

SYNOPSIS AND CLADISTICS OF THE GENUS

Misodendrum (Misodendraceae, Santalales)

CARLOS A. ZAVARO, JORGE V. CRISCI

Departamento Científico de Plantas Vasculares, Museo de La Plata.
Paseo del Bosque, 1900. La Plata, Argentina

& JUAN J. MORRONE

Laboratorio de Sistemática y Biología Evolutiva (LASBE). Museo de La Plata.
Paseo del Bosque, 1900. La Plata, Argentina

C. A. ZAVARO, J. V. CRISCI & J. J. MORRONE (1997). Synopsis and cladistics of the genus *Misodendrum* (Misodendraceae, Santalales). *Fontqueria* 48: 225-239.

Keywords: Cladistics, Taxonomy, *Misodendrum* (Misodendraceae, Santalales).

Summary. *Misodendrum* Banks ex DC., exclusively parasitic on *Nothofagus* (Nothofagaceae) and the single representative of the family Misodendraceae (Santalales), is a monophyletic group defined by its achlamydeous perianth. It comprises eight species endemic to the Subantarctic province in southern South America. A synopsis of Misodendraceae is provided, including a diagnoses, a key to the species, and distributional and host plant information. The cladistic analysis of *Misodendrum* was carried out using 18 characters of its external morphology and anatomy. The eight species of *Misodendrum* and the closely related families Eremolepidaceae and Viscaceae were used as terminal taxa. Plesiomorphic character states were identified with *Loranthaceae* as outgroup. The analysis yielded one cladogram with the following phylogenetic sequence: (Loranthaceae, (Viscaceae, (Eremolepidaceae, ((*Misodendrum linearifolium*, (*M. quadriflorum*, (*M. brachystachyum*, *M. oblongifolium*))), (*M. gayanum*, *M. punctulatum*), (*M. angulatum*, *M. macrolepis*)))))). The monophyletic groups delimited within *Misodendrum* correspond closely to the subgenera and sections previously proposed by other authors.

Resumen. *Misodendrum* Banks ex DC., parasito exclusivo de *Nothofagus* (Nothofagaceae) y único representante de la familia Misodendraceae (Santalales), es un grupo monofilético caracterizado por su perianto aclamídeo. Este género comprende ocho especies, todas endemismos de la provincia Subantártica, en el sur de Sudamérica. Se presenta una sinopsis de las Misodendraceae, que incluye diagnosis, clave para las especies más información sobre su distribución y plantas huéspedes. El análisis cladístico fue realizado sobre 18 caracteres morfológicos y anatómicos. Las ocho especies de *Misodendrum* y las familias Eremolepidaceae y Viscaceae fueron consideradas como táxones terminales. Los estados plesiomórficos de los caracteres fueron identificados usando *Loranthaceae* como grupo externo. En el análisis se obtuvo un único cladograma con la siguiente secuencia filogenética: (Loranthaceae, (Viscaceae, (Eremolepidaceae, ((*Misodendrum linearifolium*, (*M. quadriflorum*, (*M. brachystachyum*, *M. oblongifolium*))), (*M. gayanum*, *M. punctulatum*), (*M. angulatum*, *M. macrolepis*)))))). Los grupos monofiléticos delimitados dentro de *Misodendrum* se corresponden con los subgéneros y secciones propuestos por otros autores con anterioridad.

INTRODUCTION

Misodendrum Banks ex DC. is the only genus of the family *Misodendraceae*, order *Santalales*. The genus comprises eight species, traditionally classified in two subgenera and five sections (table I). The species of *Misodendrum* are strict parasites of *Nothofagus*, the single genus of the family *Nothofagaceae*, which is dominant in forests of the Austral region (southern South America, Australia, Tasmania, New Zealand, New Guinea, and New Caledonia). In contrast with other *Nothofagus* parasites, e. g., the scale insect family *Eriococcidae*, HUMPHRIES & AL. (1986) or the fungus genus *Cyttaria*, CRISCI & AL. (1988), *Misodendrum* is endemic to southern South America.

Our objectives are to contribute to the taxonomy of *Misodendrum*, by providing a synopsis and a key to its species, and undertaking a cladistic analysis, in order to elucidate its phylogenetic placement and analyze the relationship among its species.

MATERIAL AND METHODS

Taxa. *Misodendrum* forms a monophyletic group distinguished by its achlamydeous perianth. The units of the analysis (table II) are the eight species of this genus. In order to test the monophyly of the genus and establish its cladistic relationships, we included also as terminal units the closely related families *Eremolepidaceae* and *Viscaceae*.

Characters. For the cladistic analysis, 18 characters were derived from examination of 284 specimens deposited in the collections HAC, LP, LPAG, and SI, see HOLMGREN & AL. (1990) for herbarium acronyms. Multistate characters were treated as nonadditive. Plesiomorphic character states were identified by outgroup comparison with *Loranthaceae*, which is closely related to *Misodendraceae* according to CANDOLLE (1830), AGARDH (1858), and ORFILA (1978).

Analysis. Data matrix (table III) was analyzed using the branch and bound parsimony algorithm and tree analysis options of PAUP 3.1, SWOFFORD (1991), on a Macintosh IIsi computer, and Hennig86, FARRIS (1988) on a PC IBM compatible, applying the implicit enumeration (ie*) option for calculating cladograms. Consistency, KLUGE & FARRIS (1969) and retention, FARRIS (1989) indices were calculated. CLADOS 1.1, NIXON (1992) was used for examination of character distributions.

To test for nonrandom structure in the data, the frequency distribution of the lengths of 10,000 trees randomly selected by PAUP from the set of all possible trees was evaluated for left-handed skewness, HILLIS (1991), HUELSENBECK (1991), KÄLLERSJÖ & AL. (1992), MAYER & SOLTIS (1994). The significance of skewness was measured by comparing the observed distribution with that of the random data, using the *g*₁ statistics and the models of HILLIS & HUELSENBECK (1992). A decay analysis was performed to measure the relative robustness of the clades in the most parsimonious trees, MISHLER & AL. (1991), DONOGHUE & AL. (1992). This was done by constructing a strict consensus tree for all trees that were up to one step longer than the most parsimonious trees, then doing the same for trees up to two steps longer, and continuing to add steps until the strict consensus tree collapsed to an unresolved shrub. The number of extra steps required to collapse each particular clade (i. e. the decay index) can be interpreted as a measure of the relative robustness of that clade, DONOGHUE & AL. (1992). In addition, support for each branch was estimated using bootstrap analysis, FELSENSTEIN (1985). The decay and bootstrap analyses were undertaken using PAUP.

RESULTS

Misodendraceae Agardh, Theor. syst. pl. fam. phan.: 336 (1858)

Dioecious shrublets, hemiparasitic, more or less green, and chlorophyllous; plants with thickened haustoria that promote overgrowth of the host at the contact zone. Leaves alternate, small and simple, sometimes reduced and scale-like, stipules wanting. Flowers small, unisexual, in catkin-like compound racemes or spikes; staminate flowers lacking perianth, consisting of 2-3 stamens around a small lobed nectary-disk; anthers bisporangiate and monothechal, opening by a terminal slit; pollen grains 4-12 colpi; pistillate flowers without perianth, with acrescent staminodes; gynoeceum syncarpic, 3-carpellate; ovary unilocular, with very short, stout style with three stigmas; ovules 3, pendulous from the top of the free central placental column, not differentiated into nucellus and integument. Fruit an achene, crowned by strongly accrescent, feathery staminodes; seeds solitary, without testa.

This monotypic family of *Santalales*, CRONQUIST (1988), is based on the genus *Misodendrum* Banks ex DC., originally assigned to *Loranthaceae*, CANDOLLE (1830), subsequently transferred to *Santalaceae*, BENTHAM & HOOKER (1880), and treated as a distinct family by AGARDH (1858), ORFILA (1976, 1978), ROSSOW (1982, 1984), and CARLQUIST (1985).

Misodendrum Banks ex DC., Coll. mém. 6 (Loranthacées): 12 (2-X-1830)

SPECIES TYPICA: *M. punctatum* Banks ex DC.

Misodendrum comprises eight species endemic to the Subantarctic province of the Andean subregion, MORRONE (1994, 1996), of South America. This genus was previously studied by HOOKER (1847), BENTHAM & HOOKER (1880), HIERONYMUS (1889), VAN TIEGHEM (1896), ENGLER (1897, 1914), SPEGAZZINI (1902), SKOTTSBERG (1913), RUIZ (1974), ORFILA (1976, 1978), ROSSOW (1982, 1984), and CARLQUIST (1985). According to the revisionary studies of ORFILA (1978) and ROSSOW (1982), species of *Misodendrum* are classified in two subgenera and five sections (table I). The number of valid names, however, differs between both authors. ORFILA (1978) recognizes twelve species, whereas ROSSOW (1982) reduces them to eight. In this analysis the concept of the latter author was confirmed.

