**Famatinanthus**, a New Andean Genus Segregated from *Aphylocladus* (Asteraceae)

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**Abstract**—Famatinanthus, a new genus of Asteraceae (Mutisioideae, Onoserideae), is described and illustrated to accommodate one species from the Andes of Argentina, that was previously placed in *Aphylocladus*, *A. decussatus*, as *Famatinanthus decussatus* comb. nov. The new genus is tentatively assigned to the tribe Onoseriæ based on its shrubby habit, solitary radiate capitula, style rounded at the apex and dorsally papillose, and 2–3-seriate heteromorphic pappus. *Famatinanthus* is similar to *Aphylocladus* but it is easily distinguished by the leafy, decussate branches with opposite leaves, multilobed T-trichomes, cream corollas, apiculate apical anther appendages, setuliferous achenes, terete stems, lack of secretory cavities, and pollen with a conspicuous mesoaperture and microechinate-rugulate exine. A key to the genera of the Onoseriæ is presented. Affinities of the new genus with other genera of the tribes Gochnatiæ, Hyalidiæ, and Stiffiæ are also discussed.

**Keywords**—Argentina, Asteraceae, La Rioja, Sierra de Famatina, taxonomy.

The genus *Aphylocladus* Wedd. has been traditionally included in tribe Mutisieæ Cass., subtribe Gochnatiæ Benth. & Hook. f. (Cabrera 1977), Mutisieæ Less. s. l. (Mutisieæ s. s. plus Gochnatiæ, Bremer 1994), or in the subfamily Mutisioideæ (Cass.) Lindl., tribe Mutisieæ Cass. (Hind 2007, Katinas et al. 2008), based on the disc florets with deeply 5-lobed corollas, and anthers with an apical appendage several times as long as wide and basally caudate. In recent molecular studies of the Asteraceae, *Aphylocladus* is placed in tribe Onoseriæ Solbrig, subfamily Mutisioideæ (Panero and Funk 2008). The genus was established by Weddell (1855: 11) principally based on its rapidly falling epidermis, a 8–12-layered cortex consisting of collenchyma...
(1–2 layers) and starchy parenchyma (6–10 layers), and a eustele usually with ca. 14 vascular bundles around a central parenchymatous pith (Fig. 2A). Each bundle is collateral, with a crescent-shaped group of fibers at the outer boundary of the phloem (Fig. 2B), cambium between phloem and xylem and phellogen between fibers and phloem; the latter meristematic tissue will give rise to the peridermis (Fig. 2D). Secondary structure with the persistent degenerating epi-
dermis and primary cortex followed by a secondary cortex (peridermis), a well-developed siphonostele and a pith of thick-walled pitted sclerified cells (Figs. 2C–E). The peridermis consists of a slightly lignified 5–7-layered paren-
chyma with groups of 30–75 thick-walled pitted sclerotic fibers (Fig. 2D); the secondary phloem also contains groups of fibers (Fig. 2E); xylem with very small vessels (less than 50 µm diam) and abundant fibers similar to the peridermis (Fig. 2E). Secretory cavities are absent (Figs. 2A, C).

LEAVES—Epidermis unistriate, with raised stomata and glandular and eglandular trichomes on both surfaces (Figs. 2F, G). Mesophyll isolateral, with 3–4 layers of compact palisade tissue towards both surface and 10–12 layers of scarcely loose spongy tissue of rounded cells (Figs. 2G, H). Vascular bundle of the main vein with a sheath of starchy parenchyma (Fig. 2G).

STOMATA AND TRICHOMES—Stomata and trichomes are pre-
sent on stem and leaf. Stomata are very peculiar since they always appear strongly raised with curved outer stomatal cuticle ledges and a large substomatal chamber (Figs. 2A, F, G, I). Conversely, glandular trichomes are sunken on the epidermis (Figs. 2H, 3C).
Fig. 2. *Famatinanthus decussatus* (A, B: Barboza et al. 3307; C–H: Barboza et al. 2846). A. Sector of young stem in cross section. B. Detail of the vascular bundles. C. Mature stem in cross section. D. Detail of primary and secondary cortex. E. Detail of vascular tissues and sclerified pith. F. Leaf outline in transverse section. G. Detail of main veins. H. Detail of mesophyll. I. Raised stomata with large substomatal chamber. Abbreviations: st, stomata; fi, fibers; pc, primary cortex; sc, secondary cortex; p, sclerified pith; sch, substomatal chamber; gt, sunken glandular trichome.
Two different types of trichomes are observed: a) Eglandular, multistoried T-shaped trichomes, ca. 150 μm long, with a long uniseriate 2–6-celled stalk and a head comprised of 2–5 one-celled overlapping horizontal layers, the distal cell with a very short branch (Figs. 3A, B, D); this unusual trichome has only been cited for *Ianthonpus* Roque & D.J.N. Hind (tribe Hyalideae) (Melo-de-Pinna and Menezes 2002; Freire et al. 2002) and for *Dresslerothamnus* H. Robinson (tribe Senecioneae) (Robinson 1989); b) Many tiny glandular trichomes are sessile or with a short unicellular stalk and a multicellular globose head (Figs. 3C, H), sunken in the leaf and stem surface and being responsible for the secretion of essential oils (Zygadlo pers. comm.).

