

DE SPECIEBUS VARIETATIBUSQUE *Desfontainia* COLOMBIANAE NOTAE

por

Richard Evans Schultes*

This brief and preliminary contribution is offered in recognition of the more than half a century of dedicated studies on the flora of Colombia by Dr. JOSE CUATRECASAS.

Resumen

Schultes, R.E. De speciebus varietatibusque *Desfontainia* — colombianae notae. Rev. Acad. Colomb. Cienc. 17 (65): 313-319, 1989. ISSN 0370-3908.

Se proporciona información taxonómica y etnobotánica sobre el género *Desfontainia*, se describen una nueva especie y dos variedades y se presenta una clave para diferenciar los taxa presentes en la flora de Colombia.

The genus *Desfontainia* has recently attracted ethnobotanical attention as the source of an hallucinogenic preparation employed by natives in two distant parts of South America: Chile and southern Colombia.

It has long been of taxonomic interest, as botanists have been uncertain as to its proper location in the phylogenetic systems. It has usually been placed in the Loganiaceae (Bentham, 1856; Bentham and Hooker, 1876). But it has been assigned to a number of other families: to a monotypic family, Desfontainiaceae (Endlicher, 1839); to the Aquifoliaceae (Meisner, 1840); to the Solanaceae (Humboldt and Bonpland, 1808); to the Gentianaceae (D. Don, 1831, 1839). Persoon collocated the genus (under a synonym, *Linka*) in the Desfontainiaceae (Persoon, 1805). Hallier suggested a relationship between *Desfontainia* and *Columellia* of the Columelliaceae (Hallier, 1911).

A number of modern taxonomists, while often expressing uncertainty or doubts about the placement of the genus, have indicated a belief that it should be assigned to the Loganiaceae. Solereder, who studied the morphology and anatomy of the related genera, maintained it in the Loganiaceae, although he expressed doubts (Solereder, 1875). Hutchinson expressed uncertainties concerning the relationships of *Desfontainia* but placed it in the Potaliaceae (Hutchinson, 1959, 1969). Airy-Shaw assigned it to the Potaliaceae (Willis, 1973).

In 1968, Cronquist wrote: "The small genus . . . with about five species is reported to lack internal phloem and has therefore sometimes been treated as a separate family. However, it is so much like the Loganiaceae in other respects that it is here included in that family" (Cronquist, 1968). Thirteen years later, the same author reiterated this opinion: "The Loganiaceae form a loosely knit family. Some authors recognise as many as five additional segregate families. The most distinctive of these is the Desfontainiaceae, consisting of the single genus *Desfontainia* (1-5 Andean and Costa Rican species)

* Botanical Museum, Harvard University 22 Divinity Ave. Cambridge, Mass. U.S.A.

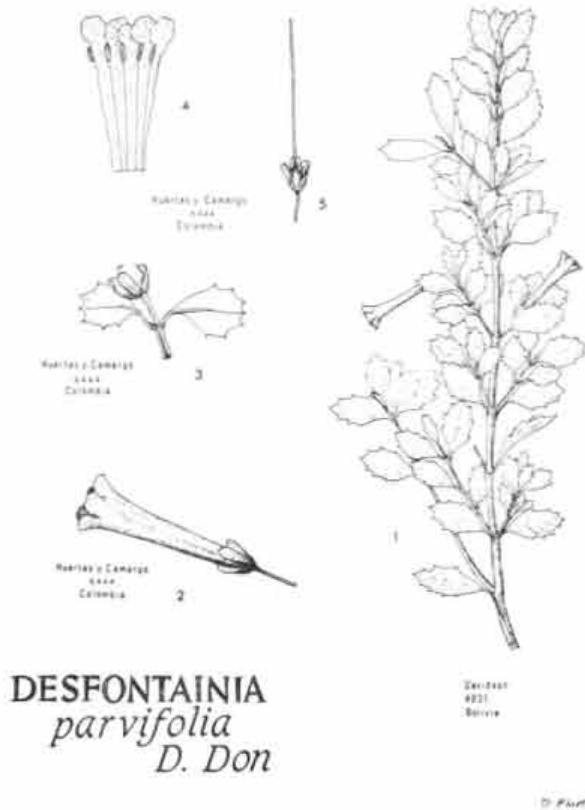
panied by scalariform or opposite intervacular pits. The anatomy certainly excluded an alliance with the Potaliaceae . . ." (Leeuwenberg, 1980).

He further quotes Punt that "palynology supports an affinity between *Columellia* and *Desfontainia*. The pollen grains of *Desfontainia* differ from all members of the Loganiaceae with the single exception of those of *Spigelia*, which is itself often placed in a separate family, the Spigeliaceae (Ertmann, 1943, 1968).

