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On three species of *Festuca* L. *(Poaceae)* from the Central Mountain System, Spain.

Abstract

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Three *Festuca* species from Central Spain belonging to the *Intravaginales* group *(Festuca* sect. *Festuca)*, i.e. *F. rivas-martinezii*, *F. curvifolia*, and *F. summilusitana,* are studied. The qualitative diagnostic characters are given, and it is demonstrated by means of statistical analyses that the three species are also separated by quantitative characters, particularly the length of the spikelet components and panicle, and the diameter and thickness of the leaf blades. The binomial *F. curvifolia* is lectotypified and accepted as the correct name for a frequently confused species distributed in the Sierra de Guadarrama and Sierra de Ayllón.

Introduction

Festuca sect. *Festuca* (*F.* sect. *Ovinae* Fr., nom. inval., Art. 22.2) [unranked] *Intravaginales* Hackel (1882), comprising the intravaginally branching species, i.e. those with some basal portion of all new shoots being enclosed within the leaf sheaths, is represented in the Iberian Peninsula by some 24 species (Markgraf-Dannenberg 1980). Having studied the *Intravaginales* group in the Central Mountain System of Spain, which comprises the mountain ranges Sierra de Ayllón, Sierra de Guadarrama, and Sierra de Gredos, we recognize there three species endemic to the Iberian Peninsula. These are the recently described diploid *F. rivas-martinezii* Fuente & Ortúñez (1994), *F. summilusitana* Franco & Rocha Afonso, originally described from the Serra da Estrela, Portugal (Amaral Franco & Rocha Afonso 1980), and a species that had long been confused with other taxa of this group and whose correct name at species rank is the widely overlooked binomial *F. curvifolia* Lag. ex Lange (1861). The last two closely related species are hexaploid (Ortúñez & Fuente 1995). The aim of this study is to elucidate the differences between these three species, particularly in quantitative characters and by means of statistical analyses.

Material and methods

The study is based on material from our own collections and from the herbaria BM, COI, G, K, LISI, MA, MAF, and W (herbarium abbreviations according to Holmgren & al. 1990).

During our field investigations specimens of 42 different populations have been collected in the Sierra de Ayllón, Sierra de Guadarrama and Sierra de Gredos. This material is listed below

Tab. 1. The principal qualitative characters distinguishing *F. rivas-martinezii*, *F. curvifolia* and *F. summilusitana*.

Characters	*F. rivas-martinezii*	*F. curvifolia*	*F. summilusitana*
Culms	glabrous	glabrous, sometimes scabrous	pubescent
Leaf sheath	fused for 1/4 of their length	fused for 1/2 of their length	fused for 1/2–3/4 of their length
	glabrous	glabrous, sometimes scaberulous	pubescent
Leaf blade			
orientation	slightly curved distally in a spiral	curved	suberect
indumentum	glabrous	glabrous	pubescent below
cross section	V-oval	oboval	elliptical-oboval
sclerenchyma	forming three islets at midrib and margin	forming a continuous ring	forming a continuous ring

and deposited in our personal herbarium at the Universidad Autónoma de Madrid.

The qualitative and quantitative characters studies are listed in Tab. 1 (see also Fig. 1) and Tab. 2. The terminology and methods of measurement follow Hackel (1882), Saint-Yves (1913), Auquier (1974), Ellis (1976) and Willkinson & Stace (1991).

The dataset for 11 quantitative characters (Tab. 2, characters marked with an asterisk) and restricted to 42 populations with 10 specimens each (in order to access the variation within the populations) were statistically analysed by means of correlation analysis, principal component analysis and discriminant component analysis. The characters excluded from our statistical analysis (Tab. 2, characters not marked with an asterisk) are those that showed high variability (culm length, blade length, number of spikelets per panicle, and anther length), or homogeneity in all taxa (ligule length, number of flowers per spikelet, number of grooves and ridges of the leaf blade, and number of bulliform cells), or strong correlation with other variables included in our study (e.g., spikelet component widths with their respective lengths).

Correlation analysis (COA) based on the data of all three species was used to determine the relationships between the 11 characters selected (Tab. 3). The characters that showed strong correlation with other characters were excluded from the principal component analysis.