KEY TO THE SPECIES OF *MISODENDRUM*

- 1a Stem with warty cortex; male flowers with two stamens 2
- 1b Stem with smooth or fissured-folded cortex; male flowers with three stamens 5
- 2a Female inflorescence composed of compact spikes with scale-like bracteoles; flowers 2, sessile, at base of each bracteole 3
- 2b Female inflorescence composed of lax spikes of umbellets or glomerules with foliaceous bracteoles; flowers 4-6, pedicellate, in each bracteole 4
- 3a Floral buds under foliar buds; female inflorescence with deciduous tectrix bract; basal bracteole of inflorescence usually sterile *M. punctatum*
- 3b Floral buds over foliar buds; female inflorescence with basal tectrix bract; basal bracteole of inflorescence fertile *M. gayanum*
- 4a Stems cylindrical; leaves ovate-lanceolate *M. macrolepis*
- 4b Stems angled and winged; leaves linear, the basal ones bract-like *M. angulatum*

- 5a Leaves obovate, spatulate, and petiolate; floral buds under foliar buds; bristles of achene plumose up to the middle, with apical hooks *M. quadriflorum*
- 5b Leaves linear or oblong, and sessile; floral buds over foliar buds; bristles of achene plumose up to the non-hooked apex 6
- 6a Stem swollen at base, cortex with minute waxy incrustations; bracteoles broader at base; male flowers numerous; ovary glabrous; achene bristles incurved at apex 7
- 6b Stem not swollen at base, cortex without waxy incrustations; bracteoles broader at apex; male flowers 1-2; ovary glabrescent or puberulous; achene bristles straight at apex *M. linearifolium*
- 7a Leaves usually glabrous; achene bristles <4 cm *M. brachystachyum*
- 7b Leaves pubescent; achene bristles >4 cm *M. oblongifolium*

1 *Misodendrum punctulatum* Banks ex DC., Coll. mém. 5: tab. IIA (1830)

= *Misodendrum punctulatum* var. *subumbellatum* DC., Coll. mém. 6: tab. IIB (1830)

= *Misodendrum commersonii* Tiegh., Bull. Soc. Bot. France 43: 557 (1896)

= *Misodendrum recurvum* Tiegh., Bull. Soc. Bot. France 43: 557 (1896)

Plants glabrous. Stem cylindrical with a warty cortex. Leaves widely cordate, subpeltate and ciliate.

Floral buds under foliar buds; male flowers composed of compact spikes, each flower protected by a scale-like bracteole, stamens 2; basic female inflorescence composed of compact spikes with scale-like bracteoles, each bracteole enclosing 2 sessile flowers of compact spikes with scale-like bracteoles, each bracteole enclosing 2 sessile flowers, stigma 3, ovary glabrous. Aquene with straight bristles plumose up to the apex. Fig. 1.

DISTRIBUTION. Widespread from Bio-Bío to Isla de los Estados, Tierra del Fuego (fig. 3).

HOST PLANTS. *Nothofagus antarctica*, *N. betuloides*, *N. dombeyi*, *N. nitida*, and *N. pumilio*.

MATERIAL EXAMINED. ARGENTINA. Neuquén: «lago Hermoso», Quintana & Balbiano (SI 28269). «parque nacional Lanín, lago Curruhué Grande», Gutiérrez 252 & Zavaro (HAC); Gutiérrez 254 & Zavaro (HAC); Gutiérrez 255 & Zavaro (HAC). «lago Lolog», Gutiérrez 256 & Zavaro (HAC). «camino a Hua Hum», Delucchi 580 (LP); Delucchi 581 (LP). «parque nacional Nahuel Huapi, colonia Cortinario, puerto Manzanos», Diem 3160 (SI); Diem 3161 (SI). «lago Espejo», Cabrera 5999 (LP); Gutiérrez 189 & Zavaro (HAC); Gutiérrez & Zavaro 215 (HAC). Gutiérrez & Zavaro 238 (HAC). «Villa la Angostura», Gutiérrez 176 & Zavaro (HAC); Gutiérrez 180 & Zavaro (HAC). Gutiérrez 181 & Zavaro (HAC). «paso Córdoba», González 315 (LP). «Rahue», Cabrera 18704 (LP). «San Martín de los Andes», Bridarolli 2222 (LP). «colonia Chapelco», Stuessy & al. 10084 (LP). «lago Lácar», Schajovskoy (LP). Río Negro: «El Bolsón», Illin (LP); Martínez Crovetto 3247 (SI). «lago Roca», Boelcke 6028 & Correa (SI). «parque nacional Nahuel Huapi», Orfila (LPAG); Fabris & Solbrig 5995 (LP). «arroyo Castaño Overo», Fabris & Solbrig 487 (LP). «Bariolche, colonia Runge», Cabrera 83 & Job (LP 21369). «colonia Otto», Neumeyer 321 (LP); Stuessy 6777 & al. (LP). «colonia Santa Elena», Fabris 1191 & Solbrig (LP). «colonia Tronador», Burkart 26478 & Troncoso (SI). «Colonia Suiza», Gutiérrez 157 & Zavaro (HAC). «lago Mascardi», Fabris 1248 & Solbrig (LP); Gutiérrez 92 & Zavaro (HAC); Gutiérrez 128 & Zavaro (HAC). «Río Machete», Rothkugel (SI 26746). Chubut: Spegazzini 17552 (LP). «Carrenleufú», Illin (LP). «colonia Piedra», Hogberg (SI 26764). «Cordillera», Burmeister (LP). «Corcovado», Casabón (LPAG); Illin (LP); Illin 1 (SI). Santa Cruz: «lago Argentino», Dimitri (LPAG); Cabrera 25880 & al. (LP); Spegazzini 17553 (LP); James 38 (SI); Hicken & Hauman 223 (SI). «glaciar norte del colonia Mayo», Dimitri 1036 (LPAG). «península Avellaneda», Hicken 208 (SI). «lago Roca, Calafate», Birabén & Birabén 210 (LP). «lago San Martín, isla Lobble», Hogberg 11 (SI). «lago Viedma», Dimitri (LPAG). «Río Turbio, valle del arroyo Santa Flavina», Romero 36 (LP). Tierra del Fuego: Spegazzini 19694 (LP). «isla de los Estados, puerto Cook», Torres 1184 (LP); Nicora 7281 (SI). «lago Roca», Boetto 8462 (LPAG). «Río Varela», Goodall 626 (LP). «Ushuaia», Alboff (LP 21365); Alboff 698 (LP); Alboff 700 (LP); Alboff 701 (LP); Gebhard 72 (LP); Pennington 248 (SI); Hicken (SI 26777); Goodall 669 (LP). CHILE. Bio-Bío: «salto del Trubunleo», Burkart 27472 (SI). Los Lagos: «Chiloé», Beldfreund (LP 33190); Spegazzini 17563 (LP). Piquina, potrero el Manzano, Junge 8 (SI). Llanquihue, cerca del volcán Osorno, Morrison 17549 (SI). «Valdivia», Hollermayer 314 (SI). «cordillera de la Pelada», Gunkel 3024 (LP). Aisén: «estancia Coihaique», Maldonado 228 (LP). «valle Coihaique», Burkart 1516

RESULTS

Misodendraceae Agardh, Theor. syst. pl. fam. phan.: 336 (1858)

Dioecious shrublets, hemiparasitic, more or less green, and chlorophyllous; plants with thickened haustoria that promote overgrowth of the host at the contact zone. Leaves alternate, small and simple, sometimes reduced and scale-like, stipules wanting. Flowers small, unisexual, in catkin-like compound racemes or spikes; staminate flowers lacking perianth, consisting of 2-3 stamens around a small lobed nectary-disk; anthers bisporangiate and monothechal, opening by a terminal slit; pollen grains 4-12 colpiate; pistillate flowers without perianth, with acrescent staminodes; gynoeceum syncarpic, 3-carpellate; ovary unilocular, with very short, stout style with three stigmas; ovules 3, pendulous from the top of the free central placental column, not differentiated into nucellus and integument. Fruit an achene, crowned by strongly accrescent, feathery staminodes; seeds solitary, without testa.

