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BRUNO FOGGI & GRAZIANO ROSSI

A survey of the genus *Festuca* L. *(Poaceae)* in Italy. I. The species of the summit flora in the Tuscan-Emilian Apennines and Apuan Alps

Abstract

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Based on own extensive collections and field studies as well as on the material preserved in the relevant herbaria, the genus *Festuca* in the summit areas of two of the three districts of the N Apennines is revised. 16 species with three subspecies are recognized; of these, one species, *F. riccerii*, is described as new to science; *F. halleri* subsp. *yvesii* and *F. billyi* are reported for the first time from Italy, *F. trichophylla* subsp. *asperifolia*, *F. cinerea*, and *F. gracilior* for the first time from the N Apennines. A key to all taxa is provided; for each taxon a description and data on its distribution as well as ecology including phytosociology are given.

Introduction

Since the taxonomic revision of the genus *Festuca* for the entire of Europe by Markgraf-Dannenberg (1980), a number of contributions concerned with the taxonomy of the genus in different regions of Europe have been published, e. g., Al-Bermani & Stace (1991), Al-Bermani & al. (1992), Stace (1980, 1991), Wilkinson & Stace (1985, 1987, 1989), and Jarvis & al. (1987) for the British Isles, Kerguélen (1983, 1987), Kerguélen & Plonka (1989) and Kerguélen & al. (1993) for France, Pils (1980, 1981, 1984, 1985), Pils & Prosser (1995) and Kiem (1990) for S Austria and NE Italy, Fuente Garcia & Sanchez Mata (1986a-b, 1987, 1989), Fuente Garcia & al. (1988) and Fuente Garcia & Ortunez (1994) for Spain, Strid (1991) and Scholz & Strid (1992) for Greece.

The last treatment of *Festuca* in the entire Italy was published by Markgraf-Dannenberg (1982), who provided a fairly different treatment compared with both the accounts in previous Italian floras (Bertoloni 1833, Parlatore 1850, Cesati & al. 1869, Fiori 1923) and Hackel (1882); her treatment did not so much increase the total number of taxa but implied considerable taxonomic reevaluations and rearrangements of the known taxa (Tab. 1). Since 1982, further contributions to our knowledge of *Festuca* in Italy were made by Ceccarelli & al. (1992, 1993), Cenci & al. (1990), Kiem (1990), Pils & Prosser (1995), and Tornadore & al. (1983).

However, a preliminary study by the present authors of the *Festuca* material preserved in several Italian and European herbaria revealed that surprisingly few specimens are available

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Tab. 1. Numbers of *Festuca* taxa recognized in Italy in general and in the Tuscan-Emilian Apennines and Apuan Alps in particular, from Bertoloni to Markgraf-Dannenberg and the present paper.

	Italy			N Apennines		
	(A) species	(B) infraspecific taxa	(A +B)	(C) species	(D) infraspecific taxa	(C + D)
Bertoloni (1833)	11	8	19	3	3	6
Parlatore (1850)	22	14	36	5	1	6
Cesati & al. (1867)	21	5	26	4	3	7
Hackel (1882)	16	54	70	3	7	10
Fiori (1923)	12	46	58	4	9	13
Markgraf-Dannenberg (1980)	56	17	71	10	1	11
Markgraf-Dannenberg (1982)	63	12	75	12	2	14
Present work	—	—	—	16	3	19

from Italy and that most of them were collected before 1920. So we can infer that the present knowledge of *Festuca* in Italy is based on rather few exsiccata only which hardly represent the considerable range of variation shown by many *Festuca* species. In fact, the descriptions of many species of this genus consider only the distinctive characters, and as soon as a larger number of specimens is analysed, these distinctions often break down (Wilkinson & Stace 1991). Presently, of many *Festuca* species in Italy we know rather little about the range of their morphological variability. For this reason, we decided to begin our taxonomic research on *Festuca* in Italy with an extensive sampling, achieving an adequate number of specimens from several areas and habitats.

The final aim of our investigation is to present a taxonomic revision of the genus *Festuca* in Italy. As a first instalment we present a survey of the taxa occurring in the Tuscan-Emilian Apennines and Apuan Alps, which were floristically extensively explored in the past years (Rossi & al. 1988, Foggi 1990, Rossi 1994, Tomaselli & Agostini 1994).

Study area

The N Apennines are a mountain range of 250 km length separating the Po plain in the north from the Italian peninsula in the south at a latitude of 44°N. Geographically and geologically, the N Apennines can be divided into three districts: the Ligurian-Emilian district in the northwest, largely built of serpentine, the Tuscan-Emilian district in the southeast, largely built of sandstone, and the Apuan Alps in the southwest, predominantly built of carbonaceous rocks (Fig. 1). The present study is limited to the latter two districts and the *Festuca* taxa of the unforested summit areas, at elevations ranging from about 1600 to 2100 m in the Tuscan-Emilian Apennines and from about 1300 to 1900 m in the Apuan Alps.

The climate in the Tuscan-Emilian Apennines can be defined as temperate montane, whereas in the Apuan Alps it is subatlantic, owing to the sea effect.

The vegetation belts are in both the Tuscan-Emilian Apennines and in the Apuan Alps still clearly recognizable although the landscape has extensively been altered by humans (Farina 1994). The montane belt is formed of *Fagus sylvatica* forests, today replaced over large areas by secondary meadows and pastures. The timberline is mostly situated at 1600–1700 m, but reaches only 1300–1400 m on the southern slopes of the Apuan Alps.

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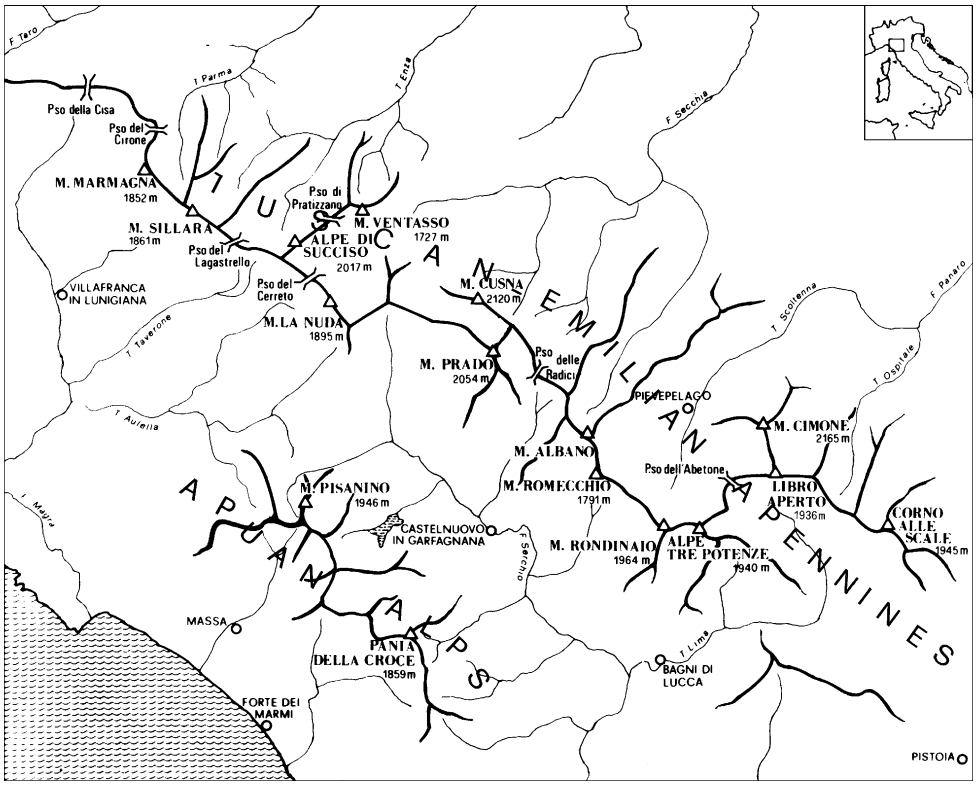


Fig. 1. The study area.

