

## New endemic taxa of *Festuca* from the Colombian Sierra Nevada de Santa Marta

Nové endemity rodu *Festuca* z pohoří Sierra Nevada de Santa Marta v Kolumbii

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Stančík D. (2003): New endemic taxa of *Festuca* from the Colombian Sierra Nevada de Santa Marta. – Preslia, Praha, 75: 339–347.

A new endemic species, *F. sanctae-martae* Stančík (sect. *Festuca*) and a new subspecies, *F. amplissima* subsp. *magdalenaensis* Stančík (sect. *Ruprechtia*), from the Colombian Sierra Nevada de Santa Marta, are described and illustrated.

Key words: Andes, Colombia, *Festuca* sect. *Festuca*, sect. *Ruprechtia*, páramo, South America

### Introduction

The genus *Festuca* (*Poaceae*) has a worldwide distribution and comprises about 400–450 species (Watson & Dallwitz 1992). It is especially diverse in Eurasia and North America, with some species in Africa, Australia, Tasmania and New Zealand. This genus is highly differentiated in the South American Andes as a dominant in the high-altitudinal páramos and puna formations, where there are about 141 native species (Darbyshire et al. 2003). In Colombia, there are 31 native species of *Festuca* (Stančík 2002, 2003).

This contribution to the grass flora of the region comprises the first records of taxa of the genus *Festuca* for Sierra Nevada de Santa Marta, their descriptions, and a key to the species. Two taxa described here, *Festuca sanctae-martae* and *F. amplissima* subsp. *magdalenaensis*, are new to science and endemic to Sierra Nevada de Santa Marta and northern South America, respectively.

### Study area

Sierra Nevada de Santa Marta is an isolated pyramid-like prolongation of the Colombian Andes (for detailed characterization see Van der Hammen et Ruiz-C. 1984, Rangel et al. 1987), includes the highest Colombian peaks (Pico Colon and Pico Bolivar, 5775 m) and possess a highly endemic flora. As estimated by Carbono & Lozano-Contreras (1997) nearby 7% of all phanerogams here are endemic. However, the regional flora is insufficiently known as is well documented in a review of the history of botanical exploration of this area (Carbono & Lozano-Contreras 1997). The same holds for the grass flora of the Sierra Nevada. There is no checklist or local flora and only a manuscript on the grasses of the region in the University of Magdalena (E. Carbono, pers. comm.).

## Materials and methods

While studying herbarium collections (AAU, B, C, CAR, COL, FMB, MA, MEDEL, P, PR, PRC, PSO, U, US, UTMC, VEN, W, abbreviations after Holmgren et al. 1990) for a revision of *Festuca* in Colombia, 14 specimens from the region of Sierra Nevada de Santa Marta belonging to this genus were found, although no species are reported for this area.

The study was carried out using a microscope and a loupe with a graticule. Leaf sections were prepared from dry herbarium specimens, after hydration in soap solution, and observed at a magnification of 100-fold. In total, 26 morphological and 5 anatomical characters relevant to the taxonomy of the genus *Festuca* were studied. All characters were measured several times on all of the specimens studied. Total length (i.e. including all florets) of spikelets was measured.

Additionally, all type specimens of the studied species were examined, if not mentioned otherwise.

## Overview of species

The known and expected species of *Festuca* of Sierra Nevada de Santa Marta can be recognized by using the following key:

- 1a Grass 1.2–1.8 m tall, leaf blade flat, 0.4–1.2 cm wide with sheaths at base fibrous. Panicles 30–40 cm long, ramified, diffuse ..... *F. amplissima*
- 1b Grass 0.4–0.8 m tall, leaf blade conduplicate or involute, 0.5–2 mm in diameter, sheaths not disintegrated into fibers. Panicles 10–25 cm long, (almost) contracted ..... 2
- 2a Tufted grass with conduplicate leaf blades, 0.8–1.2 mm wide, glabrous. Panicles 10–16 cm long, spikelets 9–13 mm long, with 2–3 florets ..... *F. sanctae-martae*
- 2b Densely caespitose grass, with involute finely scabrous leaf blade, 0.5–0.7 mm wide. Panicle 20–25 cm long, spikelets 7–10 mm long, with 3–5 florets ..... *F. tolucensis*

Subg. *Montanae* (Hack.) Nyman

Sect. *Ruprechtia* E. B. Alexeev

*Festuca amplissima* Rupr. subsp. *amplissima*, Bull. Acad. Roy. Sci. Bruxelles 9 (2): 236. 1842.