It should also be noted that the basic chromosome number ($2n = 14, x = 7$) distinguishes the Desfontainiaceae from the Loganiaceae (Leeuwenberg, 1980).

Chemotaxonomically, the tendency has been to place the genus in the Loganiaceae. This assignment of the genus is made probably on the basis of the general modern taxonomic treatment, since next to nothing was known at the time of the chemical constituents of *Desfontainia* (Hegnauer, 1966; Gibbs, 1974).

It may be of interest to note the changes in family position of the *Desfontainia* in Willis' *Dictionary of the Flowering Plants and Ferns* and in the *Syllabus der Pflanzenfamilien*. In Willis' *Dictionary . . .* (Ed. 3, 1908), the genus was allocated to the Loganiaceae with the admission that its posi-



DESFONTAINIA
parvifolia
D. Don

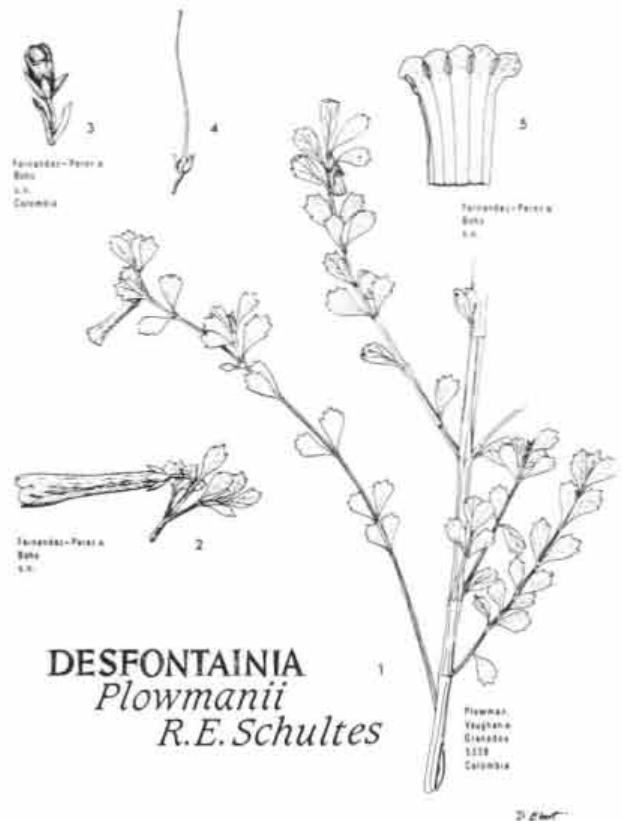
FIGURA No. 1

which lacks internal phloem and has spiny-toothed leaves and a five-locular ovary. I do not believe that their recognition as families facilitates understanding of the group" (Cronquist, 1981).

Reviewing the resemblance of several characters to the Fagraea, to the Retzieae and to *Potalia* and other genera of the Potaliaceae, Leeuwenberg resolved "to place the genus in the Loganiaceae in a separate tribe near the Potaliaceae and Retzieae. For this purpose, it is nomenclaturally sufficient to transfer the tribe Desfontainieae G. Don from the Gentianaceae to the Loganiaceae" (Leeuwenberg, 1969). This disposition he maintained in a later treatment (Leeuwenberg, 1980).

In his treatment of the flowering plants, Takhtajan maintained Desfontainiaceae as a distinct family in the Geraniales, noting, however, that the "relationships are not clear" (Takhtajan 1959, 1969).

On the basis of general anatomy, Metcalfe and Chalk included *Desfontainia* in the Loganiaceae (Metcalfe and Chalk, 1950). Leeuwenberg, however, maintained that the "wood anatomy . . . does not support accomodation of the genus in the Loganiaceae. The long scalariform perforations occur regularly in *Retzia*, occasionally in *Spigelia* and *Geniostoma*, but they are of a different type which is considered to be less primitive and are not accom-