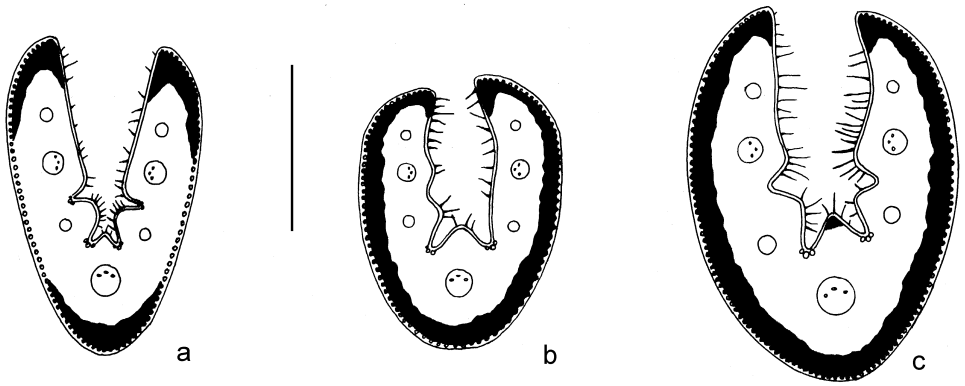

Fig. 1. Leaf blade sections – a: *Festuca rivas-martinezii* (Pto. de Navafría, Sierra de Guadarrama, 15.6.1989, *Ortúñez & Fuente*), b: *F. curvifolia* (Peñalara, Sierra de Guadarrama, 21.7.1988,*Ortúñez*), c: *F. summilusitana* (Pto. de la Peña Negra, Sierra de Gredos, 6.8.1990, *Ortúñez*). – Scale bar = 0.5 mm.

Tab. 2. List of the 11 principal quantitative characters studied in *Festuca rivas-martinezii*, *F. curvifolia* and *F. summilusitana*. The characters selected for the statistical analysis are indicated by an asterisk (*).

1.	Culm length [cm]
2.	Ligule length [mm]
3.	Leaf blade length [cm]
4.*	Panicle length [cm]
5.	Number of spikelets per panicle
6.	Number of branches per panicle
7.*	Length of bottommost panicle branch [cm]
8.	Number of spikelets per bottommost panicle branch
9.*	Length of bottommost panicle internode [cm]
10.*	Spikelet length (to apex of fourth lemma excl. awn) [mm]
11.	Number of flowers of spikelet
12.*	Lower glume length [mm]
13.	Lower glume width [mm]
14.*	Upper glume length [mm]
15.	Upper glume width [mm]
16.*	Lemma length (excl. awn) of the second one on each side [mm]
17.	Lemma width [mm]
18.*	Awn length of the second lemma [mm]
19.*	Palea length [mm]
20.	Anther length [mm]
21.*	Vertical diameter of leaf blade [mm]
22.*	Thickness of leaf blade [mm]
23.	Number of grooves on the leaf blade
24.	Number of ridges on the leaf blade
25.	Number of bulliform cells between the ridges in leaf cross section

Tab. 3. Correlation coefficients for the 11 quantitative characters selected (based on the data of all three species)

CR	PL	BL	IL	DM	TH	SL	GI	GS	LL	AL	PA
PL	1										
BL	0.87	1									
NL	0.93	0.81	1								
DM	0.12	0.13	0.11	1							
TH	0.29	0.24	0.30	0.47	1						
SL	0.47	0.44	0.41	0.12	0.23	1					
GI	0.47	0.46	0.48	0.10	0.22	0.45	1				
GS	0.60	0.54	0.58	0.12	0.25	0.57	0.71	1			
LL	0.58	0.53	0.53	0.09	0.24	0.66	0.60	0.71	1		
AL	0.05	0.23	0.006	0.11	–0.23	0.16	0.17	0.24	0.13	1	
PA	0.49	0.49	0.47	0.11	0.25	0.59	0.47	0.59	0.80	0.12	1

CR = Characters
PL = Panicle length
BL = Length of bottommost panicle branch
IL = Length of bottommost panicle internode
DM = Diameter of leaf blade
TH = Thickness of leaf blade
SL = Spikelet length
GI = Lower glume length
GS = Upper glume length
LL = Lemma length
AL = Awn length
PA = Palea length

Tab. 4. Means, variance, minimum and maximum values of 11 quantitative characters in *F. rivas-martinezii* (1), *F. curvifolia* (2) and *F. summilusitana* (3), and the number of samples of each species studied.