The summit vegetation of the Tuscan-Emilian Apennines is dominated by a subalpine belt of *Vaccinium* heaths. A phytosociological survey of the summit vegetation of the N Apennines was recently produced by Tomaselli (1994). In the Apuan Alps *Vaccinium* heaths are less common and confined to acidic substrata. This vegetation has recently been studied by Ferrari & al. (1994). On the steeper southern slopes heathlands are replaced by xerophytic grasslands dominated by *Brachypodium genuense* (Lucchese 1988); these summit grasslands belong to four orders: (1) Seslerietalia variae, including open xerophytic grasslands occurring on carbonaceous substrata and fragments of close mesophytic grasslands settled along the ledges of the arenaceous N-facing rock walls; (2) Caricetalia curvulae (Tomaselli & Rossi 1994), comprising the open grasslands colonizing the summit ridges on arenaceous substrata (only in the Tuscan-Emilian Apennines); (3) Nardetalia, corresponding to the acidophytic pastures; (4) Salicetalia herbaceae, including the fragments of snow beds. The rock-face vegetation belongs to three distinct alliances, i. e. communities on carbonaceous rocks (Saxifragion lingulatae), communities on arenaceous rocks (Androsacion vandellii) and communities on cold and moist N-facing rocks (Cystopteridion). The talus-slope vegetation, finally, can be divided into communities settled either on carbonaceous or marly debris (alliance Linario-Festucion dimorphae) and communities colonizing arenaceous boulders (order Androsacetalia alpinae).

Material and methods

The results presented are based on the study of populations in the field and on the examination of herbarium specimens including the analysis of type specimens.

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Field investigations in the study area have been carried out since 1984; in addition, specimens were collected by us in the Alps, Corsica and in the Central and S Apennines. The number of specimens collected and studied is approximately 2000; this material is conserved at PAV (the great bulk) and FI.

Furthermore, the *Festuca* material housed at the following herbaria was studied: AULLA, B, BM, BOLO, BP, CAM, FI, G, GDOR, MOD, NAP, OXF, P, PAV, RO, SI, W, ZU; of their personal herbaria specimens were kindly put at our disposal by M. Tomaselli (Parma), N. Lucchese (Campobasso) and D. Marchetti (Massa Carrara) from the N Apennines, by P. Argenti and C. Lasen (Feltre), F. Prosser (Rovereto), M. & P. Boiti (Trento) and M. Tomaselli from the Alps, and by S. Ballelli (Camerino), B. Petriccione (Roma) and M. Tomaselli from the Central and S Apennines.

The following abbreviations for frequently quoted collectors are used: PVA = Pier Virgilio Arrigoni, BF = Bruno Foggi, CR = Carlo Ricceri, GR = Graziano Rossi, and MT = Marcello Tomaselli.

Some species, i. e. *Festuca apuanica*, *F. puccinellii*, *F. alpina* subsp. *briquetii*, *F. billyi* and *F. riccerii,* were also studied under cultivation in the Botanical Garden of Florence "Giardino dei Semplici".

The measures on the floral parts were carried out by means of a Zeiss stereomicroscope (Stemi SR model) with magnifications of ×8–20. The analyses of transverse sections of leaf blades were carried out by means of a Reichert microscope (Univar model) with magnifications of ×100–600; the outlines were drawn on transparent paper placed on the 25 cm large visor of the microscope (by B. Foggi); the specimens analysed are indicated in the legends by region, collecting date, collectors, and herbarium, while the full collection data are quoted in the paragraphs 'Specimens studied' (with reference to the corresponding figure).

Terminology and methods of measures follow Hackel (1882) and Stace (1991) for the floral parts, and Hackel (1882), Saint-Yves (1913), Ellis (1976) and Kerguélen & Plonka (1989) for the transverse section of leaf blades. The descriptions refer to the variability in the study area.

The chromosome counts in *F. billyi* were obtained after the following standard method: the root tips were pretreated in 8-hydroxyquinoline for 4 h, fixated in 3:1 ethanol-acetic acid, stained with Schiff reagent, then put on a slide with one or two drops of 3:1 ethanol-acetic acid, squashed and finally examined under a light microscope.

Artificial key to *Festuca* in the summit areas of the Tuscan-Emilian Apennines and Apuan Alps

1. Culms vigorous, with swollen tuberous base . . . . . 1. *F. paniculata* subsp. *paniculata*
– Culms not vigorous, without swollen base 2
2. Vegetative tillers always intravaginal and their sheaths overlapping; ligule with auricles always present 3
– Vegetative tillers extravaginal, sometimes also intravaginal tillers present; sheaths of vegetative tillers fused into a tube up to the top; ligule without auricles or with vestigial auricles 12
3. Tiller leaf blades smooth; sclerenchyma in a continuous band, only rarely interrupted . . 4
– Tiller leaf blades with ± evident longitudinal veins, in cross section with 3(5) isolated, ± stout sclerenchyma strands 10
4. Lemma 2.5–3.5 mm, usually unawned . . . . . 10. *F. filiformis*
– Lemma always > 3.5 mm, always awned 5
5. Spikelets > (8)8.5 mm; tiller leaf blades in cross section with sclerenchyma in a thin continuous band, sometimes thickened in correspondence to the vascular bundles, or scarcely interrupted; leaves *Juncus*-like 6

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– Spikelets < 8 (or very rarely up to 8.5) mm; sclerenchyma in a continuous band sometimes laterally thickened or scarcely interrupted; leaves never *Juncus*-like 7

6. Leaves usually longer than half of the culm; anthers 2–2.5 mm; tiller leaf blades with sclerenchyma in a continuous band usually thickened in correspondence to the vascular bundles, and with 3–5 adaxial ribs; lemma 5.2–5.5(6) mm . . . . . 15. *F. apuanica*

– Leaves smaller than or equalling up half of the culm length; anthers 3–3.5 mm; tiller leaf blades with sclerenchyma in a continuous band usually laterally thinned and with 5–7 adaxial ribs; lemma 5.5–7 mm . . . . . 16. *F. billyi*

7. Panicle dense or slightly interrupted; awn of lemma < 1 mm or very rarely up to 1.5 mm . 8

– Panicle rather loose; awn of lemma generally > 1 mm 9

8. Culms 10–25(30) cm; spikelets loose, often interrupted; leaf blades ovate-rounded, 0.5–0.7 mm wide, with 1–3 rather low adaxial ribs; sheaths not papyraceous at the base . . . . . 13. *F. gracilior*

– Culms usually > 25 cm; spikelets dense, not interrupted; leaf blades ± laterally flattened, 0.7–0.9(1) mm wide, with 3–5 well evident adaxial ribs; sheaths papyraceous at the base . . . . . 11. *F. inops*

9. Leaves generally pruinose; tiller leaf blades with the sclerenchyma laterally thickened; lemma barbed in distal half, with an awn of 1–2 mm; anthers 3 mm; spikelets generally pruinose, 7–7.5(8) mm . . . . . 12. *F. cinerea*

– Leaves never pruinose; sclerenchyma never laterally thickened; lemma not barbed, with minutely hispid hairs in the distal half, with an awn of 2–4 mm; anthers 2–2.5 mm; spikelets never pruinose, 7–8(8.5) mm . . . . . 14. *F. riccerii*

10. Culms > 25 cm; tiller leaf blades > 0.7 mm wide, very laterally flattened, with 3 very stout sclerenchyma strands in correspondence to the prominent abaxial ribs well visible with the bare eye . . . . . 9. *F. circummediterranea*

– Culms < 25(30) cm; tiller leaf blades < 0.7 mm wide, not laterally flattened, with the abaxial ribs scarcely visible with the bare eye 11

11. Lower glume c. 2.5 mm; awn of lemma > 3 mm; tiller leaf blade with 3(5) small sclerenchyma strands and 5 vascular bundles . . . . . 8. *F. alpina* subsp. *briquetii*

– Lower glume 2.8–3.5 mm; awn of lemma < 3 mm; tiller leaf blade with 3 stout sclerenchyma strands, 2 small accessory sclerenchyma strands, and (5)7 vascular bundles . . . . . 7. *F. halleri* subsp. *yvesii*

12. Densely tufted grass without or with very short rhizomes; awn of lemma generally > 3 mm; tiller leaf sheaths decaying into reticulate fibres . . . . . 2. *F. puccinellii*

– More or less densely tufted grass; awn of lemma generally < 3 mm; tiller leaf sheaths not decaying into reticulate fibres 13

13. Tiller leaf blades with sclerenchyma strands unequal in size and shape 14

– Tiller leaf blades with sclerenchyma strands usually equal in size and shape 15

14. Tiller leaf blades strongly scabrid over the entire surface, 0.7–1.1 (1.3) mm wide . . . . . 6. *F. trichophylla* subsp. *asperifolia*

– Tiller leaf blades scabrid only in the distal part, 0.45–0.6 mm wide . . . . . 5. *F. cyrnea*

15. Spikelets usually 10–12 mm long, with 7–10 florets; blade of convolute leaves up to 1.3 mm wide, that of flat leaves up to 2–3 mm wide; tiller leaf blades with 7–11 sclerenchyma strands and 7–13 vascular bundles; lower glume 3–4 mm; anthers 3–4 mm; grass 50–100 cm tall with very long rhizomes . . . . . 4. *F. heteromalla*

– Spikelets up to 6–10 mm long and with 3–5 florets; all leaves convolute; tiller leaf blades with 5–7 sclerenchyma strands and (5)7 vascular bundles; lower glume 2.5–3(3.5) mm; anthers 2–2.8(3) mm; grass 30–50 cm tall, without, with short or long rhizomes . . . . 3. *F. rubra*

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Festuca* sect. *Subbulbosae Hack.
Grasses with vigorous culms and tuberous culm base.

