no significant damage is known to have been caused on cultivated flowers.

A. maculosa was described from New York and its range extends to Argentina and Chile. It was common on the weed **Conyza** in the streets in Santiago in January, 1978. It is also common in Florida and California.

In Colombia **A. maculosa** is widespread on the Sabana on the weed **Conyza** and also on the yellow daisy, **Chrysanthemum coronarium**, which is frequentley cultivated in front gardens in and around Bogotá. At La Fontana, Bogotá, the conspicuous blackish mines were common in gardens in August, 1982 and in October, 1983. Mines were also present on **Conyza** beside the Rio Cali, Cali, 30.x.83.

GENUS Cerodontha RONDANI

This large cosmopolitan genus comprises nearly 100 species in 7 subgenera. Only the subgenus **Cerodontha** is known in Colombia - species with the third antennal segment angulate (Fig. 21) or bearing a spine (Fig. 17) and normally

with only 1 pair of scutellar bristles; two new species are now described and **C. dorsalis** is recorded as new to Colombia.

Of the 7 subgenera in addition to **Cerodontha** only **Dizygomyza** Hendel (Spencer, 1973c) and **Poemyza** Hendel (Spencer, 1983a) are known in South America. Species in **Dizygomyza** which feed predominantly on **Carex** can be expected to occur in Colombia.

Key to Colombian **Cerodontha** species

1	Largely black species; third antennal segment angulate but without spine (Fig. 21)	**nigra** Spencer sp.n.
–	Yellow and grey species; third antennal segment with spine (Fig. 17)	2
2 (1)	Acrostichals present in 2 rows; mesonotum brownish-grey, uniformly dark, never with yellow patch centrally before scutellum, this entirely dark	**colombiensis** Spencer, sp.n.
–	Acrostichals lacking; mesonotum mat blackish-grey, frequently with yellow patch centrally before scutellum, this often partially yellow	**dorsalis** (Loew)

Cerodontha (Cer.) colombiensis sp.n. Figs. 17, 18.
Yellow and grey species.
Head. Essentially as in **C. dorsalis**, with third antennal segment elongate, with short spine at upper corner (Fig. 17), only 3 strong orbital bristles, orbital setulae sparse.

Mesonotum. 3+1 strong dc, acr present in 2 rows, extending from front of presutural area to level of 3rd dc.

Wing. Length from 2.75 mm in male to 3.0 mm in female; last section of vein M3+4 long, little shorter than penultimate, in ratio 25:30.

Colour. Frons basically bright yellow but variably darkened centrally from front of ocellar plate to margin of lunule, this bright yellow; orbits only slightly darkened on upper half; jowls, face, palps, first and second antennal segments bright yellow, third segment black; mesonotum and scutellum entirely mat, brownish-grey; notopleura, humerus and upper margin of mesopleura and sternopleura bright yellow, pleura otherwise grey; legs: femora predominantly yellow but faintly darkened, tibiae and tarsi darker, greyish-yellow; abdomen greyish-black, with tergites narrowly yellow-bordered; halteres bright yellow.

Male genitalia. Aedeagus long, divided from mesophallus into pale, paired, curving tubules, distiphallus triangular, darker basally (Fig. 18).
Holotype ♂, Colombia, Tabio, 35 km N. of Bogotá, 22.x.83; paratypes: 1 ♂ same data; above Tabio on road to Subachoque, 2 ♂, 2 ♀, 21.viii.82; Subachoque, 1 ♀, 21.viii.82; Mosquera, 1 ♂, 2 ♀, 15.vi.82; Zorro, 1 ♀, 16.vi.82; Bogotá, waste ground near Hotel Bogotá Plaza, 1 ♂, 22.x.83; roadside Bogotá - La Calera, 1 ♂, 1.xi.83. Holotype and paratypes in AC, 1 ♂, 1 ♀ each in collections of Unidad Entomología, Univ. Nacional, Bogotá and ICA-Tiabaitatá.

Remarks. Although generally resembling and closely related to **C. dorsalis**, this species is readily distinguishable by the characters metioned in the key above. It is possibly restricted to higher elevations, as no specimens were obtained during collecting at Cali or at La Ceja. Hosts will certainly be one or more local grasses.

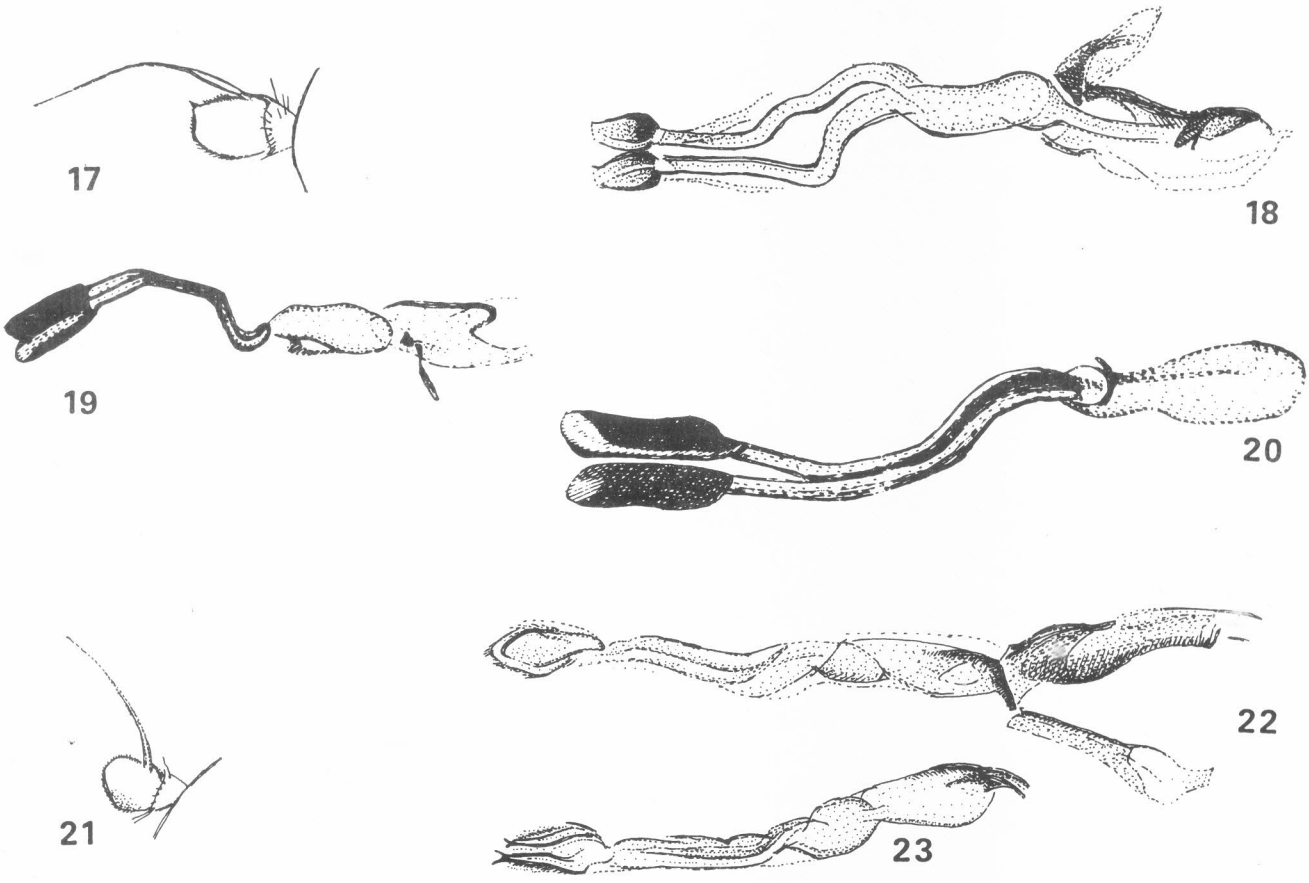
Cerodontha (Cer.) dorsalis (Loew) Figs. 19, 20.
A widespread species from Canadá, throughout the United States to Central America, Puerto Rico, Brazil and Chile; also present in Mongolia.

With the elongated third antennal segment and a short spine at the upper corner (cf. Fig. 17) this is a atypical **Cerodontha**. There are clear differences between it and **C. colombiensis** described above: acrostichals are entirely lacking, the frons is uniformly yellow, the mesonotum is basically blackish-grey but frequently with a narrow yellow patch centrally adjoining the scutellum, which is also often faintly yellowish centrally. In the male genitalia the distiphallus is more elongate and darker (Fig. 20).

C. dorsalis is not uncommon on and near the Sabana north of Bogotá and 13 males and 16 females have been seen from Funza, Madrid, Mosquera, Suba, Subachoque, Tabio and at the roadside between Bogotá, La Calera and Sopó in April and June, 82 and October, 83. Three males and 1 female were collected at La Ceja, Antioquia, 15.iv.82 and 19.vi.82 and 1 female at Cali, 11.x.83.

In California, **C. dorsalis** is recognized as a minor pest of cereals. However, despite initial damage to young seedlings, they tend to recover and it is not established whether there is any reduction in yield (Spencer, 1973b). As many as eight generations in a year have been confirmed in southern California. There are at least three generations on the Sabana. All cereals grown in Colombia could be attacked and some wild grasses certainly serve as alternate hosts.

Ceredontha (Cer.) nigra sp. n. Figs. 21, 23.
Largely black species.



Figures 17, 18. **Cerodontha** (Cer.) **colombiensis:** 17, third antennal segment; 18, aedeagus, ventral view.
Figures 19, 20. **Cerodontha** (Cer.) **dorsalis:** 19, aedeagus, side view; 20, same, ventral view.
Figures 21, 23. **Cerodontha** (Cer.) **nigra:** 21, third antennal segment; 22, aedeagus, side view; 23, same, ventral view.

Head. Frons just less than 1.5 times width of eye, not projecting above eye in profile; 1 strong, slightly reclinate ors, 2 ori, both inclined, the upper at level of lunule; orbits broad, strongly differentiated, slightly widening at midpoint between front of ocellar plate and upper margin of lunule; orbital setulae irregular, those above reclinate, those in front distinctly proclinate; jowls broad, 1/3 height of eye, cheeks prominent, filling half width of jowls; eye with conspicuous pilosity which is as long as the orbital setulae; third antennal segment bluntly angulate (Figs. 21), arista with moderate pubescense. Mesonotum. 3+1 strong dc, acr in 6 rows; scutellum with strong pair of anterior acutellars.

Wing. Length in male 2.6 mm, costa extending strongly to vein M1+2, last section of M3+4 in ratio 20:35 with penultimate, inner croos-vein slightly before midpoint of discal cell.

Colour. Frons mat black, orbits largely shining black but narrowly yellow adjoining frons; lunule, jowls, face and palps black; mesonotum and scutellum uniformly deep black, appearing moderately shining viewed from front, distinctly mat seen from rear; notopleura with a bright yellow patch on lower margin, pleura otherwise black; legs entirely black; wing base and base of R1 bright yellow; squamae pale grey, margin and fringe black.

Male genitalia. Aedeagus (Fig. 22, 23) with distal tubules narrowly divided, paired processes of distiphallus narrow, pale; sperm pump with greatly enlarged blade.

Holotype ♂, Colombia, Bogotá, track into mountains off road to La Calera near Restaurant "El Engaño", 13.vi.82, in AC.

Remarks. This species is readily distinguishable by its black colour and angulate third antennal segment. It is unique in the subgenus in having a second pair of scutellar bristles. Its black colour might suggest inclusion in the subgenus **Xenophytomyza** Hendel but the form of male genitalia excludes this (cf. Spencer, 1976a: figs. 322, 324, 325); also in this subgenus there is only a single pair of scutellar bristles present and in the New World it is not known south of Canadá. A largely black species, **Cerodontha angustipennis** Harrison, is known in New Zealand, in which the small spine on the third antennal segment is lacking in up to 20°/o of specimens (Spencer, 1976: 165). **C. nigra** is

thus an aberrant species which does not exactly fit any subgenus as hitherto delimited but until further material becomes available it is best placed in subgenus **Cerodontha**.

GENUS Liriomyza MIK

This well-known genus is with available material by far the largest in Colombia with 20 species, of which 8 are new and described below, and 5 are recorded as new to Colombia. 54 species are known in the Neotropical Region. Differentiation between **Liriomyza** and **Phytoliriomyza** may be difficult in some species, such as **Phytoliriomyza sabanae** sp. n., but the one definite character separating the two is the presence of the stridulatory organ in males of **Liriomyza** (see couplet 10 of key to genera). **Liriomyza nigra** sp.n. is of interest, having the scutellum entirely black.

Of the new species 3 are clearly grass-feeders (deduced from the characteristic male genitalia) and one, **L. hordei**, is known as a pest of barley. None of the other new species are of economic importance.

The pests, **L. huidobrensis** and **L. trifolii**, have large populations on the Sabana but the latter remains restricted to the immediate vicinity of the flower farms where it has become established. Only small populations of **L. huidobrensis** are present at the two other flower-growing areas at La Ceja and Piendamó. The third leaf-mining pest, **L. sativae**, has only been discovered at one locality near Cali but is certainly present in other suitable areas. **L. dianthicola**, the Mediterranean pest of carnations, has been intercepted at Bogotá but has not so far become established.

Key to Colombian **Liriomyza** species (including 1 **Phytoliriomyza** sp.)