Character	Taxon	Mean	Variance	Min	Max	Samples
Diameter of leaf blade [mm]	1	0.81	0.00	0.69	0.96	170
	2	0.88	0.00	0.80	0.96	170
	3	0.94	0.01	0.73	1.12	180
Thickness of leaf blade [mm]	1	0.30	0.00	0.26	0.39	170
	2	0.37	0.00	0.34	0.41	170
	3	0.41	0.00	0.33	0.50	180
Spikelet length [mm]	1	5.81	0.22	5.17	6.72	166
	2	6.21	0.27	5.48	7.07	168
	3	6.76	0.23	5.94	7.47	167
Lower glume length [mm]	1	1.70	0.03	1.44	2.23	170
	2	2.44	0.05	2.07	3.06	170
	3	2.79	0.06	2.42	3.33	180
Upper glume length [mm]	1	2.54	0.04	2.18	3.14	170
	2	3.36	0.06	2.99	4.03	170
	3	3.86	0.06	3.43	4.30	180
Lemma length [mm]	1	3.45	0.05	3.15	3.98	170
	2	4.11	0.05	3.77	4.49	167
	3	4.83	0.12	4.38	5.53	167
Awn length [mm]	1	0.85	0.01	0.70	1.04	170
	2	1.46	0.07	0.99	1.97	167
	3	1.30	0.13	0.75	2.06	167
Palea length [mm]	1	3.23	0.01	3.04	3.41	170
	2	4.00	0.07	3.61	4.68	167
	3	4.56	0.08	4.27	5.43	167
Panicle length [cm]	1	4.87	0.63	3.80	6.58	170
	2	3.60	0.27	2.90	4.50	170
	3	5.62	0.72	4.15	7.35	180
Length of bottommost panicle branch [cm]	1	2.27	0.18	1.82	3.21	170
	2	1.63	0.08	0.98	2.13	170
	3	2.31	0.18	1.60	3.37	180
Length of bottommost panicle internode [cm]	1	1.47	0.11	1.00	2.22	170
	2	0.91	0.03	0.64	1.26	170
	3	1.56	0.09	1.05	2.17	180

Each species was represented in the component analyses by the arithmetic mean of each studied character for each population. The mean for each of the characters, together with the variance and the maximum and minimum values of the three taxa are summarized in Tab. 4.

A principal component analysis (PCA) (Harman 1960, Seal 1964), widely used for large data sets of multivariate observations, e.g., Clayton (1974), Tsunewaky & al. (1976), Gupta & al. (1978), Hilu (1985), Allred (1985), was performed with the data of eight selected characters (see Tab. 5).

Additionally, a discriminant component analysis (DCA) (Fisher 1936, Reyment 1973) was used (as, e.g., by Clayton 1974, 1976, Aiken & Consaul 1995, Allred 1985) to test the a priori hypothesis that the specimens can be allocated to discrete groups.

Tab. 5. PCA with eight quantitative characters of *Festuca rivas-martinezii, F. curvifolia* and *F. summilusitana*: weight of characters and percentage of variance for the first (PC1) and second (PC2) principal component.

Characters	PC1	PC2
Diameter of leaf blade	0.32	0.06
Thickness of leaf blade	0.38	-0.09
Spikelet length	0.36	0.22
Lower glume length	0.41	-0.16
Upper glume length	0.42	-0.09
Lemma length	0.41	0.08
Awn length	0.29	-0.52
Panicle length	0.20	0.79
% Variance	65.99	13.59

Tab. 6. DCA with *Festuca rivas-martinezii, F. curvifolia* and *F. summilusitana* as a priori groups: discriminant coefficients and percentage of variance for the first two discriminant function.

Characters	Axis 1	Axis 2
Diameter of leaf blade	0.02322	0.22961
Thickness of leaf blade	0.40290	-0.38070
Spikelets length	-1.03177	0.54943
Lower glume length	0.83783	-0.46818
Upper glume length	0.06145	0.34627
Lemma length	0.45524	0.09666
Awn length	-0.10063	0.82863
Palea length	0.80933	-0.4680
Panicle length	-1.28735	-1.37045
Length of bottommost panicle branch	0.76611	0.08964
Length of bottommost panicle internode	-0.07391	-0.13527
% Variance	82.28	16.12

Tab. 7. DCA with *Festuca rivas-martinezii* (1), *F. curvifolia* (2) and *F. summilusitana* (3) as a priori groups: group centroids. See also Fig. 3.

Groups	Axis 1	Axis 2
1	–5.03074	–0.23176
2	1.89512	2.10571
3	2.75769	–1.59110

Results and discussion

The analyses revealed that the three species can be clearly distinguished not only by qualitative characters (Tab. 1, Fig. 1) but also by quantitative morphological characters:

(1) PCA: the loadings for the components are shown in Tab. 5. The first axis accounts for 65.99 % of the variance, the second for 13.59 %; the remaining variance was disregarded as not contributing to discrimination. The first principal component (PC1) representing the compound