**Palynological Analysis**—Pollen radially symetrical, isopolar; prolate-sphaeroidal; circular in polar view (Fig. 4A), subsphaeroidal outline in equatorial view (Fig. 4C). Size medium to large (P × E = 45–56 μm × 42–47 μm). Tricolporate; mesoaperturate conspicuous (Fig. 4H). Ora 10–12 μm diam. Colpi long with acute ends (Fig. 4A), 38–47 μm long; membrane microgranulate, margins smooth or punctuate (Figs. 4B–D, F). Exine uniformly thickened, ca. 4 μm (Fig. 4G), tectate; sexine 2.5–3 times thicker than the nexine, slightly

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thinner in the polar area, clearly stratified into a compact ectosexine and an endosexine with ramified columellae (Fig. 4G); nexine thickened at the apertures and forming costae. Tectum microechinate-rugulate (Figs. 4D, E), spines ca. 1.5 μm. (Fig. 4D).

**Taxonomic Treatment**

**Famatinanthus** is distinguished from *Aphyllolocladus* by its conspicuously leafy stems with opposite leaves, multistored T-trichomes, florets with cream corollas, apiculate apical anther appendages, prolate to spheroidal pollen, and setuliferous achenes.

Branched shrubs, young stems pubescent, old stems subglabrous, peridermis black with age. Leaves opposite, simple, sessile; blades small, coriaceous or subcoriaceous, elliptic to linear-obovate, pinnately veined, margins entire. Capitula solitary at tip of branches, homogamous, radiate, sessile; involucre ca. 8+2–2.2 mm, oblong, apices acute to subacute, margins entire. Achenes 1.3–1.5 mm, turbinate, setuliferous, setulae of duplex trichomes. Branches divaricate, decussate. Leaves opposite, subglabrous, peridermis black with age. Leaves opposite, small, coriaceous or subcoriaceous, elliptic to linear-obovate, base short-attenuate, margins entire, apices acute to subacute, margins entire.

**Phenology**—Flowering from December to February.

**Vernacular Name**—It is known as sacansa.

**Use**—It is used as an anti-slip for saddle horse (fide local people).

**Distribution and Habitat**—*Famatinanthus decussatus* grows on soils derived from the *Aguja Colorado* geological formation (Fig. 1A) of the Sierra de Famatina complex (Miller and Söllner 2005), in northwestern Argentina, at 1,800–2,500 m. The vegetation of this area is dominated by sparse spiny shrubs, cacti, and dwarf shrubs typical of the Monte phytogeographical Province as defined by Cabrera (1976). Associated species found with *Famatinanthus* include *Flourensia hirta* S. F. Blake and *Gocha natia glutinosap* plant communities (Fig. 6).

**Conservation Status**—This species is an endemic with a restricted geographical distribution in the Sierra de Famatina. Only small parts of this mountain system are officially protected, the main threats to the ecosystem being mining, damage caused by off-road vehicles, and poorly managed livestock grazing. Following IUCN (IUCN 2013), we suggest that this species be assigned a conservation status of vulnerable (VU). It meets criterion B.2: its geographic range, in the form of area of occupancy, is estimated to be less than 2,000 km², it is known to exist at no more than 10 locations, and a continuous decline is observed in its extent of occurrence.

**Observations**—The label of the *Aphyllolocladus decussatus* isolectotype specimen at GH (http://plants.jstor.org/specimen/gb0002308) was wrongly transcribed as ‘*Hieronymus et Niederlein 831*’, instead of ‘831’, and “Los Corrales; Tierra Famatina” instead of “Sierra Famatina”.

In the field, *F. decussatus* is easily recognized because of the blackish colour and pulverulent aspect of their branches. This feature was cited by Hieronymus (1886) when describing the species. Microscope observations revealed that mycelia and spores of a sooty mold (Kingdom Fungi, Div. Ascomycota, Subph. Pezizomycotina, Cl. Dothideomycetes, Subcl. Dothideomycetidae) are responsible for the blackish coloration (L. Domínguez pers. comm.).