1	Scutellum entirely black	**nigra** Spencer sp.n.
–	Scutellum partially yellow, at least centrally	2
2 (1)	Mesonotum yellow centrally before scutellum (Figs. 24, 49)	3
–	Mesonotum uniformly dark centrally before scutellum, at most with yellow patches at hind-corners	7
3 (2)	Angular or rounded yellow patch centrally before scutellum; acrostichals inclined inwards (Figs. 24, 55)	4
–	Mesonotum banded (Fig. 49) or more broadly yellow before scutellum (Figs. 32, 58)	5
4 (3)	Third antennal segment darkened, brownish to black; exceptionally large species, wing length 3.3 - 4. 5 mm	**braziliensis** (Frost)
–	Third antennal segment bright yellow; smaller species, wing length 2.1 - 3.2 mm	**quadrata** (Malloch)
5 (3)	Mesonotum banded, yellow and black (Fig. 49)	**marginalis** (Malloch)
–	Mesonotum with central black band, narrowly yellow centrally adjoining scutellum	6
6 (5)	Mesonotum broadly black centrally towards scutellum (Fig. 32)	**commelinae** (Frost)
–	Mesonotum narrowly black centrally towards scutellum (Fig. 58)	**robustae** Spencer, sp.n.
7 (2)	Third antennal segment uniformly rounded	8
–	Third antennal segment distinctly angulate at upper corner	19
8 (7)	Third antennal segment darkened, black or brownish	9
–	Third antennal segment entirely yellow	16
9 (8)	All antennal segments black	10

–	Third antennal segment black or brown, second more yellow	11
10 (9)	Frons bright yellow; large species, wing length in male 3.1 mm	**montserratensis** Spencer, sp.n.
–	Frons ochrous to dark brown; smaller species, wing length from 2.1 mm in male to 2.6 mm in female	**tequendamae** (Spencer)
11 (9)	Femora and antennae entirely black	**solanita** Spencer
–	Femora paler, yellow or yellowish on underside, even when appearing black above	12
12 (11)	Femora entirely bright yellow	13
–	Femora darker	14
13 (12)	Mesonotum conspicuously bright yellow adjoining scutellum beside central black band (Fig. 25); orbital setulae present	**chiensis** Spencer, sp.n.
–	Mesonotum uniformly black to margin of scutellum; orbital setulae lacking	**Phytoliriomyza sabanae** Spencer, sp.n.
14 (12)	Mesonotum at most moderately shining black	**huidobrensis** (Blanchard)
–	Mesonotum brilliantly shining black	15
15 (14)	Femora largely black, yellow at knees; small yellow patches at hind-corners of mesonotum; male genitalia: distiphallus ending in paired tubules (Figs. 35, 36)	**herrerai** sp. n.
–	Femora yellow, variably striated with black; mesonotum entirely black to margin of scutellum; male genitalia: distiphallus large, black, appearing solid (Figs. 45, 46)	**madridensis** sp.n.
16 (8)	Mesonotum mat, greyish-black; both vertical bristles on yellow ground	**trifolii** (Burgués)
–	Mesonotum shining black; both vertical bristles on black	17
17 (16)	Mesopleura and sternopleura almost wholly black	**baccharidis** Spencer
–	Mesopleura and sternopleura with conspicuous yellow upper margin	18
18 (17)	Orbits entirely yellow	**sabaziae** Spencer
–	Orbits invariably narrowly darkened, with both vertical bristles on dark ground	**sativae** Blanchard
19 (7)	Mesonotum mat-grey; outer cross-vein lacking; costa ending between veins R4+5 and M1+2	**dianthicola** (Venturi)
–	Mesonotum shining black; outer cross-vein present; costa extending strongly to M1+2	20
20 (19)	Third antennal segment bright yellow, virtually bare (Fig. 37)	**hordei** Spencer, sp.n.
–	Third antennal segment brownish-black, frequently with tuft of hairs at upper forner (Fig. 28)	**colombiella** Spencer, sp.n.

Liriomyza baccharids Spencer

This species was described from Tequendama Falls, near Bogotá from leafmines on **Baccharis floribunda** (Spencer, 1963) and this remains the only locality where the species is known in Colombia. It has since been found in Venezuela on the same host and possibly other genera of Compositae (Spencer, 1973c)and it occurs commonly in southern California, with records from **Artemisia douglasiana**, Aster sp., **Baccharis pilularis** and **Conyza bonariensis** (Spencer, 1981).

L. baccharidis generally resembles **L. sabaziae** but is darker, with the orbits narrowly blackish, the femora with variable blackish striations and both mesopleura and sternopleura largely black. The male genitalia of the two species are of the same general form but differ in detail (cf. Spencer, 1981: figs. 285, 286 (**baccharidis**) and Figs. 64, 65 (**sabaziae**)).

Liromyza braziliensis (Frost) Fig. 24.

This is the largest **Liromyza** known in South America and one of the largest in the world, with wing length up to 4.5 mm. In Colombia it can only be compared with **L. quadrata** but this, although a large species, is significantly smaller. With its large size, darkened third antennal segment and the distinctive yellow patch before the scutellum (Fig. 24) **L. braziliensis** is readily distinguishable from **L. quadrata.** Both species have the acrostichals charasteristically inclined inwards. The male genitalia and larval feeding on potato tubers were illustrated by Spencer (1973b: figs. 164, 165).

The only known hosts of **L. braziliensis** are **Solanum andigenum** and **S. tuberosum**, and considerable damage can be caused to potatoes, the larva mining on the surface of the tuber (cf. Spencer, 1973b, 1973c). Mendes (1940) made a detailed study of the species in Brazil.

L. braziliensis is restricted to high elevations and is known from Argentina and along the Andes to Venezuela. In Colombia it is known only from Pasto (Nariño) and Funza on the Sabana. Superficially it resembles **Phytoliriomyza papae** sp.n. described below, which is known only from Bolivia where the larvae have been found in dead potato stalks but, apart from the lack of the stridulating organ, this is recognizable by the more square yellow patch on the scutellum, with the acrostichals lying parallel to the dorsocentrals, not inclined inwards (Fig. 89).

Liriomyza chiensis sp.n. Figs. 25, 27.

Head. Frons broad, almost twice width of eye; orbital bristles strong, 2 equal ors, 2 ori which are only slightly weaker; orbital setulae sparse, reclinate; jowls broad, 1/3 height of eye; third antennal segment slightly longer than broad, uniformly rounded.

Mesonotum. 3+1 strong dc, acr numerous in about 8 rows; intra-alar long but slender, similar to 3rd dc.

Wing. Length in male 2.5 mm; last section of M3+4 only slightly less than twice length of penultimate, in ratio 32:17.

Colour. Frons, orbits, jowls, face and palps bright yellow; third antennal segment faintly but distinctly brownish, first and second segments yellow; hindmargin of eye black, vte on black ground, area around base of vti pale brownish; mesonotum (Fig. 25) largely brilliantly shining black, centrally black adjoining scutellum but laterally broadly yellow, with intra-alar and 1st dc on black; scutellum bright yellow; side of thorax largely bright yellow; legs: femora bright yellow, tibiae and tarsi dark, almost black; squamae pale grey, margin and fringe black; halteres yellow.

Male genitalia. Aedeagus (figs. 26, 27) with basal sclerites unusually long, distiphallus undivided, shortly cylindrical; sperm pump, with large, triangular blade; surstyli discrete, with single stout spine on inner corner.

Holotype ♂, Colombia, Chía, N. of Bogotá, 13.iv.8, in AC.

Liriomyza colombiella sp.n. Figs. 28, 31.

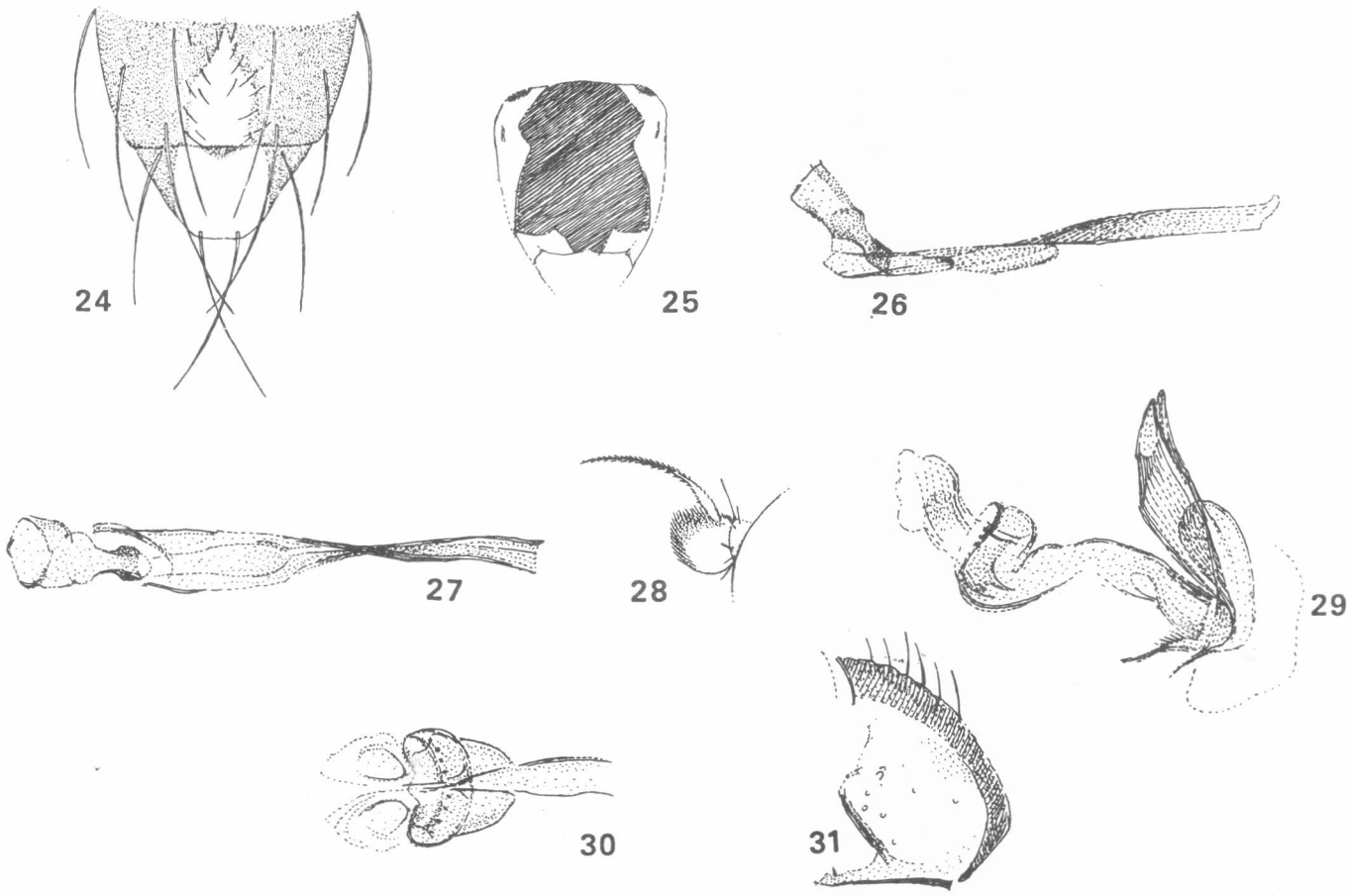
Closely resembling **L. hordei** sp.n., with the third antennal segment angulate, similar colour of head, mesonotum, pleura and legs, and similar wing venation but differing in the third antennal segment being dark brown or even black on the upper half both on the outer and inner sides and more pilose, frequently with a tuft of hairs on the upper corner (Fig. 28). Male genitalia of similar form (Fig. 29) but differing in detail, particularly with the less angular front and larger basal section of the mesophallus (Fig. 30); surstyli broader, with spine near end (Fig. 31).

Holotype ♂, Colombia, Funza, N. of Bogotá, 16.vi.82; paratypes: 1 ♀, same data; 1 ♂, 1 ♀, Madrid, N. of Bogotá, 15.vi.82; 1 ♀, 1.xi.83; 1 ♂, Tabio, N. of Bogotá, 22.x.83; 5 ♂, 3 ♀, La Calera-Guasca road, SE. of Bogotá, 1.xi.83. Holotype and paratypes in AC.

Remarks. In view of the similarity of this species to **L. hordei,** it is certain that the larvae feed on one or more local grasses. With further collecting it will be interesting to discover the range of the two species and it seems probable that **L. colombiella** may be restricted to higher elevations.

Liriomyza commelinae (Frost) Fig. 32.

A widespread Neotropical species, extending from Argentina to Venezuela and the Caribbean (Cuba, Jamaica), Costa Rica and Florida (Spencer and Stegmaier, 1973), host-specific on Commelinaceae, known mainly from **Commelina** but also **Tradescantia,** the larva forming a long, narrow mine, with the black puparium remaining in the leaf at the end of the mine. The male is unusual, in having the third antennal segment considerably e' ,ed (cf. also **L. robustae** sp.n., Fig. 57). The mesonotu.. is conspicuously marked with black (Fig. 32) but is always narrowly yellow before the scutellum. In the larva (and puparium) the posterior spiracles are abnormal for **Liromyza** in having one of the 3



Figures 24. **Liromyza braziliensis:** mesonotum.
Figures 25, 27. **Liromyza chiensis:** 25, mesonotum; 26, aedeagus, side view, 27, same, ventral view.
Figures 28, 31. **Liromyza colombiella:** 28, third antennal segment; 29, aedeagus, side view; 30, distiphallus, ventral view; 31, epandrium with surstylus.

pores greatly enlarged, hooklike (cf. **L. marginalis,** Fig. 48; also Spencer and Steyskal, in press: fig. 662); the head of the male and the genitalia were also illustrated (loc. cit.: figs. 659, 651). Da Silva and De Oliveira (1952) discussed the species in detail, with illustrations of wing, head, larval characters and leaf-mines.