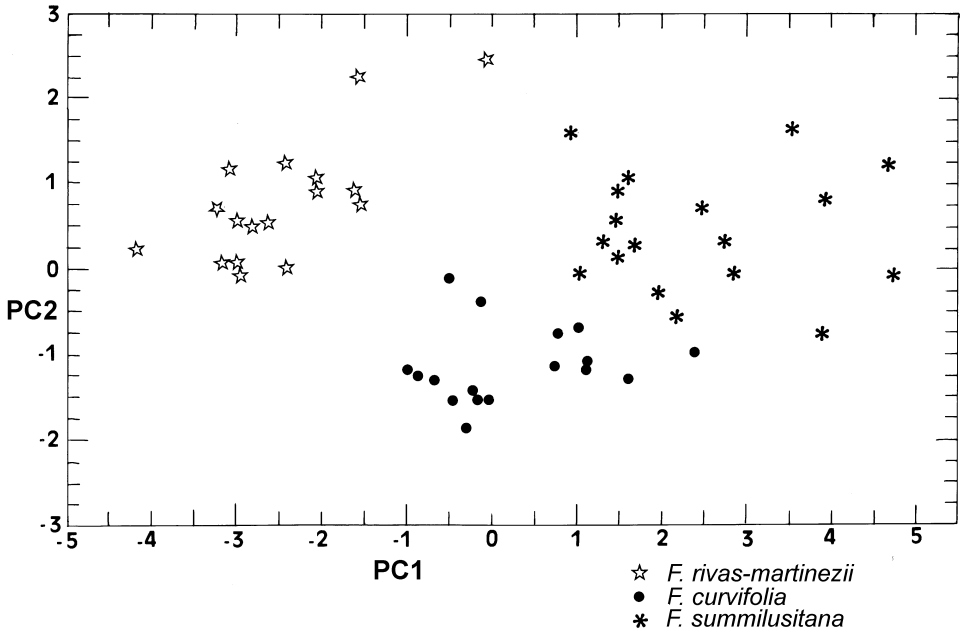

Fig. 2. PCA: plot of the first two principal components (PC1 and PC2).

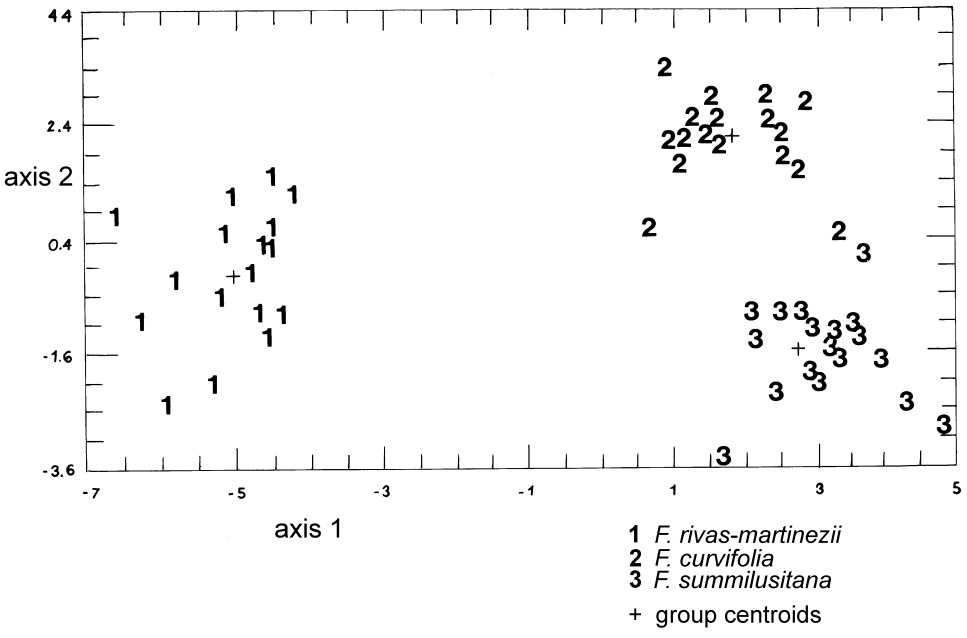

Fig. 3. DCA: plot of the first two discriminant functions (axis 1 and 2).

of eight characters, shows the biggest weights for the lengths of the lower glume, upper glume and lemma. The second principal component (PC2) shows the biggest weight for panicle length, and after the awn length with negative weight, low positive or negative weights for the other characters. The plot of the first two principal components is shown in Fig. 2.

Festuca rivas-martinezii is clearly separated from the other two species along the first axis, while *Festuca curvifolia* is separated from *F. summilusitana* along the second axis. The fact that *F. rivas-martinezii* is characterized by the lowest glume and lemma length (Tab. 4) separates this species with negative values along the first axis; the values for *F. curvifolia* are between those for *F. summilusitana* and *F. rivas-martinezii* (Tab. 4) and its position is intermediate along the axis, although closer to *F. summilusitana*. The second axis is highly correlated with the panicle length, and separates *F. rivas-martinezii* and *F. summilusitana* to positive values along the second axis, whereas *F. curvifolia* is separated to negative values. The two first species are characterized by panicle lengths greater than in *F. curvifolia* (Tab. 4).