This monotypic family of *Santalales*, CRONQUIST (1988), is based on the genus *Misodendrum* Banks ex DC., originally assigned to *Loranthaceae*, CANDOLLE (1830), subsequently transferred to *Santalaceae*, BENTHAM & HOOKER (1880), and treated as a distinct family by AGARDH (1858), ORFILA (1976, 1978), ROSSOW (1982, 1984), and CARLQUIST (1985).

Misodendrum Banks ex DC., Coll. mém. 6 (Loranthacées): 12 (2-X-1830)

SPECIES TYPICA: *M. punctatum* Banks ex DC.

Misodendrum comprises eight species endemic to the Subantarctic province of the Andean subregion, MORRONE (1994, 1996), of South America. This genus was previously studied by HOOKER (1847), BENTHAM & HOOKER (1880), HIERONYMUS (1889), VAN TIEGHEM (1896), ENGLER (1897, 1914), SPEGAZZINI (1902), SKOTTSBERG (1913), RUIZ (1974), ORFILA (1976, 1978), ROSSOW (1982, 1984), and CARLQUIST (1985). According to the revisionary studies of ORFILA (1978) and ROSSOW (1982), species of *Misodendrum* are classified in two subgenera and five sections (table I). The number of valid names, however, differs between both authors. ORFILA (1978) recognizes twelve species, whereas ROSSOW (1982) reduces them to eight. In this analysis the concept of the latter author was confirmed.

KEY TO THE SPECIES OF *MISODENDRUM*

- 1a Stem with warty cortex; male flowers with two stamens 2
- 1b Stem with smooth or fissured-folded cortex; male flowers with three stamens 5
- 2a Female inflorescence composed of compact spikes with scale-like bracteoles; flowers 2, sessile, at base of each bracteole 3
- 2b Female inflorescence composed of lax spikes of umbellets or glomerules with foliaceous bracteoles; flowers 4-6, pedicellate, in each bracteole 4
- 3a Floral buds under foliar buds; female inflorescence with deciduous tectrix bract; basal bracteole of inflorescence usually sterile *M. punctatum*
- 3b Floral buds over foliar buds; female inflorescence with basal tectrix bract; basal bracteole of inflorescence fertile *M. gayanum*
- 4a Stems cylindrical; leaves ovate-lanceolate *M. macrolepis*
- 4b Stems angled and winged; leaves linear, the basal ones bract-like *M. angulatum*

(LPAG). **Magallanes:** «Fuerte Bulnes», *Pisano* 2683 (LPAG). «isla Dawson», *Benove* 89 (SI). «isla Navarino», *Alboff* (LP 21363). «Punta Arenas», *Pastore* (SI 26759). «salto Grande del Paine», *Pisano* 2339 (LPAG); *Pisano* 2340 (LPAG). «Sección Lazo, colonia Toro», *Pisano* 4100 (LPAG). «Seno Skyring, estancia María», *Riggi* 24 (SI). «Última Esperanza, colonia Dorotea, puerto Natales», *Eyerman & al.* 24214 (SI). **Without precise data:** *Dimitri* (LPAG).

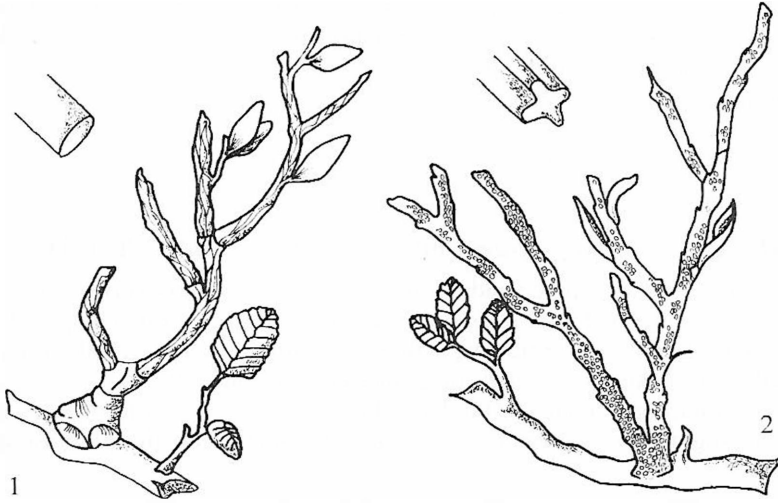


Fig. 1, 2. Habit of *Misodendrum*. 1) *M. punctulatum* Banks ex DC. 2) *M. angulatum* Phil.

2 *Misodendrum gayanum* Tiegh., Bull. Soc. Bot. France 43: 557 (1896)

- = *Misodendron imbricatum* Hook. fil., Fl. antarct. 1: 549 (1847), non Poepp. & Endl.
- = *Misodendron patagonicum* Spegg., Anales Mus. Nac. Hist. Nat. Buenos Aires 7: 161 (1902)
- = *Misodendron diemii* Ruiz, Bol. Soc. Argent. Bot. 16(1-2): 79-82 (1974)

Plants glabrous. Stem cylindrical with a warty cortex. Leaves lineal-lanceolate, sessile, ciliate, entire or minutely denticulate up to the apex. Floral buds over foliar buds; male flowers composed of compact spikes, each flower protected by a scale-like bracteole, stamens 2; basic female inflorescence composed of compact spikes with scale-like bracteoles, each bracteole enclosing two sessile flowers, stigma 3, ovary glabrous. Aquene with straight bristles plumose up to the apex.

DISTRIBUTION. From southern Neuquén and northern Río Negro in Argentina to Los Lagos, Aisén, and Magallanes in Chile (fig. 4).

HOST PLANTS. *Nothofagus antarctica*, *N. dombeyi*, and *N. nitida*.

MATERIAL EXAMINED. **ARGENTINA.** Neuquén: «parque nacional los Arrayanes», *Greenstone* (SI 26982). «parque nacional Nahuel Huapi, isla Victoria», *Corte* 24 (LP); *Boelcke* 1767 (SI). «lago Espejo», *Cabrera* 6002 (LP). «lago Nahuel Huapi, brazo Huemul», *Lanza* 3365 (LP). «colonia Cortinario, puerto Manzano», *Diem* 3060 (SI). «Quetrihué», *Diem* 89 (LP). **Río Negro:** «parque nacional Nahuel Huapi, Bariloche, bahía López», *Maldonado* 28 (LP). «lago Mascaridi», *Orfila* 629 (LPAG). «lago Nahuel Huapi», *Spegazzini* 17564 (LP). «Llao Llao», *Maldonado* 599 (LP). **CHILE. Los Lagos:** «Ensenada. lago Llanquihue», *Barros* 1900 (SI). «Valdivia», *Hollermayer* 664 (LP). «volcán Villarica», *Hollermayer* 408 (LP). **Aisén:** «istmo de Ofqui, San Rafael», *Hicken* (SI 20792, SI 26767).

3 *Misodendrum macrolepis* Phil., Anales Univ. Chile 27(3): 316 (1865)

Plants glabrous. Stem cylindric with a warty cortex. Leaves ovate-lanceolate, sessile, ciliate, entire. Floral buds over foliar buds; male flowers composed of compact spikes, each bracteole protecting 2 flowers, stamens 2; basic female inflorescence composed of lax spikes of umbellets or glomerules, each umbellet with 4-6 flowers protected by a foliaceous bracteole, the basal bracteole usually sterile, flowers minutely pedicellate, stigma 3, ovary glabrous. Fruit unknown.

DISTRIBUTION. Restricted to Valdivia, Los Lagos, Chile (fig. 5).

HOST PLANTS. *Nothofagus dombeyi*.

MATERIAL EXAMINED. CHILE. Los Lagos: «Valdivia, cordillera de la Pelada», *Hollermayer* 672 (LP).

4 *Misodendrum angulatum* Phil., Anales Univ. Chile 27(3): 315 (1865)

Plants glabrous. Stem angled and usually winged with a warty cortex. Leaves lineal, entire, sessile, glabrous. Floral buds over foliar buds; male flowers composed of compact spikes, each bracteole protecting 2 flowers, stamens 2; basic female inflorescence composed of lax spikes of umbellets or glomerules, each umbellet with 4-6 flowers protected by a foliaceous bracteole, the basal bracteole usually sterile, flowers minutely pedicellate, stigma 3, ovary glabrous. Aquene with straight bristles plumose up to the apex. Fig. 2.

DISTRIBUTION. Widespread from Neuquén to Magallanes (fig. 6).

HOST PLANTS. *Nothofagus antarctica*, *N. betuloides*, and *N. dombeyi*.