It is now known that **L. commelinae** can occur together with a second species on **Commelina, L. robustae,** described below but, although obviously closely related, with similar enlargement of the third antennal segment in the male, generally similar genitalia and similar structure of the larval spiracles, the two are readily distinguishable as adults by the differing pattern of the mesonotum (Figs. 32, 58) and most obviously by the leaf-mines which are long and narrow in **L. commelinae** and more irregular, associated with the midrib, in **L. robustae** (Fig. 62).

Three females have been seen from Piendamó, Cauca, reared from **Commelina diffusa,** 15.vi.83 (R.I. Prieto); I found a leaf-mine at the same locality, 21.vi.82. These are the first records for Colombia.

Liriomyza dianthicola (Venturi) Figs. 33, 34.
There has been confusion about the correct generic position of this isolated species. It was described in **Pseudonapomyza,** based on its angulate third antennal segment (Venturi, 1949: fig. 1) and the lack of the outer cross-vein, these characters associating it with the well-known grass-feeder, **Pseudonapomyza atra** (Meigen). In correspondence with Venturi, Hering pointed out that **dianthicola** should correctly be included in **Phytagromyza** but Venturi (1951) rejected this. Nevertheless in his keys to European leaf-mines Hering (1957: 395) included **dianthicola** in **Phytagromyza.** It was later discovered that the genotype of **Phytagromyza** had been misidentified and represented a grass-feeding species and **Phytagromyza** has since been treated as a subgenus of **Cerodontha;** all other species in **Phytagromyza** were then placed in the available genus **Paraphytomyza** and **dianthicola** was accepted in this genus by Spencer (1973b: 320). Von Tschirnhaus (1981: 319) transferred **dianthicola** to **Liriomyza,** having detected the stridulating organ characteristic of **Liriomyza** in specimens he bred

from **Dianthus** in Spain. I have not been able to confirm this in the single male I have examined but I accept its inclusion in **Liriomyza,** as the genitalia (Fig. 33) associate the species more closely with this genus than with **Paraphytomyza.**

Further significant characters of **L. dianthicola** are the mat grey mesonotum, with acrostichals lacking, the costa continuing but attenuated beyond vein R4+5 and not reaching M1+2 and its small size, with wing length in the male from 1.25 mm and in the female less than 2 mm. It is a well-known pest of carnations in southern Europe, the larvae forming lower surface leaf-mines (Fig. 34) which can seriously damage young plants. Its economic importance was discussed by Spencer (1973b: 320).

A shipment of carnation cuttings from Italy to Colombia was found on inspection by ICA at Bogotá in October,

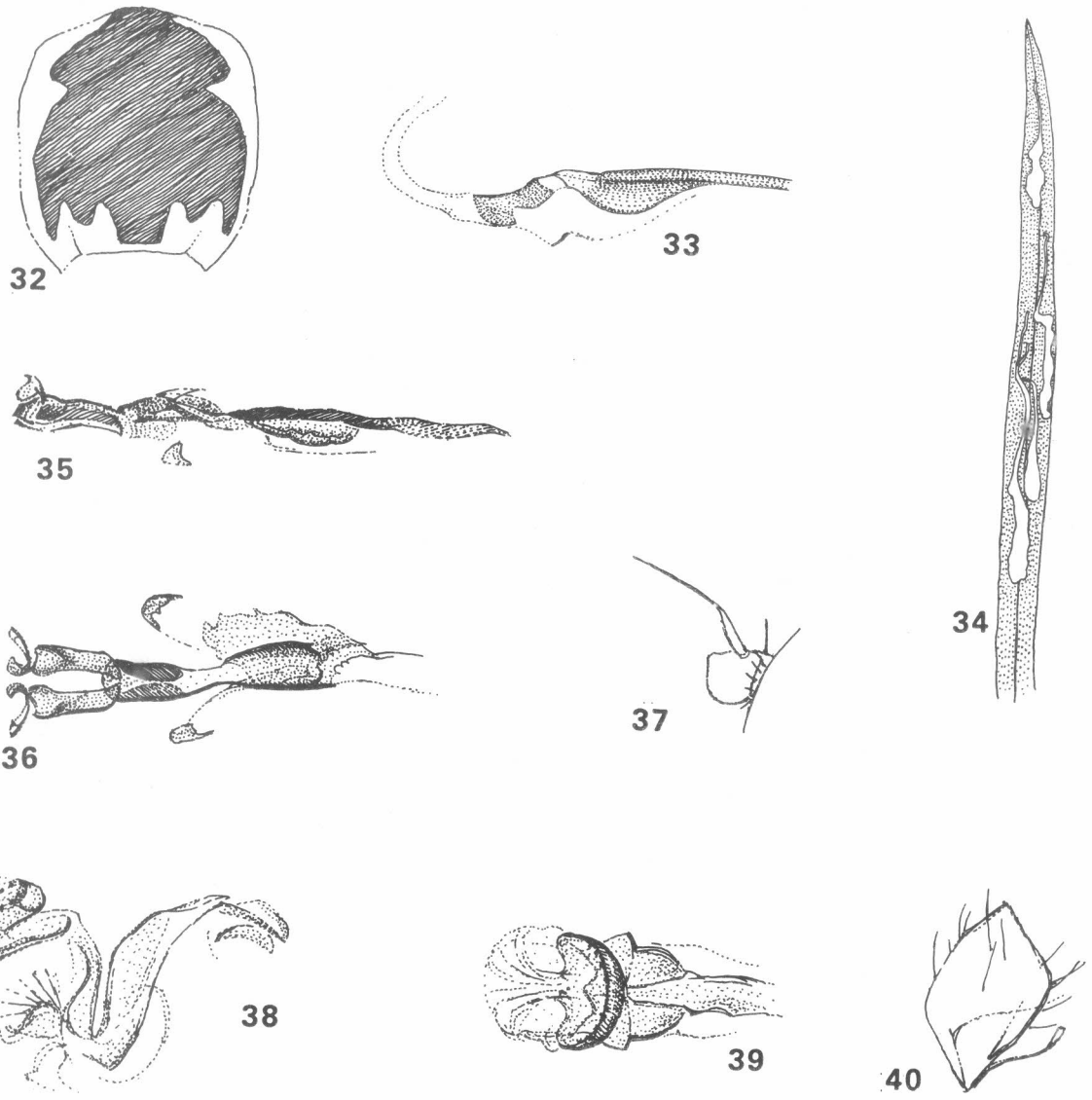


Figure 32. **Liriomyza commelinae:** mesonotum.
Figures 33, 34. **Liromyza dianthicola:** 33, aedeagus, side view; 34, leaf-mines on **Dianthus.**
Figures 35, 36. **Liromyza herrerai:** 35, aedeagus, side view; 36, same, ventral view.

Figures 37, 40. **Liromyza hordei:** 37, third antennal segment; 38, aedeagus, side view; 39, distiphallus, ventral view; 40, epandrium with surstylus.

1983 to be heavily infested with leafmines and many puparia were found among the plants. Although this shipment was destroyed, **L. dianthicola** could easily become established in Colombia and the mines can easily escape detection, as they occur almost exclusively on the lower leaf surface.

Liriomyza herrerai sp.n. Figs. 35,36.
Closely resembling **L. madridensis** so that only points of difference need be noted.

Orbital bristles stronger, even the lower ori which is similar to the upper (holotype); frons bright yellow; all antennal segments brown (not partially black); mesonotum similarly shining black but with small yellow patches at hind-corners adjoining scutellum; legs: femora largely black, narrowly yellow at knees; larger, wing length 2.3 mm in male, 2.25 mm in female, last section of M3+4 twice length of penultimate; male genitalia: aedeagus ending in slender, symmetrical tubules (Figs. 35, 36); surstyli widening internally, with a short spine at each corner; sperm pump exceptionally broad.

Holotype ♂, Colombia, Madrid, N. of Bogotá, sweeping **Galinsoga caracasana**, 26.viii.82; paratypes: 2 ♀, same data, all in AC.

Remarks. This species was caught at the same time as **L. madridensis** and was originally confused with it, until the male genitalia were examined. The aedeagus is of a very distinctive form, showing that the two species are not closely related. Both closely resemble **L. huidobrensis** but this is distinguishable by the more mat mesonotum.

I have pleasure in dedicating this species to Don Camilo Herrera V., whose hospitality I was enjoying when I collected this interesting species.

Liriomyza hordei sp.n. Figs. 37, 40.
Head. Frons broad, twice width of eye; orbital bristles strong, 2 equal ors, 2 ori which are little weaker, occasionally a third weak ori also present; orbital setulae sparse, reclinate; jowls broad, 2/5 height of eye, this large, upright; third antennal segment conspicuously angulate (Fig. 37), virtually bare.

Mesonotum. 3+1 strong dc, acr regularly in 4 rowns in front, at rear several inclined.

Wing. Length variable, 2 - 2.25 mm in both sexes; discal cell small, last section of M3+4 from slightly over 2 to 3 times length of penultimate.

Colour. Frons, jowls, face, palps and all antennal segments yellow; orbits black on upper half, both vt on black ground; mesonotum deep black, only weakly shining, scutellum bright yellow centrally, with prominent black patches at sides; rear of humerus and notopleura yellow, upper margin of mesopleura and sternopleura narrowly yellow, otherwise black; legs: coxae on fore-legs yellowish, on mid and hind-legs black, all femora largely bright yellow but narrowly black basally, tibiae and tarsi black; abdomen entirely black; squamae yellowish-grey, margin and fringe black; halteres yellow.

Male genitalia. Aedeagus (Figs. 38, 39) with distinctive curvature, distiphallus with paired membranous extensions; sperm pump with narrow stalk and only moderately widening blade, appearing long; surstyli reduced, very narrow (Fig. 40)

Host. **Hordeum vulgare** (barley) details of mine not known; puparium reddish-brown, posterior spiracles each with 3 minute pores on a conical projection, the two projections on a low common base.

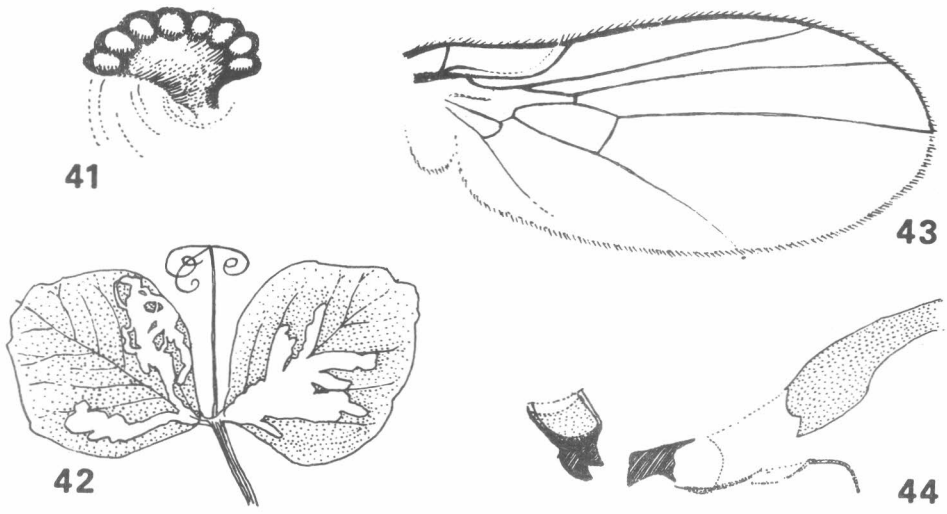
Holotype ♂, Colombia, Obonuco, SW of Pasto (Nariño), Febrero, 1983; paratypes: 3 ♂, 3 ♀, same data; 2 ♂, 2 ♀, 23.iii.71 (all H. Calvache, ex barley). Holotype and paratypes in AC, further paratypes in coll. ICA, Tibaitatá.

Remarks. This species generally resembles **L. colombiella** which is only known from the higher elevations around Bogotá. It is immediately distinguishable by the entirely yellow third antennal segment. Although the only known host is barley, the larva certainly feeds on other related grasses. The larvae occur in large numbers and some damage is probably caused to young plants but more detailed investigations are necessary before their economic importance can be established.

Liriomyza huidobrensis (Blanchard). Figs. 41, 44.
This highly polyphagous species occurs naturally in much of South America, apart from lowland tropical areas. It was described from Argentina, I found it to be common in Chile (Spencer, 1982), it is present in Brazil and Perú and present in large numbers at one locality on the edge of the Andes in Venezuela (Spencer, 1973c). In Central America there is a small population in Costa Rica (Spencer, 1983a) and it has been found at higher elevations in the Dominican Republic (Parrella, pers. comm.). In the United States it is restricted to California and for ecological reasons which are not fully understood has never become established in Florida or elsewhere in eastern states in the U.S.A. There is a large population on the Sabana around Bogotá and it is present in small numbers at la Ceja and Piendamó.

L. huidobrensis is closely related to the European species, **L. strigata**, with generally similar external morphology, similar larval characters (Fig. 41), with the posterior spiracles each having an ellipse of 6-8 pores, and the larvae form similar mines which are normally associated with the midrib, with lateral offshoots into the leaf-blade (Fig. 42). An unusual feature of the leaf-mine is that the larva may feed extensively on the lower surface of the leaf. It seems clear that the ancestral population reached North America via the Bering Straits and then dispersed southwards through California to much of South America (Spencer, 1983b).

