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USE, COLLECTION, COMMERCIALIZATION, AND VULNERABILITY OF TWO SPECIES OF THE GENUS *ORITROPHIUM* (*O. venezuelense* and *O. peruvianum*, COMPOSITAE) IN THE VENEZUELAN ANDES

Anairamiz ARANGUREN*, N. Johnny MARQUEZ*, Roberto PRATO, Yves LESENFANTS****

** Instituto de Ciencias Ecológicas (ICE), Universidad de Los Andes, Facultad de Ciencias, Núcleo Universitario Pedro Rincón Gutiérrez La Hechicera, Mérida - Venezuela*

*** Programa Andes Tropicales, Mérida - Venezuela*

RESUMEN

El trabajo aborda los siguientes puntos: recopilación de información básica documental sobre las especies de *Oritrophium* descritas para Venezuela; recopilación de información sobre los mecanismos de comercialización; recopilación a nivel de comunidades campesinas de información sobre la colecta de estas especies; verificación *in situ* del estado de las poblaciones de *Oritrophium* en una serie de localidades seleccionadas; y caracterización del hábitat y requerimientos de las especies estudiadas.

Se encontró que *O. peruvianum* se conoce y colecta en comunidades de montaña para consumo doméstico y cierto volumen se comercializa. Es difícil estimar el volumen y valor de esta comercialización, a la luz de la evidencia recabada, de allí que no es posible concluir sobre el impacto de ésta sobre las poblaciones silvestres.

Palabras clave: *Oritrophium*, Compositae, uso, comercialización, vulnerabilidad, páramo, etnobotánica, Andes, Venezuela.

ABSTRACT

This document was focused on: the compilation of basic documentary information about the species of *Oritrophium* described in Venezuela; information about the species known as frailejón morado, and the mechanisms of its commercialization; information about its collection in the Andean Páramo by local people; verification *in situ* of the state of these species in a series of selected locations; and characterization of the habitat and requirements of frailejón morado.

In the light of the information collected, frailejón morado corresponds only to *Oritrophium peruvianum*, but not to *O. venezuelense*. *O. peruvianum* is known and collected in mountain communities; part of the gathered material is kept for domestic use and a certain volume for regional commercialization.

Keywords: *Oritrophium*, Compositae, use, commercialization, vulnerability, páramo, ethnobotany, Andes, Venezuela.

INTRODUCTION

The *Oritrophium* Project is a conservation research effort falling within the Subprogram for Resource Management of Biodiversity of the Tropical Andes Program. The objective of the program is to promote a plan for ecological and socially viable development in the Venezuelan Andes. Based on this, the research about aspects of the use and vulnerability of species traditionally used in popular medicine arouses great interest as the base for strategies for its conservation and eventual use in productive activities which could strengthen the local economy. The pilot area of the Subprogram for Resource Management of Biodiversity of the Tropical Andes Program is the Páramo de Piedras Blancas Biological Reserve, in the Sierra del Norte or La Culata (Fig. 1). It is in this reserve, neighboring zones, and rural communities located in its area of influence where the *Oritrophium* Project is centered.

The genus *Oritrophium* consists of 17 species of plants of the Andean páramos and highlands of Guayana. In Venezuela, there are eight species, four of which are endemic. Of these eight species, *O. peruvianum* and *O. venezuelense* apparently had a relationship to a traditional medicinal use in the Andes called the frailejón morado. This is a species with a limited habitat, found in small populations, and also subject to collection by residents of the region for its medicinal benefits. Its use has been reported as a treatment for certain respiratory and gastrointestinal problems.

The objectives were:

- Compile information about the diversity and geographic distribution of the species of *Oritrophium* in Venezuela starting with data coming from reference herbaria, documentary information, and contacts with specialists. This objective responds to the necessity of establishing how many species of this genus are present in the country, if details of their ecology have been well studied and, in general, what are their habitats. At the same time, contacts were established in academic and scientific circles to provide assistance for the current project as well as eventual continuation of the research.

- Establish which species of *Oritrophium* correspond to the plant known as frailejón morado. Once this point was established, compile information about the commercialization of the frailejón morado on the national and regional level, verifying if it is the endemic species being marketed. The objective responds to the need to know if a network of commercialization exists capable of exercising significant pressure on the wild populations. It would likewise serve to estimate if a potential market exists, where the product could be placed with eventual controlled reproduction, or if the production of homemade medicinal preparations is based on the frailejón morado by local microcompanies.

- Compilation of information about the collection and use of the one or more species corresponding to the name frailejón morado identified as a com-