(1) *Festuca paniculata* (L.) Schinz & Thell. in Vierteljahrsschr. Naturf. Ges. Zürich 58: 40. 1913 subsp. ***paniculata***

Densely tufted grass, culms erect, vigorous, 40–100 cm tall, yellowish-green, with swollen tuberous base. Vegetative tillers intravaginal. Basal sheaths up to 10 cm, persistent, tardily decaying into greyish fibres; ligule not more than 1 mm. Culm leaf blades flat, tiller leaf blades plicate-convolute, striated with numerous prominent abaxial ribs. Tiller leaf blade in transverse section 2–3 mm wide, with 7–8(9) principal vascular bundles and up to 20 little accessory vascular bundles, with little sclerenchyma strands in correspondence to accessory vascular bundles and 5–7 girders in correspondence to principal vascular bundles, extending to the adaxial surface; adaxially with 7–9 sparsely hairy ribs; bulliform cells usually present. Panicles ovoid, 4–8 cm, dense, pendent, golden yellow. Spikelets 9–11 mm, with 3–5 florets, green-yellowish, sometimes variegated tinged violet; lower glume 4–6 mm, carinate, 1-veined, upper glume 5–6 mm, 3-veined; lemmas 7–8.5 mm, broadly lanceolate, 3–5 veined, slightly scabrid, awn 0–0.5 mm. Anthers 3.5–4.5 mm.

Distribution
Mountains of S Europe. In Italy *F. paniculata* subsp. *paniculata* is known from the Alps and Apennines as far south as Calabria (Markgraf-Dannenberg 1982); in the study area it is found only in the Tuscan-Emilian Apennines.

Ecology
F. paniculata subsp. *paniculata* mostly occurs on SW-facing, inclined slopes on deep and acidic soil between the beech forest limit and the summit ridges. In the Alps, *F. paniculata* is regarded as a character species of the Festucion spadiceae (Braun-Blanquet 1972). Locally, the typical subspecies grows in *Brachypodium genuense* grasslands belonging to the Nardion strictae (Rossi 1994), where it becomes predominant at sites with stronger acidic soil. Occasionally, it is also found in *Vaccinium* heaths (Ferrari & al. 1994).

Specimens studied
TUSCAN-EMILIAN APENNINES: PROV. PARMA: Pascoli alpini del M. Orsaio, 21.7.1858, *Parlatore* (FI); M. Orsaro, nei prati freschi, 1750 m, esp. N, 7.6.1964, *E. Ferrarini* (Museo S. Nat. Lunigiana, Aulla, MS). — PROV. REGGIO-EMILIA: M. Prado, brachipodieto, esp. E, 18.6.1993, *GR*

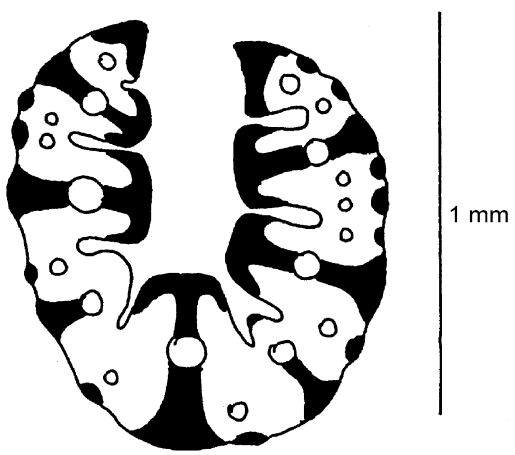


Fig. 2. *Festuca paniculata* subsp. *paniculata* – transverse section of tiller leaf blade; Prov. Pistoia, 17.7.1993, *GR* (PAV).

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(PAV); M. Vecchio, brachipodieto a *F. p.*, esp. S, 25.7.1994, *GR* (PAV). — Prov. Modena: M. Cimone, reg. alpina, 1.8.1857, *Parlatore* (FI); pi del Cimone, prope Fiumalbo, 7.6.1878, *G. Riva* (FI); prati alle falde del M. Cimone, 24.7.1884, *A. Fiori* (FI); ad radices montis Cimone, 1.7.1885, *A. Fiori* (FI), *A. Fiori 27* (RO); dirupi della cima del Rondinaio a 1800 m, 2.7.1885, *A. Fiori* (FI); in pascuis alpinis Montis Rondinaio, herb. Rolli, sec. IX, n.26 (RO); M. Rondinaio, sulla scogliera, 10.7.1889, *coll. ignot.* (FI); Nuda in Garfagnana, 6.7.1894, *coll. ignot.* (FI). — Prov. Bologna: Corno alle Scale, 8.1842, *Savi* (FI). — Prov. Pistoia: In Apennino Pistoiensi, al Boscolungo, 8.1847, *Parlatore* (FI); Prato Fiorito, 26.7.1852, *Caruel* (FI); Tre Potenze, 8.1847, *Parlatore* (FI); in herbosis alpinis prope cacumen montis tre Potenze, 1800-1900 m, 16.7.1885, *coll. ignot.* (FI); Alpe Tre Potenze, in vaccinieto, 1800 m, esp. E, 17.7.1993, *GR* (PAV – Fig. 2). — Prov. Lucca: App. lucchese al Prato Fiorito, 6.1863, *Beccari* (FI); Piandelagotti-Alpicella, 6.7.1909, *Lunardi* (FI). — Prov. Massa: Negli erbosi del crestone nord di macigno del M. Buffanaro, nei Groppi di Camporaghena, nell'Appennino lunigianese (MS), 1800 m, 6.8.1980, *E. Ferrarini* (SI).

Festuca* sect. *Aulaxyper Dumort.
Lemmas never scarious; ligules always very short; caryopsis adnate to palea; vegetative tillers intra- and extravaginal; tiller leaf sheaths fused.

(2) *Festuca puccinellii* Parl., Fl. Ital. 1: 440. 1850

Densely tufted grass without rhizome, culms (10)15–30(35) cm. Vegetative tillers intra- and extravaginal. Tiller leaf sheath fused, decaying into reticulate reddish fibres in the lower portion; ligule very short. Heterophyllous: leaf blades in upper portion of the culms flat, tiller leaf blades subsetaceous, soft, slightly scabrid in the distal part. Tiller leaf blades in transverse section irregularly hexagonal to polygonal, 0.4–0.6 mm wide, with 5 vascular bundles, 5 adaxial ribs with sparse to dense long hairs, and with 7 little sclerenchyma strands of which the median strand is slightly larger than the others; abaxial epidermal cells large to very large. Panicles not very wide, slightly lax, (3)4–7 cm long, sometimes pendent. Spikelets 7–8(9) mm, green or rarely shiny violet-blackish tinged, with 3–6 florets; lower glume 2.5–3.5 mm, 1-veined, upper glume 3–6 mm, 1-veined, scarcely acuminate, broadly scarious; lemmas 5.5–6.5(7) mm, 5-veined, linear-lanceolate, often smooth, awn subterminal, (2.5)3–4 mm. Anthers 2.5–3.3 mm.

Distribution
F. puccinellii is widespread in the N Apennines and was also reported from the Alps by Markgraf-Dannenberg (1980, 1982).

Ecology
F. puccinellii grows on acidic as well as on base-rich soils. Oberdorfer (1983) regards it as character species of the association Trifolio-Festucetum violaceae (Poion alpinae). In the N Apennines, *F. puccinellii* is a character species of an association provisionally named Trifolio-Festucetum puccinelii (Rossi 1994), and occurs also in various associations of N-facing rocky habitats, such as Valeriano-Saxifragetum, Asplenio-Cystopteridetum, Drabo aizoidis-Primuletum apenninae (Tomaselli 1994), Cryptogrammo-Dryopteridetum oreadis, and Arenarietum bertolonii.