Type: Mexico, Veracruz: Pico d'Orijaba, 10 000 ft., Jun–Oct. 1840, Galeotti 5766 (W, isotype).

- = *Festuca fratercula* Rupr. ex E. Fourn. Mexicanas Plantas 2: 124. 1886. Type: Mexico, Veracruz. Pico de Orizaba, Galleotti 5778 (US, holotype).
- = *Festuca fratercula* Rupr. Bull. Acad. Roy. Sci. Bruxelles 9 (2): 236. 1842, nom. nud.
- = *Uniola effusa* E. Fourn. Mexicanas Plantas 2: 122. 1886. Type: Mexico, San Nicolas, Bourgeau 1032 (P, holotype, non vidi).
- = *Uniola muelleri* E. Fourn. Mexicanas Plantas 2: 122. 1886. Type: Mexico, Orizaba, Mueller 2115 (LE, holotype, non vidi; US, isotype, non vidi).

**Description:** Perennial, rhizomatous. Culms 120–180 cm tall, erect, scabrid, with 3–6 nodes. Leaf blade 35–70 cm long and 0.4–1.2 cm wide, flat (involute only at apex), green, scabrous. Sheaths coriaceous, brown, striate, margins free, base fibrous; innovations extravaginal; auricles absent. Ligules 0.8–1 mm long, coriaceous, truncate. Panicles 30–40 cm long, 25–40 cm wide, open, slightly pendant, branches scabrid. Spikelets 12–15 mm

long, florets 4–5; rachillas densely pilose. Glumes narrowly lanceolate, membranous, green; lower glume 4.5–6 mm long, 1-nerved; upper glume 6–8 mm long, 3-nerved. Lemmas 8–9 mm long, coriaceous-membranous, lanceolate, 5-nerved, scabrous and densely pilose; apex entire, without awns; callus sparsely pilose. Paleas as long as lemma, membranous, papillose, two-keeled, the keels scabrous, two-dentate, membranous, papillose, keels scabrous. Anthers 2.8–3.0 mm long. Ovary apex glabrous. Caryopsis lanceolate; hilum linear, 4/5 of total length.

**Leaf blade anatomy:** Cross-section with numerous vascular bundles, with small ribs above; schlerenchyma of both abaxial and adaxial epidermis discontinuous; unit with vascular bundles, bulliform cells present between the ribs; abaxial and adaxial epidermis with scattered prickles, adaxial without hairs.

**Observations:** *F. amplissima* is the only member of *F.* sect. *Ruprechtia* (Alexeev 1980). It differs from other species of the subgen. *Montanae* in lacking cataphylls and hairs on ovaries.

**Habitat and ecology:** Forest (*Pinus*, *Quercus*), forest clearings and mountain meadows at an altitude of 2500–3300 m.

**Distribution:** This species is known from Mexico (confirmed by herbarium collections), Guatemala, Costa Rica and Panama.

**Specimens examined:** **Mexico:** Puebla. Mun. San Nicolas de los Ranchos 6 km al SE de Paso de Cortez, brecha a Xalitlitzintla, 20°18'N, 98°44'W, 3400 m, Sep 14, 1988, Tenorio 15093 (US). – Veracruz. Pico de Orizaba, 2500 m, Liebmann 6110, 6109 (C); Sep 1841, Liebmann 12904 (C).