MATERIAL EXAMINED. ARGENTINA. Neuquén: «parque nacional los Arrayanes», *Greenstone* (SI 26778). «San Martín de los Andes», *Rasp.* 19 (SI). Río Negro: «parque nacional Nahuel Huapi, Paso de las Nubes», *Fabris & Solbrig* 482 (LP); *Boelcke & Correa* 5482 (SI). Santa Cruz: «colonia Fitz Roy, lago Azul», *Dimitri* (LPAG). CHILE. Los Lagos: «Valdivia, cordillera de la Pelada», *Beldfreund* (LP 33165, LP 33192). Magallanes: «Seno Skyring, Río León», *Pisano* 2686 (LPAG); *Pisano* 2699 (LPAG).

5 *Misodendrum quadriflorum* DC., Coll. mém. 6: tab. 12, 1 (1830); Prodr. 4: 286 (1830)

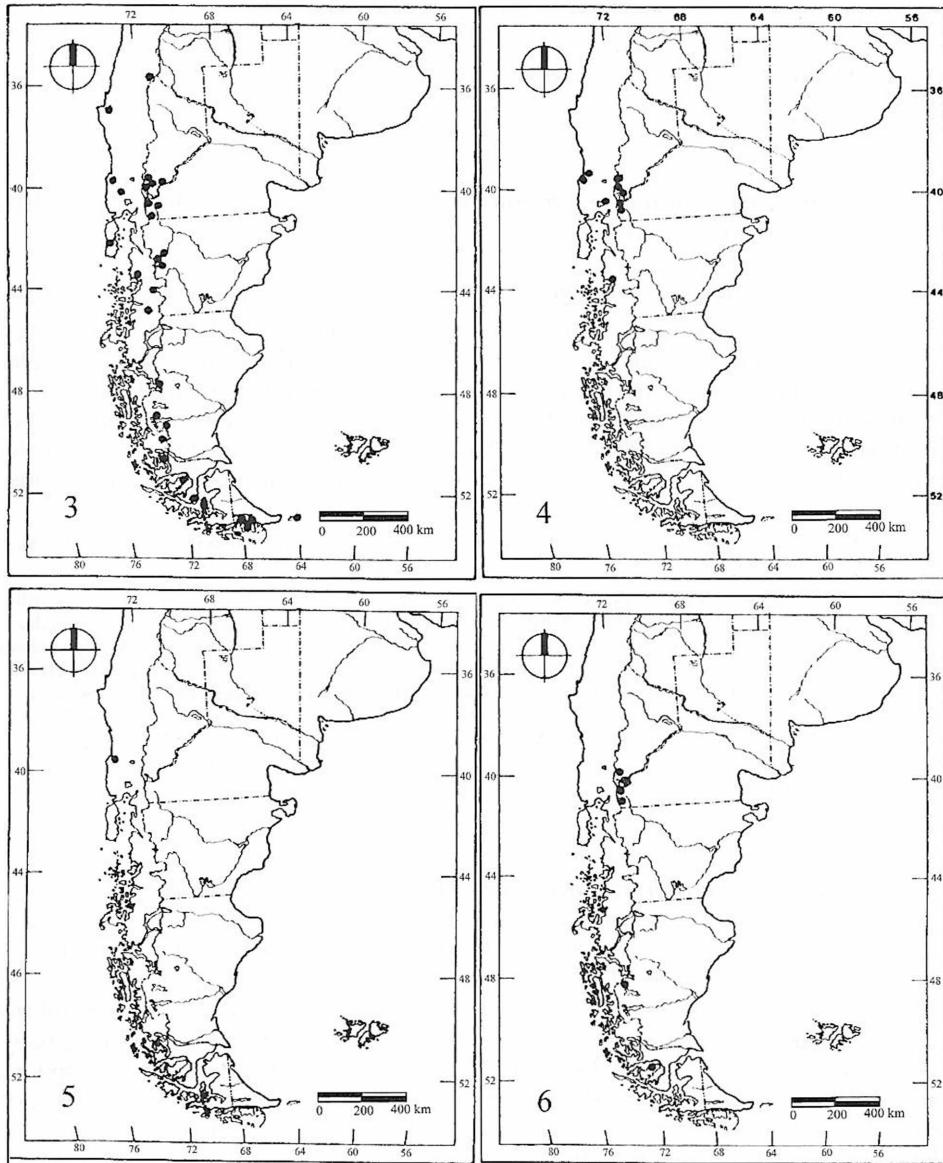
= *Telophyllum quadriflorum* (DC.) Tiegh., Bull. Soc. Bot. France 43: 558 (1896)

Plants pubescent. Stem cylindric, swollen at base, with a smooth or fissured-folded cortex and waxy incrustations. Leaves obovate-spatulate, entire, minutely pedicellate, glabrous. Floral buds under foliar buds; male flowers composed of compact spikes, each bracteole protecting 2(3) flowers, stamens 3; basic female inflorescence composed of lax spikes, flowers 6, opposite, ebracteolate but with a apical bracteole in the floral axis, flowers sessile, stigma 3, ovary glabrous. Aquene with claviform bristles plumose up to the middle with apical hooks

DISTRIBUTION. Widespread in the Subantarctic province (fig. 7).

HOST PLANTS. *Nothofagus pumilio*.

MATERIAL EXAMINED. ARGENTINA. Neuquén: «lago Hermoso», *Diem* 3168 (SI). «lago Meliquina», *Birabén & Birabén* 715 (LP). «lago Paz», *Spegazzini* 17554 (LP). «parque nacional Nahuel Huapi, colonia Cortinario, puerto Manzano», *Diem* 3182 (SI). «San Martín de los Andes», *Rasp.* 21 (SI). Río Negro: «parque nacional Nahuel Huapi, lago Mascardi», *Orfila* 533 (LPAG); *Orfila* 609 (LPAG); *Orfila* 621 (LPAG); *Orfila* 622 (LPAG); *Orfila* 695 (LPAG). Chubut: *Spegazzini* 17555 (LP). «lago General Vintter», *Orfila* 694 (LPAG); *Orfila* 695 (LPAG); *Orfila* 755 (LPAG); *Orfila* 800 (LPAG). Santa Cruz: «arroyo Tosso», *Hicken* 515 & *Hauman* (SI). «colonia Cazador», *Centili* 398 (LP). «colonia Fitz Roy, lago Azul», *Dimitri* (LPAG).



Figs. 3-6. Geographic distribution of *Misodendrum*. 3) *M. punctulatum*. 4) *M. gayanum*, 5) *M. macrolepis*. 6) *M. angulatum*

«lago Viedma», *Orfila* (LPAG); *Penibertum* (SI 26682). **Tierra del Fuego**: «Brown», *Goodall* 275 (LP). «lago Roca», *Orfila* 582 (LPAG); *Orfila* 591 (LPAG). «parque nacional Tierra del Fuego, Ensenada», *Orfila* 593 (LPAG). «Ushuaia», *Gebhard* 71 (LP); *Hicken* (SI); *Hicken* 20 (SI); *Goodall* 87 (LP); *Goodall* 588 (LP). **CHILE. Magallanes**: «isla Navarino», *Alboff* 703 (LP); *Alboff* 705 (LP); *Alboff* 706 (LP); *Alboff* 708 (LP); *Alboff* 709 (LP, LP 21375). «Mina Carota», *Donat* 297 (SI).

6 *Misodendrum brachystachyum* DC., Coll. mém. 6: 14, tab. 12: 1 (1830); Prodr. 4: 286 (1830)

- = *Archiphyllum brachystachyum* (DC.) Tiegh., Bull. Soc. Bot. France 43: 557 (1896)
- = *Archiphyllum macrophyllum* (Phil.) Tiegh., Bull. Soc. Bot. France 43: 557 (1896)

Plants pubescent. Stem cylindrical swollen at base, with a smooth or fissured-folded cortex and waxy incrustations. Leaves lineal-oblongate, entire, sessile, glabrous or glabrescent. Floral buds over foliar buds; male flowers composed of compact spikes, each bracteole protecting many flowers, stamens 3; basic female inflorescence composed of lax spikes, with a bracteole at the base of the floral axis, flowers numerous, alternate, minutely pedicelate, ebracteolate, stigma 3, ovary glabrous. Aquene with incurvate bristles plumose up to the apex.

DISTRIBUTION. From Bío-Bío (Chile) to Isla de los Estados in Tierra del Fuego, Argentina (fig. 8).

HOST PLANTS. *Nothofagus antarctica*, *N. betuloides*, *N. dombeyi*, and *N. pumilio*.