In addition, we observed some floret stamens without anthers but with filaments, so although these florets appear to be female (true functionally female florets usually have staminodes) their apparent unisexuality is probably to the result of insect herbivory.

**Discussion**

**Systematic Position**—The new genus shares with the tribe Onoserideae (Roque and Funk 2013) its shrubby habit (Fig. 1B), solitary capitula (Fig. 1C), bilabiate marginal corollas (Fig. 1C), style branches rounded at the apices and dorsally papilllose (Fig. 1G), and 2–3-seriate heteromorphic pappi. *Famatinanthus* shares with tribe Gochtinae...
Fig. 6. Distribution map of *Famatinanthus decussatus* in La Rioja province (Argentina). Stars denote localities of collected specimens; dots are towns.
Panero & V. A. Funk and Hyalideae Panero (Sancho and Freire 2009) apiculate anther appendages (Fig. 1F), but smooth style branches of Hyalideae and Gochnatieae mark a departure from the new genus, where the style branches are papillose. *Famatinanthus* also resembles *Hyaloseris* Griseb. (Stiftieae tribe) in its opposite leaves and few-flowered capitula, but *Famatinanthus* is distinct from *Hyaloseris* by its short bifid style branches and dorsally papillose (vs. long and recurved style branches that are papillose above and below the bifurcation), apiculate anther appendages (vs. acute anther appendages), and dimorphic florets (vs. isomorphic florets).

*Famatinanthus* is therefore tentatively placed in tribe *Onoserideae* (Panero and Funk 2008) pending molecular phylogenetic studies. With the inclusion of this genus, Onoserideae now contains eight genera and approximately 53 species most found in the Andes, i.e. *Aphyllocladus* Wedd., *Famatinanthus*, *Gypothamnium* Phil., *Lycoseris* Cass., *Onoseris* Willd., *Plazia* Ruiz & Pav., *Urmenetea* Phil., and more recently *Paquirea* Panero & S.E. Freire (Panero and Freire 2013).

**Comparison of Famatinanthus and Related Genera of the Tribe Onoserideae**—*Famatinanthus* shares more morphological features with *Aphyllocladus* than with any other genus of the Onoserideae. They are both monoeious shrubs with linear to spathulate leaves, solitary capitula, disc florets with deeply 5-lobed corollas, long pilose anther tails and dorsally papillose style branches. In addition, both genera share similar habits. However, the new genus can be distinguished from *Aphyllocladus* by its inconspicuously leafy stems with opposite leaves, multistoried T-trichomes, homogamous capitula with dimorphic florets, cream corollas, apiculate apical anther appendages, prolate to sphaeroidal pollen, and setuliferous achenes. *Aphyllocladus* differs from *Famatinanthus* in having rapidly caducous alternate leaves, simple 2–3-cellular flagellate trichomes, homogamous or heterogamous capitula with isomorphic or dimorphic florets, lilac to purple corollas, truncate apical anther appendages, prolate to subprolate pollen, and long-pilose achenes (Table 1).

Anatomically, both genera are also different. *Famatinanthus* has cylindrical leafy stems (vs. strongly ribbed stems with inter rib areas covered with tufts of long flagellate trichomes in *Aphyllocladus*), secretory cavities absent (vs. stem ribs with large secretory cavities), secondary cortex with groups of fibers embedded in the parenchyma (vs. secondary cortex without groups of fibers), siphonostele well-developed and secondary phloem with groups of fibers (vs. siphonostele not well developed: continuous secondary phloem bounded mostly by a continuous ring of fibers and a discontinuous xylem bounded by groups of fibers in *Aphyllocladus*), and sclerified pith, without crystals (vs. pith non-sclerified with abundant solitary cubic or prismatic crystal and druses in *Aphyllocladus*), and leaves with thin cuticles and epidermis with raised stomata, (vs. very thick cuticles, epidermis with flat stomata in *Aphyllocladus*) (Figs. 2, 7A, C–G). Some of the anatomical characters of *Aphyllocladus* have already been stated by Cabrera (1951).

Pollen morphology is different between *Famatinanthus* and *Aphyllocladus*. *Famatinanthus* has prolate-sphaeroidal pollen grains, with mesoaperturate conspicuous medium-to-large sized grains, and microechinate-rugulate exines, whereas *Aphyllocladus* has subprolate, or prolate or subprolate pollen, with mesoaperture diffuse, large-sized grains, and microechinate exines (Telleria and Katinas 2004; Katinas et al. 2008).