(2) DCA: The groups separated by the PCA were analysed and given the following numbers: *F. rivas-martinezii* (1); *F. curvifolia* (2); *F. summilusitana* (3). The first axis accounts for 82.28 % of the variance, the second for 16.12 %, both axes are significant (Tab. 6). The first two discriminant axes are represented in Fig. 3. The first axis separates *F. rivas-martinezii* with negative values. *F. curvifolia* and *F. summilusitana* have separated group centroids (Tab. 7), but Fig. 3 shows the proximity of the populations because of their great range of variation. The second axis separates *F. curvifolia* and *F. summilusitana*.

The statistical analyses thus clearly support the separation of *F. rivas-martinezii*, *F. curvifolia* and *F. summilusitana* by quantitative characters, particularly by the length of the spikelet components and panicle length, which showed the greatest weights in both analyses (Tab. 5, 6), followed by the thickness and diameter of the leaf blade.

F. rivas-martinezii is clearly separated from *F. curvifolia* and *F. summilusitana* and is characterized by the lowest spikelet, glume and lemma lengths (Tab. 4). These results correspond well to the clear differences between *F. rivas-martinezii* and both *F. curvifolia* and *F. summilusitana* found in qualitative morphological, anatomical as well as cytological characters. *F. curvifolia* and *F. summilusitana*, which have both longer spikelet components than *F. rivas-martinezii* (Tab. 4), are, however, clearly separated in the analyses by their panicle length and awn length.

(1) *Festuca rivas-martinezii* Fuente & Ortúñez in Bot. J. Linn. Soc. 114: 94. 1994.
Holotype: Spain, "Madrid, puerto de Navafría (Sierra de Guadarrama), 30TVL3236, 1580 m", 15.6.1989, *E. Ortúñez & V. de la Fuente* (MAF 137908).

For a full description see Fuente & Ortúñez (1994); chromosome number: 2n = 2x = 14 (Fuente & Ortúñez 1994).

Ecology: The species is commonly found on acid sandy soils. It occurs in grazing land in Hieracio castellani-Plantaginion radicatae communities, in *Quercus rotundifolia* and *Q. pyrenaica* scrub, and it is occasionally also found in Campanulo-Nardion communities.

List of populations statistically analysed
1. Pto. de la Quesera, Sierra de Ayllón, 30TVL6564, 1720 m, 20.7.1990, *E. Ortúñez*; 2. Estación de la Pinilla, subida al Pico del Lobo, Sierra de Ayllón, 30TVL6161, 1550 m, 20.7.1990, *E. Ortúñez*; 3. El Rocín, cuerda Este, Sierra de Ayllón, 30TVL65, 1720 m, 24.6.1991, *E. Ortúñez*; 4. Pto. de la Hiruela, Sierra de Ayllón, 30TVL6046, 18.7.1973, *S. Rivas-Martínez, J. Izco & M. Costa*; 5. Pto. de Navafría, Sierra de Guadarrama, 30TVL3236, 1580 m, 15.6.1989, *E. Ortúñez & V. de la Fuente*; 6. La Mimbrera, Sierra de Guadarrama, 30TVL4533, 1180 m, 31.7.1981, *F. Fernández González*; 7. Alto de los Leones, Sierra de Guadarrama, 30TVL0407, 7.1964, J. Borja, MAF 103430; 8. Pto. de la Paradilla, 30TUK99, 24.6.1990, *V. de la Fuente & E. Ortúñez*; 9. Pico de San Juan, frente al Pico Abantos,

30TVK0198, 1610 m, 7.6.1990, *E. Ortúñez*; 10. Cruz de Hierro, 30TUL7608, 1650 m, 1.7.1984, *P. Cantó*; 11. La Cañada, 30TUK7395, 1370 m, 24.6.1990, *V. de la Fuente & E. Ortúñez*; 12. Entre Pto. de Villatoro y Villanueva del Campillo, Sierra de Gredos, 30TUK1692, 1550 m, 12.7.1990, *V. de la Fuente & E. Ortúñez*; 13. Pto. de Villatoro, Sierra de Gredos, 30TUK1690, 1450 m, 11.7.1990, *V. de la Fuente & E. Ortúñez*; 14. Narrillos del Rebollar, Cerro Gorría, Sierra de Gredos, 30TUL3302, 1370 m, 11.7.1990, *V. de la Fuente & E. Ortúñez*; 15. Pto. de Menga, Sierra de Gredos, 30TUK2982, 1560 m, 6.1990, *E. Ortúñez*; 16. Hoyos del Espino, Sierra de Gredos, 30TUK1668, 1400 m, 5.7.1991, *E. Ortúñez & C. Escobar*; 17. Pto. de Peña Negra, Sierra de Gredos, 30TUK0577, 1909 m, 7.1990, *V. de la Fuente & E. Ortúñez*.