MATERIAL EXAMINED. **ARGENTINA. Río Negro**: «parque nacional Nahuel Huapi, lago Mascardi», *Orfila* 641 (LPAG); *Orfila* 642 (LPAG). **Chubut**: «Corcovado», *Casaubón* (LPAG). «lago Menéndez», *Neumayer* 386 (LP 41030). **Santa Cruz**: «lago Argentino», *James* 2261 (SI). **Tierra del Fuego**: *Spegazzini* 17570 (LP); *Spegazzini* 19693 (LP). «isla de los Estados, puerto Cook», *Torres* 1134 (LP). «puerto Ferrari», *Iter Patagonicum* 224 (SI). «Ushuaia», *Hicken* (SI 26749). **CHILE. Bío-Bío**: «laguna del Laja, Los Barros», *Burkart* 27473 (SI). **Los Lagos**: «Valdivia», *Buchtien* (SI 26762). «Valdivia, Purulou», *Hollerlmayer* 312 (SI). **Aisén**: «istmo de Ofqui», *Hicken* (SI 20824). **Magallanes**: «isla Dawson», *Benove* 88 (SI). «Punta Arenas», *Bonarelli* (SI 26745); *Hicken* 137 (SI). «Río Blanco», *Kunkel* 2220 (SI). «Río Seco», *Donat* 296 (SI). **Without precise data**: *Hicken* 72 (SI).

7 *Misodendrum oblongifolium* DC., Prodr. 4: 671 (1830)

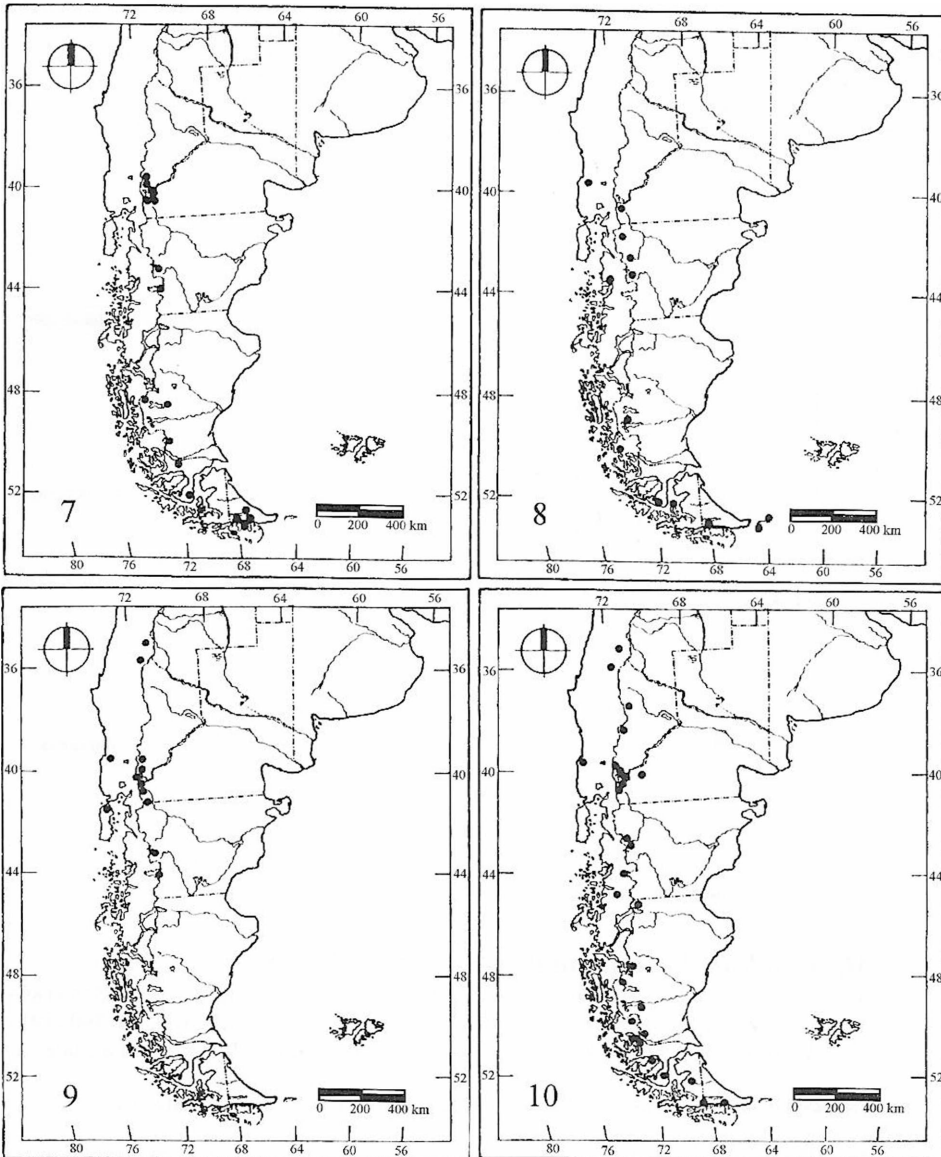
- = *Archiphyllum oblongifolium* (DC.) Tiegh., Bull. Soc. Bot. France 43: 557 (1896)
- = *Misodendron oblongifolium* DC. var. *lilacinum* Orfila, Revista Fac. Agron. Univ. Nac. La Plata, ser. 2, 52(1-2): 51 (1976)

Plants pubescent. Stem cylindrical swollen at base, with a smooth or fissured-folded cortex and waxy incrustations. Leaves lineal-oblongate to elliptic, entire, sessile, usually pubescent. Floral buds over foliar buds; male flowers composed of compact spikes, each bracteole protecting many flowers, stamens 3; basic female inflorescence composed of lax spikes, with a bracteole at the base of the floral axis, flowers numerous, alternate, minutely pedicelate, ebracteolate, stigma 3, ovary glabrous. Aquene with incurvate bristles plumose up to the apex.

DISTRIBUTION. From Bío-Bío, Araucanía, and Los Lagos (Chile) to Chubut in Argentina (fig. 9).

HOST PLANTS. *Nothofagus antarctica*, *N. betuloides*, and *N. pumilio*.

MATERIAL EXAMINED. **ARGENTINA. Neuquén**: «lago Hermoso», *Diem* 3170 (SI). «parque nacional Nahuel Huapi, colonia Bayo», *Dolly* 112 & *Jones* (LP). «colonia Cortinario, puerto Manzano», *Diem* 3081 (SI). «Río Estancado», *Diem* 3097 (SI). «Pulmarí», *Comber* 383 (LP). **Río Negro**: «El Bolsón, colonia Pilquitrón», *Cabrera* 23064 & al. (LP). «parque nacional Nahuel Huapi, colonia Catedral», *Cabrera* 11498 pp. (LP). «colonia Otto», *Neumeyer* 323 (LP). «colonia Tronador», *Burkart* 26477 (SI); *Burkart* 26476 pp. & *Troncoso* (SI). «lago Mascardi», *Orfila* 606 (LPAG); *Orfila* 638 (LPAG); *Orfila* 713 (LPAG). «puerto Blest»,



Figs. 7-10. Geographic distribution of *Misodendrum*. 7) *M. quadriflorum*. 8) *M. brachystachyum*. 9) *M. oblongifolium*. 10) *M. linearifolium*

Orfila 706 (LPAG). «valle del Río Ouleuc», *Fabris 86 & Solbrig* (LP). **Chubut**: *Spegazzini* (LP). «Carrenleufú», *Spegazzini 17571* (LP). «lago Fontana», *Kozlowsky* (LP 21360). «lago General Paz», *Gerluig* (SI 20828). «lago General Vinter», *Orfila 640* (LPAG); *Orfila 698* (LPAG); *Orfila 703* (LPAG); *Orfila 704* (LPAG); *Orfila 753* (LPAG); *Orfila 754* (LPAG); *Orfila 759* (LPAG); *Orfila 763* (LPAG); *Orfila 764* (LPAG); *Orfila 765* (LPAG). **CHILE. Bio-Bio**: «Termas de Chillán», *MacHerboru* (SI 26772); *Cabrera 3627* (LP). **Araucanía**: «Cautín, volcán Llaima», *Werdermann 1218* (SI). **Los Lagos**: «Valdivia, cordillera Pelada», *Hollermayer 681* (LP).