*Plazia*, *Gypothamnium* and *Paquirea* share with *Famatinanthus* the presence of disc florets with deeply 5-lobed corollas. However, the new genus can be easily separated by its opposite leaves (vs. alternate or spiralled), 10 or 11-flowered capitula (vs. >15), apiculate apical anther appendages (vs. truncate), prolate-sphaeroidal and microechinate-rugulate pollen (vs. subprolate and microechinate, Telleria and Katinas 2004), and setuliferous achenes (vs. glabrous in *Paquirea* and *Plazia*, and long-pilose in *Gypothamnium*).

Differences among *Famatinanthus* and all the genera of tribe *Onoserideae* are presented in the key below.

**Key to the Genera of Tribe Onoserideae**

1. Disc floret corollas deeply 5-lobed, lobes ½–⅓ length of corolla ................................................................................. 2
2. Achenes glabrous ......................................................................................................................................................... 3
3. Capitula radiate; florets dimorphic; leaves spiralled ........................................................................................................ 4
2. Achenes pilose ......................................................................................................................................................... 3
4. Leaves spiralled, filiform ................................................................................................................................................. 4
5. Plants appearing leafless; leaves alternate; corollas lilac to purple; achenes long-pilose ........................................ 5
5. Plants conspicuously leafy; leaves opposite; corollas cream; achenes setuliferous . .................................................. 6
1. Disc florets corollas shallowly 5-lobed, less than ½ length of corolla ........................................................................... 6
6. Plants dioecious (capitula with only female or only male florets) .................................................................................. 7
7. Plants monoeious (capitula with female and hermaphrodite florets or all hermaphrodite) ........................................ 7
8. Capitula radiate or discoid; marginal florets corollas, when present, purple or violet .................................................. 8
9. Achenes setuliferous ................................................................................................................................................... 7
10. Achenes pilose ............................................................................................................................................................. 6

**Comparison of Famatinanthus and Related Genera with Apiculate Apical Anther Appendages of Tribes Gochnatieae and Hyalideae**—*Famatinanthus* differs morphologically from *Gochnatia* Kunth and *Cyclolepis* D. Don by the presence in the latter genera of subdimorphic or isomorphic florets (vs. dimorphic in *Famatinanthus*) and dorsally smooth style branches (vs. papillose in *Famatinanthus*). However, as stated earlier, because of similar habits, *Famatinanthus* and *Gochnatia glutinosa* at first sight in the field are difficult to distinguish. Anatomically, both species are almost alike, having a similar tissue arrangement in stems (Figs. 7A, B), the same mesophyll structure and glandular trichomes, and lacking secretory cavities at all; but they differ in the type of e glandular trichomes, the stomata, and the leaf vascular bundles. In fact, *Famatinanthus* has multistoried T-shaped trichomes, stomata very raised, and vascular bundles bounded only by a
### Table 1: Morphological comparison between *Famatinanthus* and its related genera of the tribes Onoserideae, Gochnatieae and Hyalideae.