In California **L. huidobrensis** (unidentified at the time) was



Figures 41, 44.
Liriomyza huidobrensis:
41, larval spiracles;
42, leaf-mine on **Pisum**;
43, wing; 44, aedeagus, side view.

known as a pest of peas and spinach 38 years ago (Lange and Smith, 1947). It was described as a new pest of carnations, as **L. dianthi** by Frick (1958). However, in California in recent years there have been no reports of any serious damage being caused, although it occurs commonly on what now appears to be a favourite host, **Gypsophila elegans.** The biology of **L. huidobrensis** has recently been studied by Parrella and Bethke (1983), using chrysanthemum and aster as hosts.

In Colombia **L. huidobrensis** has been found on the following hosts:

Alstroemeria, Sabana, 15.vi.82

Capsella bursa-pastoris, Madrid, 27.viii.82; Subachoque, 24.x.83

Chrysanthemum, Funza, 17.vi.82; Chía, 19.viii.82

Galinsoga caracasana ("guasca"), widespread on the Sabana, April, June, August, 1982, October, 1983; La Ceja, 16.viii.82; Piendamó, 21.vi.82; Medellín, 17.viii.82

Gazania sp., Bogotá, near airport, 17.vi.82
Gypsophila elegans, Sabana, April, June, August, 1982
Petunia sp., Mosquera, 24.vi.82
Phaseolus vulgaris humilis, Fusagasugá, 4.v.84 (ICA)

Unidentified Composite, near **Gamochaeta** sp., Zorro, 16.vi.82.

On **Alstroemeria** all mines are abnormal and larvae invariably die, indicating that this is not an acceptable host. **Chrysanthemum** is also not a preferred host, rarely being attacked, but once established, large populations can develop. The commonest natural host on the Sabana is **Galinsoga** but here the mines seen most frequently represent not **huidobrensis** but **sabaziae.** With many mines invariably present on a single leaf, the exact course of individual mines can be difficult to follow and identification from the mines may be problematic. Populations in the La Ceja area and at Piendamó are small; I have confirmed the species from a dead larva on **Galinsoga** at Piendamó and caught a single female at Rionegro, 17.viii.82.

Among species with the third antennal segment partially or entirely dark, **L. huidobrensis** closely resembles both **L. herrerai** sp.n. and **L. madridensis** sp.n. but these have the mesonotum more shining black. The wing (Fig. 43) has the discal cell relatively large, with the last section of vein M3+4 rarely more than twice the length of the penultimate section. Positive identification of these three species may only be possible from the male genitalia (Fig. 44).

Liriomyza madridensis sp.n. Figs. 45, 46.
Head. Frons twice width of eye; 2 equal ors, 2 ori, the lower weaker; orbital setulae sparse, reclinate; jowls broad, somewhat variable, at least 1/3 height of eye; third antennal segment small, round, with only sparse pubescence.

Mesonotum. 3+1 dc, acr in 4-5 rows; intra-alar strong.

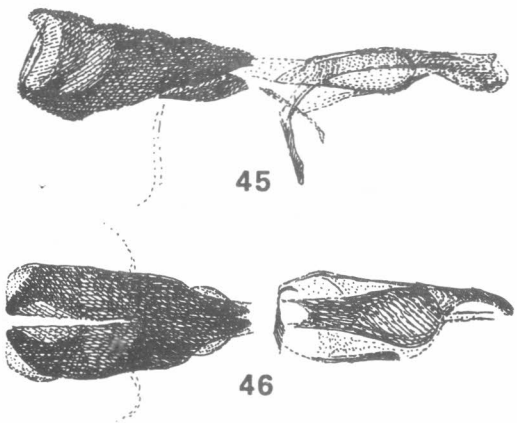
Wing. Length from 1.75 - 2 mm in male, up to 2.25 mm in female; costal sections 2, 3, 4 (holotype) in ratio 38:8:9; discal cell small, last section of M3+4 slightly more than twice length of penultimate.

Colour. Frons yellowish-ochrous, orbits slightly darkened, both vt on black ground; jowls yellow, face similar or slightly darkened; third antennal segment black or dark brown; palps yellowish-black; mesonotum uniformly brilliantly shining black to margin of scutellum this largely bright yellow, narrowly black at sides; notopeura, rear of humerus and upper third of mesopleura bright yellow, latter otherwise black, pteropleura largely black, only narrowly yellow along upper margin; legs: coxae variably blackish-yellow, femora basically yellow with variable black striations, tibiae and tarsi black; abdomen entirely shining black; squamae grey, margin and fringe black, halteres yellow.

Male genitalia. Aedeagus (Figs. 45, 46) with distiphallus large, strongly pigmented; sperm pump with large, broad blade; surstyli having paired processes, with 2 short spines at end.

Holotype ♂, Colombia, Madrid, N. of Bogotá, sweeping **Galinsoga caracasana**, 26.viii.82; paratypes: 3 ♂, same data, all in AC.

Remarks. This species might easily be confused with **L. huidobrensis** but the mesonotum is more shining and the male genitalia are entirely distinct. The type series were all caught on a large area of **Galinsoga caracasana**, together with **L. herrerai** sp.n. and it seems possible that this was the host. However, the plants were heavily mined by **L. sabaziae** and no distinctive mines were noted which might have been ascribable to it.



Figures 45, 46. **Liriomyza madridensis;** 45, aedeagus, side view; 46, same, ventral view.

Liriomyza marginalis (Malloch). Figs. 47, 49.

A widespread Neotropical species, extending from Brazil and central Chile (Spencer, 1982) to the Caribbean, Costa Rica (Spencer, 1983a) and southern states of U.S.A. The larvae feed exclusively on a number of genera of grasses, with the conspicuous anterior spiracles (Fig. 47) projecting through the leaf epidermis. The posterior spiracles (Fig. 48) have the normal 3 pores but one is greatly enlarged, hook-like, with the other two below, minute. This form associates the species with **L. commelinae** (cf. Spencer and Steyskal, in press: fig. 662) and **L. robustae** sp.n. and also with species in the subgenus **Dizygomyza** of **Cerodontha**. The head is largely yellow and the mesonotum conspicuously banded (Fig. 49) with the dark colour varying from shining black to reddish-brown. The male genitalia were illustrated by Spencer (1973c: figs. 157, 158).

Five specimens have been seen from La Ceja, 19.vi.82; Piendamó, 21.vi.82; and Rionegro, 17.viii.82, representing the first records from Colombia. Although **Zea mays** (corn) is known as a host, the species is of no economic significance.

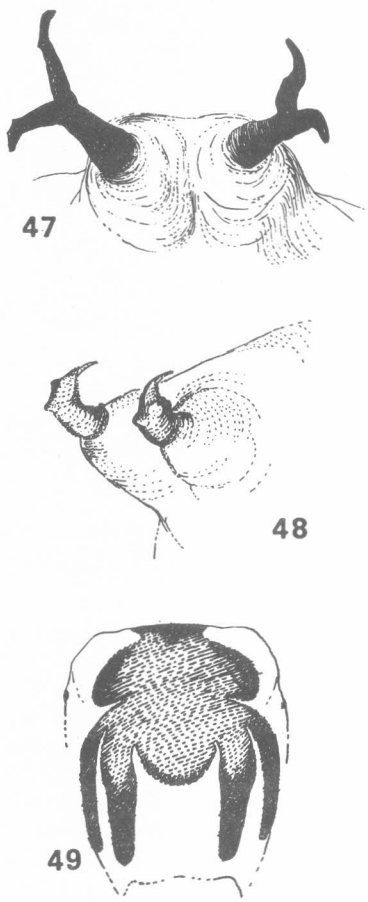
Liriomyza montserratensis sp. n. Figs. 50, 51.

Head. Frons 1.5 times width of eye; normally 2 ors, the upper weaker, occasionally lacking, 2 more slender ori; orbital setulae sparse, reclinate; jowls narrow, 1/5 vertical height of eye; third antennal segment small, round, only finely pubescent.

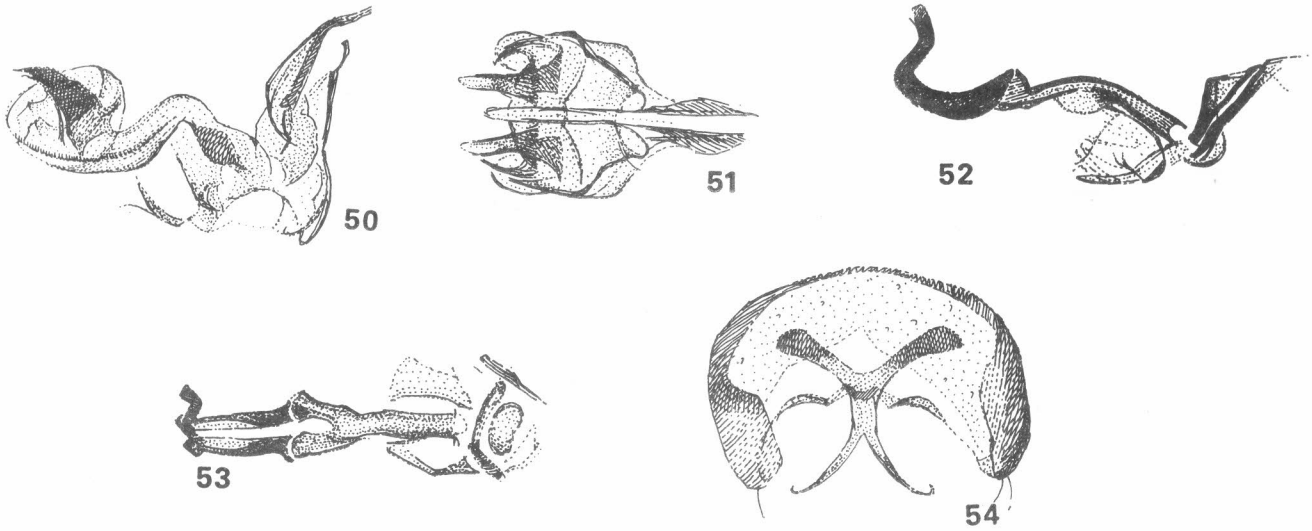
Mesonotum. 3+1 dc; acr numerous in front, in at least 6 rows, sparser at rear, there partially inclined; inner post-alar strong, 2/3 length of post-alar.

Wing. Length in male 3.1 mm; costal sections 2, 3, 4 in ratio 17:14:14; discal cell large, last section of M3+4 only slightly longer than penultimate, in ratio 30:26.

Colour. Frons bright yellow, orbits entirely deep black, both vt on black ground; jowls yellow, face, all antennal segments and palps black; mesonotum shining black, with no trace of yellow at hind-corners; scutellum bright yellow centrally, black at sides; notopleura and rear of humerus bright yellow, other pleura black; legs deep black, apart from conspicuously yellow tips of femora; abdomen black; squamae grey, margin and fringe black; halteres yellow.



Figures 47, 49. **Liriomyza marginalis:** 47, anterior spiracles of puparium; 48, posterior spiracles; 49, mesonotum.



Figures 50, 51. **Liriomyza montserratensis:** 50, aedeagus, side view; 51, distiphallus, ventral view.
Figures 52, 54. **Liriomyza nigra:** 52, aedeagus, side view; 53, same, ventral view; 54, epandrium.

Male genitalia. Aedeagus as in Figs. 50, 51, distiphallus unusually broad in ventral view; sperm pump with large dark blade; surstyli confluent with inner corner of epandrium, narrow.

Holotype ♂, Colombia, Monserrate, above Bogotá, 26.vi.82, in AC.

Remarks. This species generally resembles **L. tequendamae** but is readily differentiated by the large size, yellow frons and very large discal cell. The male genitalia indicate that the larva is a grass-feeder.

Liriomyza nigra sp. n. Figs. 52, 54.
Head. Frons 1.5 times width of eye; orbits pronounced, with 2 equal, reclinate ors, 2 inclined ori, the lower weak; orbital setulae sparse, reclinate; jowls extended at rear, there 1/3 height of eye; third antennal segment small, either round or slightly angulate.

Mesonotum. 3+1 strong dc, acr in 4 rows.

Wing. Length from 1.75 mm in male to 1.85 mm in female; costal sections 2, 3, 4 in ratio 30:10:9; discal cell small, last section of M3+4 2 2.5 times length of penultimate.

Colour. Frons varying from sooty black to brownish-ochrous, orbits more shining black; jowls blackish-ochrous, face, all antennal segments and palps black; mesonotum and scutellum shining black; humerus black, notopleura dark, faintly ochrous, pleura otherwise black; legs black, fore-knees at most narrowly and faintly yellow; wing base brigth yellow, squamae yellowish-grey, margin and fringe black; halteres yellow; abdomen black.

Male genitalia. Aedeagus (Figs. 52, 53) with distiphallus in form of paired black tubules, with distinctive curvature; surstyli fully fused with inner corner of epandrium, this with a symmetrical 2-armed black process internally (Fig. 54); sperm pump with large, pale, slightly asymmetric blade.

Holotype ♂, Colombia, near Guasca, SE of Bogotá, 1.xi.83; paratypes: 1♀, roadside near La Calera, SE of Bogotá. 1.xi.83; 2 ♀, Suba, N. of Bogotá, 25.x.83. Holotype and paratypes in AC.

Remarks. Few true **Liriomyza** species (with stridulating organ) are known with the scutellum black. Four are present in New Zealand (Spencer, 1976b) and two in California (Spencer, 1981) but these are not obviously related to **L. nigra.** The male genitalia indicate the isolated position of this species, particularly in the epandrium with the paired curving structure internally and the lack of differentiated surstyli.