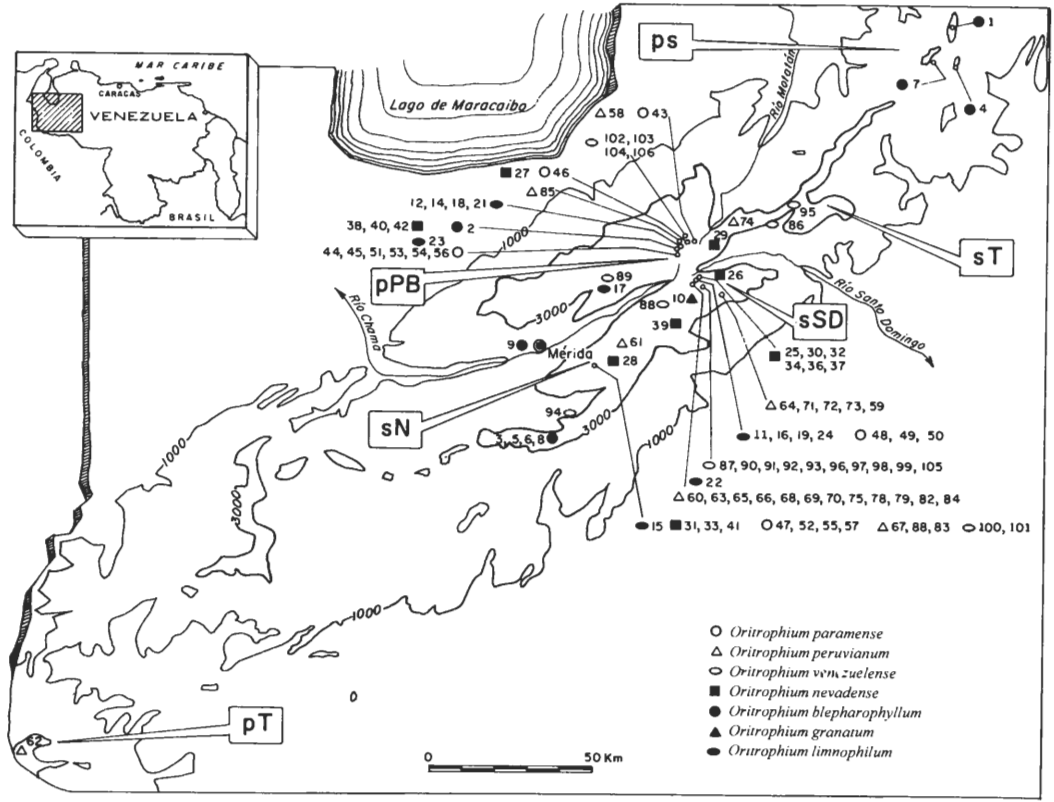

Fig. 1. Distribution of *Oritrophium* in the Venezuelan Andes according to the specimens deposited in some Venezuelan herbaria. The numbers refer to specimens deposited in herbaria cited in Table 1 **ps:** Northern páramos (Guache, Cendé, Jabón, Las Rosas, Tumal); **sT:** Serranías de Trujillo (ramal de Calderas, Niquitao, Tuñame); **sSD:** Sierra de Santo Domingo, Mucubají area, **pPB:** Páramo de Piedras Blancas; **sN:** Sierra Nevada de Mérida (Pico Bolívar zone); **pT:** Páramo de Tamá.

mercial product, at the level of rural communities of the páramo in the area of influence of the Páramo de Piedras Blancas Biological Reserve. The aim of this was to estimate its areas of origin, the possible disappearance or reduction of the populations, the role of the gathering of these plants on the family economy, its volume, and the form of marketing it, as well as forms of use of the frailejón morado in popular medicine of the páramo residents.

- Verification *in situ* of the state of the populations of the species referred to as frailejón morado in the usual areas of collection.
- Undertake a preliminary characterization of the habitat and requirements of the species referred to as frailejón morado in order to establish the bases for eventual controlled reproduction. This is for the purpose of counteracting possible pressure on wild populations.

METHODOLOGY

Compilation of information related to the diversity and geographic distribution of the species of *Oritrophium* in Venezuela

This compilation was realized by consulting the registration cards and collections of the herbaria of Caracas and Mérida. Additionally, documentary information was checked in different specialized libraries and data bases. Venezuelan researchers involved in the study of plant ecology in the Andean páramos were also contacted.

Collection of information related to the commercialization of the species of frailejón morado

To gather information about the commercialization of the species, three popular markets in the city of Caracas were visited: Quinta Crespo, San Martín, and El Cementerio. Five retail outlets for plants were also visited on Av. Baralt in Caracas. Personnel in charge of these establishments were interviewed.

In the city of Mérida the following markets were visited: the Principal Market, Soto Rosa open market, Periférico Market, Tatuy Mini-Market, the market of the town of Ejido, and ambulatory herb vendors. In these locations, information was obtained through a commercialization survey. The data was gathered through interviews with owners or the people in charge of the establishments. Information was collected about the source, form of collection, characteristics for recognizing it, form of use, and prices.

The method of the personal interview confronted a reserved attitude on the part of the merchants with respect to details about their business, with fear of competitors and possibilities of reprisals by the authorities.

Gathering of information about the collection and use of the species frailejón morado, at the level of rural communities

This compilation is based on two surveys undertaken among local informants, residents in distinct rural communities. The first is the ethnobotanical data card elaborated by Lacruz (1989) in Barro Negro, a rural community in the Sierra de La Culata in the Páramo de Piedras Blancas. The Ethnobotanical Record of Barro Negro (ERBN) consists of 11 questions directed toward providing the following information: (i) destination of the extraction: for the family, commercialization, or both; (ii) type of use and form of preparation; (iii) part of the plant used; (iv) quantity, season, and frequency of collection; (v) zones of collection; and (vi) knowledge of the informant about the habitat and density of the species.

The second survey, which we call the Expanded Ethnobotanical Survey (EES), was prepared using the same interrogators and was complemented with questions directed toward establishing the taxonomic identity of the plant known as frailejón morado, a point which had not been established to date. This was also complemented with questions about whether the populations of the species of *Oritrophium* had been reduced or had disappeared from overcollection. Observations in the communities had provided some elements pointing in this direction.

This survey was conducted among 52 families, distributed in four rural communities within the area of influence of the Páramo de Piedras Blancas Biological Reserve. These communities are: La Toma Alta, Mitivivó, Misintá, Cañada de Las González, and Valle del Campanario (Fig. 2).

Verification *in situ* of the state of the populations of frailejón morado in the usual areas of collection of the Sierra del Norte or Sierra de La Culata

Based on the data obtained from the interviews with collectors and merchants dealing with frailejón morado, and with the help of people knowledgeable about the region, the very probable principal areas of origin of *Oritrophium* were identified: extensions of the base of valleys over 3000 m asl and exposed to flooding. This identification oriented the operations of verification *in situ* toward specific locations in the zone of influence of the Páramo de Piedras Blancas Biological Reserve.

Realization of the preliminary characterization of the habitat and requirements of the frailejón morado, with the aim of establishing the bases for eventual controlled reproduction

The preliminary determination of the habitat and requirements of the frailejón morado was based on documented research, contacts with specialists, data provided by local informants, and verification *in situ*.