DESFONTAINIA
Plowmanii
R.E.Schultes

FIGURA No. 2

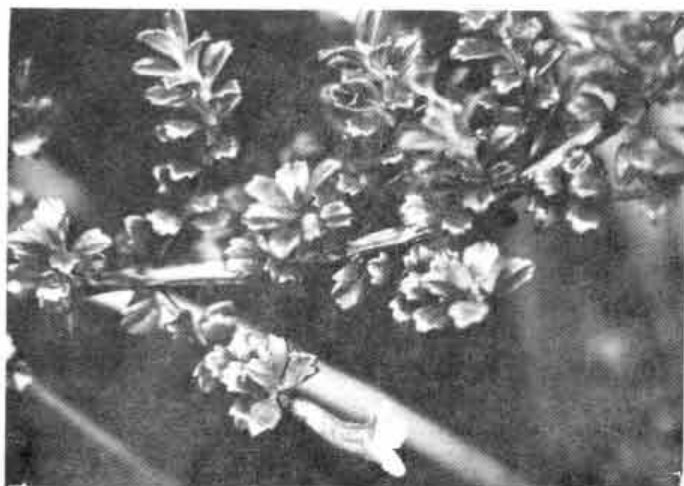


FIGURA No. 3

Desfontainia Plowmanii: the plant from which the collection Fernández-Pérez et Bohs sine num. was taken. Parque Nacional de Puracé, Cauca, Colombia. Photograph: L. Bohs.

tion was "doubtful". The sixth (1951), seventh (1966) and eighth (1973) editions have assigned it to the Potialiaceae. The *Syllabus* . . . placed *Desfontainia* in the Loganiaceae with uncertainty in the fourth (1904), fifth (1907), sixth (1909) and seventh (1912) editions. Edition nine-ten (1924) put the genus in the Desfontainiaceae. The twelfth edition (1964) kept it in Desfontainiaceae but remarked that its systematic position was unclear.

A survey of selected floras and manuals indicates continued uncertainty. Bailey's *Hortus* . . . , has consistently assigned *Desfontainia* to the Loganiaceae (Bailey, 1935, 1976). In 1891, Baillon included it in the Gentianaceae (Baillon, 1891). Pulle (1950); Lawrence (1951); Johnson (1931); Weberbauer (1945); and Muñoz (1966) have treated it as a member of the Desfontainiaceae. Macbride (1959) and Skottsberg (1916) have kept it in the Loganiaceae.

At the present time, I prefer to accept the genus as the only member of the Desfontainiaceae. It is obviously closely allied to the Loganiaceae, but the presence of internal phloem a character of the anatomy, the most conservative part of a plant-seems to be sufficiently significant to warrant its separation on a family level, notwithstanding the other more minor differences which, taken together, are also significant.

The specimens consulted in this synoptical study have been made available thanks to the authorities of the following herbaria: Arnold Arboretum-Gray Herbarium and Economic Herbarium of Oakes Ames, Harvard University, Cambridge, Massachusetts; Herbario Nacional Colombiano, Bogotá; British Museum (Natural History), London; Royal Botanic Gardens, Kew; Oxford University Herbarium, Oxford; Field Museum of Natural History, Chicago; Missouri Botanical Garden, St. Louis; United States National Herbarium, Washington, D.C.;

Herbario del Instituto del Museo de La Plata La Plata; Herbarium Jutlandicum, Botanisk Institut Aarhus, Denmark; Rijksmuseet, Stockholm.

II

Although the genus is regarded usually as comprising but two or three species, some eleven binomials have been described.

The type species, *Desfontainia spinosa* Ruiz et Pavón, was collected near Churupallano, Tarma, or between Muna and Pozuzo, Perú. The most recent treatment (Leeuwenberg, 1969) reduced all eleven concepts to synonymy under "a highly variable" *D. spinosa*, attributing the "variability" to altitudinal and ecological factors. It enumerated informally six "forms" (not recognizing them with Latin epithets) and a number of intermediates between these "forms", noting in summary that "the complexity of the variation is not yet completely described" by his enumeration.