Notes
Markgraf-Dannenberg (1980, 1982) reported *F. puccinellii* only from the Alps. However, the locus classicus of this species is situated in the N Apennines (Parlatore 1850), where this species has recently been recollected by Foggi (1990). The populations of *F. puccinellii* in the study area examined by us are very close to the type material of *F. puccinellii*, whereas the populations from the Alps show some, though minor, morphological differences.

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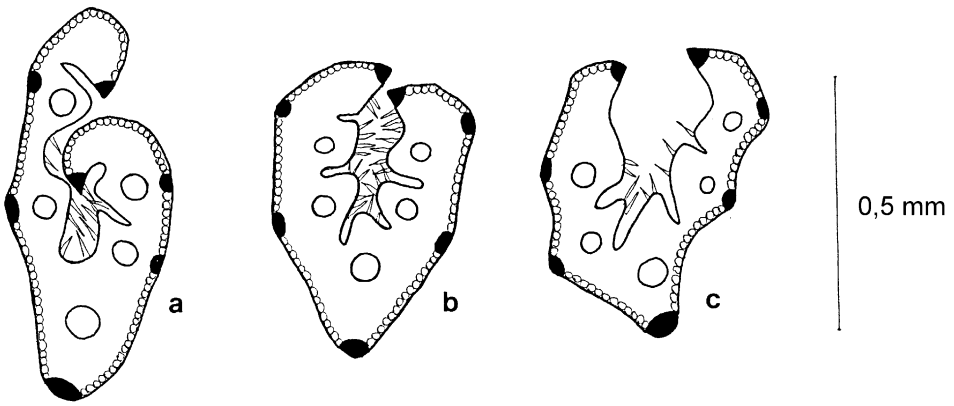


Fig. 3. *Festuca puccinellii* – transverse sections of tiller leaf blades; a: Prov. Pistoia, 1.8.1992, *GR & MT* (PAV); b: Apuan Alps, 31.7.1992, *L. Di Fazio & BF* (FI); c: Prov. Modena, 12.8.1988, *BF & CR* (FI).

Specimens studied

Tuscan-Emilian Apennines: Prov. Parma: Monte Orsaio, 20.7., *U. Martelli* (FI); Corniglio, vaccinieti e rupi della cresta rocciosa tra il M. Marmagna e il M. Braiola, arenaria, 1600–1800 m, 21.7.1986, *PVA, BF & CR* (FI); Monchio di Corti, rupi tra Lago Palo e M. Malpasso, arenaria, 1500–1700 m, esp. N, 22.7.1986, *PVA, BF & CR* (FI); M. Bragalata, su arenaria macigno, in rupe fresca, Drabo aizoidis-Primuletum apenninae, 1700 m, esp. NW, 27.7.1992, *GR & MT* (PAV); cresta Bocco-Malpaasso, su arenaria macigno, in rupe fresca, Drabo aizoidis-Primuletum apenninae, 1700 m, esp. N, 27.7.1992, *GR & MT* (PAV). — Prov. Reggio-Emilia: Dirupi del Ventasso, 3.8.1888, *A. Fiori* (FI); Alpe di Mommio, 7.8.1888, *A. Fiori* (FI); M. Scalocchio, rupi di arenaria, nel Drabo aizoidis-Primuletum, 1820 m, esp. N, 2.8.1983, *MT* (PAV); Collagna, M. Alto, rupi e pascoli cacuminali, arenaria, 1600–1904 m, 14.7.1987, *BF & CR* (FI); Ligonchio, M. Prado, pendici rocciose settentrionali fra il Lago di Bargetana e Sella Sprone di Prado, arenaria, 1800–1950 m, 28.7.1987, *BF & CR* (FI); Ligonchio, M. Cusna, pascoli da Rif. Battisti a M. La Piella, arenaria, 1800–2070 m, 29.7.1987, *BF & CR* (FI); Ligonchio, M. Cusna, prati rocciosi della vetta, 2100 m, 10.8.1988, *BF & CR* (FI); tra M. Alto e Passo di Pietra Tagliata, al piede di una rupe, Ril. 11, 1770 m, esp. W, 26.7.1992, *GR & MT* (PAV); La Nuda, in pietraia a felci, Cryptogrammo-Dryopteridetum oreadis, 1780 m, esp. NE, 30.7.1992, *GR & MT* (PAV); M. Prado, 20.8.1992, *GR & MT* (PAV); M.Cusna, su arenarie di M. Modino, in praterie pingui, nel trifolio-festuceto, 1950 m, esp. NE, 5.9.1992, *GR & MT* (PAV). — Prov. Modena: Regione scoperta sul versante meridionale del Monte Rondinajo, 7.1853, *S. Caruel* (FI); pascoli (..) rupi del Balzo, 27.7.1857, *Parlatore* (FI); tra Lagoni e Passo Paitino, in pietraia a felci su arenaria macigno, Cryptogrammo-Dryopteridetum oreadis, 1550 m, esp. N, 29.7.1992, *GR & MT* (PAV); Monte Pizzo, 6.7.1934, *A. Lunardi* (FI); Fontanaluccia, Monte Pizzo, 21.7.1920, *A. Lunardi* (FI); rupi, Libro Aperto, 1939 m, 9.7.1863, *Parlatore* (FI); pascoli, Giovo, 14.7.1863, *Parlatore* (FI); Pascoli del Cimone, 24.7.1884, *A. Fiori* (FI); Monte Rondinaio, 10.7.1889, *U. Martelli* (FI); M. Giovo, 24.7.1928, *Lunardi & Gavioli* (FI); Presso la Porticciola, Colle Bruciata, M. Giovo, su detriti di arenarie-marnose, nell'Arenarietum betolonii, 1590 m, esp. W, 8.1983, *MT* (PAV); Pievepelago, cresta da Foce al Giovo a Bozzo al Fosso, prati e vaccinieti, arenaria, 1674–1781 m, 13.7.1987, *BF & CR* (FI); M. Pievepelago, M. Rondinaio, rocce fra la sella sopra Lago Torbido e la vetta, vaccinieti e prati, 1781–1964 m, 30.7.1987, *BF & CR* (FI); Fiumalbo, M. Cimone, da Pian Cavallaro alla vetta, prati rocciosi, 1850–2150 m, esp. NNW, 12.8.1988, *BF & CR* (FI – Fig. 3c); versante sud M. Cimoncino, detriti a *Cirsium bertolonii* su arenaria, 1800 m, esp. SE, 9.9.1990, *MT* (PAV); su arenarie di M. Modino, in praterie mesofitiche, nel Trifolio-Festucetum puccinelii, M. Giovo, 1950 m, esp.

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NNW, 7.8.1991, *TM* (PAV). — PROV. BOLOGNA: M. Spigolino, su arenarie di M. Cervarola, nel Trifolio-Festucetum puccinelii, 1670 m, esp. NW, 9.7.1989, *GR & MT* (PAV). — PROV. PISTOIA: S. loc., herb. Rolli, sec. IX (RO); alle Tre Potenze, 8.1847, *Parlatore* (FI); Lago Nero, Tre Potenze, 25.7.1887, *E. Levier* (FI); in pietraia a felci, Cryptogrammo-Dryopteridetum oreadis, 1780, esp. S, 21.10.1984, *MT* (PAV); Alpe Tre Potenze, vicino Lago Nero, in pietraia a felci, Cryptogrammo-Dryopteridetum oreadis, 1840 m, esp. NNE, 1.8.1992, *GR & MT* (PAV – Fig. 3a). — PROV. MASSA: Fivizzano, fra il Bivacco Rosaro e il M. La Nuda, rupi, arenaria, 1600–1800 m, esp. N, 17.7.1987, *BF & CR* (FI);
APUAN ALPS: Alpe di Gramolazzo, 25.7.1857, *Targioni* (FI); ibid., 28.7.1857, *M. Grilli* (FI); presso il Passo della Tambura, fra le fessure della roccia, 10.7.1886, *D.G. Gibelli* (FI); Foce della Pecoraccia, in rupium rimis (?), 29.7.1888, *S. Sommier & Hackel* (FI); Pizzo delle Saette, su detriti di calcare madreporico, 1620 m, esp. N, 8.7.1984, *MT* (PAV); Uomo Morto, su calcare selcifero, in brachipodieto, 1570 m, esp. N, 14. 7.1984, *MT* (PAV); Vallone Inferno, seslerieti iniziali su calcare madreporico, 1800 m, esp. N, 14.7.1984, *MT* (PAV); M. Pisanino, da Foce del Cardeto a Orto di Donna, esp.W, 1500 m, 31.7.1992, *L. Di Fazio & BF* (FI – Fig. 3b); Tambura, detriti su marmo, nell'Heracleo-Valerianetum montanae, 1730 m, esp. E, 15.9.1985, *MT* (PAV); Pania della Croce, Vallone dell'Inferno, in detriti su calcare madreporico, 1700–1800 m, esp. NE, 1.7.1992, *GR & MT* (PAV); Passo Tambura, dedriti fini calcarei, 1620 m, 11.7.1994, *GR* (PAV); Tambura, 7.1888, *P. Fantozzi* (FI); M. Tambura, Foce dei Campaniletti, su rupi calcaree, nel Valeriano-Saxifragetum, 1420 m, esp. N, 26.6.1983, *MT* (PAV); Altissimo, su rupi calcaree, nell'Asplenio-Cystopteridetum, 1610, esp. N, 26.6.1983, *MT* (PAV); Contrario, rupi di diaspro, 1650 m, esp. N, 10.7.1983, *MT* (PAV); Cavallo, su diaspri, in trifolio-festuceto, 1620 m, esp. NE, 31.7.1992, *GR & MT* (PAV).