### *Festuca amplissima* Rupr. subsp. *magdalenaensis* Stančík **subsp. nova** (Fig. 1)

**Type:** Colombia. Magdalena. Sierra Nevada de Santa Marta, SE slope, Hoya del Río Donachuí, Cancuría, 2400–2650 m, Oct 10, 1959, Cuatrecasas & Castañeda 24736 (COL, holotype; US, isotype).

**Diagnosis:** Haec subspecies a *F. amplissima* subsp. *amplissima* paniculae robustioribus, ramis et spiculis abundantibus differt.

**Observations:** This subspecies differs from the nominate subspecies in having significantly larger, more ramified and dense panicles with many spikelets. This outstanding character of the panicle, together with the isolated geographical position of the localities (Sierra Nevada de Santa Marta, Serranía de Perijá), were the main reasons for assigning subspecies status.

**Habitat and ecology:** Forest clearings, shrubby formations and transitional zone of páramo at an altitude of 2400–3500 m.

**Distribution:** This subspecies is endemic to Sierra Nevada de Santa Marta (Colombia) and closeby range of Serranía de Perijá (border zone of Colombia and Venezuela). The presence of *F. amplissima* in Venezuela is mentioned in Davidse & Pohl (1994) but no specimen is cited. The specimen cited here, *F. amplissima* subsp. *magdalenaensis* from Serranía de Perijá (Tillett & Hönig 746–765 MO), is probably the only known specimen of this species from Venezuela. Sierra de la Nevada de Santa Marta and Serranía de Perijá are the southernmost localities of *F. amplissima* and represent a floristic connection between Mesoamerica and South America. In addition, this record is a new South American locality for the sect. *Ruprechtia*, which is considered endemic to Mesoamerica (Alexeev 1980).

The subspecies epithet refers to the type locality region: Magdalena (N Colombia).