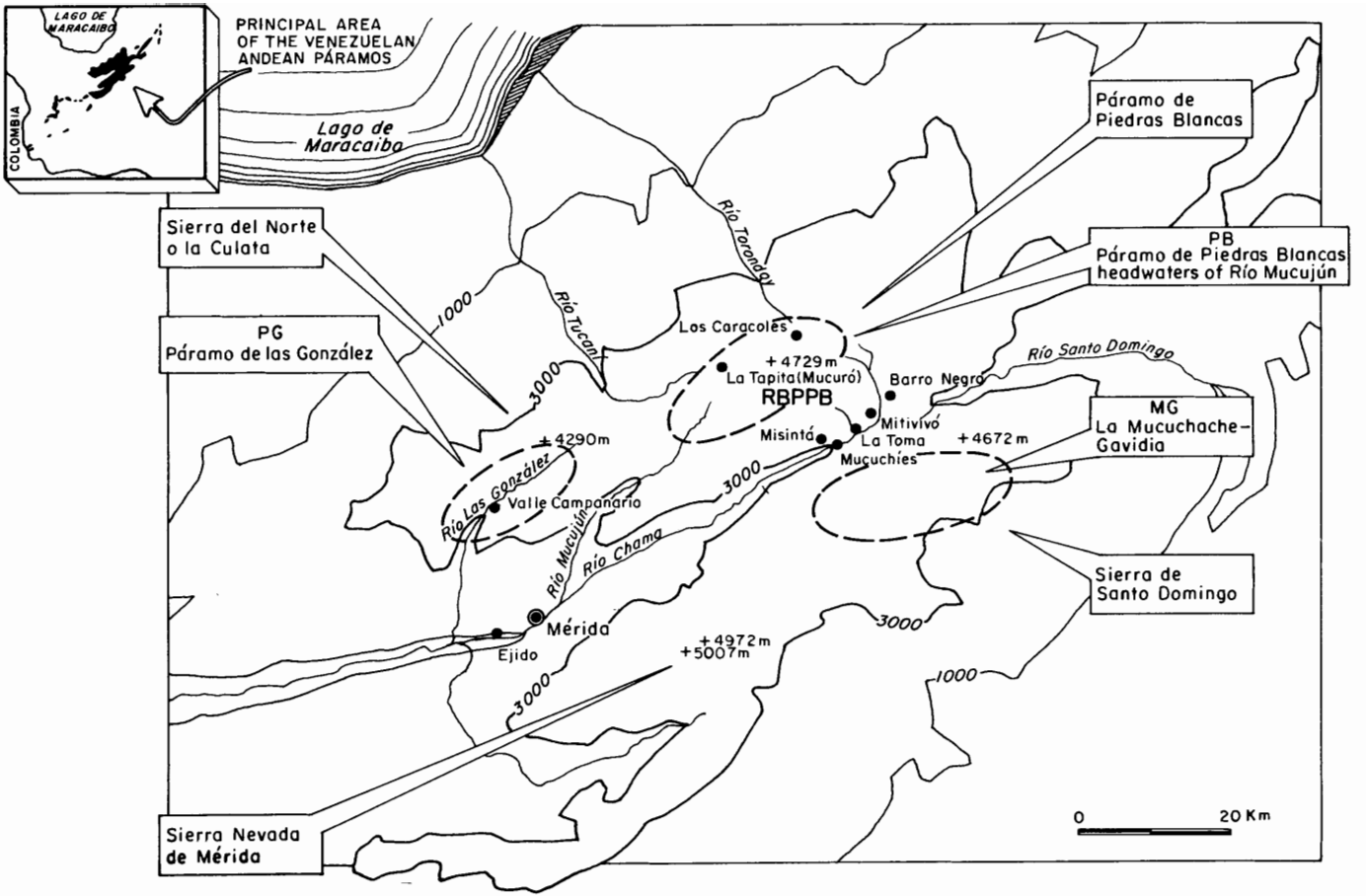

Fig. 2. Principal areas of high occurrence of *Oritrophium* in the nucleus of the Venezuelan Andean Páramos. Locations reached through field reconnaissance.

RESULTS

Distribution of the species of the genus *Oritrophium*

The genus *Oritrophium* (Kunth) Cuatrec. consists of 17 species of rosellate and sessile plants, frequent in meadows, preferably grassy, of the Andean páramos (Cuatrecasas 1979). In Venezuela there are eight species (four endemic), in Colombia five species (two endemic), in Ecuador five species (two endemic), in Peru six species, in Bolivia one species, and in the south of Argentina-Chile one species (Cuatrecasas *op. cit.*).

The Venezuelan species endemic to the Andes are (Aristeguieta 1964): *O. blepharophyllum* (S.F. Blake) Cuatrec., *O. nevadense* (Wedd.) Cuatrec., and *O. venezuelense* (Steyerm.) Cuatrec. Another new Andean species is reported as *O. figueirasii* Cuatrec. in Llano Corredor in Mérida State (Badillo 1994), but it was not seen by us in the visited herbaria.

These species can be considered rare or threatened since they are encountered in small populations, in colonies of dispersed individual plants, in restricted habitats, and in the central Andes object of intense collection on the part of the local population (BIOMA 1989).

In Table 1 and Fig. 1, information about the distribution of the genus *Oritrophium* is summarized for the Venezuelan Andes, compiled in the context of the *Oritrophium* Project. The greatest part of the locations is found within the areas of páramo in the Sierra Nevada, but the genus has also been reported in the Sierra de La Culata, the mountains of Trujillo and northern páramos of Trujillo-Lara, and one species has also been reported in the Páramo de Tamá (the southernmost páramo in Venezuela).

Table 1: Localities where species of *Oritrophium* were collected, according to labels of specimens deposited in some Venezuelan herbaria. The numbers correspond to the points indicated in the map of Fig. 1.

N°	State	Location	Alt. (m asl)	Herb.
Oritrophium blepharophyllum (S.F.Blake) Cuatrec.				
1	Lara	Between Buenos Aires and Páramo Las Rosas	3290	VEN
2	Mérida	Piedras Blancas	3300	VEN
3	Mérida	Páramo Pozo Negro between San José y la Beguilla	2590	VEN
4	Mérida	Páramo del Jabón	3100	MERF
5	Mérida	Páramo de San José, open páramo in El Cupís	3100	MERF
6	Mérida	Páramo El Cupís in the Zone of Pozo Negro, San José and Mucutuy (Páramo de Canaguá)	3000	MERF
7	Mérida	El Turmal toward the Páramo del Jabón and Las Rosas, Río Turmal basin	3100	MERF

Table 1: continuation.