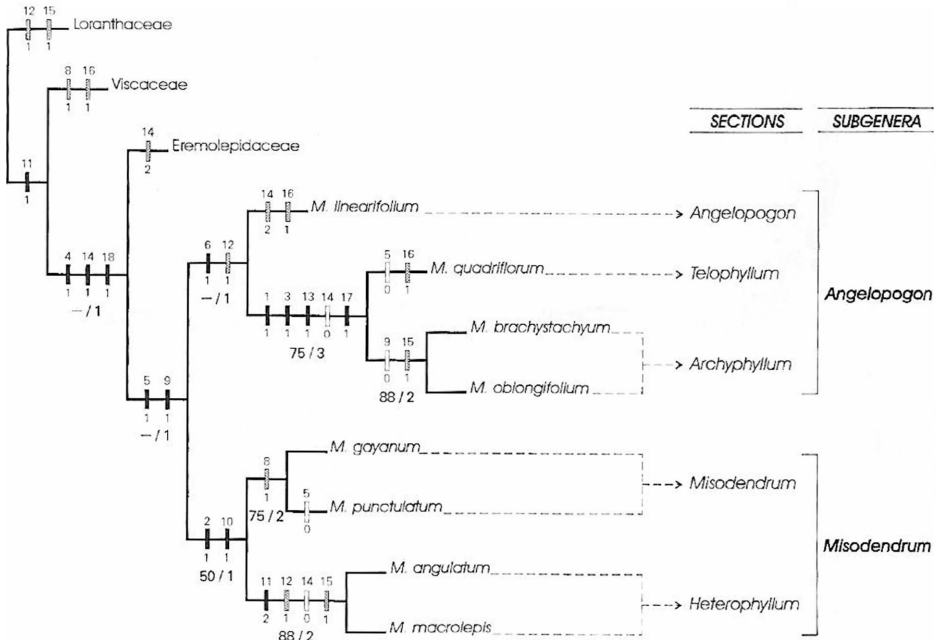


Fig. 11. Cladogram of *Misodendrum*. Character state changes are superimposed: solid black bars = synapomorphies; dotted bars = parallelisms; open bars = reversals

8 *Misodendrum linearifolium* DC., Prodr. 4: 12 (1830)

- ≡ *Angelopogon linearifolium* (DC.) Poepp. ex Tiegh., Bull. Soc. Bot. France 43: 558 (1896)
- = *Misodendron linearifolium* DC. var. *contractum* Skottsbl., Bot. Jahrb. Syst. 50: 390 (1913)
- ≡ *Misodendron contractum* (Skottsbl.) Orfila, Revista Fac. Agron. Univ. Nac. La Plata, ser. 2, 52(1-2) (1976)
- = *Misodendron densifolium* Orfila, Revista Fac. Agron. Univ. Nac. La Plata, ser. 2, 52(1-2): (1976)
- = *Misodendron reflexum* Orfila var. *reflexum* Orfila, Revista Fac. Agron. Univ. Nac. La Plata, ser. 2, 52(1-2): (1976)
- = *Misodendron reflexum* Orfila var. *brevisetaceum* Orfila, Revista Fac. Agron. Univ. Nac. La Plata, ser. 2, 52(1-2): (1976)

Plants pubescent. Stem cylindric, with a smooth or fissured-folded cortex. Leaves lineal, entire, sessile, ciliate. Floral buds over foliar buds; male flowers composed of compact spikes, each bracteole protecting 1 (2) flowers, stamens 3; basic female inflorescence composed of lax spikes, with 1(2) flowers in each bracteole, flowers alternate, sessile, stigma 3, ovary glabrous or pubescent. Aquene with straight bristles plumose up to the apex.

DISTRIBUTION. Widespread from Maule (Chile) to Tierra del Fuego (Argentina); fig. 10.

HOSTS PLANTS. *Nothofagus alpina*, *N. antarctica*, *N. dombeyi*, *N. obliqua*, and *N. pumilio*.

MATERIAL EXAMINED. **ARGENTINA.** Neuquén: *Spegazzini 17565* (LP). «Aluminé», *Maldonado 662* (LP). «Cañadón Seco», *Orfila* (LPAG). «colonia Bandurria, lago Lácar», *Gutiérrez 257 & Zavaro* (HAC); *Gutiérrez 258 & Zavaro* (HAC). «lago Hermoso», *Diem 3167* (SI). «lago Meliquina», *Birabén & Birabén 717* (LP). «parque nacional Lanín, lago Lolog», *Cabrera 19741* (LP). «parque nacional Nahuel Huapi», *Diem 799* (SI). «colonia Bayo», *Jones 111* (LP). «colonia Cortinario, puerto Manzano», *Diem 3064* (SI). «lago Trafal», *Birabén & Birabén 711* (LP). «valle del Pichi», *Boelcke 13634 & al.* (SI). «Villa La Angostura», *Fabris & Solbrig 1027* (LP); *Gutiérrez 178 & Zavaro* (HAC). «Pino Hachado», *Burkart 9697* (SI). «lago Aluminé», *Cabrera 19115 & Crisci* (LP). «Quetruhué», *Diem 92* (LP). «San Martín de los Andes», *Bridarolli 2075* (LP); *Dawson 1290* (LP); *Spegazzini 17561* (LP); *Diem 3174* (SI). «colonia Bandurria, lago Lácar», *Gutiérrez 260 & Zavaro* (HAC). **Río Negro:** «parque nacional Nahuel Huapi, Bariloche, colonia Runge», *Covas 6* (LP). «colonia Catedral», *Cabrera 11498 pp.* (LP). «colonia Otton», *Cabrera 5863* (LP); *Neumeyer 330* (LP). «colonia Tronador», *Ruhilis* (LP); *Correa* (SI 26779); *Burkart 26476 pp. & Troncoso* (SI). «lago Mascardi», *Orfila 540* (LPAG); *Orfila 632* (LPAG); *Orfila 635* (LPAG); *Orfila 636* (LPAG); *Orfila 639* (LPAG); *Gutiérrez 108 & Zavaro* (HAC); *Gutiérrez 121 & Zavaro* (HAC). **Chubut:** *Orfila* (LPAG). «Carrenleufú», *Illin* (LP). «Cordillera», *Bruneister* (LP). «laguna Blanca», *Spegazzini 17562* (LP); *Koslowsky 209* (SI). «Río Corcovado», *Illin 99* (SI). **Santa Cruz:** «colonia Fitz Roy», *Dimetri 10651* (LPAG). «lago Argentino», *Dimetri 1078* (LPAG); *Dimetri 10837* (LPAG); *Spegazzini 17568* (LP); *Hicken & Hauman 210* (SI). «lago Buenos Aires», *Greiner & Platen 119* (SI). «lago San Martín», *Hogberg 3* (SI). «Río Turbio», *Romero 63* (LP). **Tierra del Fuego:** «estancia Viamonte», *Goodall 546* (LP). «Lapataia», *Orfila 597* (LPAG); *Orfila 600* (LPAG); *Goodall 2422* (SI). «Río Grande», *Spegazzini 17569* (LP). «Ushuaia, estancia Harberton», *Goodall 752* (LP). **CHILE.** **Maule:** «colonia del Roble», *Looser 228* (SI). «Linares, Roblería, camino al Melano», *Ricardi 2767* (LP). **Bío-Bío:** «Chillán», *Beldfreund* (LP 33164, LP 33191). **Los Lagos:** «Valdivia, Puñire», *Hollermayer 355* (SI). «Quinchilca», *Hollermayer 239* (LP 53658, LP 53801). **Aisén:** «Los Mollines, Balmaceda», *Maldonado 60* (LP). **Magallanes:** «laguna Sofía», *Pisano 2813* (LPAG). «Punta Arenas», *Alboff* (LP 21361); *Hicken 136* (SI). «Miraflores», *Benove 87* (SI). «Sección Lazo, colonia Toro», *Pisano 4099* (LPAG). «seno Skyring, estancia Maria», *Riggi 26* (SI). «Última Esperanza, puerto Prat», *Hicken 134* (SI); *Hicken 135* (SI).

CLADISTIC ANALYSIS OF *MISODENDRUM*

The analysis yielded one cladogram (fig. 11) with 30 steps, a consistency index of 0.63, and a retention index of 0.72. The random search of 10,000 of all possible trees produced a highly-skewed ($g1 = -0.712$) frequency distribution of tree lengths, indicating considerable ($P < 0.01$) nonrandom structure in the data, HILLIS & HUELSENBECK (1992). In the cladogram, the following phylogenetic sequence results: (*Loranthaceae*, (*Viscaceae*, (*Eremolepidaceae*, ((*Misodendrum linearifolium*, (*M. quadriflorum*, (*M. brachystachyum*, *M. oblongifolia*))), (*M. gayanum*, *M. punctulatum*), (*M. angulatum*, *M. macrolepis*))))). Based on the cladogram, *Eremolepidaceae* are the sister group of *Misodendraceae*, supported by synapomorphies 4.1, 14.1, and 18.1.