(2) *Festuca curvifolia* Lag. ex Lange in Vidensk. Meddel. Dansk Naturhist. Foren. Kjöbenhavn, ser. 2, 1: 51. 1861.
Syntypes: Spain, "in montium Carpetanorum regione subalpina, Cerro de Cuelgamoros supra Escorial", 15.6.1852[?], *Lange* (G!); ibid., "in fissuris superior reg. subalpina monts. Carpetan. supra Navacerrada (Castellanova)", 21.6.1852, *Lange* (K!, P!); ibid., "Encinillas (prov. Burgos)", 10.1852, *Lange* (not traced). – Lectotype (designated here): "In fissuris ... supra Navacerrada (Castellanova)", 21.6.1852, *Lange* (K!; isolectotype: P!).
[= *Festuca duriuscula* var. *hystrix* sensu Lange in Vidensk. Meddel. Dansk Naturhist. Foren. Kjöbenhavn, ser. 2, 1: 51. 1861, p.p. non (Boiss.) Boiss. sensu typi]
[= *Festuca indigesta* var. *hystrix* sensu Willkomm in Willkomm & Lange, Prodr. Fl. Hispan. 1: 94. 1861, p.p. non (Boiss.) Willk. sensu typi]
[= *Festuca ovina* subsp. *eu-ovina* var. *indigesta* subvar. *aragonensis* sensu St.-Yves in Bull. Soc. Bot. France 72: 1002. 1926, p.p. non (Willk.) St.-Yves sensu typi].

F. curvifolia is a widely overlooked binomial which recently has only been listed by Chase & Niles (1962).

None of Lange's specimens quoted in the protologue ("In montium Carpetanorum regione subalpina (Cerro Cuelgamoros supra Escorial, Cerro de las aguilas pr. Navacerrada) Jun. c. fl.; Encinillas (prov. Burgos) (Oct. c. fl. !)") were traced in his original herbarium at C, but, as quoted above, specimens of two of the three original collections were found at G, K and P. We also searched for the specimen in MA that has been, according to the protologue, annotated by Lagasca as *Festuca curvifolia* ("Lag. in herb. hort. Matrit."), but in vain; we have seen only a specimen referable to this species that is annotated by Lagasca as "*Festuca recurvifolia*" and preserved at G-BOIS.

F. curvifolia has been confused with *F. hystrix* Boiss. (Elench. Pl. Nov.: 89. 1838 ≡ *F. duriuscula* var. *hystrix* (Boiss.) Boiss., Voy. Bot. Espagne 2: 671. 1845 ≡ *F. indigesta* var. *hystrix* (Boiss.) Willk. in Willkomm & Lange, Prodr. Fl. Hispan. 1: 94. 1861) and *F. aragonensis* (Willk.) Fuente & Ortúñez (in Itinera Geobot. 10: 347. 1997 ≡ *F. indigesta* var. *aragonensis* Willk. in Willkomm & Lange, Prodr. Fl. Hispan. 1: 94. 1861 ≡ *F. ovina* subsp. *eu-ovina* var. *indigesta* subvar. *aragonensis* (Willk.) St.-Yves in Bull. Soc. Bot. France 72: 1002. 1926 ≡ *F. indigesta* subsp. *aragonensis* (Willk.) Kerguélen in Lejeunia, ser. 2, 75: 158. 1975). It is, however, clearly distinct from both taxa, as has been shown in previous papers: *F. hystrix* is a diploid taxon, endemic to the Iberian Peninsula and North Africa (see Ortúñez & al. 1995, Fuente & al. 1997), and *F. aragonensis* is a tetraploid taxon, endemic to the Moncayo mountains in Spain (see Fuente & al. 1997).