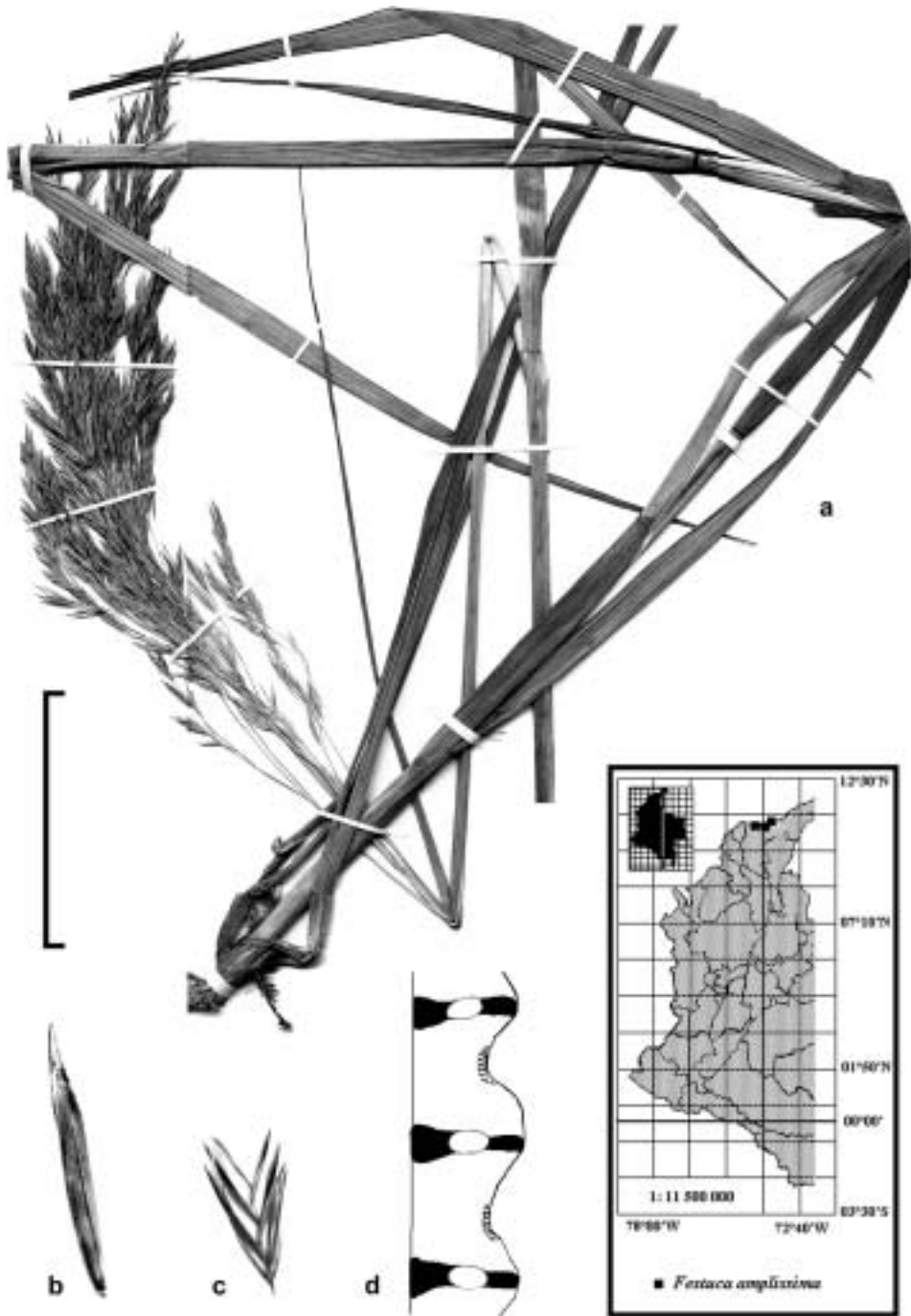


Fig. 1. – *Festuca amplissima* subsp. *magdalenaensis* (Rangel et al. 945 COL): a. habit (bar = 9.5 cm), b. lemma (bar = 6 mm), c. spikelet (bar = 17 mm), d. cross section of leaf (bar = 0.8 mm).

**Specimens examined:** **Colombia:** Magdalena. Sierra Nevada de Santa Marta, alrededores de cabeceras de Río Ancho, páramo de Macotama, 3490 m, 16 Feb 1959, Barclay & Juajibioy 7033 (COL, MO, US); 5 Feb 1959, Barclay & Juajibioy 7017 (MO); transecto del Buritaca – filo La Cumbre, 3020 m, 15 Aug 1977, Rangel et al. 945 (COL); about 30 miles inland from Dibulla, 3850 m, Jul 1923, Seifritz 489 (US). Munic. Ciénaga, Cabeceras del Río Sevilla, 3500 m, Carbono 2474 (UTMC). – **Venezuela:** Zulia. Serranía de Perijá, along the Colombian border, Tillett & Hönig 746–765 (MO).

Subg. *Festuca*

Sect. *Festuca*

***Festuca sanctae-martae* Stančík spec. nova (Fig. 2)**

**Type:** Colombia. Magdalena. Sierra Nevada de Santa Marta, SE slope, Hoya del Río Donachuí: Laguna de Calocribe (E of Meollaca), páramo, 3600–3700 m, 30 Sep 1959, Cuatrecasas & Castañeda 24532 (COL, holotype; US, isotype).

**Diagnosis:** Haec species a *Festuca glumosa* Hack. ex E. B. Alexeev fasciculi vasculares foliaries (8) 10–11 (non 5–7), rachilla pilosa (non glabra), glumis inferioribus 7.5–9.5 (non 4.5–6.0) mm, glumis superioribus 7.5–10.5 (non 6.0–6.5) mm, lemmate 8–10 (non 7–8) mm differt. A *F. cocuyana* Stančík folis longioribus (25–35 non 15–20 cm long.), paniculae latoribus (1.5–2.0 cm non 0.8–1.5 cm lat.), glumis inferioribus 8.5–9.0 mm (non 7.5–8.0 mm) long. differt.