N°	State	Location	Alt.	Herb.
8	Mérida	Páramo de Canaguá	?	MERC
9	Mérida	Páramo de Los Conejos, near San Isidro	3100	MERC
		Oritrophium granatum Cuatrec.		
10	Mérida	Sierra de Santo Domingo, in front of the glen of Mucuñuque	3750	MERF
		Oritrophium limnophilum (Sch.Bip.) Cuatrec.		
11	Mérida	Laguna Mucubají	3500	VEN
12	Mérida	Páramo de Mucuchíes, just below Pico El Aguila	2900	VEN
13	Mérida	Around Pico El Aguila	4000	VEN
14	Mérida	Páramo de Piedras Blancas	3900	VEN
15	Mérida	Around Laguna Los Anteojos, towards Pico Bolívar	3800	VEN
16	Mérida	Mucubají	3700	VEN
17	Mérida	Sierra del Norte: Páramo de Mucurubá. Quebrada Los Colorados-Cueva de Los Colorados	3900	MERF
18	Mérida	Near Pico El Aguila	4000	MER
19	Mérida	Páramo de Mucubají near Laguna Grande	3500	MER
20	Mérida	Unknown location		MER
21	Mérida	Piedras Blancas, Valle de La Tapa	4200	MERC
22	Mérida	Piedras Blancas, intersection road to Piñango	4050	MERC
23	Mérida	Piedras Blancas, Valle de La Tapa	4300	MERC
24	Mérida	Sierra Nevada Nat. Park, Laguna de Mucubají	3600	MERC
		Oritrophium nevadense (Wedd.) Cuatrec.		
25	Mérida	Páramo de Mucubají near Laguna Negra	3500?	VEN
26	Mérida	Santo Domingo	3500	VEN
27	Mérida	Lagunita between Alto de Timotes and Picacho El Gavilán, 3 km to the northeast of Pico El Aguila	?	VEN
28	Mérida	Laguna Coromoto and Laguna Verde	3700	VEN
29	Trujillo	Guirigay	3300	VEN
30	Mérida	Timotes and Santo Domingo	3700	VEN
31	Mérida	Laguna Anteojos - Loma Redonda	4150	VEN
32	Mérida	Mucubají	3700	VEN
33	Mérida	On the path to Pico Bolívar, 15 km SE of Mérida, near the La Moya refuge	4100	MER
34	Mérida	Páramo de Mucubají, near Laguna Grande	3500?	MER
35	Mérida	not indicated	?	MER
36	Mérida	Páramo de Santo Domingo	3500	MER
37	Mérida	Páramo de Mucubají, on the path to Laguna Negra	3600	MERC
38	Mérida	Piedras Blancas	4040	MERC
39	Barinas	Los Arbolitos, NE region of Sierra Nevada National Park (Dtto. Pedraza)	3200	MERC
40	Mérida	Piedras Blancas, Laguna La Fea	4050	MERC
41	Mérida	Loma Redonda, Sierra Nevada Nat. Park	4040	MERC
42	Mérida	Piedras Blancas	4050	MERC

Table 1: continuation.

N°	State	Location	Alt.	Herb.
Oritrophium paramense (Aristeg. & Cuatrec.) Aristeg.				
43	Mérida	Páramo de Almorzadero	4200	VEN
44	Mérida	Headwaters of the Río Chama - Piedras Blancas	4400	VEN
45	Mérida	Páramo de Piedras Blancas	4500	VEN
46	Mérida	Small lake of the Páramo de Mucuchíes, Alto de Timotes and El Gavilán 3 km NE of El Aguila	?	VEN
47	Mérida	Laguna Los Anteojos	3800	VEN
48	Mérida	Laguna de Mucubají	3700	VEN
49	Mérida	Páramo de Mucubají, near Laguna Grande	3500	MER
50	Mérida	Laguna de Mucubají	3700	MER
51	Mérida	Llano Redondo, on the banks of the Quebrada Mifafí	3850	MER
52	Mérida	Between Pico Espejo and Laguna de Sangre, on the southern flank of the Sierra Nevada	4680	MER
53	Mérida	Llano Redondo, on the banks of the Quebrada Mifafí	3850	MER
54	Mérida	Stream to the north of Pico El Aguila	4000	MER
55	Mérida	Between Campo Humboldt and Timoncito glacier	?	MER
56	Mérida	Páramo de Piedras Blancas, in Valle de la Tapa	4300	MERC
57	Mérida	Sierra Nevada Nat. Park, Loma Redonda	4300	MERC
Oritrophium peruvianum (Lam.) Cuatrec.				
58	Mérida	Páramo de Almorzadero	4200	VEN
59	Mérida	Sierra de Sto. Domingo, Laguna de Miyu	3720	VEN
60	Mérida	Sierra de Sto. Domingo, Laguna Los Patos and Laguna Negra	3650	VEN
61	Mérida	Sierra Nevada	4070	VEN
62	Táchira	Páramo de Tamá, 28 km south of San Vicente de La Revancha	3100	VEN
63	Mérida	Páramo de Santo Domingo	3600	VEN
64	Mérida	Between Laguna El Yoyo and Laguna de Barrios	4050	VEN
65	Mérida	Laguna Los Patos and Laguna El Infiernito	3700	VEN
66	Mérida	Laguna Mucubají	3900	VEN
67	Mérida	On the path to Pico Bolívar	2700	VEN
68	Mérida	Laguna Negra	?	VEN
69	Mérida	Near Laguna Negra	3500	VEN
70	Mérida	Moraine ending in Laguna de Mucubají	3500	ICE
71	Mérida	Sierra Nevada de Santo Domingo-Páramo Los Granates, Cañada del Padre	3550	MER
72	Mérida	Sierra Nevada de Santo Domingo, glen of Laguna Los Anteojos	3930	MERF
73	Mérida	Laguna Brava- Páramo Los Granates	3300	MERF
74	Trujillo	Páramo de Guirigay, on the path to Laguna La Paridas	3300	MERF
75	Mérida	Sierra Nevada de Santo Domingo, Laguna Los Patos	3800	MERF
76	Mérida	Sierra de Santo Domingo, Laguna Los Patos, above Mucubají and Laguna Negra	3650	MERF
77	Mérida	Place of collection not indicated	?	MERF
78	Mérida	Place of collection not indicated	?	MER
79	Mérida	Sierra Nevada Nat Park, on the path to Pico Bolívar, 15 km SE of Mérida, La Moya refuge	4200	MER
80	Mérida	Páramo de Santo Domingo	3500	MER

Table 1: continuation

N°	State	Location	Alt.	Herb.
81	Mérida	Paramito, Pico Bolívar	3400	MER
82	Mérida	Páramo de Santo Domingo	3500	MER
83	Mérida	Paramito, Pico Bolívar	3400	MER
84	Mérida	Sierra Nevada Nat. Park, Loma Redonda	3400	MER
85	Mérida	Piedras Blancas, via Piñango	3900	MERC
Oritrophium venezuelense (Steyerm.) Cuatrec.				
86	Trujillo	Guirigay, toward Laguna La Parida	3500	VEN
87	Mérida	Páramo de Mucubají	3950	VEN
88	Mérida	Quebrada Saisay	3580	VEN
89	Mérida	Páramo de Mucurubá	4100	VEN
90	Mérida	Laguna Mucubají	3950	VEN
91	Mérida	Páramo de Mucuchíes	4000	VEN
92	Mérida	Laguna Los Patos-Laguna Negra	3650	VEN
93	Mérida	Near Laguna Negra	3500	VEN
94	Mérida	Laguna Las Lajas, Páramo de Acequias	3935	MERF
95	Mérida	Río Burate basin - Páramo de Las Mesitas, above Niquitao	3300	MERF
96	Trujillo	Sierra de Santo Domingo, Laguna de Mucubají, Valle de Mucuñuque	3700	MERF
97	Mérida	Mucubají, at the edge of a small marsh near the field station	3600	MER
98	Mérida	Laguna de Los Patos, Sierra de Santo Domingo	3650	MER
99	Mérida	Páramo de Mucubají	3600	MER
100	Mérida	Sierra Nevada, Laguna de Los Anteojos	3920	MER
101	Mérida	Sierra Nevada, on the path to Laguna de Los Anteojos	3920	MER
102	Mérida	Páramo de Piedras Blancas, Laguna Fea, SE of the road to Piñango	3950	MERC
103	Mérida	Piedras Blancas	4050	MERC
104	Mérida	Piedras Blancas	4150	MERC
105	Mérida	Sierra Nevada Nat. Park, Loma Redonda	4050	MERC
106	Mérida	Piedras Blancas, Laguna La Fea	3950	MERC