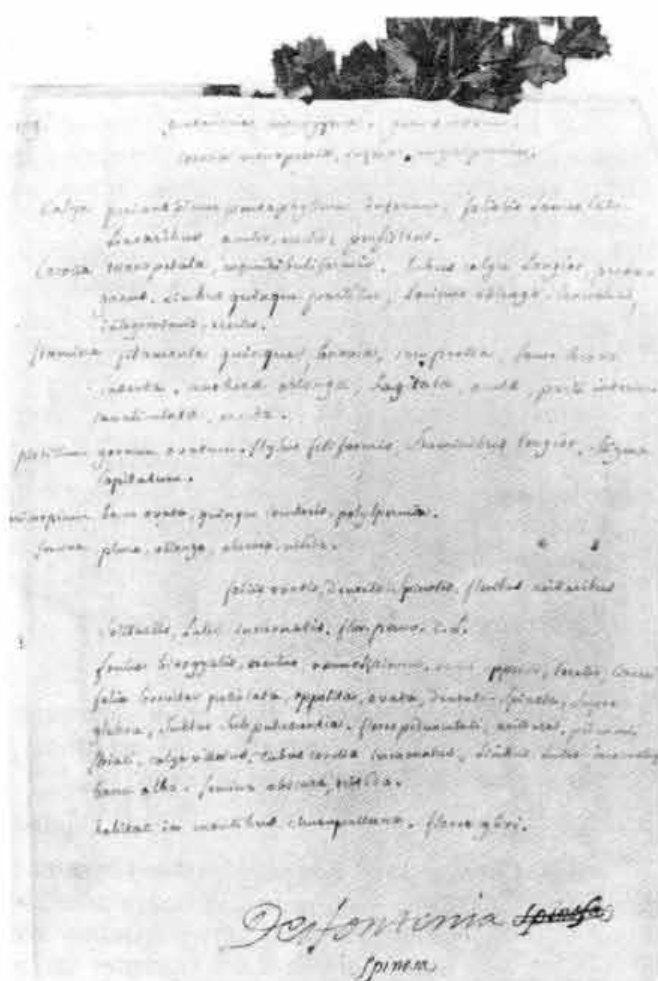


FIGURA No. 4

Ruiz's manuscript description of *Desfontainia spinosa*. Courtesy of the director of the Royal Botanical Garden of Madrid, Dr. Santiago Castroviejo.

III

It is not easy to procure data on the medicohallucinogenic use of *Desfontainia* in the Valley of Sibundoy in the Comisaría del Putumayo of Colombia. Whilst collecting in the high Páramo de Tambillo northeast of Sibundoy in 1942, one of my native assistants—son of a local shaman—volunteered the information that Kamsá Indian medicine men drank a tea of the leaves of *D. spinosa*, known locally as *borrachero de páramo*, “when they want to dream” (Voucher specimen: *Schultes et Smith 3127*). Later, in 1953, whilst collecting in the neighbouring Páramo de San Antonio, several natives informed me that medicine men take a decoction of the leaves “to see visions and diagnose illness”. One of the Indians stated that the tea causes the shamans to “go crazy” (Voucher specimen: *Schultes et Cabrera 18898*).

In view of these reports from Andean Colombia, it was of very special interest to read a report that local Mapuche Indians of Chile employ the leaves of “*Desfontainia spinosa* var. *Hookeri* Dunal” as a narcotic and stomachic (*Mariani, R., 1965*). It was further indicated that the plant is used as the source of a yellow dye in their textiles. The vernacular names of the shrub in Chile are *taique*, *chapico*, *mi-chai blanco* and *trau-trau*.

On the basis of the discovery of its use in Colombia and the report of its similar utilization in Chile, *Desfontainia* has been included in several books on hallucinogenic plants (*Schultes, 1976; Schultes, 1977; Schultes et Hofmann, 1973, 1979, 1980, Du Toit, 1977; Furst, 1972; Emboden, 1972, 1979*).

IV

In a preliminary study of *Desfontainia*, an undescribed species has been collected in Colombia. It is apparently endemic in the general region of Popayán in the Departamento del Cauca.

Specierum varietatumque Desfontainiae colombianae clavis

A. Folia magna (praeter varietatem *acutangula*); lamina maxima pro parte 3.5-7 cm longa.

B. Corollae lobi obscure indentati

D. spinosa

B.B. Corollae lobi non indentati sed subacuti.

C. Folia elongato-elliptica, usualiter grosse dentata, basi generaliter cuneata; lamina 3.5-6 (rarenter usque ad 8) cm longa. Corollae lobi maturitate subpatentes

D. spinosa var. *chilensis*

CC. Folia usualiter in ambitu rhombica, acute dentata, basi plerumque late

cuneata; lamina maxima pro parte 1.5-2 cm longa. Corollae lobi maturitate erecti

D. spinosa var. *acutangula*

AA. Folia parva; lamina maxima pro parte 1-2 cm longa.

D. Folia plus minusque triangulares, base longe acuminata, margine integra sed apicem versus tantum laeviter denticulata, 8-10 mm longa. Corollae lobis rotundatis, laeviter fassis, maturitate vix subpatentibus vel erectis. Stamina filamentis quam corollam aequilongis.

D. Plowmanii

DD. Folia plerumque elliptica, margine fere omnino denticulata, 20-30 mm longa. Corollae lobis inaequaliter, usualiter valde patentibus, profunde fassis. Stamina filamentis brevioribus.

D. parvifolia

A preliminary survey of the genus indicates that three species and two varieties have been collected in the Republic of Colombia.

All of the Colombian species and varieties of *Desfontainia* are found in highland environments in the neighbourhood of 3000 to 3800 m.