**Description:** Perennial, tufted grass. Culms 40–80 cm tall, erect, finely scabrous, with 1–2 basal nodes. Leaf-sheaths coriaceous-membranous, stramineous, glabrous, finely striate, margins free; innovations intravaginal; auricles absent. Ligules 0.8–1.2 mm long, coriaceous-membranous, truncate. Leaf blade 20–35 cm long, (0.8) 2.0–3.5 mm wide, linear, conduplicate or flat, glabrous. Panicles 10–16 cm long, 1–2 cm wide, contracted. Spikelets 9–13 mm long, florets 2–3, rachillas pubescent. Glumes lanceolate, acute, membranous, almost as long as spikelet, purplish-white, scabrous on the back; lower glume 8.5–9.5 mm, 1-nerved; upper glume 8.5–10.5 mm, 3-nerved. Lemma 8–10 mm long, membranous, lanceolate, 5-nerved, without awn or shortly awned (0.5–1.0 mm); callus glabrous or sparsely hairy. Palea 3/4 of lemma length, membranous, two-keeled, papillose, apex scabrous, shortly two-dentate. Lodicules 1.0–1.4 mm long, lanceolate, two-dentate. Anthers 0.8–1.1 mm long. Ovary apex glabrous. Caryopsis lanceolate, hilum linear, 3/4 of total length.

**Leaf blade anatomy:** Cross-section with (8–) 10–11 vascular bundles and 5–7 ribs; schlerenchyma of abaxial and adaxial epidermis discontinuous, vascular bundles free; adaxial epidermis with hairs about 20 µm long.

**Observations:** The structure of inflorescence and spikelets suggest that this species is closely related to *F. cocuyana* Stančík, a species endemic to the Sierra Nevada del Cocuy in Colombian Cordillera Oriental (Stančík 2003) and to *F. glumosa* E. B. Alexeev, a species known from the Colombian Cordillera Central (mountain complex of Nevado del Ruiz) and Ecuador. The basic morphological characters of this species are summarized in Table 1.

**Habitat and ecology:** The species grows at altitudes of 3600–4000 (–4300) m, in grass-páramo communities dominated by *Calamagrostis effusa* and on rocky cliffs at higher altitudes.