Commercialization of the frailejón morado, identification of the species being sold

Of the three markets visited in Caracas, the capital of Venezuela, material of frailejón morado was not found in any of them at the time of the interviews. Nevertheless, the informants mentioned that occasionally a person comes from Mérida to commercialize this species. They could not identify this person, nor establish the amount he was selling. They could not estimate the prices or identify the material for sale. In the city of Mérida, capital of Mérida state, the situation is distinct: of the eight places which sell medicinal plants in the Mercado Soto Rosa, three had some bunches of frailejón morado. Of a total of 15 commercializing informants interviewed in Mérida and Ejido (a neighboring community), all indicated they

Fig. 3. *Oritrophium peruvianum* (Lam.) Cuatrec. **a.** Plant x 0.8; **b.** Leaf x 0.8; **c.** Capitulum x 1; **d.** Ray flower (female) x 5; **e.** Disc flower (bisexual) x 5. (From Aristeguieta, 1964)

were familiar with frailejón morado and usually sell it.

At the time of the interview, 67% of the informants had the plant in their establishment, without exception all had *O. peruvianum* (Fig. 3). Those who did not have any, recognized as frailejón morado a sample of *O. peruvianum* which was shown to them. In fact, united with the information supplied by informants in the rural communities, it allowed the affirmation that the plant commonly known as frailejón morado is *O. peruvianum*, and we will henceforth refer to it by the common name in this report. From this it is clear that for the purpose of commercialization, only *O. peruvianum* is collected, and the species indicated as endemic (*O. blepharophyllum, O. nevadense,* and *O. venezuelense*) were not the object of collection for commercial purposes.

According to the information provided by the vendors in Mérida, this mate-

rial came from the páramos adjacent to Mucuchíes and was commercialized by different people. All coincided in mentioning that frailejón morado is a scarce plant in the páramos. Another geographic area indicated as an origin of the material for sale is the Páramo de Las González, in the headwaters of the river of the same name located in the Sierra del Norte or La Culata (this area was the object of field investigation). Locations in the Sierra de Santo Domingo and the Sierra Nevada de Mérida were also mentioned as an origin of frailejón morado being sold.

Prices in the city of Mérida ranged between US$ 0.64 and $ 0.71 for 100 g of the dry material. Homemade syrup was also obtained, with a base of very slightly refined cane sugar, whose price was $ 0.85 for 250 ml. By comparison, the minimum daily salary in rural areas fixed by the Venezuelan government is $ 5, while commercially prepared cough syrup was priced between $ 2.04 and $ 4.50 for a bottle of 130 ml.

Eighty percent of the merchants commission people who live in the páramos to obtain frailejón morado for them, while 20% obtain it from people who come to offer it for sale. Thirteen percent indicated that they obtain it all year long and 87% order it various times during the year, with the greatest possibilities of obtaining it during the rainy season, especially after August.

Sixty percent consider that there now exists a greater number of people demanding frailejón morado, making it more difficult to obtain it; while 40% indicate that demand is the same. In general, people who acquire the plant are local consumers from Mérida. Forty percent reported that some European and North American tourists were interested in natural medicines and frailejón morado had been recommended to them when they were affected by the flu, cough, or asthma.

All of the informants said that the destiny of the frailejón morado is for medicinal use, to alleviate respiratory afflictions (cough, asthma, etc.). Likewise, 27% said they knew it was used in research or industry (though it was not possible to determine what research or industrial process, according to them, involved frailejón morado). All of the informants agreed that the whole plant is used and it is solicited directly by the interested person, even though 60% indicated that they recommend it when a client requests something to treat a cough or asthma. Ninety-three percent of those interviewed affirmed that they knew of no other plant called frailejón morado. Likewise, those informants said they knew the supplier and indicated the places they came from: the Páramo de Las González or de Los Conejos, Los Nevados, Mucurubá, and páramos near Mucuchíes.

No wholesale purchasers of frailejón morado were detected, nor warehouses where large quantities of this product were stored. No evidence was found of international traffic of frailejón morado. Thus, the pressure on the wild populations of this plant coming from its collection for commercial purposes, does not in itself seem to represent a threat to the species. However, the increasing presence of products like syrup, united with the equally growing interest by the public for natural medicines, represent an increase in the demand which could eventually pose a threat.

Compilation of information about the collection and use of the species frailejón morado, at the level of rural communities

METHODS OF COLLECTION, HABITAT, KNOWLEDGE OF THE STATE OF THE POPULATIONS

The Ethnobotanical Record of Barro Negro (ERBN, in Lacruz 1989) revealed that the collection of *Oritrophium* was realized occasionally (61%), once a year (22%), and frequently (17%). While the ERBN did not precisely identify the species called frailejón morado, in the light of the EES, it is possible that it dealt with *O. peruvianum*.

The estimation by the inhabitants of the area where the species is found is principally in the low páramos (the bottoms of valleys dominated by glacial morphology) and in lesser quantities in the high páramos (springs, hillsides, and summits dominated by periglacial morphology). The informants coincided in indicating the areas which become inundated as the habitat of the frailejón morado. According to the residents of Barro Negro, the species has always been common.

The EES, used with 52 rural families, generally confirms this pattern and offers greater information (see Table 2). The informants almost unanimously coincide in identifying the frailejón morado with *O. peruvianum*. The plant is widely known and used, only 5% say that they do not know about it or use it (in the ERBN, 60% of the informants said they collect and use it). Seventy-five percent of those interviewed keep small quantities of frailejón morado in their houses as a reserve. This material, without exception, is *O. peruvianum*, product of occasional collection as part of other activities carried out in the wild areas of the páramo (looking for cattle, gathering firewood, trips, fishing, etc.). This consists of small bunches of the whole plant which are left to dry in the hot ambient of the kitchen. Only very few informants refer to the activity of collecting frailejón morado as a specific activity.

Even though small quantities are generally collected, informants who undertake expeditions for the purpose of collecting it gather an estimated 10 kg per trip. Nevertheless, as was indicated, this activity of specifically going out to collect it is the exception to the rule.