(3) *Festuca rubra* L., Sp. Pl.: 74. 1753.

More or less densely tufted grass, 20–50 cm tall. Vegetative tillers intra- and extravaginal. Tiller leaf sheaths fused; ligule very short (0–0.3 mm), without or with vestigial auricles. Tiller leaf blades green or greyish-green, smooth or slightly scabrid in the distal part; in transverse section polygonal, irregularly V-shaped, 0.6–1.2 mm wide, with 5–9 vascular bundles, (5)7 sclerenchyma strands, and 5–7, often sparsely hairy adaxial ribs. Panicles 3–15 cm. Spikelets 6–12 mm, with 3–9 florets, glabrous, or more or less hairy, sometimes tinged violet and pruinose; lower glume 2–4 mm, 1-veined, upper glume 3–5 mm, 3-veined; lemmas 5–6 mm, 5-veined, awn 2–3.5 mm. Anthers 2–3.5 mm.

1. Grass without rhizomes . . . . . 3c. *F. rubra* subsp. *commutata*
– Grass with rhizomes 2
2. Grass with long rhizomes; tiller leaf blade never pruinose, with small sclerenchyma strands, ± equal in size and shape . . . . . 3a. *F. rubra* subsp. *rubra*
– Grass with short rhizomes; tiller leaf blade generally pruinose, with stout sclerenchyma strands, unequal in size and shape . . . . . 3b. *F. rubra* subsp. *juncea*

(3a) *Festuca rubra* subsp. ***rubra***

Vigorous, laxly tufted grass with long rhizomes, culms often 30–50 cm tall. Tiller leaves sometimes puberulent, reddish near the base. Tiller leaf blades in transverse section 0.6–0.9 mm wide, with (5)7 vascular bundles, 7 usually small sclerenchyma strands of which the median strand is slightly larger than the others, and (5)7 adaxial ribs sometimes with some sclerenchyma; bulliform cells adaxially rarely present. Panicles 6–15 cm long, lax, wide, irregular with lengthened lower branches. Spikelets 6–10 mm, with 3–5 florets; lower glume 2.5–3(3.5) mm, upper glume 3–4(5) mm; lemmas 5–6 mm, awn 2–2.5 mm. Anthers 2–2.8 (3) mm.

Distribution
Holarctic. Widespread in Italy (Markgraf-Dannenberg 1982) and in the N Apennines.

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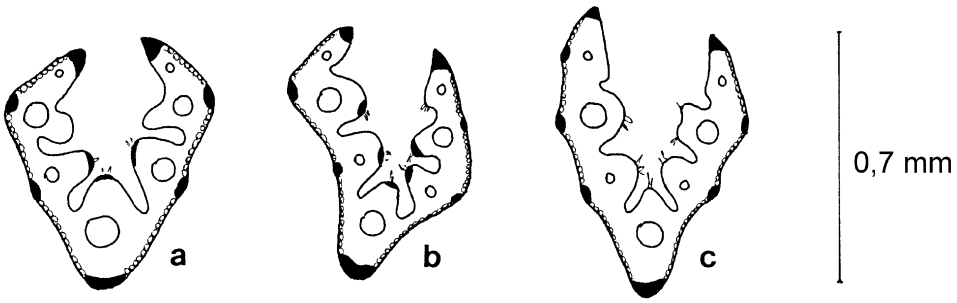


Fig. 4. *Festuca rubra* subsp. *rubra* – transverse sections of tiller leaf blades; a: Prov. Modena, 30.7.1987, *BF & CR*, (FI); b: Apuan Alps, 11.7.1994, *GR* (PAV); c: Prov. Modena, 26.7.1993, *GR* (PAV).

Ecology

F. rubra subsp. *rubra* grows mostly on acidic soils; nevertheless, sometimes it may be found also on slightly basic soils (Apuan Alps). Oberdorfer (1983) regards this species as a character species of the Molinio-Arrhenatheretea. In the N Apennines it occurs in the Nardion communities; in the Apuan Alps, it has occasionally been collected also in the basiphytic grasslands belonging to the Seslerion variae. It is a very common species also in the *Vaccinium* heaths. Finally, in the Tuscan-Emilian Apennines, it occurs also on sandstone block fields in the Cryptogrammo-Dryopteridetum oreadis (Tomaselli 1994). In the past, this species has probably often been misidentified as *F. rubra* subsp. *commutata* or another subspecies of *F. rubra*.

Specimens studied

Tuscan-Emilian Apennines: Prov. Parma: Monchio di Corti, zone di cresta del M. Malpasso, su arenaria, 22.7.1986, *PVA, BF & CR* (FI); in crittogrammeto, 1550 m, esp. N, 1992, *GR & MT* (PAV); sotto M. Sillara, laghi, in nardeto, 1770 m, 29.7.1992, *GR & MT* (PAV). — Prov. Reggio-Emilia: M. Cavalbianco, prati e vaccinieti, 1650–1850 m, su arenaria, 16.7.1987, *BF & CR* (FI); rocce della vetta, 2000–2100 m, 29.7.1987, *BF & CR* (FI); Alpe di Vallestrina, in vaccinieto, 19.8.1987, *GR* (PAV); tra il Bivacco Rosaro e M. La Nuda, rupi, 1600–1895 m, esp. N, 15.7.1987, *BF & CR* (FI); tra M. La Nuda e lo Scalocchio, sulla cresta, in nardeto, 1820 m, 30.7.1992, *GR & MT* (PAV); La Nuda, in crittogrammeto, 1780 m, esp. NE, 30.7.1992, *GR & MT* (PAV); tra M. Prado e M. Vecchio, in nardeto, 2000 m, 19.8.1992, *GR & M. Gentilini* (PAV); in luzuleto con *Luzula alpino-pilosa*, 1945 m, esp. N, 20.8.1992, *GR* (PAV). — Prov. Modena: M. Rondinaio, tra Fonte Rondinaio e Lago Turchino, su arenaria, in vaccinieti, 1600–1880 m, 30.7.1987, *BF & CR* (FI); da Passo al Giovo alla sella sopra Lago Torbido, su arenaria, in prati e vaccinieti, 1600–1781 m, esp. N, 30.7.1987, *BF & CR* (FI); Pievepelago, da Passo del Giovo alla sella sopra Lago Torbido, prati e vaccinieti esposti a N, 1500 m, arenaria, 30.7.1987, *BF & CR* (FI – Fig. 4a); M. Cimone, da Pian Cavallaro alla vetta, in prati rocciosi, 1850–2150 m, esp. N-NW, 12.8.1988, *BF & CR* (FI); M. Giovo, in nardeto, 1700 m, 7.8.1991, *MT* (PAV); cresta M. Giovo-M. Rondinaio, in brachipodieto, 1900 m, esp. SW, 26.7.1993, *GR* (PAV – Fig. 4c); sopra lago Baccio, alla base di una rupe, 26.7.1993, *GR* (PAV); Lago Santo Modenese, pietraia a *Cryptogramma crispa*, 1520 m, 26.7.1993, *GR* (PAV).