Description
Culms (8)10–27(30) cm, erect, glabrous or sometimes scabrous. Sheaths of the leaves membranous, glabrous or sometimes scaberulous, fused for half of their length. Ligules (0.15)0.2–0.25 mm, ciliate at margin; auricle short and ciliate. Blades (2.5)3–12(17) cm, curved, smooth, glabrous, glaucous green; apice of leaves acute-obtuse. Leaf blade cross section in outline oboval, 0.65–1.1(1.3) mm in vertical diameter, (0.25)0.28–0.48(0.52) mm thick, with 7 veins; sclerenchyma forming a complete ring (2)3–4 cells thick; adaxial grooves 2–4; adaxial ridges

1–3, sometimes with some sclerenchyma over the midvein or indistinctly so over other veins. Panicles (1.8)2–5.5(6.8) cm, erect, dense, with (6)8–20(25) spikelets and with 1–3(4) branches. Spikelets (4.7)5–7.5(8.8) mm (to the tip of the fourth lemma, excl. awn), pruinose, with (3)4–6(7) florets, green or violet. Glumes unequal, with scarious and ciliate margins; lower glume lanceolate, (1.7)1.8–3(3.3) × (0.35)0.5–0.8(0.9) mm, 1-veined; upper glume oval-lanceolate, (2.3)2.5–4(4.7) × (0.7)0.9–1.45(1.6) mm, 3-veined. Lemma oval-lanceolate, (2.8)3.3–5(5.2) × (1.2)1.3–1.7(2) mm (excl. awn), with ciliate, narrowly scarious margins and scabrid tip, 5-veined; awns 0.9–2(2.5) mm. Palea oblong, bidentate, (2.6)3.1–4.75(5) × (0.45)0.5–0.85(0.9) mm, ciliate on the keels and the tip. Anthers (1.2)1.4–3.2(3.3) mm. Ovary glabrous. Grains oblong, 2.5–3.5 mm, adnate to palea. Chromosome number: 2n = 6x = 42 (Ortúñez & Fuente 1995)

Ecology: *F. curvifolia* grows on acid soils. It occurs mostly in Minuartio-Festucion curvifoliae and Hieracio-Plantaginion radicatae communities.

List of populations statistically analysed
1. Pico del Ocejón, Sierra de Ayllón, 30TVL7851, 1820 m, 20.8.1989, *E. Ortúñez*; 2. Pico del Lobo, Sierra de Ayllón, 30TVL65, 1650 m, 20.7.1990, *E. Ortúñez*; 3. Pto. de la Quesera, Sierra de Ayllón, 30TVL66, 1730 m, 27.6.1985, *V. de la Fuente*; 4. Pto. de Navafría, El Reventón, Sierra de Guadarrama, 30TVL3238, 1850 m, 15.6.1989, *E. Ortúñez*; 5. El Reajo Capón, Sierra de Guadarrama, 30TVL3137, 2060 m, 28.6.1989, *E. Ortúñez*; 6. El Nevero, Sierra de Guadarrama, 30TVL3137, 1870–1910 m, 28.6.1989, *E. Ortúñez*; 7. Puerto de Canencia, Sierra de Guadarrama, 30TVL3524, 1600 m, 15.6.1989, *E. Ortúñez*; 8. Pto. de la Morcuera, Sierra de Guadarrama, 30TVL2920, 1800 m, 15.6.1989, *E. Ortúñez*; 9. Peñalara, Sierra de Guadarrama, 30TVL1921, 2030–2260 m, 21.7.1988, *E. Ortúñez*; 10. Cerro de Valdemartín, Cuerda Larga, Sierra de Guadarrama, 30TVL1916, 2230 m, 29.6.1989, *E. Ortúñez*; 11. Collado de las Guarramillas, Sierra de Guadarrama, 30TVL1816, 2140 m, 29.6.1989, *E. Ortúñez*; 12. Bola del Mundo, Sierra de Guadarrama, 30TVL1615, 1950–2200 m, 29.6.1989, *E. Ortúñez*; 13. Siete Picos, Sierra de Guadarrama, 30TVL11, 2127 m, 10.7.1965, *Rivas-Martínez*; 14. Alto de los Leones de Castilla, Sierra de Guadarrama, 30TVL00, 1445–1460 m, 6.1964, *Rivas-Martínez*; 15. Pico Abantos, 30TVK0297, 1700 m, 5.7.1989, *E. Ortúñez*; 16. Cabeza Líjar, 30TVL0205, 1750 m, 7.6.1990, *E. Ortúñez*; 17. Cueva Valiente, 30TUL9405, 1900 m, 22.10.1988, *E. Ortúñez*.

(3) ***Festuca summilusitana*** Franco & Rocha Afonso in Bol. Soc. Brot., ser. 2., 54: 94. 1980.
Holotype: Portugal, "Sª da Estrela, in saxosis graniticis subalpinis l. Os Cantaros supra Nave de S. António", 1700 m, 17.6.1938, *W. Rothmaler, Fl. Lusit. nº 13685* (COI!).