Liriomyza quadrata (Malloch). Figs. 55, 56.
Host-specific on Solanaceae and common from Argentina to Venezuela, the large blotch mines of this species are conspicuous on **Solanum** spp. and potato. Other known hosts are **Nicotiana tabacum** and tomato. Large populations are present on the Sabana. On potato its relatively large size might lead **L. quadrata** to be mistaken for **L. braziliensis** but it is readily distinguishable by the entirely bright yellow antennae and the larger, more rounded yellow patch on the mesonotum (Fig. 55). In the first instar the larva forms a narrow linear mine (Fig. 56) but this is sometimes not apparent, as it may be enveloped and obscured by the later blotch.

L. quadrata has been redescribed and discussed by Spencer (1973b, 1973c).

Liriomyza robustae sp. n. Figs. 57, 62.
Head. Frons twice width of eye; 2 equal ors, 2 ori, upper little weaker than ors, lower minute; orbital setulae sparse, only 1 or 2 present in area of ori; jowls 1/4 height of eye, this upright; third antennal segment in male enlarged (Fig. 57), with a fringe of short, thick pubescence, slightly angulate at upper corner.

Mesonotum. 3+1 dc, acr in about 4 rows (all specimens seen in imperfect condition, mounted ex alcohol).

Wing. Length 2.5 mm in male, 2.6 mm in female; costal sections 2,3, 4 in ratio 35:14;10, last section of M3+4 slightly more than half length of penultimate.

Colour. Head largely yellow, third antennal segment faintly darkened, brownish; both vt on yellow ground but eye margin black beyond vte; mesonotum (Fig. 58) with dark area deep black; broadly yellow adjoining scutellum but with a narrow central black band almost reaching scutellum margin; scutellum largely bright yellow with only small lateral black patches; pleura yellow apart from sternopleura which are predominantly shining black; legs: coxae and femora bright yellow, tibiae and tarsi faintly brownish; abdomen with tergites 1-3 black, 4 and 5 black centrally, yellow at sides; squamae yellowish, margin and fringe black; halteres yellow.

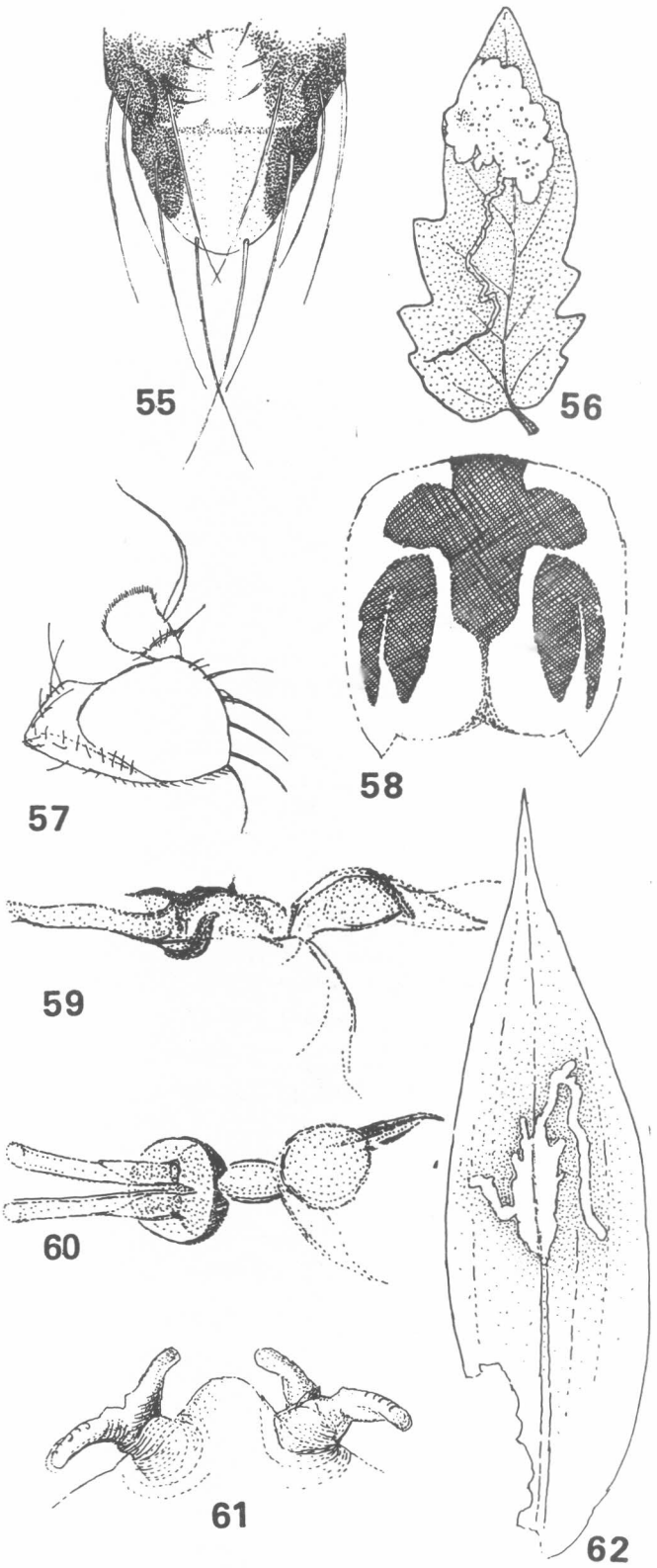
Male genitalia. Aedeagus (Figs. 59, 60) with distiphallus having elongated paired tubules; surstyli fully divided from epandrium, rather square, with normal short, stout spine on inner corner.

Host. **Commelina robusta** Kunth, larva forming a large irregular mine near the midrib, with irregular offshoots into the leaf-blade (Fig. 62); puparium yellowish, anterior spiracles 1-horned, with the upper arm slightly longer, each bearing numerous minute pores (Fig. 61); posterior spiracles on a broad projection, curving ventrally to anal segment, each with 3 pores, one long, curving, hook-like, two minute (cf. **L. marginalis**: Fig. 48; **L. commelinae**, Spencer and Steyskal, in press: fig. 662).

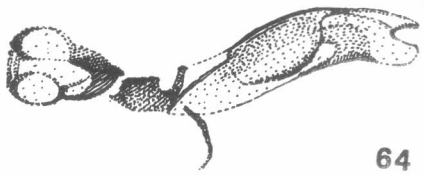
Holotype ♂; Colombia, Cauca, Piendamó, ex leaf-mine on **Commelina robusta**, 1982; paratypes, 1 ♂, 1 ♀, same data (AC); 1 ♂, 9.vi.83 (BM) (all R.I. Prieto).

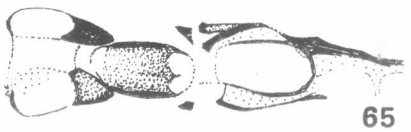
Further specimens in alcohol from the same locality in collection of Inversiones Targa Ltda. at Piendamó are treated as paratypes.

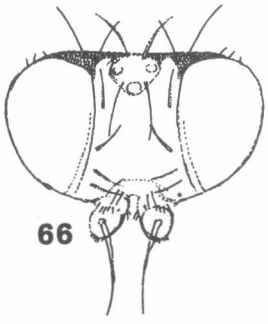
Remarks. Externally this species only differs from the more widespread and well-known **L. commelinae** in the differing pattern of the mesonotum (cf. Figs. 32 and 58). However, there are significant differences in the larvae and leafmines. In **L. robustae** the larva forms an irregular mine associated with the midrib (narrow linear mine in **L. commelinae**) the puparium is yellowish (black in **L. commelinae**) and the anterior spiracles are longer. It remains to be established whether **L. robustae** feeds exclusively on



Figures 55, 56. **Liriomyza quadrata:** 55, mesonotum; 56, leaf-mine on tomato.
Figures 57, 62. **Liriomyza robustae:** 57, third antennal segment; 58, mesonotum; 59, aedeagus, side view; 60, same, ventral view; 61, anterior spiracles of puparium; 62, leaf-mine on **Commelina robusta.**







Figures 63, 65. **Liromyza sabaziae:** 63, leaf-mine on **Gallinsoga caracasana;** 64, aedeagus, side view; 65, same, ventral view.
Figures 66, 69. **Liriomyza sativae:** 66, head; 67, posterior spiracles of puparium; 68, aedeagus, side view; 65, same, ventral view.

C. robusta which is believed to be restricted to the western Andes in Colombia.

Liriomyza sabaziae Spencer. Figs. 63, 65.
Described from Caracas, Venezuela on **Sabazia urticaefolia** (Spencer, 1963). This species has since been found commonly in California on **Baccharis, Carduus, Cirsium, Dahlia, Gnaphalium** and **Silybum** (Spencer, 1981) and around Bogotá on the Sabana it is very common on **Galinsoga caracasana.** The larvae form irregular linear mines (Fig. 63) and, with many mines frequently present in the same leaf, the exact form is often difficult to detect. Identification from the leaf-mines is further complicated by the regular occurrence of **L. huidobrensis** on **Galisoga** and the two species may even be present together in one leaf. However, the adults are readily distinguishable, with the third antennal segment, frons and femora bright yellow in **sabaziae** and these parts all variably darkened in **huidobrensis.** The larvae are also distinguishable, with the posterior spiracles each having 3 bulbs in **sabaziae** (as in **L. trifolii** and **L. sativae** (Fig. 67)) but an ellipse of 6-9 bulbs in **huidobrensis** (Fig. 41). The male genitalia are shown in Figs. 64, 65.

Although **L. sabaziae** has been recorded on 8 genera of Compositae, it has never been found on **Chrysanthemum.** This is in fact not an acceptable host for most **Liriomyza** species (in the Palaearctic Region, including Europe and Japan, only 2 of 142 species are known on **Chrysanthemum**). Although **L. sabaziae** is present with large populations on **Galinsoga** in immediate proximity to many farms on the Sabana, also at La Ceja and Piendamó, I consider it to be highly improbable that **sabaziae** represents any threat to the Colombian flower industry.

I have found **L. sabaziae** on the Sabana in June and August, 1982 and October, 1983; at La Ceja in April, 1982 and at Piendamó in October, 1983.

Liriomyza sativae Blanchard. Figs. 66, 69.
This serious pest of vegetables was described from Argentina and is widespread in South America, with records from Chile (Spencer, 1982), Venezuela (Spencer 1973c), Brazil, Perú, Costa Rica (Spencer, 1983a), throughout the Caribbean and is common in California, Florida and other Gulf states.

In Colombia the only record is a leaf-mine I found on beans at Palmira, near Cali, 21.vi.82. It is not present on the Sabana but doubtless occurs commonly at warmer, lower elevations but surprisingly is not known to have caused damage to any crops. In Venezuela in the vegetable growing areas around Maracay it is a major problem on tomatoes. In Florida and California it was the most serious leaf-mining pest on a wide range of vegetables throughout the 1960s and early 70s but recently it has assumed less significance with the increased importance of **L. trifolii.**

L. sativae is distinguishable from **L. trifolii** by the darker upper orbits, with both vertical bristles on dark ground (Fig. 66) and by the brilliantly shining black mesonotum.

The leaf-mines of the two species are similar, as are the posterior spiracles of the larva and puparium, with 3 relatively large pores (Fig. 67) but this character enables **L. sativae** to be immediately distinghished from **L. huidobrensis** with which it may occur together at some localities. The male genitalia (Figs. 68, 69) closely resemble those of **L. trifolii** but are quite distinct from **L. huidobrensis** (Fig. 44).

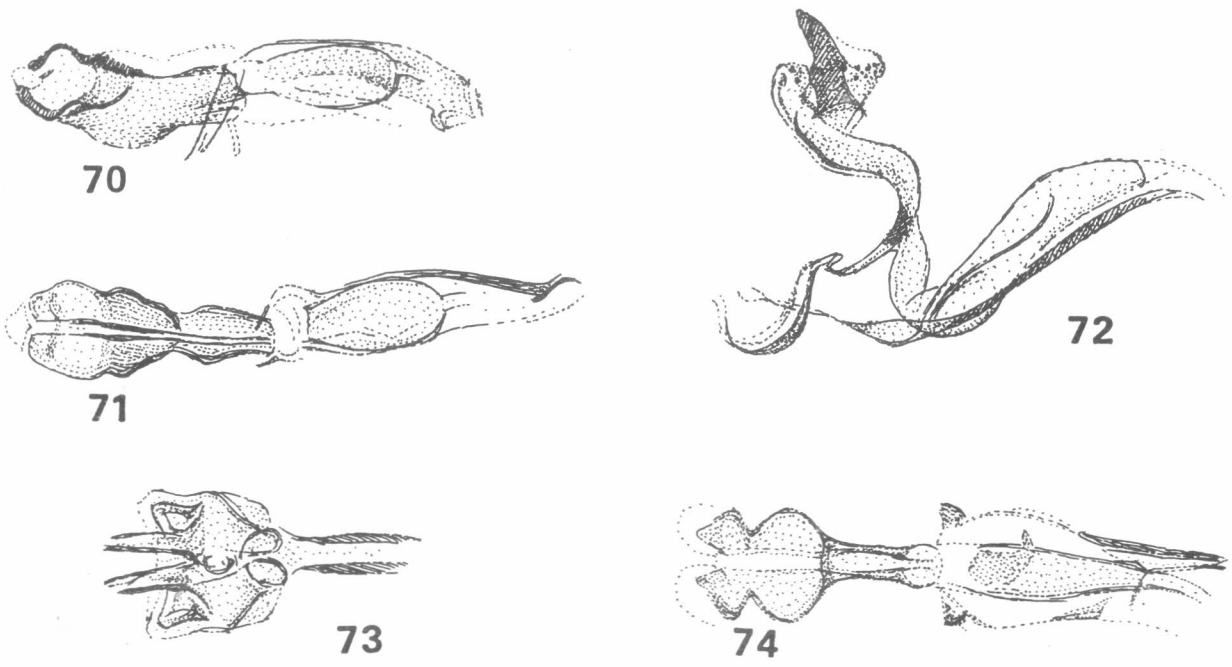
Liriomyza solanita Spencer. Figs. 70, 71.
Known only from Colombia and Venezuela. The hosts of this species are restricted to Solanaceae. The type series of 4 specimens were reared from **Solanum marginatum** and **Physalis peruviana** in the grounds of the Universidad Nacional, Bogotá, 31.xii.58 (Spencer, 1963). At the same locality I found mines on the small tree, **Brugmansia** sp., 4.xi.83. Mines were common in a garden at Mosquera on **Datura arborea**, 24.vi.82 and in the collection of ICA at Tibaitatá there are specimens reared from **Solanum quitoensis** ("lulo"). This species is thus widespread and common on the Sabana and in Venezuela it was found near Mérida, May, 1972 (Spencer, 1973c).