Apuan Alps: Uomo Morto, in vaccinieti e nardeti, 14.7.1984, *MT* (PAV); Pania Secca, brachipodieto con *Sesleria tenuifolia*, 1550 m, esp. NW, 9.7.1993, *GR & MT* (PAV); M. Corchia, in brachipodieto, 1600 m, esp. N, 28.7.1993, *RG & MT* (PAV); Pania Secca, in seslerieto, 1600 m, esp. NW, 9.7.1994, *GR & MT* (PAV); Pania Secca, in brachipodieto, 1540 m, esp. N, 9.7.1994, *GR & MT* (PAV); M. Tambura, in nardeto, 1620 m, esp. NE, 11.7.1994, *GR & MT* (PAV); M. Tambura, cresta sommitale, in pratelli nitrofili, 1750 m, 11.7.1994, *GR* (PAV); M. Tambura, nardeto, 11.7.1994, *GR* (PAV – Fig. 4b); M. Cavallo, selletta sotto anticima, in brachipodieto, 1840 m, 16.7.1994, *GR* (PAV).

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(3b) ***Festuca rubra*** subsp. ***juncea*** (Hack.) K. Richt., Pl. Europ.: 99. 1890.

Densely tufted grass with very short, hardly noticeable rhizomes, culms 25–45 cm tall. Tiller leaves sometimes pruinose. Tiller leaf blades in transverse section irregularly V-shaped and obscurely obovoid, 0.7–1(1.2) mm wide; with 7–9 vascular bundles, 7 sclerenchyma strands, unequal in shape and size, of which the median and the marginal, sometimes also the submarginal, are larger than the others (± evident when dry), and with 5–7 adaxial ribs with sclerenchyma strands; abaxial epidermal cells large, with some antrorse prickle-hairs. Panicles 5–9(12) cm long, erect, dense. Spikelets (8)8.5–12 mm, with 5–9 florets, greyish-green, sometimes pruinose, generally glabrous; lower glume (2)2.8–3.7(4) mm, upper glume (4)4.5–4.9(5) mm, ovate-elliptic, shortly acuminate; lemmas 5–6.0(6.5) mm, glabrous or shortly scabrid in the distal half, awn 2–2.5 mm. Anthers 2–3.5 mm.

Distribution

Europe. In Italy in general (Markgraf-Dannenberg 1982) and in the N Apennines in particular this subspecies is widespread throughout the range of *F. rubra* subsp. *rubra* but less common.

Ecology

F. rubra subsp. *juncea* grows mostly on acidic soils; nevertheless, sometimes it may be found also in slightly basic soils, e. g. in the Apuan Alps. It occurs mostly in Nardion communities and also frequently at the SW-facing ledges with *Genista radiata* and *Brachypodium genuense*. Locally this subspecies seems to be more thermophilous than *F. rubra* subsp. *rubra.*

Notes

The specimens collected in the N Apennines show a clear similarity with those of Spain (Fuente & Sanchez Mata 1988). Some morphological characters, such as sclerenchyma strands unequal in shape and size, and the presence, in some individuals, of antrorse prickle-hairs on the abaxial epidermis, are diagnostic features of the *F. trichophylla* aggregate, as delimited by Al-Bermani & al. (1992). According to Al-Bermani & al. (1992), *F. rubra* subsp. *juncea* links *F. rubra* and the *F. trichophylla* aggregate, whereby the N and Central European populations are nearer to the former and the S European populations are nearer to the latter. Hackel (1882) considered *F. rubra* subsp. *juncea* as a Central and N European taxon (locus classicus near Prague, see Al-Bermani & al. 1992).

Specimens studied

Tuscan-Emilian Apennines: Prov. Parma: M. Orsaro, in festuceto a *F. paniculata*, 1800 m, esp. SE, 7.1992, *GR & MT* (PAV); in nardeto, 1676 m, esp. ESE, 27.7.1992, *MT & GR* (PAV); in

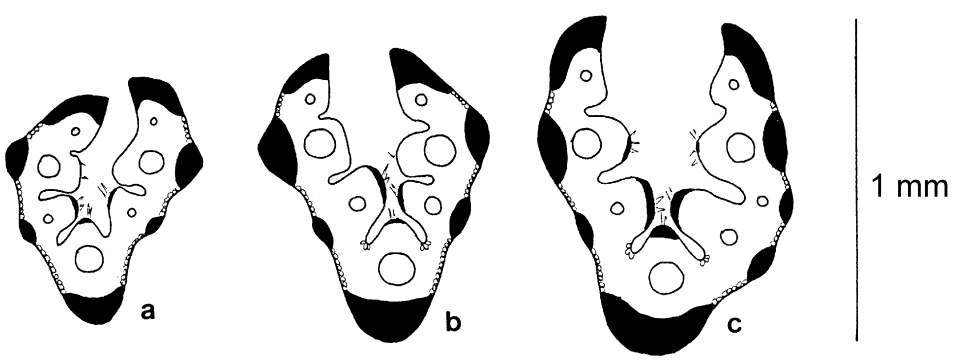


Fig. 5. *Festuca rubra* subsp. *juncea* – transverse sections of tiller leaf blade; a: Apuan Alps, 15.7.1994, *GR & MT* (PAV); b: Prov. Reggio-Emilia, 31.7.1993, *GR* (PAV); c: Apuan Alps, 15.7.1994, *GR & MT* (PAV).

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nardeto, 27.7.1992, *GR & MT* (PAV); in festuceto a *F. paniculata*, 1800 m, esp. SW, 29.7.1992, *GR & MT* (PAV). — Prov. Reggio-Emilia: M. Cusna, pascoli da Rif. Battisti a M. La Piella, su arenaria, 1800–2070 m, 29.7.1987, *BF & CR* (FI); M. Prado, 19.8.1988, *GR* (PAV); M. Prado, 1800 m, esp. W, 20.7.1989, *GR & MT* (PAV); M. Cusna, in arenarieto con *Arenaria bertolonii*, 1975 m, esp. NNE, 31.8.1991, *GR & MT* (PAV); fra M. Castellino e M. Prado, in comunit a *F. robustifolia*, 1947 m, esp. N, 31.7. 1993, *GR* (PAV – Fig. 5b); Alpe di Succiso, in brachipodieto, 1600 m, esp. E, 1.8.1993, *GR* (PAV); ibid., brachipodieto con *Genista radiata*, 1580 m, esp. S, 1.8.1993, *GR* (PAV). — Prov. Modena: M. Lagoni, in aggruppamento a *Festuca robustifolia*, 1900 m, esp. NW, 2.8.1991, *MT* (PAV); Lago Scaffaiolo, su detriti marnosi con *Trifolium thalii* e *Arenaria bertolonii*, 18.7.1993, *GR* (PAV); Lago Santo, in pietraia a *Cryptogramma crispa*, 1520 m, 26.7.1993, *GR* (PAV); Lago Santo, in brachipodieto, 1810 m, esp. SE, 27.7.1993, *GR* (PAV). — Prov. Pistoia: Abetone, da Foce Campolino a Diaccetto al Bosco, in prati e vaccinieti, su arenaria, 1840–1862 m, esp. NW, 11.8.88, *BF & CR* (FI); Alpe tre Potenze, Lago Nero, in nardeto, 1.8.1992, *GR & MT.*; Alpe tre Potenze, in vaccinieti, 1800 m, esp. E, 17.7.1993, *GR* (PAV).
Apuan Alps: Pania Secca, seslerieti sassosi su calcare, 1600 m, 9.7.1994, *GR* (PAV); in brachipodieto, 1700 m, esp. SW, 10.7.1994, *GR* (PAV); M. Sumbra, luoghi sassosi, 1680–1730 m, esp. SSW, 15.7.1994, *GR & MT* (PAV – Fig. 5a); M. Fiocca, brachipodieti su scisti diasprini, 1500 m, esp. N, 15.7.1994, *GR & MT* (PAV – Fig. 5c); M. Sumbra, in brachipodieto di cresta, su calcare selcifero, 1750 m, esp. E, 15.7.1994, *GR & MT* (PAV).