Tree topology shows that there are two big monophyletic groups within *Misodendrum*, corresponding to the subgenera accepted by ROSSOW (1982, 1984). Subgenus *Misodendrum* is based on the warty cortex (2.1) and two stamens in the male flower (10.1). Two sections can be recognized within this subgenus: *Misodendrum punctulatum* and *M. gayanum* form section *Misodendrum*, based on scale-like bracts (8.1), and *Heterophyllum* (*M. macrolepis* and *M. angulatum*) is supported by the flower clusters in glomerules or umbellets in each bracteole (11.2), lax internodes (12.1), pedicellated flowers (15.1), and many flowers in each bracteole (14.0).

Concerning subgenus *Angelopogon*, *M. linearifolium* corresponds with section *Angelopogon*, the sister group of the remaining species, which are supported by stems

swollen at base (1.1), waxy incrustations (3.1), bracteoles in the floral axis (13.1), two flowers per bracteole (14.0), and apex of bristles in pistillate flowers incurved or claviform (17.1). In this group the clade formed by *M. brachystachyum* and *M. oblongifolium* corresponds to section *Archyphyllum*, which is the sister group of section *Telophyllum* (*M. quadriflorum*).

Several characters have been attained in a parallel mode. Lax internodes in the inflorescence (12.1) are shared between *Angelopogon* and *Heterophyllum*, pedicellated flowers (15.1) are shared between *Archyphyllum* and *Heterophyllum* and opposite female flowers (16.1) are present in *Telophyllum* and *Angelopogon*. Three characters reverse to their plesiomorphic state, e. g., flower buds placed under foliar buds (5.0) in *M. quadriflorum* and *M. punctulatum*, male flowers numerous in each bracteole (9.0) in *Archyphyllum*, and 4-6 female flowers in each bracteole (14.0) in *Heterophyllum* and *Thelophyllum-Archyphyllum*.

The cladogram allows the re-examination of the taxonomic placement of *Misodendrum* (*Misodendraceae*). CANDOLLE (1830) included *Misodendrum* in *Loranthaceae* s. l. (i. e., including *Viscaceae* and *Eremolepidaceae*). Both AGARDH (1858) and HIERONYMUS (1889) gave separate family status to the genus, considered by the latter to be intermediate between *Santalaceae* and *Loranthaceae*. *Viscaceae* was recognized as a family distinct from *Loranthaceae* by Bentham in BENTHAM & HOOKER (1880), and *Eremolepidaceae* was validated as a family by KUIJT (1968). Our results show that all these families are part of the same phylogenetic lineage, where *Eremolepidaceae* is the sister group of *Misodendraceae*. Recent research using a traditional approach has distinguished two subgenera and five sections, ORFILA (1978), ROSSOW (1982), in *Misodendrum*. Our analysis confirms these findings through transformation of characters sequence using a phylogenetic analysis.

Acknowledgements

We thank Susana Freire (LP), Pedro Pablo Herrera Oliver (HAC), Liliana Katinas (LP) and Lourdes Rico (K), for their useful comments on the manuscript, and Diego Gutiérrez and Hugo Calvetti for the drawings. Financial support for CAZ was provided by a fellowship from the Red Latinoamericana de Botánica (93-P2), and for JVC and JJM by National Geographic Society grant 4662-91, and the Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Argentina.

References

- AGARDH, J. G. (1858). *Theoria systematis plantarum*: 236-237.
- AGARWAL, S. (1963). Morphological and embryological studies in the family *Olacaceae*. 1, *Olox*. 52, *Strombosia*. *Phytomorphology* 13: 185-196, 348-356.
- BARLOW, B. A. (1964). Classification of the *Loranthaceae* and *Viscaceae*. *Proc. Linn. Soc. New South Wales* 2(89): 268-272.
- BENTHAM, G. & J. D. HOOKER (1880). *Genera plantarum*. 3: 206-230.
- CANDOLLE, A. P. DE (1830). Collection de mémoires: VI, Mémoire sur le famille *Loranthacées*: 12-14.
- CARLQUIST, S. (1985). Wood and stem anatomy of *Misodendraceae*: Systematic and ecological conclusions. *Brittonia* 37: 58-75.
- CRISCI, J. V., I. GAMUNDI & M. CABELLO (1988). A cladistic analysis of the genus *Cyttaria* (*Fungi-Ascomycotina*). *Cladistics* 4: 279-290.
- CRONQUIST, A. (1988) *The evolution of flowering plants*. Second ed. New York Botanical Garden, Bronx, New York.
- DONOGHUE, M. J., R. G. OLMSTEAD, J. F. SMITH & J. D. PALMER (1992). Phylogenetic relationships of *Dipsacales* based on rbcL sequences. *Ann. Missouri Bot. Gard.* 79: 333-345.

- ENGLER, A. (1897). *Mysodendraceae*. Nat. Pflanzenfam., Nachrichten II-IV: 140-141.
- ENGLER, A. (1914). *Mysodendraceae*. *Das Pflanzenreich* 4(68): 1-16.
- FARRIS, J. S. (1988). *Hennig86*. Version 1.5. Published by the author, Port Jefferson, New York.
- FARRIS, J. S. (1989). The retention index and rescaled consistency index. *Cladistics* 5: 417-419.
- FELSENSTEIN, J. (1985). Confidence limits of phylogenies: An approach using bootstrap. *Evolution* 39: 783-791.
- HIERONYMUS, J. (1889). *Mysodendraceae* In: ENGLER, *Pflanzenfamilien. Nachrichten* III. I: 198-202.
- HILLIS, D. M. (1991). *Discriminating between phylogenetic signal and random noise in DNA sequences*. In: M. M. MIYAMOTO & J. CRACRAFT (eds.), *Phylogenetic analysis of DNA sequences*. Oxford Univ. Press, New York, pp. 278-294.
- HILLIS, D. M. & J. P. HUELSENBECK (1992). Signal noise and reliability in molecular phylogenetic analyses. *J. Heredity* 83: 189-195.
- HOLMGREN, P. K., W. KEUKEN & E. K. SCHOFIELD (1990). Index herbariorum. Part 1. The herbaria of the world. Ed. 8. *Regnum Veg.* 120.
- HOOKER, J. D. (1847). *Flora antarctica* 1: 289-302.
- HUELSENBECK, J. P. (1991). Tree-length distribution skewness: an indicator of phylogenetic and information. *Systematic Zoology* 40: 257-270.
- HUMPHRIES, C. J., J. M. COX & E. S. NIELSEN (1986). *Nothofagus* and its parasites: A cladistic approach to coevolution. In: A. R. STONE & D. L. HAWKSWORTH (eds.) *Coevolution and systematics*. Clarendon Press, Oxford, pp. 55-76.
- KALLERSJÖ, M., J. S. FARRIS, A. G. KLUGE & C. BULT (1992). Skewness and permutation. *Cladistics* 8: 275-287.
- KLUGE, A. J. & J. S. FARRIS (1969). Quantitative phyletics and the evolution of anurans. *Systematic zoology* 18: 1-32.
- KUIJT, J. (1968). Mutual affinities of Santalalean families. *Brittonia* 20: 136-147.
- KUIJT, J. (1988). Monograph of *Eremolepidaceae*. *Syst. Bot. Monogr.* 18: 1-60.
- MAYER, M. S. & P. S. SOLTIS (1994). The evolution of serpentine endemics: A chloroplast DNA phylogeny of the *Streptanthus glandulosus* complex (*Cruciferae*). *Syst. Bot.* 19(4): 557-574.
- MISHLER, B. D., M. J. DONOGHUE & V. A. ALBERT (1991). *The decay index as a measure of relative robustness within a cladogram*. *Hennig X*. Toronto, Canada. (Abstract)
- MORRONE, J. J. (1994). Distributional patterns of species of *Rhytirrhini* (*Coleoptera: Curculionidae*) and the historical relationships of the Andean provinces. *Global Ecology and Biogeography Letters* 4: 188-194.
- MORRONE, J. J. (1996). The biogeographical Andean subregion: A proposal exemplified by Arthropod taxa (*Crustacea, Arachnida, and Hexapoda*). *Neotropica* 42(107-108): 103-114.
- NIXON, K. C. (1992). *CLADOS 1.1. IBM PC compatible character analysis program*. Documentation published by the author, Ithaca, New York.
- ORFILA, E. N. (1976). Sinopsis de las *Misodendraceae* de la Argentina y Chile. *Revista Fac. Agron. Univ. La Plata*, ser. 2, 52(1-2): 37-62.
- ORFILA, E. N. (1978). *Misodendraceae de la Argentina y Chile*. Fundación Elias y Ethel Malamud Bs. As. 1-73.
- PHILIPPI, F. F. (1865). *Catalogous plantarum vascularum chilensis*, 110, 1881. *Anales Univ. Chile* 27(3): 1-316.
- RAO, L. N. (1942). Studies in the *Santalaceae*. *Ann. Bot. London* 2(6): 151-175.
- ROSSOW, J. A. (1982). Sinopsis de las *Misodendraceae*. *Parodiana* 1(2): 245-270.
- ROSSOW, J. A. (1984). *Misodendraceae*. In: M. N. CORREA (ed.). *Flora Patagónica, parte IV*. Instituto Nacional de Tecnología Agropecuaria, Buenos Aires, pp. 43-52.
- RUIZ, E. N. (1974). Una nueva especie de *Misodendrum* (*Misodendraceae*). *Bol. Soc. Argentina Bot.* 16(1-2): 79-82.
- SKOTTSBERG, C. (1913). Bemerkungen zur Systematik der Gattung *Myzodendron*. *Bot. Jahrb.* 50(4):