Description
Culms (18.5)23.5–53(57) cm, erect, scabrid-pubescent at least above. Sheaths of the leaves membranous, pubescent, fused for half to three quarters of their length. Ligules 0.2–0.25(0.3) mm, ciliate at margin; auricles short and ciliate. Blades (7)12–27(29) cm, suberect, glabrous, pubescent below, green; apice of leaves acute-obtuse. Leaf blade cross sections in outline elliptical-oboval, (0.65)0.75–1.25(1.5) mm in vertical diameter, 0.3–0.5(0.55) mm thick, with 7(9) veins; sclerenchyma forming a complete ring (2)3–4 cells thick; adaxial grooves (2)3–4; adaxial ridges (1)2–3, sometimes with some sclerenchyma over the midvein or indistinctly so over other veins. Panicles (3.5)4.5–9.4(10.2) cm, erect, dense, with (12)14–27(34) spikelets and with (2)3–4(5) branches. Spikelets (5)5.8–8(8.2) mm (to tip of the fourth lemma, excl. awn), pruinose, with 4–6(7) florets, green or violet. Glumes unequal, with scarious and ciliate margins; lower glume lanceolate, (2)2.3–3.4(3.5) × (0.5)0.65–0.85(0.9) mm, 1-veined; upper glume oval-lanceolate, (3)3.3–4.6(4.8) × (1)1.1–1.5(1.6) mm, 3-veined, with scabrid-pubescent tip. Lemmas oblong-lanceolate, (4)4.3–5.5(6.3) × (1.3)1.5–1.7(1.9) mm (excl. awn), with shortly ciliate margins and scabrid-pubescent tip, 5-veined; awns (0.8)1–2.1(2.4) mm. Palea oblong, bidentate, (3.5)4–5(5.5) × (0.65)0.7–0.85(0.9) mm, scabrid on the keels and the tip. Anthers (1.6)1.7–3(3.6) mm. Ovary glabrous. Grains oblong, 2.8–3.5 mm, adnate to palea. Chromosome number: 2n = 6x = 42 (Ortúñez & Fuente 1995).

Ecology: *F. summilusitana* grows on acid soils. It is a characteristic species of the Arenario querioidis-Festucetum summilusitanae, and occurs also in Minuartio-Festucion curvifoliae communities.

List of populations statistically analysed
1. San Martín de la Vega, Piedrahita, Sierra de Gredos, 30TUK27, 20.5.1982, *D. Sánchez-Mata*; 2. Pto. de Mijares, Sierra de Gredos, 30TUK46, 1600–1760 m, 4.6.1991, *E. Ortúñez*; 3. Pto. de los Serranillos, Sierra de Gredos, 30TUK3563, 1600 m, 7.8.1990, *E. Ortúñez*; 4. Navadijos, Sierra de Gredos, 30TUK27, 1530 m, 5.8.1985, *D. Sánchez-Mata*; 5. Pto. de Menga, Sierra de Gredos, 30TUK28, 1560 m, 3.8.1992, *E. Ortúñez*; 6. Hoyos del Espino, Sierra de Gredos, 30TUK16, *M. Mayor*; 7. Los Barrerones, Sierra de Gredos, 30TUK0760, 2150 m, 7.8.1990, *E. Ortúñez*; 8. Laguna del Barco, La Covacha, Sierra de Gredos, 30TTK75, 1650 m, 24.7.1983, *V. de la Fuente*; 9. Pto. de la Peña Negra, Sierra de Gredos, 30TUK0577, 1910 m, 6.8.1990, *E. Ortúñez*; 10. Pto. del Tremedal, pico Calutema, Sierra de Gredos, 30TTK77, 1700 m, 5.7.1991, *E. Ortúñez*; 11. Pto. de Honduras, Canchal Negro, Sierra de Gredos, 30TTK5657, 1500–1630 m, 5.8.1989, *E. Ortúñez*; 12. Pto. del Pico, Sierra de Gredos, 30TUK26, 1352–1500 m, 5.1992, *V. de la Fuente*; 13. Cerro Gorría, Sierra de Gredos, 30TUL30, 1700–1770 m, 11.7.1990, *E. Ortúñez*; 14. Pto. de Villatoro, Sierra de Gredos, 30TUK18, 1400 m, 3.8.1992, *V. de la Fuente & E. Ortúñez*; 15. La Serrota, Sierra de Gredos, 30TUK2385, 2040–2090, 31.8.1985, *D. Sánchez-Mata*; 16. Pto. de Chía, Sierra de Gredos, 1470–1660 m, 3.8.1992, *E. Ortúñez*; 17. Candelario, El Calvitero, Sierra de Gredos, 30TTK6866, 2400 m, 25.7.1989, *S. Sardinero*; 18. Solana de Avila, Sierra de Gredos, 30TTK76, *S. Sardinero*.

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