With the frons yellow and the third antennal segment and femora entirely black, **L. solanita** somewhat resembles the two grass-feeders **L. montserratensis** and **L. tequendamae** (cf. couplets 10-12) but the male genitalia (Figs. 70, 72) are entirely distinct. The irregular leaf-mines on **Physalis peruviana** were illustrated by Spencer (1973c: fig. 178).

It is not known whether **L. solanita** will feed on tomato but as it is clearly a high-altitude species it probably represents no threat to tomatoes which are cultivated at lower elevations.

Liriomyza tequendamae (Spencer). Figs. 72, 73.
Described from three females caught at Tequendama Falls, below Bogotá on the road to Girardot (Spencer, 1963: 373), this species was subsequently found near Mérida, Venezuela, 9.v.72 (Spencer, 1973c: 63).

The holotype is unusually dark, with the frons blackish-brown and this led to it being described in **Metopomyza** but it was transferred to **Liriomyza** when males were obtained in Venezuela. Also 2 further females obtained with the holotype have the frons paler, ochrous. I collected 16 further specimens at 3 localities on the Sabana in April and June, 1982, at Monserrate in June, 1982 at 2 localities in Bogotá in October, 1983 and at the roadside near La Calera, NE of Bogotá in November, 1983. Of these 3 were males, 13 females. From this long series it can now be seen that this species closely resembles **M. montserratensis** but the frons is darker, normally dull ochrous with black orbits and it is smaller, with wing length in the male 2.1 - 2.5 mm, 2.5-2.6 mm in the female. The discal cell is variable, with the last section of M3 + 4 varying from 1.5 times to little longer than the penultimate section.



Figures 70, 71. **Liriomyza solanita:** 70, aedeagus, side view; 71, same, ventral view.
Figures 72, 73. **Liriomyza tequendamae:** 72, aedeagus, side view; 73, distiphallus ventral view.
Figure 74. **Liriomyza trifolii:** 74, aedeagus, ventral view.

The male genitalia (Figs. 72, 73) are of the same general form as in **montserratensis** but distinctively different in detail (cf. Figs. 50, 51). The larva is certainly a grass-feeder.

L. irazui Spencer (1983a: 56) is another species in this complex, described from 3,120 m on Volcan Irazú, NE of San José, Costa. Rica. The male genitalia (Spencer, 1983 a: fig. 37) cloarly indicate that **L. irazui** is less closely-related to **L. montserratensis** and **L. tequendamae** than they are to each other.

Liriomyza trifolii Brugess). Fig. 74.
Since its explosive spread to many parts of the world, including Colombia, with chrysanthemum cuttings from the United States in 1976 and subsequent years, **L. trifolii** is now well-known in the horticultural industry. It has become the most serious of leaf-mining pests, in part due to the wide range of hosts it attacks, with 400 species now recorded in 17 different families, but primarily due to the rapidity with which it has developed resistance to successive insecticides. It can though be effectively controlled, as has been shown in Europe but the cost is high.

L. trifolii was described from **Trifolium repens** in the Washington area, U.S.A. in 1880. It next came to attention attacking onions at Ames, Iowa in 1933 and I have seen specimens from Long Island, N.Y., November, 1935. It was found attacking beans at Bridgton, N.J. in 1942. In the 1960s, with the intensive collecting by Stegmaier, many records were obtained in Florida (Spencer and Stegmaier, 1973). Surprisingly, **L. trifolii** was absent from California until 1977, when it reached the west from Florida and has now become established as a major pest.

In South and Central America **L. trifolii** is known from Perú, Venezuela and Costa Rica, and is present in the Bahamas and probably now elsewhere in the Caribbean. In Colombia it is widespread on farms on the Sabana and at La Ceja and Piendamó. From the limited collecting I have done, it appears not to have dispersed widely from its cultivated horticultural hosts. This is in contrast to Kenya where it has spread to many parts of the country from the propagating nursery at Masongaleni, east of Nairobi, where it was first introduced, largely by commerce but probably to some extent also on local hosts which it has colonized. I have found leaf-mines on the following hosts in the immediate vicinity of farms where it is (or was) established: **Conyza** sp., Medellín, 18.vi.82; **Petunia** sp., Mosquera, 24.vi.82; **Cucurbita maxima,** Piendamó, 21.vi.82; **Plantago australis,** Rionegro, 17.viii.82; **Galinsoga caracasana,** Rionegro, 15.iv.82; **Senecio vulgaris,** Chía, 14.iv.82; **Gazania** sp., Bogotá, 22.vi.82; **Sonchus oleraceus,** Rionegro, 15.iv.82; **Gerbera** sp., La Ceja, 15.iv.82; **Vigna luteola,** La Ceja, 16.viii.82; **Hydrocotyle umbellatum,** La Ceja, 17.viii.82.

Among species with the third antennal segment round and yellow, **L. trifolii** is immediately recognisable by the mat grey mesonotum and the yellow upper orbits with both vertical bristles on yellow ground (contrast **L. sativae**, Fig. 66). The conspicuous colour difference between **L. trifolli** and **L. sativae/huidobrensis** is very apparent in the colour photographs included in Parella et al. (1981). In the larva (and puparium) the posterior spiracles have only 3 bulbs (cf. **L. sativae,** Fig. 67), in contrast to **L. huidobrensis,** in which there is an ellipse of 6-8 bulbs (Fig. 41). The male genitalia of **L. trifolii** (Fig. 74) generally resemble those of **L. sativae** but are strikingly different from those of **L. huidobrensis** (Fig. 44). All aspects of its biology have been studied in considerable detail by Parrella and co-workers at the Riverside Campus, University of California, and an important review of its pest status was given by Parrella and Keil (1984).

GENUS Calycomyza HENDEL

The majority of species in this genus are readily recognisable by the following combination of characters: third antennal segment black, frons normally bright yellow (rarely darker), notopleura normally yellow, pleura otherwise largely black, mesonotum and scutellum always black. In the male genitalia the aedeagus is of diverse form but there is always a distinctive patch of bristles at the hind-corner of the epandrium.

Over 50 species are known, mainly in the Nearctic and Neotropical Regions. In South America 39 species have been described (Spencer, 1963; 1973c; 1982; 1983a; Spencer and Stegmaier, 1973; Valladares, 1981). Only a single species, **C. artemisiae,** has hitherto been known in Colombia (now identified as **C. steviae**); two further species are recorded below.

Identification of adults on external characters is frequently difficult or even impossible. However, the male genitalia are well differentiated and illustrations are available of all known species. The larvae of most species form conspicuous blotch mines and are frequently host-specific. Species can thus in many cases be readily identified from their leaf-mines if the host can be reliably named. It is certain that many additional species await discovery in Colombia when collecting can be undertaken in further localities at lower elevations. A key to the 20 species known in Venezuela was given by Spencer (1973c).

Key to Colombian **Calycomyza** species

1	Squamae and fringe white	**lantanae** Frick
–	Squamae grey, fringe black	2
2 (1)	Relatively small species, wing length 1.8 - 2.2 mm; male genitalia: aedeagus	

as in Fig. 75; hosts: **Ipomoea** spp. (Convolvulaceae) **ipomaeae** (Frost)

Larger species, wing length 2.5 - 2.75 mm; male genitalia: aedeagus as in Figs. 77, 78; hosts: Compositae **steviae** Spencer

Calycomyza ipomaeae (Frost). Figs. 75, 76.
This species was described from Puerto Rico and is widespread throughout the Caribbean in association with its hosts, **Ipomoea** spp. It is common in Florida and has been recorded at Santos, Brazil (Spencer, 1963). The firsr record can now be given for Colombia, where a leaf-mine was found on **Ipomoea** sp. at Piendamó, 18.viii.82.

C. ipomaeae belongs to the difficult group with the squamal fringe dark and adults can only be satisfactorily identified by the male genitalia. The aedeagus in ventral view is hown in Fig. 75 and the irregular leaf-mine in Fig. 76.

Calycomyza Lantanae (Frick)

Frick described this species from Texas, U.S.A. It has since been found commonly in Florida, and has been recorded in the Bahamas, Jamaica, Mexico, Trinidad and Venezuela. A single female was caught beside the Rio Cali, Cali, 17.viii.82 and leaf-mines were found on **Lantana** at the same locality, 30.xi.83.

C. lantanae belongs to the small group of species with the squamae and fringe white. The round third antennal segment and shining black mesonotum are also important characters. Illustrations of the male genitalia are available in Spencer (1973c) and Spencer and Stegmaier (1973).

The species is host-specific on **Lantana**, the larvae forming conspicuous roundhish blotch mines. It was introduced to northern Australia, where **Lantana** has become a noxious weed, for biological control in 1978 and is now established. Its effectiveness as a biocontrol agent, however, is likely to be limited.

Calycomyza steviae Spencer. Figs. 77, 79.
A single male of this species was reared from **Stevia elatior**, near Mérida, Venezuela, 31.v.72 ex leaf-mine coll. 6.v.72 (Spencer, 1973c). The genitalia of the holotype are shown in Figs. 77, 78.

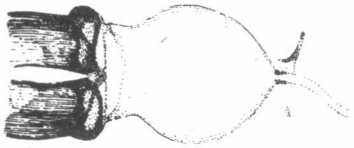
A male and 3 females were reared from three different composites at the Tequendama Falls and beside the road from Bogotá to Girardot, coll. 10.xii.58. The host of one female was **Gnaphalium** sp. (mine illustrated by Spencer, 1963: fig. 54c). and that of the male can now be identified as **Stevia elatior**. The genitalia of this male were illustrated by Spencer (1963: figs. 54a, b.). This specimen was originally mistakenly identified as the European species **C. artemisiae** (Kalt.) which forms similar blotch mines on **Artemisia** and **Eupatorium**. The genitalia of **C. artemisiae** are of the same general form as **C. steviae** (cf. Spencer, 1976a: figus. 549, 550) and at the time it was not known that there is a complex of species with different hosts, and genitalia differing only slightly but constantly, extending from California to Argentina. I now consider that the species in California also identified as **C. artemisiae** represents a further species in this complex (Spencer, 1981: figs. 417, 418). Yet another species has recently been reared from **Bidens pilosa** at Córdoba, Argentina by G. Valladares who will be describing it in due course.

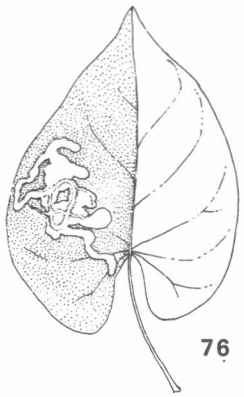
C. steviae closely resembles **C. ipomaeae** but is generally larger, with wing length varying from 2.5-2.75 mm. Positive identification will only be possible from the male genitalia. The leaf-mine on **Stevia** at Tequendama Falls is shown in Fig. 79.

GENUS Phytoliriomyza HENDEL

This worldwide genus is well represented in South America, where 20 species have been recorded from Costa Rica, Venezuela, Brazil and Chile (Spencer, 1973c; 1982; 1983a). It has not previously been known in Colombia and four species have now been collected in the vicinity of Bogotá and one at Medellín, of which four are described below. Three of these species belong to the group with the orbital setulae proclinate for which the genus was originally erected but as our knowledge of the genus has increased with studies of the fauna on all continents, the concept of the genus has expanded and two of the species now described have the orbital setulae either reclinate or entirely lacking. The conspicuous spines on either the surstyli or the inner margin of the epandrium or both (Figs. 87, 91) are frequently characteristic of the genus. However, in a few species even the male genitalia give no certain indication of the genus as between **Phytoliriomyza** and **Liriomyza**. In such cases the lack of the stridulating organ present in all **Liriomyza** species is the critical deciding character.

A new species from Bolivia feeding in potato stalks is also described below. It seems unlikely but is possible that it may also be present in Colombia and it is appropriate to describe it here.





Figures 75, 76. **Calycomyza ipomaeae:** 75, aedeagus, ventral view; 76, leaf-mine on **Impomoea** sp.
Figures 77, 79. **Calycomyza steviae:** 77, aedeagus, side view; 78, same, ventral view; 79, leaf-mine on **Stevia elatior.**

Key to Colombian **Phytoliriomyza** species

1	Orbital setulae proclinate	2
–	Orbital setulae upright, reclinate or lacking	4
2 (1)	Third antennal segment black	3
–	Third antennal segment yellow	**imperfecta** (Malloch)
3 (2)	Third antennal segment with exceptionally long pubescence (Fig. 80); last section of vein M3+4 little longer than penultimate; mesonotum uniformly grey	**colombiana** sp.n.
–	Third antennal segment with short pubescence; last section of M3+4 twice length of penultimate; mesonotum with brownish central band	**similis** sp.n.
4 (1)	Mesonotum yellow centrally before scutellum (Fig. 89)	**papae** sp.n.
–	Mesonotum uniformly dark	5
5 (4)	Scutellum bright yellow	**sabanae** sp.n.
–	Scutellum deep black	**medellinensis** sp.n.