Desfontainia parvifolia D. Don in Edinburgh Phil. Journ. (July-Sept. 1831) 275. Fig. 1

This species occurs from Colombia and Ecuador south to Peru, Argentina and Bolivia.

COLOMBIA: Departamento de Boyacá, Vado Hondo, *Cleef 9240*; Peña de Arnical, *Cleef 9420*. Departamento de Risaralda, Santuario Macizo de Tamana, *Torres, Rangel et al. 1550, 1628, 1672, 1718*. Departamento del Chocó, Cerro Ventanas, Macizo de Tamañá, *Torres, Rangel et al 1894*. Departamento de Cundinamarca, Carupa, Peña de Sumanga, *Uribe 5923*; Fomeque, Chingaza, *Huertas et Camarago 6444*; Fomeque, Chingaza, *Hirschel sine num, 6052*; Fomeque, Parque Nacional de Chingaza, *Franco et Rangel 20, 24*. Departamento de Caldas, Termales, Nevado del Ruiz, *Cuatrecasas 9216*. Departamento de Santander, Río Susa, camino de Hato Viejo a la Figuera, *Jaramillo et van der Hamen 4387*. Departamento del Cauca, cabeceras del Río Palo, Alto del Duende, *Cuatrecasas 18847*. Departamento del Tolima, Cordillera Central, Alto del Condor, *Cuatrecasas 2765*. Departamento de Nariño, Volcán de Pasto, *Jameson 412*.

Desfontainia plowmanii R.E. Schultes, sp. nov.

Figs. 2-3

Arbuscula scandens debilisque, usque ad 3.5 ped. alta. Caules ramique flexiles, cortice brunneo et glabro, nodis annulatis; ramulorum internodiis

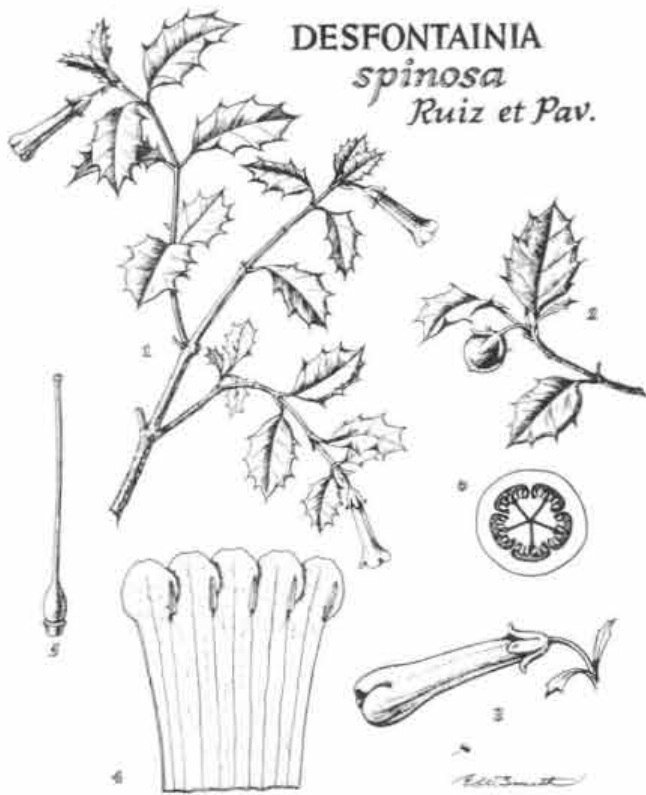


FIGURA No. 5

plerumque 3.5-5.5 longis. Folia opposita, subcoriacea, supra nitida, obovata, basi generaliter cuneata, apice subtruncata atque plus minusve 3- (vel rarer 4-) denticulata sed margine saepissime integrilamina usualiter 8-10 mm longa, 5-7 mm lata, nervio centrale infra valde conspicua. Flores apparenter solitares atque nutantes, 2.5-4 cm longi (plerumque 2.8 cm); corollae tubo cylindrico sed apicem versus vix dilatatio, sanguineo, 1-8 cm longo, 4-6 mm in diametro et cum limbo flavescente, 13-14 mm lato; pedicello brunneo 5-8 mm longo, calyx viridis, profunde 5-fidus, lobis membranaceis, lanceolatis, acutis, tubi ad apicem insertis; antherae introrsae, elongato-triangulares, basifixae, basi cordatae, plerumque 4 mm longae, apice acuti, 25 mm longi, basi 1.5 mm lati; corollae lobis apice valde rotundatis sed saepe inconspicue mucromuculatis 4-6 mm longis, 6 mm latis. Stamina non exserta; filamentis brevissimis. Pistillum 3 cm longum; stigma parvo, nigro. Fructus adhuc ignotae.