One informant in the community of Valle del Campanario, in the Páramo de Las González, is dedicated to the extraction of frailejón morado to sell in the city; even though it is difficult to collect large quantities, he can always pursue this activity and knows all of the outlets for medicinal plants in Mérida and Ejido, to whom he supplies not only frailejón morado, but other medicinal plants of the páramo. In the community of La Toma, an informant was contacted who is also devoted to the collection of frailejón morado in the areas of the Sierra de Santo Domingo. These were the only two people, of a total of 52 interviewed, who could qualify as "professional" collectors.

In contrast with the informants of Barro Negro, who referred to collecting the plant all year long, the rainy season was chosen by 40% of the informants of

Table 2. Summary of the results of the Ethnobotanical Record of Barro Negro (ERBN) about the frailejón morado.

Questions	Categories of replies			
Destination of the extraction	Family use 31%	Sale 33%	Family use-sale 31%	
Type of use	Medicinal 100%	Other 0%		
Form of preparation	Beverage 99%	Poultice 1%		
Part of the plant used	All the plant 46%	Roots 39%	Leaves 8%	Resin 7%
Quantity collected	Under 0.250 kg 80%	0.250–1 kg 10%	1–2 kg 10%	
Season of collection	All year long 100%			
Frequency of collection	Occasionally 61%	Frequently 17%	Once a year 22%	
Habitat	High Páramo 23%	Low Páramo 69%	Lakes-marshes 92%	Others* 8%
Knowledge about the density	Always common 69%	More abundant before 15%	Always rare 3%	Don't know 4%

*areas of fragmented rock, peaks, and narrow mountain ridges.

the EES as the time for collecting frailejón morado. All of the informants coincided in that it was a plant typical of the marshes and flooded terrain.

The informants, in the ERBN as well as in the EES, supplied data about the zones where they usually gather frailejón morado. Nevertheless, the information about location suffers from imprecision in the names given, with the lack of maps with all the place-names making it even more difficult. However, it was possible to identify the principal areas of probable origin of the frailejón morado in broad terms, an aspect which will be touched upon in the next section.

Forty-six percent of those interviewed in the EES, residents of a geographical area more extensive than that of Barro Negro, and collectors in distinct wild zones, indicate that the frailejón morado is now more difficult to find. Nonetheless, as has been indicated, in view of the few professional commercial collectors and relatively small quantities offered for sale, it does not seem likely that this can be attributed exclusively to the collection for commercial purposes. It appears in light of the evidence registered, that endemic species such as *O. venezuelense* and *O. nevadense* would not be the object of collection.

On the other hand, the collection for domestic use of *O. peruvianum* is important and reflects the fact that in the majority of rural homes material of the frailejón morado is permanently kept as a reserve. In spite of being, in general, a small quantity per family, the diffusion of this practice involves an appreciable total quantity. As such, the impact on *O. peruvianum* is being felt due to overcollection for domestic uses, or at least exposed to pressures from it.

MODES OF USE AND EXPLOITATION

Both the ERBN and the EES indicated that frailejón morado is used for respiratory afflictions such as coughing, build-up of phlegm, stuffy chest, as well as for asthma. Information was obtained about afflictions of the bloodstream which have not been identified. Literature (Vareschi 1970) reports it as indicated in the case of gastrointestinal afflictions such as diarrhea. In view of these indications, the presence can be surmised of a sedative, secretory, or bronchodilatory agent in the frailejón morado, something which would have to be established through specific research.

The majority of the informants in the EES (65%) indicate infusions based on the entire plant as the form of administration; while in Barro Negro, the agreement by informants on this point is nearly unanimous (99%). Nearly one-fourth of the informants of the EES reported on the combined use of infusion and syrup of frailejón morado as the ideal treatment. This syrup is prepared with a base of the whole frailejón morado cooked with water and papelón (a coarse, unrefined sugar obtained from sugar cane), to which spices are added to improve its bitter flavor. Thirteen percent of the informants maintained that the syrup is the best form of use for the frailejón morado (Table 3).

It is noteworthy that the ERBN indicated that the whole plant was used by only 46% of the informants (Fig. 4). The exclusive use of other parts, such as the roots (39%), leaves, and resin, makes one suppose that possibly in traditional medicine there are different applications for each part of the frailejón morado. The absence of this differentiation in the EES could signal the progressive casting aside of these other uses.

The ERBN indicated that 33% of the families commercialize the frailejón morado and 31% use it only for home medicine. The other 31% use the species in both ways. In the first the collection varied between 0.250 to 2 kg of fresh

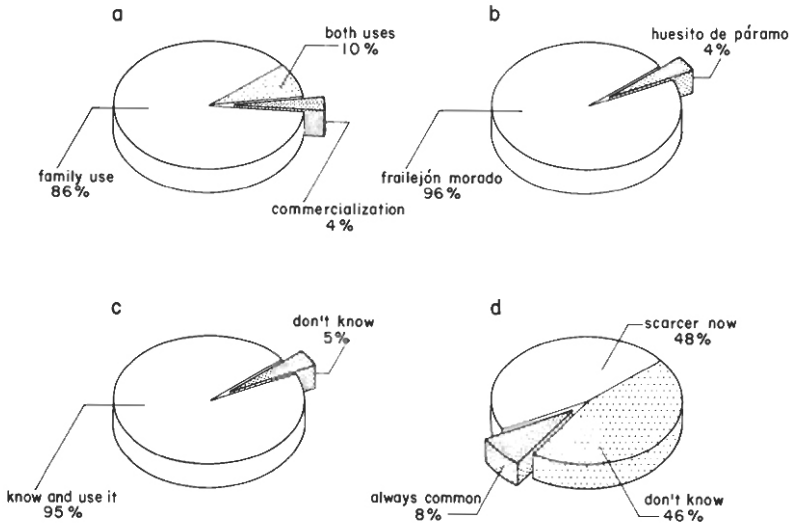

Fig. 4. Some results of the expanded ethnobotanical survey (EES) about the frailejón morado (*Oritrophium peruvianum*), applied to a universe of 52 families. **a.** Destiny of the material of frailejón morado collected; **b.** Common name of *O. peruvianum;* **c.** Knowledge about and use of frailejón morado; **d.** Estimation of the density.

material. The prices ranged from $0.23 to $0.29 per 100 g. For the families of Barro Negro, the collection and sale of frailejón morado constitutes a source of occasional income or, rather, represents a savings on expenditures for obtaining patent medicines for attacking frequent respiratory tract afflictions common among inhabitants of the páramo, particularly among the elderly and children.