Phytoliriomyza colombiana sp.n. Figs. 80, 83.
Head. Frons exceptionally broad, almost 3 times width of eye; 2 reclinate ors, the upper stronger, 1 inclined ori, the two ors further removed from eye margin than the ori; orbital setulae sparse, proclinate; eye large, upright, jowls 1/3 its vertical height, largely covered with thick, short pilosity; third antennal segment small, round, with conspicuous fringe of hairs which are longer than basal width of arista (Fig. 80).

Mesonotum. 3+1 strong dc, with a short additional presutural; acr sparse, in at most 2 rows.

Wing. Length 2.1 mm in male, 2.2 mm in female, discal cell large, last section of vein M3+4 little longer than penultimate in ratio 22:20 (♂), 23:21 (♀).

Abdomen. In female, ovipositor sheath unusually long, equal in length to tergites 4 and 5.

Colour. Frons yellowish-brown (♂) or more greyish at rear (♀), orbits slightly paler in front, more greyish at rear; jowls and face bright yellow, palps black; third antennal segment black, first and second yellowish; mesonotum and scutellum uniformly mat grey, with slight brownish tinge; pleura largely bright yellow, only sternopleura black on lower three-quarters; legs: femora greyish, with yellow undertone (♂) or more distinctly yellow (♀), tibiae and tarsi greyish; halteres with stalk yellowish basally, above and knob dark grey (♂) or paler, yellowish-grey (♀); ovipositor sheath shining black.

Male genitalia. Aedeagus (Fig. 81) ending in slender paired tubules, basiphallus strongly sclerotized distally, ventral sclerite short; epandrium with strongly chitinized comb of about 7 teeth along inner margin, surstyli with 5 strong teeth (Fig. 82); sperm pump small, asymmetrical (Fig. 83).

Holotype ♂, Colombia, Monserrate, above Bogotá, 26.vi.82; paratype ♀, same data, both in AC.

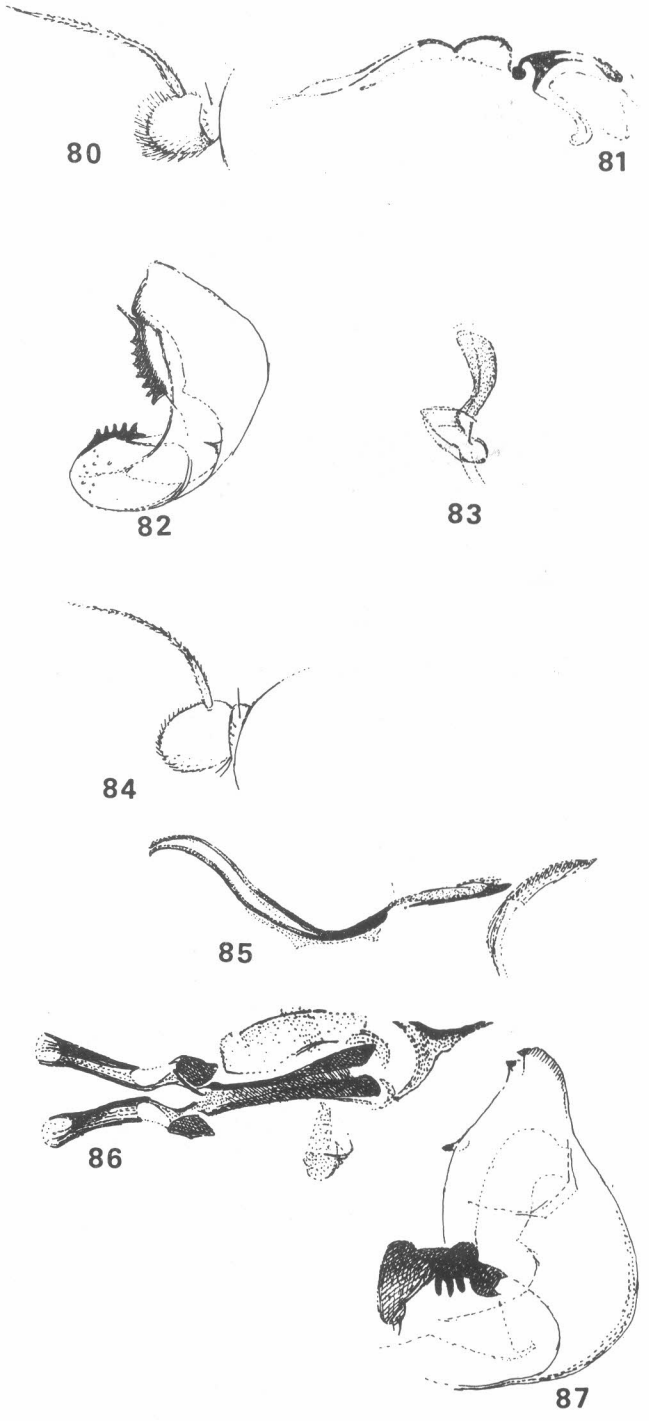
Remarks. The most distinctive character of this species is the long pilosity of the third antennal segment which immediately distinguishes it from **P. similis** which it generally resembles. Other differences are indicated in the key above.

The similarity in the male genitalia confirms the close relationship of the two species.

Two other species are known in Central America and the Caribbean with long pubescence on the third antennal segment - **P. pilosella** Spencer (in Spencer and Stegmaier, 1973, Costa Rica, Puerto Rico, Florida) and **P. jurgensi** Spencer (1983a, Costa Rica) but the male genitalia of these two species are entirely distinct.

Phytoliriomyza imperfecta (Malloch) Figs. 84, 84.
This small species is distinguishable by the proclinate orbital setulae, rather large, yellowish third antennal segment (Fig. 84), mat grey mesonotum with sparse acrostichals, the scutellum largely grey but faintly yellowish centrally and the darkened halteres; wing length ranges from 1.8 mm in the male to 2.5 mm in the female, with the discal cell large and the last section of vein M3–4 normally about 1.5 times the length of the penultimate section. In the male genitalia the aedeagus ends in strongly sclerotized, slightly sinuous paired tubules (Fig. 85) and the surstyli have a comb of 6 strong bristles (cf. Spencer and Stegmaier, 1973: figs. 292-294; Spencer, 1981: figs. 461-464).

P. imperfecta was described from Chile in 1934 and further specimens were recorded by Spencer (1982, Chile), it is



Figures 80, 83.
Phytoliriomyza colombiana: 80, third antennal segment; 81, aedeagus; 82, epandrium with surstylus; 83, sperm pump.
Figures 84, 85. **Phytoliriomyza imperfecta:** 84, third antennal segment; 85, aedeagus.
Phytoliriomyza medellinensis: 86, aedeagus, ventral view; 87, epandrium.

present in Florida (Spencer and Stegmaier, 1973), is common in southern California (Spencer, 1981) and I collected two specimens in Costa Rica (Spencer, 1983a). A single female has now been seen from Madrid, NW. of Bogotá on the Sabana, 21.vii.82.

Phytoliriomyza medellinensis sp.n. Figs. 86, 87.
Head. Frons 1.5 times width of eye; 2 equal, reclinate ors, 1 similar inclined ori; orbital setulae lacking; jowls 1/4 height of eye, this upright, sparsely pilose; third antennal segment longer than broad, with short pubescence, arista with similar pubescence.

Mesonotum. 3+1 strong dc, acr irregularly in 4 rows.

Wing. Length in male 1.85 mm; costal sections 2, 3, 4 in ratio 32:11:8; discal cell large, last section of M3+4 only slightly longer than penultimate, in ratio 20:17.

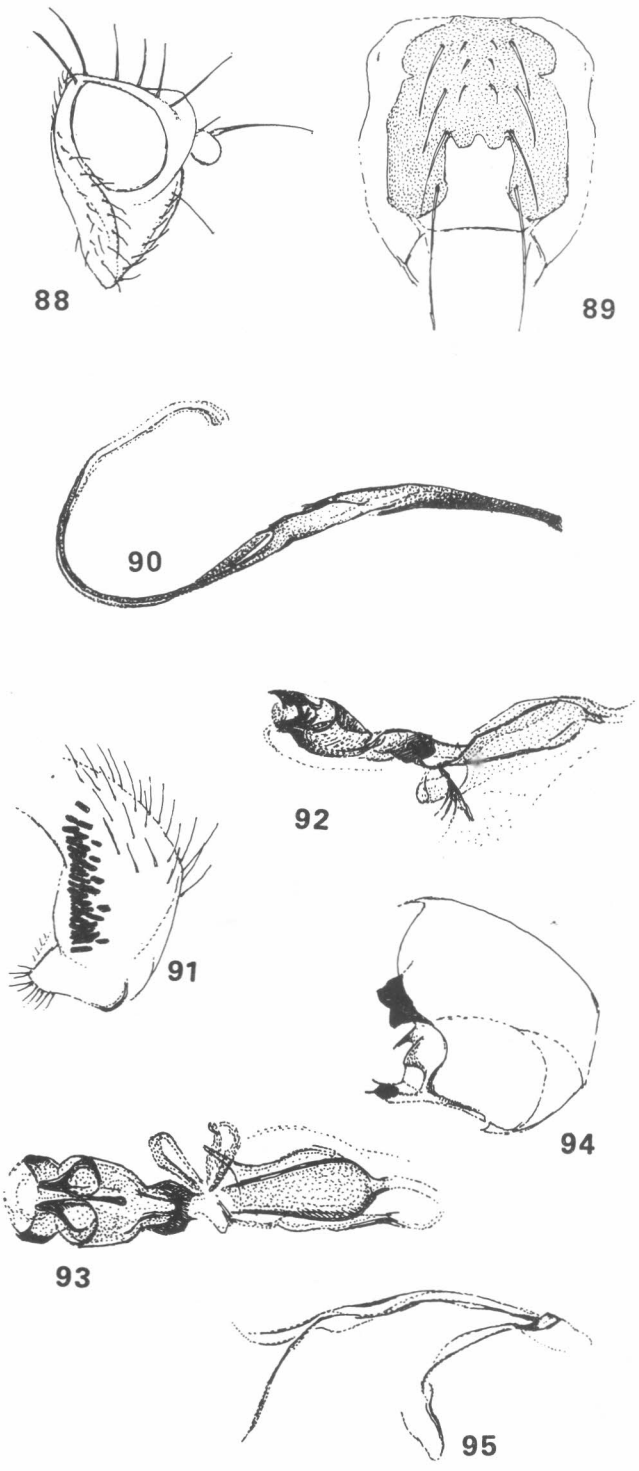
Colour. Frons largely bright yellow, becoming slightly greyish above between lower ors and ocellar tubercle; jowls and face yellow, palps black; mesonotum and scutellum uniformly deep black, predominantly mat but weakly shining seen from rear; pleura largely black, only mesopleura yellow in upper third; legs entirely black; squamae grey, margin black; halteres deep black.

Male genitalia. Aedeagus (Fig. 86) with distiphallus divided into strong paired tubules, characteristic of the **Lemurimyza** group (cf. Spencer and Stegmaier, 1973: fig. 429); epandrium (Fig. 87) with strongly sclerotized internal process, with 3 strong teeth but solid on inner side; surstyli elongate, largely fused with epandrium bearing 3 short, stout rudimentary spines; sperm pump with pale, slender blade.

Holotype ♂, Colombia, Medellín, roadside above Hotel Intercontinental, 18.iv.82. in AC.

Remarks. Among Neotropical species, **P. medellinensis** most closely resembles **P. perturbata** Spencer, 1973c, known only from 3 females from Mérida, Venezuela. However, this is larger, with wing length of 2.4 mm, orbital setulae are present and the jowls are broader, 1/3 the eye height. It therefore seems justified to treat the specimen from Medellín as distinct.

Phytoliriomyza papae sp.n. Figs. 88, 91.
Head (Fig. 88). Frons twice width of eye, strongly projecting above eye in profile; normally 2 ors and 2 ori but sometimes irregular, with 4 on one side, 5 on the other; orbital setulae lacking; ocellar bristles exceptionally long, extending to front margin of frons; jowls deeply extended at rear, varying from slightly more than 1/2 to 3/4 height of eye, this small, slanting, bare; third antennal segment slightly longer than broad, virtually bare, arista with only short pubescence; broad epistoma present, equal to length of third antennal segment.



Figures 88, 91. **Phytoliriomyza papae:** 88, head; 89, mesonotum; 90, aedeagus; 91, epandrium with surstylus.

Figures 92, 94. **Phytoliriomyza sabanae:** 92, aedeagus, side view; 93, same, ventral view; 94, epandrium with surstylus.

Figure 95. **Phytoliriomyza similis:** aedeagus.

Mesonotum. 3+1 strong dc, 4th exceptionally long, extending to apex of scutellum; acr variable, from 2 to 3 irregular rows, normally ending at level of 3rd dc, parallel to the dc (not inclined inwards, contrast **Liriomyza braziliensis,** Fig. 24).

Wing. Length from 2.6 - 2.9 mm in male, 3.25 - 3.8 mm in female; costa extending strongly to vein M1–2, discal cell large, last section of M3+4 at most 1.5 times length of penultimate.