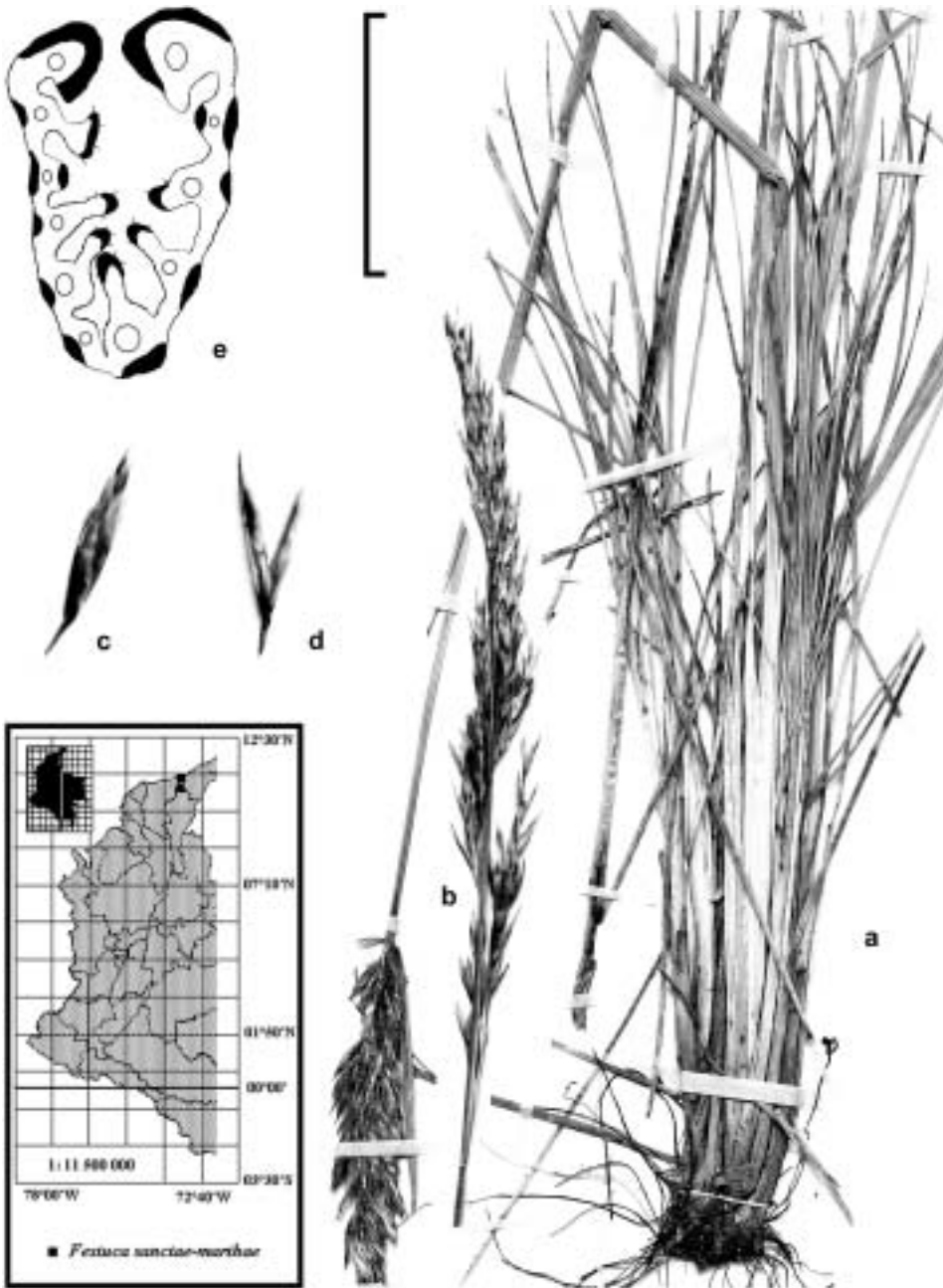


Fig. 2. – *Festuca sanctae-martae* (Cuatrecasas & Castañeda 24532 COL, holotype): a. habit (bar = 6 cm), b. panicle (bar = 4.5 cm), c. spikelet with two long glumes and three florets (bar = 15 mm), d. glumes (bar = 13 mm), e. cross-section of leaf (bar = 1.3 mm).

Table 1. – Morphological comparison of the closely related species: *Festuca glumosa*, *F. sanctae-martae* and *F. cocuyana* (range of values are the lower and upper values obtained when measuring the specimens).

	<i>F. glumosa</i>	<i>F. sanctae-martae</i>	<i>F. cocuyana</i>
Culm size (cm)	15–55	40–80	20–50
Number of nodes	1	2	1
Leaf diameter (mm)	0.8–1.4	(0.8) 2.0–3.5	0.8–1.5 (–2.0)
Leaf size (cm)	10–25	20–35	15–20
Number of vascular bundles	(5–) 7	(8–) 10–11	(8–) 10–11
Ligule size (mm)	0.8–1.2	0.8–1.2	0.6–1.0
Panicle longitude (cm)	8–10	10–16	8–12
Panicle latitude (cm)	0.6–1.0	1–2	0.8–1.5
Spikelet size (mm)	8.5–10	9–13	10–13
Number of florets	3–4	2–3	2–3
Lower glume size (mm)	4.5–6.0	8.5–9.5	7.5–8.0
Upper glume size (mm)	6.0–6.5	8.5–10.5	7.5–10.5
Lemma size (mm)	7–8	8–10	8–10
Awn size (mm)	0.5–1.5	0–0.5 (–1.0)	0 (–0.5)
Anthers size (mm)	0.8–0.9	0.8–1.1	0.8–1.1

**Distribution:** Endemic to Sierra Nevada de Santa Marta (Colombia).

The species epithet refers to the type locality: Sierra Nevada de Santa Marta (N Colombia).