The EES reveals that in the majority of cases, the frailejón morado collected is destined for domestic consumption. Only 4% of the informants declared that they gathered it for the specific purpose of selling it, and 10% said that they collected it for both reasons. This seems to confirm the supposition that the major pressure on the wild populations appears to come for collection for domestic use. In general, the gathering and sale of frailejón morado is perceived as an occasional source of income for families. The EES completely coincides in that the major benefit consists in the savings realized by using frailejón morado in place of commercially produced medicines.

Verification *in situ* of the state of the populations of frailejón morado in the usual areas of collection in the Sierra del Norte or La Culata

The probable principal areas of high occurrence of the frailejón morado

The work of compilation of information related to the diversity and geographic distribution of the species of *Oritrophium* in Venezuela provided the

Table 3. Summary of Results of the Expanded Ethnobotanical Survey (EES).

Questions	Categories of answers						
Common name of *O. peruvianum*	frailejón morado 96%		huesito de páramo 4%				
Do you have frailejón morado in your house?	yes 75%		no 25%		this is *O. peruvianum* 100%		
How do you obtain the plant?	collect it myself 54%	collect it as a specific activity 8%	collect it as part of another activity 46%	send family members out to collect it 41%	buy it 5%	average amount purchased 1 kg	average cost Bs. 20
Frequency and season of collection	all year 5%	various times a year 20%	number of times 2–4	only when it is needed 33%	in the dry season 2%	in the rainy season 40%	approx. month August 100%
Where do you collect the plant?	*Sierra del Norte*: area of Mucuró, Páramo de Los Caracoles, El Gritadero, La Tapa, Cañada de Minasuy, El Cañadón, Mucumamó, Mifafí, La González *Sierra Nevada*: Sierra de Sto. Domingo, Las Cuevas, Fila del Oso, Gavidia, El Royal, Cañada de Mucuñuque						
Habitat	low páramo 0%	high páramo 0%	marshy zone 100%	peak and ridges 0%	rocky areas 0%	scrub land 0%	other 0%
Knowledge about density	always common 8%		more abundant before 48%		don't know 46%		
Quantity collected	varies according to necessity and density of the material collected (see text)						

Destiny of the extraction	family use 86%		commercialization 4%		both uses 10%							
Type of people who order and buy it	neighbors 62%		merchants 28%		herbologists 5%	tourists 5%						
Part of the plant used	root 0%		leaf 0%		flower 0%	complete plant 100%	resin 0%	other 0%				
Cases when frailejón morado is used	cough 80%		asthma 11%		"stuffy chest" 0%	vomiting 0%	diarrhea 0%	other 9%				
Manner of use	infusion 65%	syrup 13%		poultice 0%	ointment 0%	dry pulverized 0%	others (syrup plus infusion) 22%					
Economic support to the family	direct through sales 0%		indirect (savings on medicines) 100%									
Is there an alternative species?	yes 4%		no 96%									
Identification of alternative species	*O. venezuelense* 0%											

general characteristics of the zones where frailejón morado could be found. The study of registers in herbaria tie the habitat of this genus to the zones of the Andean páramo (natural region located in the tropical Andes above 3000 m in altitude, defined biogeographically by Monasterio 1980) to areas with an excess of water, such as marshes and bogs. The areas where water spills over from streams in the rainy season, flat zones in the base of valleys, areas of landslides which have become flooded, and cracks in rocky outcroppings which hold the moisture are presented as the most frequent habitats according to this information. Flood plains, or areas subject to seasonal drainage, and certain lakes were also indicated.

Based on this, and through analysis of topographical maps and of field information, it was possible to identify, in broad terms, a group of very probable principal areas of high occurrence of *Oritrophium* sp. collected in the context of the principal nucleus of the Venezuelan Andean páramo. These areas (see Fig. 2) consist of significant extensions of the floodable valley floor above 3000 m in altitude, and are:

Area LG: páramo region Las González, headwaters of Río Las González, in the Sierra del Norte or La Culata.

Area PB: region of the Páramo de Piedras Blancas, headwaters of rivers Mucujún-Mifafí, Los Caracoles, Mucuró, Sierra del Norte.

Area MG: region of La Mucuchache-Gavidia, Sierra de Santo Domingo.

Dispersed additional areas, of much less extension, are associated with the lakes. It seems probable that the principal areas of origin represent the most important reserves of *Oritrophium*, and thus of frailejón morado, in the principal nucleus of the Venezuelan páramo. The organization of the operations of inspection *in situ* were oriented toward reaching points in principal areas of probable origin.

At the time of editing of the Summary of Preliminary Results (March 1995), reconnaissance in the field had not been undertaken since the dry season in the Venezuelan Andean region had just ended. Local informants, coinciding with the specialists, indicated that it is in the wet season when it is possible to successfully locate and identify *Oritrophium* sp. During the first three months of 1995, an exceptionally severe dry season in the Venezuelan Andes ended. The time of the usual beginning of the rains, at the start of April, was delayed various weeks, generating losses to farmers and fires in the páramos.

The chronogram of field operations was postponed as long as possible to allow time for recuperation of the vegetation. Thus, the rainy season arrived and, in the month of June 1995, field recognition took place in the principal areas of origin in the Sierra del Norte, in the zone of influence of the Páramo de Piedras Blancas Biological Reserve: Páramo de Las González and Páramo de Los Caracoles-Mucuró. All were high mountain locations (above altitudes of 3000 m) with access only on foot or on beasts of burden.

VERIFICATION *IN SITU* IN THE PÁRAMO DE LAS GONZALEZ

The principal area of probable origin Páramo de Las González corresponds to a mountainous zone located in the Sierra del Norte where the high basin of the river of the same name is located. The river and its tributaries drain into a group of valleys and depressions of glacial morphology in whose bases, of relatively smooth topography, marshes, bogs, and lakes (referred to as *lagoons* locally) are found. The high points of the topography reach 4300 m, while the bases of the valleys vary in altitude between 3000 and 4000 m. Access to this zone requires a difficult journey on horseback or several days' travel on foot.