Desfontainia plowmanii is dedicated to the late Dr. Timothy C. Plowman, a most active, dedicated and discerning taxonomist and ethnobotanist of the present century. His collections in the Andean and Amazon regions of South America have materially advanced our understanding of the floras of these areas.

The species appears to be most closely allied to *Desfontainia pulchra* Moldenke, known only from moist forests at the base of the Páramo de Tamá in the Venezuelan State of Tachira on the Co-

lombian border. The most obvious differences are found in the leaves, which in both species are unusually small for the genus: whereas the leaves of *D. plowmanii* are strongly cuneate and rhombic with only two or rarely four very minute "teeth" at the top, those of *D. pulchra* are elongate-elliptic and usually devoid of any terminal teeth but with a pronounced mucronation or, at most, several slight indentations. *Desfontainia plowmanii* has, furthermore, a somewhat smaller flower and calyx lobes which are elongate-triangular instead of elongate-elliptic and flowers which tend to be larger than those of *D. pulchra*.

Typus: COLOMBIA: Departamento del Cauca, Parque Nacional de Puracé, road from Puracé to La Plata, alt. 3300 m. "Scandent shrub in moist dense thickets. Corolla tube red, limb pale yellow" January 28, 1976. Timothy C. Plowman, Duncan Vaughan et H. Granados 5338. Holotypus Gray; Isotypi, Col.

Specimina altera: Volcán de Puracé, Barclay et Schultes 157; Páramo de las Papas, Idrobo et Barclay 4090; Idrobo, Pinto et Bischler sine num.; between El Boquerón and Cerro de los Remedios, Fer-

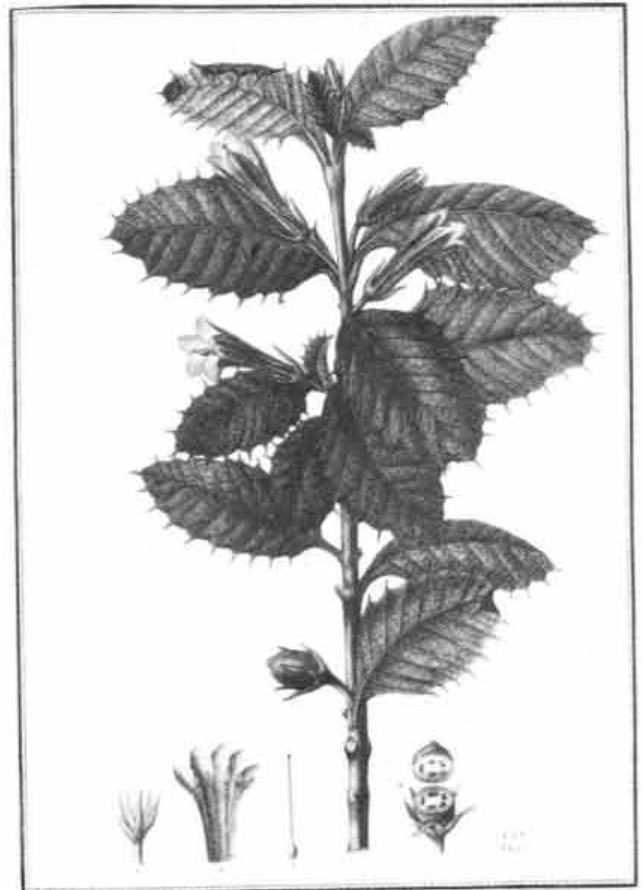


FIGURA No. 6

The original illustration of *Desfontainia spinosa* Ruiz et Pavón, published with the description of the species.

nández-Pérez et Bohs sine num.; páramo, Parque Nacional de Puracé, *Uribe 5923*; Parque de Puracé, Laguna San Rafael, *Lozano, Rangel et al. 4669*; Parque del Nevado de Huila, *Rangel, Sturm et Rodríguez 1471*.

Desfontainia spinosa Ruiz et Pavón. Fl. Peruv. Chil. 2 (1799) 47, t. 186.

Desfontainia spinosa is found in highlands from Costa Rica south to Chile and Argentina.