**Specimens examined:** **Colombia:** Magdalena. Sierra Nevada de Santa Marta, valley descending SW from Picos Reina and Ojeda, around Lagoons Naboba, Mamito and Mamo, 4200–4300 m, 5 Oct 1959, Cuatrecasas & Castañeda 24563 (COL, US).

*Festuca toluensis* Kunth, Nov. Gen. Sp. 1: 153. 1815 [1816].

**Type:** Crescit in montis scopulosis, apricis regni Mexicani, inter Islahuaca et Toluca, 1380 hexap., Humboldt & Bonpland s.n. (P, holotype; B, P isotype).

*Festuca multiculmis* Steud., Syn. Pl. Glumac. 1: 310. 1854. Type: Mexico. Mt. Toluca, Heller 306 (P, holotype).

*Festuca liebmannii* E. Fourn., Mexicanas Plantas 2: 124. 1886. Type: Mexico, Liebmann 6113 (C, holotype).

*Festuca toluensis* subsp. *eutolucensis* St.-Yves, Candollea 3: 215. 1927, nom. inval.

**Description:** Perennial, forming dense tussocks. Culms (40–) 60–80 cm tall, erect, finely scabrous, with one basal node. Sheaths coriaceous, stramineous, glabrous, margins free, innovations intravaginal; auricles absent. Ligule 1.8–3.5 mm long, membranous, acute. Blades linear, involute, 0.5–0.7 mm in diameter, 20–30 cm long, apex pungent. Panicles 13–22 cm long, 0.5–3.0 cm wide, (almost) contracted; branches finely scabrous. Spikelets 7–10 mm long, (oblong-) lanceolate, florets 3–5; rachillas densely pilose. Glumes lanceolate, acute, coriaceous, green, scabrous; lower glume (4–) 5–6 mm long, 1-nerved; upper glume (5–) 6–8 mm long, 3-nerved. Lemma 6.5–7.5 mm long, lanceolate, coriaceous, scabrous, 5-nerved, green; apex entire, awn 1–3 mm long, callus glabrous. Paleas almost as long as lemma, two-keeled, apex two-dentate, scabrous and shortly pilose. Anthers 2.5–3.0 mm long. Ovary apex glabrous. Caryopsis lanceolate; hilum linear, 5/6 of total.

**Leaf anatomy:** Cross-section with 5–7 vascular bundles and 5 ribs above; bulliform cells absent; schlerenchyma under abaxial epidermis continuous, forming girders with 1–3 vascular bundles, sclerenchyma under adaxial epidermis in strands, excep-

tionally the central vascular bundles forming girders; abaxial epidermis covered densely by prickles, hairs on adaxial epidermis 30–50 mm long.

**Observations:** This species is close to *F. subulifolia* Benth., which is known from Peru to S Colombia. Both species are characterized by having finely scabrous leaves but clearly differ in internal leaf anatomy. Whereas *F. toluensis* has only 5 vascular bundles without (or with only one) connection with adaxial sclerenchyma, *F. subulifolia* is characterized by 7–13 vascular bundles (where at least 3 form girders). Generally, *F. toluensis* also has larger floral parts [lower glume 5.0–6.0 (not 3.0–4.5) mm, upper glume 6.0–8.0 (not 4.5–5.5) mm long].

**Habitat and ecology:** The species grows in the Andean páramo zone. On dry, warm rock outcrops, it occurs as a co-dominant in the grass-páramo and in swamps on margins of mountain lagoons. Usually it is an allogamous plant, exceptionally several viviparous spikelets occur in a panicle.

**Distribution:** Known from Mexico and Costa Rica, also from Serranía de Perijá on the Colombian and Venezuelan border and from the Andes of Táchira, Mérida and Trujillo in Venezuela. No specimens are known from Sierra Nevada, but this species is expected to occur there.