In this area, rural communities of the Valle del Campanario were contacted, reaching a series of points on foot with the indispensable aid of local guides. The points reached are located between two and three hours' walk from the communities and are:

the Quebrada de Las González	Los Puentes
the Lago del Campanario	the path to Laguna Albarregas

In general terms, the vegetation in the places reached corresponds to the associations described by Monasterio (1980), such as "Rosetal-Arbustal of *Espeletia schultzii*", "Rosetal of *Espeletia pannosa*," which is distributed in the most humid páramos, above 3500 m, in the Sierra del Norte or La Culata (Páramo de Los Conejos, Páramo de Piedras Blancas), and in the Sierra Nevada de Mérida. These associations pertain to the plant formation described as Andean Páramo. It is also possible to identify associations with components in dominant grasses in a greater or lesser measure, being of "Pajonal-Rosetal of *Espeletia pannosa*" and the association *Calamagrostis-Carex*. These associations, in turn, pertain to the formation described as "Pajonal Paramero Andino," characterized as a cold and wet pasture which reaches its maximum development near 4100 m asl (Monasterio *op. cit.*).

In the points reached, the total cover is less than 100%. The species of grasses and cyperaceous plants are made up of clumps which, as forms of life, amply dominate the area (60%). The cushion forms and the rosellate plants together surpass 5%. Among the grasses, the dominant species are: *Calamagrostis mulleri, Muhlenbergia ligularis, Agrostis trichodes, Vulpia australis;* and among the cyperaceous plants: *Eleocharis acicularis* and *Carex albolutescens*. Among the herbs: *Lachemilla* sp., *Acaulimalva* sp., *Paepalanthus* sp., *Gnaphalium paramorum, Noticastrum paramorum, Hypochoeris sessiliflora, Gentianella viridiflora,* among others. Mosses also occupy an important place in these humid pastures, with more than 10% of the coverage of the vegetation. As far as the genus *Oritrophium*, the most common species is *O. paramense* which, together with *O. venezuelense*, accounted for about 18% of the herb coverage.

O. peruvianum and *O. venezuelense* were not found in all of the points within the same association. The distribution of *O. venezuelense* is notably more ample

than that of *O. peruvianum*, which is located in small patches. It was not possible to establish if this condition is a product of *O. peruvianum* having been the object of collection. The presence of cow dung in the points reached could be interpreted as evidence that the genus *Oritrophium* could be subject (as are other plants in the zone) to consumption or trampling by domestic and/or wild animals.

THE VERIFICATION *IN SITU* IN THE PÁRAMO DE PIEDRAS BLANCAS

The principal area of probable origin Páramo de Piedras Blancas corresponds to a mountainous zone located in the Sierra del Norte which drains toward the basin of Lago de Maracaibo. The operations were directed toward the extreme northeast of this principal area, in two zones known as Los Caracoles and Mucuró, in the headwaters of the Torondoy and Tucaní rivers respectively. The highest topographical points reach nearly 4700 m asl, the bottom of the valleys vary between altitudes of 3600 and 4300 m. This is a group of valleys and depressions of glacial morphology in whose bases, of smooth topography, are located swamps, bogs, and lakes.

In general, the valleys are narrower and shorter than in the area of Las González and exposed to a much drier climate. Los Caracoles and Mucuró are zones with more extreme climatic conditions than Las González, do not harbor any human population, and their access - exclusively on foot or on animals, presents great difficulty. The base of the reconnaissance was the Biological Station of the Páramo de Piedras Blancas Biological Reserve, managed by the Tropical Andes Program, a journey of some four to six hours on horseback.

In the area of Páramo de Piedras Blancas, two points can also be reached on foot with the help of people familiar with the very complex topography of the region. These places are: Los Caracoles, in the marsh of the Quebrada La Paila (in the zone of Los Caracoles) y La Tapita, in the marsh area by the stream of the same name (in the zone of Mucuró).

The operations were faced with obstacles of bad weather throughout the area at the time of undertaking the inspections. It was only possible to realize a basic characterization in the points reached. In general terms, the vegetation in the points reached was recognized as associations of Rosetal-Arbustal of *Espeletia schultzii* and Rosetal of *Espeletia pannosa*. The ground cover dominated by recognized grasses corresponded to Pajonal-Rosetal of *Espeletia pannosa* and the association *Calamagrostis-Carex*. Examples of *O. peruvianum* were found in association with grasses and in cracks in outcroppings of grooved rocks.

Realization of the preliminary characterization of the habitat and requirements of frailejón morado for the purpose of attempting its eventual controlled reproduction

In light of the information which could be collected in the context of the *Oritrophium* Project, while it is not possible to precisely establish the requirements

of the frailejón morado, it is possible to establish its habitat in general terms.

Thus, according to the observations, the conditions of temperature and light characteristic of the Andean páramo above the altitude of 3000 m asl, in associations with grasses linked to soils saturated with humidity, with clay-like or slippery texture, seem to be the fundamental requirements of the habitat of the species studied.

CONCLUSIONS

The medicinal plant known as frailejón morado, which plays an important role in the traditional Andean popular pharmacopoeia, corresponds, in the region of the central Venezuelan Andes, to *Oritrophium peruvianum*. In light of the present study, apparently the idea can be discarded that endemic species are involved in relation to the use and collection of the medicinal product called frailejón morado. Thus, *O. venezuelense*, described as endemic to the Venezuelan Andes, which was initially suspected as that being collected as frailejón morado, turns out not to be utilized for medicinal purposes.

The frailejón morado (*O. peruvianum*) was found to be distributed in swampy areas at the bases of valleys and depressions of glacial morphology, in the principal nucleus of the Venezuelan Andean páramo, at altitudes above 3000 m. Areas were identified which very possibly constitute the reserves of frailejón morado and other species of *Oritrophium* in the central Venezuelan Andes.

The frailejón morado is very widely known and used in the traditional medicine of the local inhabitants who collect it, usually in small quantities, for use in treatment of respiratory afflictions. The local residents perceive it as an advantage to use frailejón morado in view of the high cost of commercially produced medicines. The volume collected for domestic use was not precisely established, but it seems to be significant given the diffusion of knowledge about the medicinal properties of frailejón morado among rural families, manifested by permanent reserves in nearly every home. Evidence of large-scale collection for commercial or industrial purposes was not found, nor important traffic at the national or international level.

It seems plausible that the wild populations are currently being more affected by collection for domestic consumption than for collection for strictly commercial purposes. In this sense, the deterioration of the acquisitive power of rural families could bring about an increase in the collection of medicinal species as a substitute for patent medicines. Additionally, the commercial demand for frailejón morado is changing with an orientation toward processed products such as syrup made with the plant as its base. Growing public interest was observed about this and other medicinal species as a consequence in the increased interest in natural medicine. In view of this, it seems that the eventual controlled reproduction of frailejón morado is a valid initiative in the context of perceivable increase in demand.

The populations of *O. peruvianum*, like the majority of vegetal components of the páramo, are widely threatened by cattle, fire, and the advance of the agricultural frontier. The measure in which the populations have deteriorated is an important element to establish, in view of indirect evidence gathered of certain reduction of the densities.

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