Colour. Somewhat variable; frons bright yellow or more orange, third antennal segment yellow or rarely darker, blackish-brown, arista varying from yellow to more blackish; jowls, face and palps always yellow; mesonotum (Fig. 89) mat grey but with large yellow patch before scutellum, the dark area only occasionally broken and faintly banded with yellow (even in otherwise darker specimens); scutellum broadly yellow centrally, narrowly black at sides; mesopleura either entirely bright yellow or with distinct grey or blackish bands along lower - and hind-margins; intermediate forms occur with these dark bands only faintly indicated; sternopleura always dark on lower-three-quarters; legs entirely yellow or femora with slightly darker striations; abdomen either largely blackish-grey (even in paler specimens) or with tergites broadly yellow-bordered (even in darker specimens); halteres yellow, squamae yellow with margin and fringe black; ovipositor sheath in female with margin and fringe black; ovipositor sheath in female varying from entirely shining black to grey-dusted basally, shining only at rear.

Male genitalia. Aedeagus (Fig. 90) dividing at midpoint into paired tubules, which are highly flexible and may form a loop as illustrated or be entirely straight (in the copulation position) or form a corkscrew-like coil; epandrium (Fig. 91) with a band of strong bristles along inner margin, with surstyli largely fused with the inner corner bearing some 6-10 strong hairs. .

Puparium. Pale brown, posterior spiracles each with 3 pores (generally similar to **Liriomyza sativae,** Fig. 67).

Holotype ♂ Bolivia, Torralapa, 15.xii.68, c.3,300 mm., 150 km. E. of Cochabamba, 17°26'S, 65°43'W, ex "potato haulms" (–stalks); paratypes: 20 ♂, 22 ♀, same data (3 ♂, 1 ♀ lacking heads) (all F.A. Squire). Holotype and paratypes in U.S. National Museum, 11 paratypes in AC.

Remarks. It was originally considered that these specimens represented two species and they were divided into the palest form (14) and the darker form (29). However, I have found that there is no clear-cut division between the two, with the mesopleura sometimes being only slightly darkened and even in the palest specimens the third antennal segment may be slightly brownish. The male genitalia in the palest and darkest specimens are identical. All specimens have in common the exceptionally long ocellar and dorsocentral bristles, the deep jowls, broad epistoma, sparse acrostichals and the distinctive colour of the mesonotum. It is clearly far more probable that this represents a single variable species than that two species, which are not clearly defined, should be feeding on the same host, in the same part of the plant, at the same locality, at the same time. Also comparable or even greater colour variation is well-known in other species in Europe, such as **Cerodontha denticornis** and **Phytomyza ranunculi.**

It is not known whether more than one larva feeds in a single potato stalk but, if a number occur together, the plants could be appreciably weakened and the species would be considered to be of some economic importance. While **P. papae** superficially resembles **Liromyza braziliensis,** which feeds in the lower stems and tubers of potatoes at high altitudes in the Andes, both are exceptionally large but are readily distinguishable by the differing pattern of the mesonotum and arrangement of the acrostichals (Figs. 24, 89).

The name papae is derived from papa, Spanish for potato, treated as Latin, in the genitive case. I would like to thank Mr. G. Steyskal for allowing me to describe this interesting species.

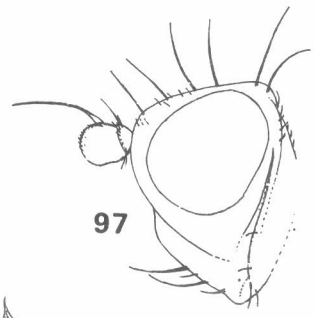
Phytoliriomyza sabanae sp.n. Figs. 92, 94.
Head. Frons 1.5 times width of eye, not projecting above eye in profile; 2 strong, equal reclinate ors, 1 slightly weaker inclined ori; orbital setulae sparse, reclinate; jowls extended at rear, there 1/3 height of eye, this upright, with very sparse pilosity; third antennal segment small, round, with only fine pubescence; arista long, only slightly shorter than vertical height of eye, with short pubescence.

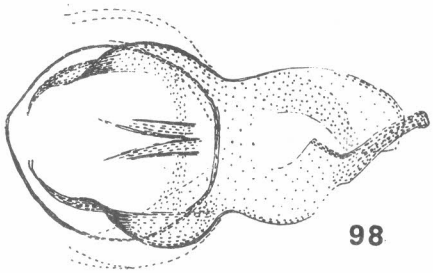
Mesonotum. 3+1 strong dc, acr in 4 rows.

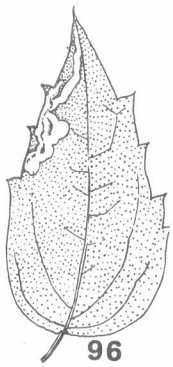
Wing. Length in male 2.3 mm; costal sections 2, 3, 4 in ratio 43:12:10, discal cell small, last section of M3+4 more than twice length of penultimate, in ratio 32:14.

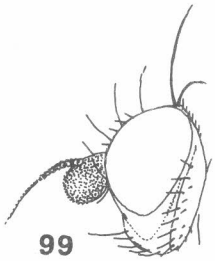
Colour. Frons bright yellow, orbits dull blackish to level or ori; jowls, face and palps yellow; first and second antennal segments yellow, third yellow on lower half, brown above, darkest towards upper corner; mesonotum shining, deep black, with only small yellow patches at hind-corners; scutellum bright yellow; apart from small lateral black patches; notopleura yellow, mesopleura largely black, yellow on upper quarter, sternopleura entirely black; legs: coxae largely black, more yellowish apically, femora bright yellow, tibiae and tarsi brownish black; squamae yellowish, margin and fringe dark; halteres and wing bare, bright yellow.

Male genitalia. Aedeagus as in Figs. 92, 93; epandrium (Fig. 94) with area of strong sclerotization on inner margin and









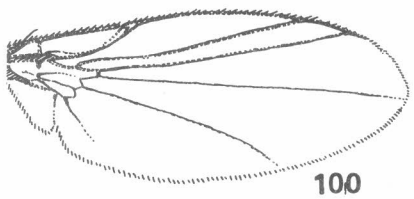


Figure 96. **Phytomyza loewii:** leaf-mine on **Clematis.**
Figures 97, 98. **Phytomyza rufipes:** 97, head; 98, aedeagus, ventral view.
Figures 99, 100. **Chromatomyia syngenesiae:** 99, head; 100, wing.

one strong spine towards surstylus which is partially fused with inner corner of epandrium and is largely sclerotized apically, with 2 weak hairs; sperm pump with large, dark blade.

Holotype ♂, Colombia, Mosquera, NW of Bogotá on Sabana, 16.vi.82, in AC.

Remarks. In its general colour, particularly with the bright yellow scutellum, this species resembles a **Liriomyza** but the stridulating organ is lacking and the form of the epandrium and surstyli confirms its position in **Phytoliriomyza.** The

darkened third antennal segment, although not conclusive in itself, is frequently an indication that a species belongs in **Phytoliriomyza.**

Phytoliriomyza similis sp.n. Fig. 95.
Closely resembling **P. colombiana,** particularly in the broad frons, pilose eyes, proclinate orbital setulae and general colour, but with following essential differences: third antennal segment with only short, normal pubescence; mesonotum brownish-grey centrally between lines of dc, distinctly silvery-grey at sides; smaller, wing length in male 1.75 mm, in female 2.1 mm; discal cell much smaller, last section of M3+4 thus relatively longer, in ratio 24:14 (♂), 30:15 (♀); male genitalia; aedeagus of same general form but with longer distal tubules, longer ventral sclerite and less sclerotized basiphallus (Fig. 95); epandrium and surstyli similar.

Holotype ♂, Colombia, Mosquera (Sabana), NW of Bogotá, 27.x.83; paratype ♀, Bogotá, near Restaurant "El Engaño" on road to La Calera, 16.vi.82, both in AC.

Remarks. The close relationship of this species with **P. colombiana** is apparent from the similarity of their male genitalia but the external differences between the two species are substantial.

GENUS Phytomyza FALLEN

This is the largest world genus, with over 450 described species, occurring predominantly in the Nearctic and Palaearctic Regions. In the tropics a few species are found at high elevations and there is some radiation in southern continents but the number of species remains small - Chile, 5; South Africa, 11; Australia, 8; New Zealand, 5.

No species have hitherto been known in Colombia but two are now recorded below, one, **P. rufipes,** an introduced pest of brassicas and the second, **P. loewii,** which is widespread in North America and the Caribbean area.

As adults in the genera **Phytomyza** and **Chromatomyia** cannot be distinguished on external characters a combined key to these two genera is provided below.

Key to genera **Phytomyza** Fallén and **Chromatomyia** Hardy

1	Entirely black species	**Phytomyza loewii** Hendel
–	Frons yellow	2
2	Third antennal segment black; femora black with yellow knees	**Chromatomyia syngenesiae** Hardy
–	Third antennal segment yellowish-brown; femora largely yellow	**Phytomyza rufipes** Meigen

Phytomyza loewii Hendel. Fig. 96.
This species is host-specifi on **Clematis** and an empty leaf-mine (Fig. 96) was found at the roadside between Bogotá and Girardot, 10.xii.58. The species could not originally be identified but **P. loewii** is now well-known and widespread from Canada: Quebec; U.S.A.: DC., California, Cuba and Costa Rica (Spencer, 1983a). The male genitalia were illustrated by Spencer and Stegmaier (1973: fig. 490).

Phytomyza rufipes Meigen. Figs. 97, 98.
This species is host-specific on Cruciferae and is well-known in Europe as a pest on cabbages and other brassicas.

The broad frons, up to 3 times the eye width and the deeply extended jowls (Fig. 97) are distinctive. Wing length is from 2.5 mm in the male to 3.5 mm in the female. The male genitalia are shown in Fig. 98.

The egg is laid in the leaf-blade and the young larva mines towards the nearest vein, then continuing to feed downwards in the mid-rib and petiole and even into the stalk. Normally a number of larvae are found in a single plant and seedlings can be seriously weakened and damaged, with stunting of mature plants. The economic importance of **P. rufipes** was discussed by Spencer (1973b).

Three males can now be recorded in Colombia, representing the first records in South America, all on or near the Sabana: Chía, 1 ♂, 13.iv.82; Tabio, 1 ♂, 22.x.83; near Guasca, SE of Bogotá, 1 ♂, 1.xi.83. These specimens must represent an introduction from Europe, probably from Spain which in recent years has been exporting to Colombia several hundred tons annually of "German cabbage". With **P. rufipes** now clearly established, there is a risk of economic damage to any cruciferous crops.

In North America **P. rufipes** has been recorded from New Brunswick and Newfoundland in eastern Canada and the sole record in the United States is from Oregon on the west coast. These populations doubtless also represent introductions from Europe.

GENUS Chromatomyia HARDY

Approximately 100 species are now known in this predominantly north-temperate genus. All were previously included in **Phytomyza** and the two genera cannot be separated on external characters. However, Griffiths (1974) in revisionary studies, accepted that the form of the male genitalia, associated with the distinctive method of pupation with the puparium remaining in the mine, lying upside down with the anterior spiracles projecting through the leaf epidermis, justifies retention of **Chromatomyia** as distinct from **Phytomyza.**

Four species have hitherto been known in the Neotropical Region (Spencer, 1973c (Venezuela), 1982 (Chile) and 1983a (Costa Rica)). The European species, **C. syngenesiae** can now be recorded in Colombia, representing the first record in South America.

Chromatomyia syngenesiae Hardy. Figs. 99, 100.
This highly polyphagous species is common and widespread in much of Europe and is a serious pest of chrysanthemums in greenhouses. It was first noticed on the Sabana at Chia in April, 1982 where the conspicuous leaf-mines were frequent on the introduced weed **Sonchus oleraceus** ("cerraja "). **Sonchus** is one of its commonest hosts in Europe and **C. syngenesiae** is likely to occur wherever this weed is present on the Sabana. Later, I found that the mines are numerous on the yellow –or white– flowering "daisy", **Chrysanthemum coronarium** (native to the Mediterranean) which is cultivated as an ornamental in the gardens of many houses in and around Bogotá; it was also present at Monserrate, 27.vi.82. I have also seen mines on **Cineraria** and **Petunia** in a garden at Mosquera and mines were found once on the ubiquitous weed **Galinsoga caracasana** ("guasca") growing beside Hotel Bogotá Plaza, 2.xi.83.

With cultivated chrysanthemums so readily attacked in Europe, it is puzzling that **C. syngenesiae** is not present in the chrysanthemum farms (although I did see mines possibly representing this species once at Subachoque). It is clearly widespread and well-established on the Sabana on at least two wild hosts and also **Chrysanthemum coronarium.** Its introduction from Europe may be relatively recent and this might explain why it has not yet adjusted to the particular conditions in the high-elevation farms on the Sabana. However, I believe the transfer from **Chrysanthemum coronarium** to **C. morifolium,** the main species cultivated as "pompones", will inevitably occur and **C. syngenesiae** poses a real threat to the Colombian flower industry.

The adult is recongnisable by the small, round, black third antennal segment (Fig. 99), and by its wing venation (Fig.

100), with the costa extending only to vein R4+5 and the outer cross-vein lacking and the greyish-black scutellum. The leaf-mines are longer and narrower than those of **Liriomyza huidobrensis** and **L. trifolii** which may be found on chrysanthemums, and are instantly recongnisable by the puparium remaining in the leaf at the end of the mine. The posterior spiracles of the larva each have some 6-9 minute pores on a short projection, forming an irregular circle. No confusion can occur with **L. trifolii** which has only 3 pores (cf. Fig. 67) but dead larvae could be mistaken for **L. huidobrensis,** which also has 6-8 pores but these are arranged in a more regular ellipse (Fig. 41). One case is known to me where the Plant Quarantine authorities at Miami mistook an infestation of **C. syngenesiae** for **L. huidobrensis.**

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