**Specimens examined:** **Colombia:** Magdalena. Sierra de Perijá, E of Manaure, Cerro Avi6n, 3550–3450 m, 30 Oct 1970, Cuatrecasas & Castañeda 25136 (COL, US), plain between Cerro Venado and Cerro Avi6n, 3270–3350 m, 8 Jan 1959, Cuatrecasas & Castañeda 25133 (COL, US). – **Mexico:** Mexico. Popocatepetl, 3400 m, 6 Aug 1910, Hitchcock 496 (C). – Veracruz. Pico de Orizaba, 14 000 ft. [ca 4300 m], Sep 1841, Liebmann 12885 (C). – **Venezuela:** Zulia. Sierra de Perija – Serrania de Valledupar, campamento “Monte Viruela”, 10°25'13"N, 72°52'42"W, 3100 m, 28 Jul 1974, Tillett 747–1122 (COL). – Mérida. Munic. Santo Domingo, Laguna Mucubaji, swamps around the lagoon. 08°47'N, 70°49'W, 3600 m, 6 Nov 2000, Stan6ík 4172 (CAR, COL, PRC). – Táchira. Munic. La Grita, Páramo La Negra, 08°15'N, 71°53'W, 3200 m, 10–11 Nov 2000, Stan6ík 4280 (CAR, PRC). – Trujillo. Páramo de la Cristalina, 2900 m, Oct 1910, Jahn 18 (US, VEN).

## Note

Besides the specimens cited, two other specimens from Sierra Nevada probably belong to the genus *Festuca*. One (Carbono 2475 UTMC) shows a high affinity to *F. ulochaeta* Nees ex Steud., recently confirmed for Venezuela and Colombia (Stan6ík 2001), but the fragment did not allow a definite determination; confirmation is therefore needed. The second specimen (CARBONO 3219 UTMC) was too incomplete to be identified as *Festuca* with certainty.

## Acknowledgement

I would like to thank curators of the following herbaria: AAU, B, C, CAR, COL, FMB, MA, MEDEL, P, PR, PRC, PSO, U, US, UTMC, VEN and W for their kind help. My thanks are to ICETEX for financial support of my studies in Colombia and to the Instituto de Ciencias Naturales de la Universidad Nacional de Colombia for providing study facilities. Completion of the study was made possible due to financial support from the developmental project of Ministry of Education of the Czech Republic (no. 313004) and the Grant agency of Czech Republic (GA6R no. 206/01/0687).

## Souhrn

Práce představuje první údaje o výskytu rodu *Festuca* v pohoří Sierra Nevada de Santa Marta v severní Kolumbii. Toto pohoří pyramidálního tvaru představuje izolovaný výběžek kolumbijských And, jež zde nabývají svého výškového maxima (Pico Bolívar a Pico Colon, 5775 m n. m.). Také díky této geografické izolaci se oblast vyznačuje



vysokou mírou endemismu, který zde u cévnatých rostlin dosahuje 7 % (Carbono & Lozano-Contreras 1997). Z jihoamerických And je doposud známo kolem 140 druhů rodu *Festuca* a celkem 31 druhů bylo zjištěno také na území Kolumbie (Stančík 2002).

V této práci jsou popsány dva nové taxony, druh *F. sanctae-martae* Stančík a poddruh *F. amplissima* subsp. *magdalenaensis* Stančík, endemické pro studovanou oblast. Jde o druhy vysokohorských travinných společenstev zvaných páramos, i když druh *F. amplissima* zasahuje i do níže položeného andského lesa a matorralu (keřovité formace přechodové zóny).

Druh *F. amplissima* byl až doposud znám jen ze Střední Ameriky, zde uvedený údaj představují první jasně doložený výskyt tohoto druhu (a také sekce *Ruprechtia*, doposud považované za endemit Střední Ameriky) v Jižní Americe.

Do publikace a určovacího klíče byl dále zahrnut druh *F. toluensis* Kunth. Ze studované oblasti nebyl zatím doložen, je však znám ze Střední Ameriky, severní části kolumbijsko-venezuelské hranice a také z And Venezuely, a tak je jeho nález v pohorí Sierra Nevada de Santa Marta vysoce pravděpodobný.

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Received 15 October 2002  
Revision received 15 July 2003  
Accepted 10 September 2003