<table>
<thead>
<tr>
<th>Character</th>
<th><em>Famatinanthus</em></th>
<th><em>Aphyllocladus</em></th>
<th><em>Cyclolepis</em></th>
<th><em>Gochnatia</em></th>
<th><em>Gypothamnium</em></th>
<th><em>Hyalis</em></th>
<th><em>Ianthopappus</em></th>
<th><em>Plazia</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Capitula</td>
<td>Solitary</td>
<td>Solitary</td>
<td>Spicate</td>
<td>Solitary, coryms, racemes, panicles or glomerules</td>
<td>Solitary</td>
<td>Corymbss</td>
<td>Corymbss</td>
<td>Solitary</td>
</tr>
<tr>
<td>Florets</td>
<td>Dimorphic</td>
<td>Dimorphic (isomorphic)</td>
<td>Subdimorphic</td>
<td>Dimorphic (subdimorphic)</td>
<td>Dimorphic</td>
<td>Dimorphic</td>
<td>Dimorphic</td>
<td>Dimorphic</td>
</tr>
<tr>
<td>Number of florets</td>
<td>10–11</td>
<td>12–40</td>
<td>10–15</td>
<td>4–130</td>
<td>Numerous</td>
<td>5–6</td>
<td>Ca. 46</td>
<td>17–42</td>
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<tr>
<td>Number of disk florets</td>
<td>Numerous</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Numerous</td>
<td>1</td>
<td>Numerous</td>
<td>Numerous</td>
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<tr>
<td>Florets color</td>
<td>Cream</td>
<td>Lilac to purple</td>
<td>Yellowish</td>
<td>Cream or yellowish</td>
<td>Purple or pinkish-purple</td>
<td>Pink, white or purple</td>
<td>Ray: white; disc: purple</td>
<td>White to pink</td>
</tr>
<tr>
<td>Apical anther appendage</td>
<td>Apiculate</td>
<td>Truncate, reddish</td>
<td>Apiculate</td>
<td>Apiculate</td>
<td>Apiculate</td>
<td>Truncate, reddish</td>
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<tr>
<td>Style branches Achenes</td>
<td>Papillose</td>
<td>Setuliferous</td>
<td>Smooth</td>
<td>Smooth</td>
<td>Smooth</td>
<td>Smooth</td>
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<tr>
<td>Carpopodium</td>
<td>Short cylindrical 2–3-seriate, barbellate, unequal in length and width</td>
<td>Short cylindrical 2–3-seriate, barbellate, unequal in length and width</td>
<td>Annular or cylindrical 1–3-seriate, barbellate, equal to unequal in length and width</td>
<td>Annular or cylindrical 1–3-seriate, barbellate, equal to unequal in length and width</td>
<td>Scarce ly differentiated 2–4-seriate, barbellate, unequal in length and width</td>
<td>Annular 3-seriate, barbellate, unequal in length</td>
<td>Not differentiated Many-seriate, barbellate, unequal in length and width</td>
<td></td>
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<tr>
<td>Pappus bristles</td>
<td>2–3-seriate, barbellate, unequal in length and width</td>
<td>2–3-seriate, barbellate, unequal in length and width</td>
<td>3-seriate, barbellate, unequal in length and width</td>
<td>1–3-seriate, barbellate, unequal to unequal in length and width</td>
<td>2–4-seriate, barbellate, unequal in length and width</td>
<td></td>
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<tr>
<td>Leaf duration</td>
<td>Persistent</td>
<td>Opposite</td>
<td>Rapidly caducous</td>
<td>Persistent</td>
<td>Persistent</td>
<td>Persistent</td>
<td>Persistent</td>
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<tr>
<td>Leaf phylotaxis 2-armed trichomes</td>
<td>—</td>
<td>—</td>
<td>Alternate</td>
<td>Alternate</td>
<td>Alternate</td>
<td>Alternate</td>
<td>Alternate</td>
<td>Alternate</td>
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<td>Multistoried T-shaped trichomes</td>
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<td>—</td>
<td>—</td>
<td>Present</td>
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<td>Secretory cavities</td>
<td>—</td>
<td>Present</td>
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<td>—</td>
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<tr>
<td>Pollen ratio P/E</td>
<td>Prolate to sphaeroidal</td>
<td>Prolate to subprolate</td>
<td>Sphaeroidal to prolamate</td>
<td>Sphaeroidal to prolamate</td>
<td>Subprolate</td>
<td>Prolate</td>
<td>Prolate</td>
<td>Subprolate</td>
</tr>
<tr>
<td>Pollen size</td>
<td>Medium to large</td>
<td>Large</td>
<td>Medium to large</td>
<td>Large</td>
<td>Medium to large</td>
<td>Large</td>
<td>Large</td>
<td>Large</td>
</tr>
<tr>
<td>Exine surface</td>
<td>Microechinate-rugulate</td>
<td>Microechinate</td>
<td>Microechinate</td>
<td>Microechinate, scabrate or echinate (spines 1.5–2.5 μm)</td>
<td>Microechinate</td>
<td>Microechinate</td>
<td>Microechinate</td>
<td>Microechinate</td>
</tr>
</tbody>
</table>
parenchymatous sheath while *G. glutinosa* has a particular eglandular double T-shaped trichomes (the upper T-shaped cell inverted, Figs. 3E, G, I) here reported for the first time in *Gochnatia*, stomata slightly raised, and vascular bundles bounded by two conspicuous groups of fibers (Fig. 3F). Concerning the Hyalideae genera, *Famatinanthus* resembles *Hyalis D. Don ex Hook. & Arn.* and *Ianthopappus* in having few-flowered capitula, and multistoried T-shaped trichomes, respectively. However, *Famatinanthus* differs morphologically from *Hyalis* and *Ianthopappus* by the presence in the latter genera of dorsally smooth style branches (vs. papillose in *Famatinanthus*) and capitula arranged in corymbs (vs. solitary capitula in *Famatinanthus*) (Table 1).

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