384-391.

SPEGAZZINI, C. (1902). Nova addenda ad Floram patagonicam III. *Anales Mus. Nac. Hist. Nat. Buenos Aires* 7: 160-161.

SWOFFORD, D. L. (1991). Paup: *Phylogenetic Analysis Using Parsimony*. Version 3.0. Computer program distributed by the Illinois Natural History Survey, Champaign, Illinois.

TIEGHEM, M. PH. VAN (1895). Sur les genres *Basicarpus* g. n., *Stachyphyllum* g. n. et *Antidaphne* Poepp. et Endl. de la sous-famille des viscoïdées dans la famille loranthacées. *Bull. Soc. Bot. France* 42: 562-573.

TABLE I		
TWO MOST RECENT CLASSIFICATIONS OF THE GENUS <i>MISODENDRUM</i>		
Category	Orfila (1978)	Rossow (1982)
Genus	<i>Misodendrum</i> Banks ex DC.	<i>Misodendrum</i> Banks ex DC.
Subgenus	<i>Gymnophyton</i> Hooker	<i>Misodendrum</i> Banks ex DC.
Section	<i>Ephedranthus</i> Skottsbo. <i>M. gayanum</i> Tiegh. <i>M. punctulatum</i> var. <i>punctulatum</i> DC. <i>M. punctulatum</i> var. <i>subumbellatum</i> DC. <i>M. recurvum</i> Tiegh.	<i>Misodendrum</i> Banks ex DC. <i>M. gayanum</i> Tiegh. <i>M. punctulatum</i> DC. s. l.
Section	<i>Heterophyllum</i> Skottsbo. <i>M. angulatum</i> Phil. <i>M. macrolepis</i> Phil.	<i>Heterophyllum</i> Skottsbo. <i>M. angulatum</i> Phil. <i>M. macrolepis</i> Phil.
Subgenus	<i>Eumyzodendron</i> Hooker	<i>Angelopogon</i> (Tiegh.) Rossow
Section	<i>Angelopogon</i> (Tiegh.) Skottsbo. <i>M. linearifolium</i> DC. <i>M. contractum</i> (Skottsbo.) Orfila <i>M. densifolium</i> Orfila <i>M. reflexum</i> var. <i>reflexum</i> Orfila <i>M. reflexum</i> var. <i>brevisetaceum</i> Orfila	<i>Angelopogon</i> (Tiegh.) Skottsbo. <i>M. linearifolium</i> var. <i>linearifolium</i> DC. <i>M. linearifolium</i> var. <i>contractum</i> Skottsbo.
Section	<i>Archiphyllum</i> (Tiegh.) Skottsbo. <i>M. brachystachyum</i> DC. <i>M. oblongifolium</i> var. <i>oblongifolium</i> DC. <i>M. oblongifolium</i> var. <i>lilacinum</i> Orfila	<i>Archiphyllum</i> (Tiegh.) Skottsbo. <i>M. brachystachyum</i> DC. <i>M. oblongifolium</i> DC., s. l.
Section	<i>Telophyllum</i> (Tiegh.) Skottsbo. <i>M. quadriflorum</i> DC.	<i>Telophyllum</i> (Tiegh.) Skottsbo. <i>M. quadriflorum</i> DC.

TABLE II	
species of <i>Misodendrum</i> and their geographical distribution	
<i>Misodendrum</i> species	Geographical distribution
<i>M. angulatum</i> Phil.	Argentina and Chile, from Los Lagos to Magallanes
<i>M. brachystachyum</i> DC.	Argentina and Chile, from Los Lagos to Tierra del Fuego
<i>M. gayanum</i> Tiegh.	Argentina and Chile, from Los Lagos to Río Negro
<i>M. linearifolium</i> DC.	Argentina and Chile, from Bio-Bio to Tierra del Fuego
<i>M. macrolepis</i> Phil.	Chile, restricted to Los Lagos
<i>M. oblongifolium</i> DC.	Argentina and Chile, from Bio-Bio to Chubut
<i>M. punctulatum</i> Banks ex DC.	Argentina and Chile, from Araucanía to Tierra del Fuego
<i>M. quadriflorum</i> DC.	Argentina and Chile, from Neuquén to Tierra del Fuego

TABLE III																			
data matrix and character list for the cladistic analysis of <i>Misodendrum</i>																			
0) plesiomorphic; 1, 2) apomorphic; P) polymorphic; -) not applicable or unknown																			
Terminal taxa	Characters																		
<i>Loranthaceae</i>	P	0	0	0	0	0	P	P	0	-	0	0	1	0	-	1	0	-	0
<i>Viscaceae</i>	0	0	0	0	0	0	P	0	1	0	0	1	0	0	0	0	1	-	0
<i>Eremolepidaceae</i>	0	0	0	1	0	0	0	0	0	0	0	1	0	0	2	0	0	-	1
<i>M. angulatum</i>	0	1	0	1	1	0	0	0	1	1	2	1	0	0	1	0	0	1	
<i>M. brachystachyum</i>	1	0	1	1	1	1	0	0	0	0	1	1	1	0	1	0	1	1	
<i>M. gayanum</i>	0	1	0	1	1	0	0	1	1	1	1	0	0	1	0	0	0	1	
<i>M. linearifolium</i>	0	0	0	1	1	1	P	0	1	0	1	1	0	2	0	1	0	1	
<i>M. macrolepis</i>	0	1	0	1	1	0	0	0	1	1	2	1	0	0	1	0	-	1	
<i>M. oblongifolium</i>	1	0	1	1	1	1	0	0	0	0	1	1	1	0	1	0	1	1	
<i>M. punctulatum</i>	0	1	0	1	0	0	0	1	1	1	1	1	0	0	1	0	0	1	
<i>M. quadriflorum</i>	1	0	1	1	0	1	0	0	1	0	1	1	1	0	0	1	1	1	
Characters																			
1	Stem: (0) not swollen, (1) swollen																		
2	Cortex: (0) smooth or fissured-folded, (1) warty																		
3	Stem incrustations: (0) absent, (1) present																		
4	Leaves position: (0) opposite, (1) alternate																		
5	Position of floral buds in respect to foliar buds: (0) under, (1) over																		
6	Pubescence of flower shoots: (0) glabrate, (1) pubescent																		
7	Flowers: (0) unisexual, (1) hermaphrodite																		
8	Bracts: (0) foliose, (1) scale-like																		
9	Number of staminate flowers/bracteole: (0) three or more, (1) one or two																		
10	Number of stamens: (0) three or more, (1) two																		
11	Type of basic inflorescencia: (0) raceme, (1) spike, (2) spike of glomerules or umbellules																		
12	Inflorescence development: (0) compact, (1) lax																		
13	Position of bracteoles: (0) at base of flowers, (1) on the floral axis																		
14	Number of pistillate flowers/bracteole: (0) three or more, (1) two, (2) one																		
15	Pedicel of pistillate flowers: (0) absent, (1) present																		
16	Position of pistillate flowers on floral stem: (0) alternate, (1) opposite																		
17	Apex of bristles in pistillate flowers: (0) straight, (1) incurved or claviform																		
18	Stomata: (0) paracytic, (1) anomocytic																		