(3c) ***Festuca rubra*** subsp. ***commutata*** (Gaudin) Markgr.-Dann., Kart. der Schweiz. Fl.: 81. 1968.
= *F. nigrescens* Lam. subsp. *nigrescens* (Markgraf-Dannenberg 1989, 1982)

Densely tufted grass, without rhizomes, culms 20–40 cm tall. Tiller leaf sheaths fused, generally decaying into fibres. Tiller leaf blades with acuminate apex, in transverse section 0.6–0.8(1) mm, with 5–7 vascular bundles, 7 sclerenchyma strands, the median and the marginal slightly larger than the others, and adaxially with 5(7) ribs, sometimes with sclerenchyma cells. Panicles 3–8 cm long, contracted, linear, sometimes unilateral. Spikelets 6.5–7 mm, with 3–9 florets, sometimes puberulent; lower glume 3.5 mm, upper glume 4–5 mm; lemmas 5 mm, awn 3.5 mm or rarely shorter. Anthers 2–3 mm.

Distribution
Europe. In Italy this subspecies is reported from the Alps, the N and Central Apennines up to Abruzzo (Markgraf-Dannenberg 1982). It is widespread throughout the N Apennines.

Ecology
F. rubra subsp. *commutata* grows on acidic as well as on base-rich soils. In the Alps, it is considered a character species of the Nardetalia. In the N Apennines it mostly occurs in Nardion grasslands (*Nardus stricta* grasslands and *Brachypodium genuense* grasslands).

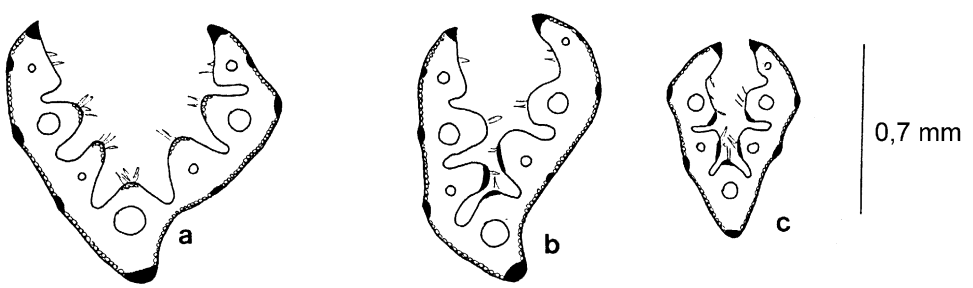


Fig. 6. *Festuca rubra* subsp. *commutata* – transverse section of tiller leaf blades; a: Apuan Alps, 15.7.1994, *GR & MT* (PAV); Apuan Alps, 15.7.1994, *GR* (PAV); c: Prov. Modena, 16.7.1993, *GR* (PAV).

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Notes
This taxon was treated by Markgraf-Dannenberg (1980, 1982) as *F. nigrescens* subsp. *nigrescens*; however, the type specimens (Kerguélen & Plonka 1989) at P(!) are not clearly distinguishable from the *F. rubra* aggregate, and thus the treatment of this taxon as a subspecies of *F. rubra* seems more appropriate (Markgraf-Dannenberg 1968, Stace 1991, Kerguélen & al. 1993).

Specimens studied
Tuscan-Emilian Apennines: Prov. Reggio-Emilia: Prati paludosi presso il Lago Cerretano, 7.7.1882, *A. Fiori* (FI); M. Cusna, su arenarie di M. Modino, Cryptogrammo-Dryopteridetum oreadis, 1750 m, esp. S, 12.8.1990, *MT & GR* (PAV); M. Prado, su arenaria macigno, in valletta nivale, nell'Oligotricho-Gnaphalietum supinii, 1870 m, 10.8.1991, *GR & MT* (PAV); M. Cusna, vegetazione di detriti marnosi con *Arenaria bertolonii*, 1975 m, esp. NE, 31.8.1991, *GR & MT* (PAV); La Nuda, su arenaria macigno, in pietraia a felci, Cryptogrammo-Dryopteridetum oreadis, 1780 m, esp. NE, 30.7.1992, *GR & MT* (PAV); sotto vetta M. Casarola, canalone con *Luzula alpino-pilosa*, esp. NW, 2.8.1993, *GR* (PAV). — Prov. Modena: Pascoli del M. Rondinajo, reg. alp., 9.1894, *A. Fiori* (FI); M. Giovo, 24.7.1928, *A. Lunardi* (FI); da Foce al Giovo a Bozzo al Forno, in prati e vaccinieti, su arenaria, 1674–1781 m, 13.7.1987, *BF & CR* (FI); crittogrammeto, 1675 m, esp. E, 4.8.1991, *MT* (PAV); M. Cimone, in valletta nivale dell'Oligotricho-Gnaphalietum supini, 1980 m, esp. NNW, 9.8.1991, *MT* (PAV); Lago Santo, 1520 m, pietraia a *Cryptpogramma crispa,* 16.7.1993, *GR* (PAV – Fig. 6c); ibid., sopra al lago, Cryptogrammo-Dryopteridetum oreadis, 1520 m, 26.7.1993, *GR* (PAV). — Prov. Pistoia: Alpe Tre Potenze, in pietraia a felci, Cryptogrammo-Dryopteridetum oreadis, 1.8.1992, *GR & MT* (PAV); al Cigliarone, sopra Cutigliano, 5.7.1868, *coll. ignot.* (FI).
Apuan Alps: Vallone Inferno, su calcare madreporico, in seslerieti, 1810–1850 m, esp. N, 14.7.1984, *MT* (PAV); M. Contrario, su scisti diasprini, in vaccinieto, 1600 m, esp. N, 19.8.1984, *MT* (PAV); sentiero tra Orto di Donna e Foce di Cardeto su calcare selcifero, in brachipodieto, 1500 m, esp. W, 10.7.1994, *GR & MT* (PAV); M. Tambura, in brachipodieto, 1640 m, esp. SE, 11.7.1994, *GR* (PAV); M. Fiocca, in brachipodieto, 1630 m, esp. S, 15.7.1994, *GR & MT* (PAV); M. Sumbra, zone di vetta, in brachipodieto, 1740–1760 m, 15.7.1994, *GR* (PAV – Fig. 6b); Passo Sella, in nardeto, 1520 m, esp. NW, 15.7.1994, *GR & MT* (PAV – Fig. 6a).

(4) *Festuca heteromalla* Pourr. in Hist. & Mém. Acad. Roy. Sci. Toulouse 3: 319. 1788.
= *F. diffusa* Dumort. (Markgraf-Dannenberg 1980, 1982)

Laxely or not very densely tufted grass, up to 100 cm tall, with very long rhizomes; leaf blades ± flat. Tiller leaf sheaths fused, reddish, decaying into fibres; ligule very short. Tiller leaf blades long, very wide, flat or plicate, with evident keel in correspondence with the median vascular bundle; in transverse section largely opened V-shaped, smooth; with (7)8–10(13) vascular bundles, 7–11 little sclerenchyma strands, the median and the marginal slightly larger than the others, and with 5–7(9) sparsely hairy, prominent adaxial ribs with sclerenchyma cells; bulliform cells always present in correspondence with the first and sometimes second furrows. Panicles 10–25 cm long, lax and wide with lower branches spreading. Spikelets up to 12 mm, with 7–10 florets, ± tinged violet; lower glume 4 mm, 1-veined, upper glume 5.5–6.5 mm, 3-veined; lemmas 5–6 mm, glabrous or slightly scabrid in the distal half, awn 1–3 mm. Anthers 3–4 mm.

Distribution
Europe (partially cultivated). In Italy it is reported from the north (Markgraf-Dannenberg 1982). In the study area, *F. heteromalla* occurs scatteredly as an indigenous element, probably reaching here its southernmost limit in Italy.

Ecology
F. heteromalla grows mostly on acidic soils, more rarely also on basic soils in the Apuan Alps. It is found mostly in grasslands dominated by *Bracypodium genuense*.

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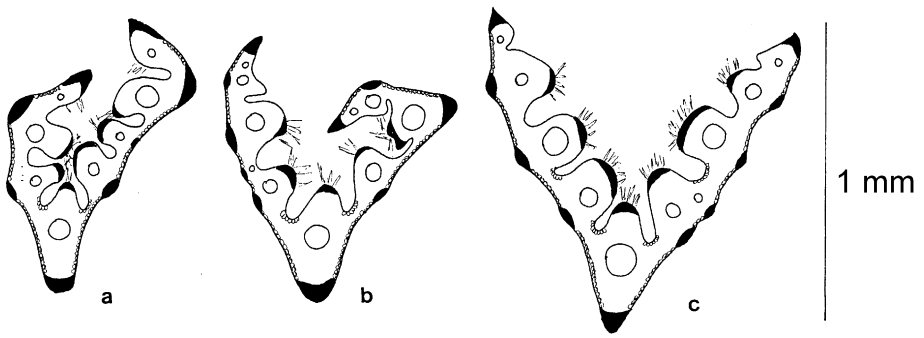


Fig. 7. *Festuca heteromalla* – transverse sections of tiller leaf blades; a: Prov. Reggio-Emilia, 30.7.1992, *GR & MT* (PAV) ; Prov. Reggio-Emilia, 31.7.1993, *GR* (PAV); c: Prov. Reggio-Emilia, 1.8.1993, *GR* (PAV).