COLOMBIA. Departamento del Tolima, Mt. Quindío, *Bonpland 2060*; Departamento de Cundinamarca, between San Miguel and La Aguadita; *Humbert, Idrobo et al 26941*; Peñón Sibaté, *Popeño 1113*; Alto de Las Cruces, *Ruiz S. sine num*; Fusagasugá, *Triana 3875*. Departamento del Cauca, between Pital and Popayán, *Luteyn, Dumont et al 4977*; Río López, Tierra Adentro, *Pittier 1082*. Departamento del Valle, Abelina, *Core 1652*. Departamento de Nariño, Pasto *Jameson 472N*: Bosque Botana, *Soejarto 979*; Almaguer, *Triana 2319*. Comisaría del Putumayo, between La Cocha and San Francisco, *Fernández P. 7125*; Laguna de La Cocha, *Gentry, Benavides et al. 30394*; Páramo de Tambillo, *Schultes et Smith 3127*; Páramo de San Antonio, *Schultes et Cabrera 18898*; Laguna de La Cocha, *Espinell 966*; Locality data lacking or insufficient, "Cordillera Oriental, Páramo de San Fortunato", *Goudot sine num*; *Lobb 79*; *Mutis 71*; 2790; "New Granada", *Purdie sine num*.

DESFONTAINIA

spinosa Ruiz et Pav.
var. acutangula (Dun.)

R. E. Schultes

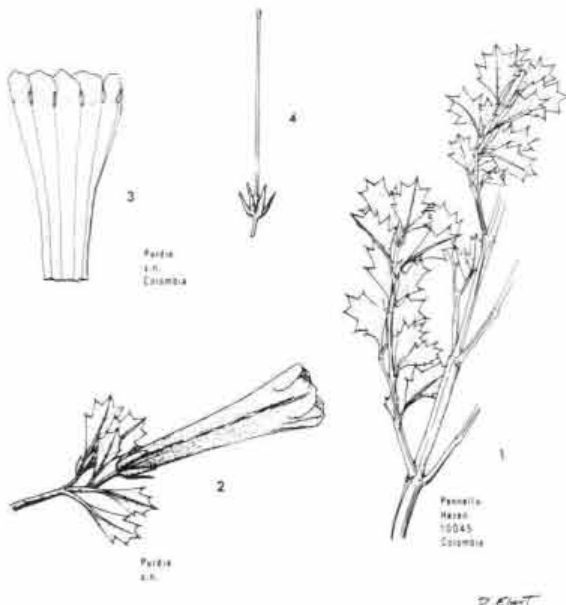


FIGURA No. 7

Desfontainia spinosa var. *acutangula* (Dun.) R. E. Schultes var. nov.

D. acutangula Dunal in DeCandolle, Prodr. 13 (1852) 675.

A Desfontainia spinosa principaliter foliis minoribus, margine usualiter acute dentatis, corollae lobis erectis differt.

This variety is known only from Colombia.

Typus: COLOMBIA: Departamento de Huila, Santa María, *Camargo 7241*. (COL.).

Paratypi: Departamento de Tolima, Mariquita, Linden 944; Departamento de Caldas, Páramo de Quindío, *Pennell et Hazen 10045*.

Desfontainia spinosa Ruiz et Pavón var. *chilensis* (C. Gay) Reiche, Fl. Chile. 6 (1911) 100.

D. chilensis C. Gay., Fl. Chilena 5 (1981) 100.

A Desfontainia spinosa principaliter foliis grosse dentatis, basi usualiter late cuneatis, lamina plerumque 1.5-2 cm longa; corollae lobis plus minusve submucronulatis, in maturitate erectis differt.

This variety is found in the floras of Colombia, Peru, Chile, Ecuador and probably Argentina.

COLOMBIA: Departamento del Valle, Los Farrallones, Alto de Buey. *Cuatrecasas 18097*. (COL.).

Desfontainia pulchra Moldenke in Phytologia 2 (1947) 216.

Inasmuch as *Desfontainia pulchra* has been collected on the Páramo de Tamá, which is located exactly on the boundary between Venezuela and Colombia (part of the páramo lies in each country), it is probable that this species occurs also in Colombia.

VENEZUELA: Estado de Táchira, Páramo de Tamá, above Betania *Steyermark 57344*

REFERENCES

- BAYLEY, L.H. and E.Z. BAILEY. 1935. *Hortus*. Macmillan Co., New York.
- BAILLON, H. 1891. *Histoire des Plantes*. Libraire Hachette & Cía., Paris 10:124.
- BENTHAM, G. 1856. *Journ. Linn. Soc.* 1: 97.
- BENTHAM, G. and J.D. HOOKER. 1876. *Genera Plantarum*. L. Reeve & Co., London 2: 794.
- CRONQUIST, A. 1968. *The Evolution and Classification of Flowering Plants*. Houghton Mifflin, Boston.

- 1981. *Ann Integral System of Classification of Flowering Plants*. Columbia Univ. Press, New York.
- DON, D. 1977. *Edinburgh New Philosoph. Journ.* 11 (1831) 274-276. du Toit, B.M. Ed. *Drugs, Rituals and Altered States of Consciousness*. A.A. Balkema, Rotterdam.
- EMBODEN, W.A., 1979. Jr. *Narcotic Plants*. Macmillan Co., New York. Ed. 1 (1972); Ed. 2.
- FURST, PETER, T. 1972. *Flesh of the Gods: the Ritual Use of Hallucinogens*. Praeger Publishers, New York.
- GIBBS, R.D. 1974. *Chemotaxonomy of Flowering Plants*. McGill-Queens 3.
- HALLIER, H. 1910. *Meddel. Rijksherb.*, Leiden 28.
- HEGNAUER T. *Chemotaxonomie der Pflanzen*.
- HUMBOLDT, A. and A. BONPLAND. 1808. *Planta, Lutetina Parisiorum* 1.
- HUTCHINSON, J. 1959. *The Families of flowering Plants*. Oxford, Clarendon Press Ed. 2.
- 1969. *Evolution and Phylogeny of flowering Plants*. Academic Press, London.
- JOHNSON, A.M. 1931. *Taxonomy of the Flowering Plants*. Century Co., New York 484.
- LAWRENCE, A.M. 1951. *Taxonomy of Vascular Plants*. Macmillan Co., New York 667.
- LEEUWENBERG, A.J.M. 1969. "Notes on American Loganiaceae IV. Revision of *Desfontainia* Ruiz et Pav". *Acta. Bot. Neerl.* 18. 669-679.
- 1980. in *Die Natürlichen Pflanzenfamilien*. 28b, I.
- MACBRIDE, J.F. 1959. *Flora of Peru*. Field Mus. Nat. Hist., Bot. 13, pt. 5, no. 2: 249-251.
- MARIANI R., C. 1965. *Temas de Hipnosis*. Editorial Andrés Bello, Santiago, Chile 362-363, t. 23.
- MEISNER, C.F. 1839. *Genera Plantarum*. Librariae Weidmannia, Leipzig 1: 252.
- METCALFE, C.R. and L. CHALK. 1950. *Anatomy of the Dicotyledons*. Oxford Univ. Press, London 2.
- MUÑOZ, P.C. 1959. *Sinopsis de la Flora Chilena*. Ediciones Universidad de Chile, Santiago, Chile 124-125.
- 1966. *Flores Silvestres de Chile*. Ediciones Universidad de Chile, Santiago 207-208, t. 42.
- PERSOON, C.H. 1805. *Synopsis Plantarum*. Carol. Frid. Cramerum, Paris 219.
- PULLE, A.A. *Compendium van de Term Nomenclatur en Systematik der Zaadplanten*, N.V.A. Oosthoek Uitgevers.
- SCHULTES, R.E. 1976. *Hallucinogenic Plants*. Golden Press, New York 150-151.
- 1977. "De plantis toxicariis e Mundo Novo tropicale commentationes. XIV. *Desfontainia*, a new Andean hallucinogen". *Bot. Mus. Leafl.*, Harvard Univ. 25: 99-104.
- 1981. *Einführung in der Botanik der wichtigsten psychotropen Pflanzen*" in G. Volker (Ed.) *Rausch und Realität-Drogen im Kulturvergleichen*. Rautenstrauch-Joest-Museums für Völkerkunde, Cologne 28-41.
- SCHULTES, R.E. and A. HOFMANN. 1973. *Plants of the Gods: Origins of Hallucinogenic Use*. McGraw Hill Book Co., New York (1979).
- 1973. *The Botany and Chemistry of Hallucinogens*. Charles C. Thomas, Publishers, Springfield, III. Ed. 1 219; Ed. 2 (1980) 230-233.
- SKOTTSBERG, C. 1916. *Kungl. Svensk. Vetenskaps. Handl.* 56. no. 5: 287.
- SOLEREDER, H. 1875. in *Die Natürlichen Pflanzenfamilien*. IV. Teil, Abt.: 2 49-50.
- TAKHTAJAN, A. 1959. *Die Evolution der Angiosperm*. Gustav Fischer Verlag, Jena.
- 1969. TRANSL. C. JEFFREY *Flowering Plants: Origin and Dispersal*. Smithsonian Institution Press, Washington, D. C. 230.
- WEBERBAUER, A. 1945. *El Mundo Vegetal de los Andes Peruanos*. Estación Experimental Agrícola La Molina, Lima.