Notes

In recent papers (Stace 1991, Kerguélen & al. 1993) *F. heteromalla* is treated as *F. rubra* subsp. *megastachys* Gaudin and *F. rubra* subsp. *multiflora* Piper respectively. In contrast, we prefer to maintain it as a separate species because morphologically this taxon is quite different from the *F. rubra* aggregate.

Specimens studied

Tuscan-Emilian Apennines: Prov. Parma: Cresta rocciosa tra M. Marmagna e M. Braiola, vaccinieti e rupi, 1600–1800 m, 22.7.1986, *PVA, BF & CR* (FI); zone di cresta M. Malpasso, 1700 m, 21.7.1986, *PVA, BF & CR* (FI). — Prov. Reggio-Emilia: La Nuda, in brachipodieto, 1890 m, esp. SW, 30.7.1992, *GR & MT* (PAV – Fig. 7a); Alpe di Succiso, brachipodieto, 1.8.1993, *GR* (PAV – Fig. 7c); M. Prado, in nardeto, 1950 m, 19.8.1992, *GR & M. Gentilini* (PAV); M. Prado, 1800 m, esp. SE, 20.8.1992, *GR* (PAV); Le Porraie (gr. M. Prado), in brachipodieto, 1800 m, esp. SW, 31.7.1993, *GR* (PAV – Fig. 7b). — Prov. Modena: Cresta M. Giovo-M. Rondinaio, in brachipodieto, 1900 m, esp. SW, 26.7.1993, *GR* (PAV). — Prov. Pistoia: Prope Boscolungo, 22.8.1886, herb. E. Levier (FI); Alpe tre Potenze, festuceto a *F. robustifolia*, 1940 m, esp. W, 1.8.1992, *GR & MT* (PAV).

Apuan Alps: Pania Secca, su calcare, in seslerieti brachipodietosi, 1580–1650 m, 9.7.1994, *GR & MT* (PAV); sotto vetta Pania Secca, su calcare, in seslerieti sassosi, 1600 m, 9.7.1994, *GR & MT* (PAV); versante SW dei Zucchi di Cardeto, in brachipodieto, 1650 m, esp. SW, 10.7.1994, *GR & MT* (PAV); Passo Sella, in nardeto, 1520 m, esp. NW, 15.7.1994, *GR & MT* (PAV); cresta del M. Cavallo, brachipodieto, 1760 m, esp. NE , 16.7.1994, *GR & MT* (PAV).

Festuca trichophylla aggregate

(5) *Festuca cyrnea* (St.-Yves & Litard.) Markgr.-Dann. in Bot. J. Linn. Soc. 76: 327. 1978.

Densely tufted grass with more or less developed rhizomes, culms 20–40 cm tall. Vegetative tillers extravaginal. Tiller leaf sheaths fused; ± sparsely hairy; ligule very short. Tiller leaf blades short, rigid, subsetaceous, scabrid at least in the distal part, sometimes pungent; in transverse section polygonal, obscurely V-shaped, 0.45–0.6 mm wide, with 5(7) vascular bundles, 7 sclerenchyma strands, unequal in shape and size, the median much larger than the others, and 5 adaxial ribs; epidermis cells very large, with antrorse prickle-hairs. Panicles 3–5 cm long, contracted, narrow, erect, with scabrid branches. Spikelets 7–9 mm, with 3–5 florets; lower glume 2.5–4 mm, 1-veined, upper glume 4–6 mm, 3-veined, with a wide scarious margin; lemmas 4.5–6 mm, sometimes tinged violet, ± scabrid in the distal half, 5-veined, awn 1–2.5 mm. Anthers 2–2.5 mm.

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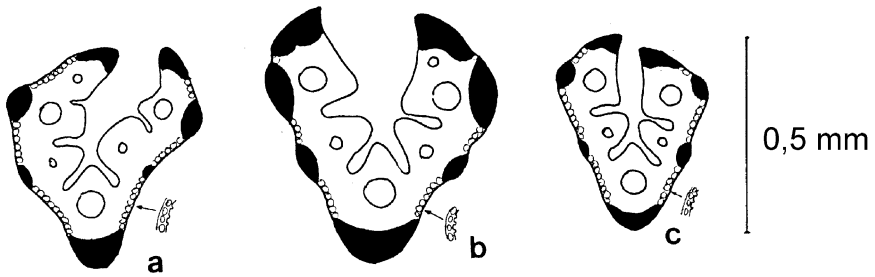


Fig. 8. *Festuca cyrnea* – transverse sections of tiller leaf blade; a: Apuan Alps, 10.7.1994, *GR & MT* (PAV); b: Apuan Alps, 3.8.1994, *L. Di Fazio & BF* (FI); c: Apuan Alps, 18.7.1991, *M. Clauser, L. Di Fazio & BF* (FI).

Distribution
Corsica, Sardinia(?), Apennines. The report for Sardinia (Markgraf-Dannenberg 1982) must probably be corrected and the species excluded from the Sardinian flora (P.V. Arrigoni, pers. comm.). In the N Apennines *F. cyrnea* is apparently confined to a few localities in the Apuan Alps, where it reaches its northern limit in Italy.

Ecology
F. cyrnea grows on both basic and acidic soils, mostly in grasslands dominated by *Brachypodium genuense*.

Notes
In contrast to Al-Bermani & al. (1992), who considered *F. cyrnea* as being synonymous with *F. trichophylla* (Ducros ex Gaudin) K. Richt. subsp. *trichophylla*, growing in the Alps and in Central Europe, we see good reasons to maintain Markgraf-Dannenberg's treatment of *F. cyrnea* as a separate species in addition to *F. trichophylla:* the specimens show several characters, such as the narrow, dense and short panicles, short leaves, and sheaths not decaying into fibres, that are not found in *F. trichophylla*; furthermore, *F. trichophylla* and *F. cyrnea* seem also ecologically separated as the former typically grows in grass meadows while the latter in rocky grasslands on limestone or granite.

Specimens studied
Apuan Alps: M. Pisanino, alte erbe all'uscita della faggeta, 1300 m, esp. N, 18.7.1991, *M. Clauser, L. Di Fazio & BF* (FI – Fig. 8c); M. Sagro, in brachipodieto, 1620 m, esp. SW, 29.7.1993, *GR & MT* (PAV); M. Corchia, su rupide acide, 1300 m, 29.7.1993, *GR & MT* (PAV); M. Pisanino - M. Cavallo, pressi Foce di Cardeto, 1600 m, esp. E, 31.7.1992, *L. Di Fazio & BF* (FI); verso Foce di Cardeto, in brachipodieto, 1500 m, esp.W, 10.7.1994, *GR & MT* (PAV); ibid., in brachipodieto, 10.7.1994, *GR & MT* (PAV – Fig. 8a); M. Tambura, in brachipodieto-seslerieto, 1730 m, esp. E, 11.7.1994, *GR & MT* (PAV); M. Focolaccia (gr. Tambura), su pendio detritico, 1630 m, esp. E, 11.7.1994, *GR* (PAV); M. Tambura, pareti sopra la miniera su rocce nere, 11.7.1994, *GR* (PAV); M. Fiocca, creste sommitali, in brachipodieto, 1550 m, esp. NE, 15.7.1994, *GR & MT* (PAV); M. Corchia, su scisti silicei, 1200 m, esp. W, 3.8.1994, *L. Di Fazio & BF* (FI – Fig. 8b).

(6) ***Festuca trichophylla*** subsp. ***asperifolia*** (St.-Yves) Al-Bermani in Anales Jard. Bot. Madrid 50: 219. 1992
≡ *F. rubra* subsp. *asperifolia* (St.-Yves) Markgr. -Dann. (Markgraf-Dannenberg 1980, 1982)

More or less densely tufted grass up to 80 cm tall. Vegetative tillers extravaginal. Tiller leaf sheaths fused, reddish, ± sparsely hairy, decaying into fibres; ligule very short. Tiller leaf blades long, abaxially strongly scabrid throughout and with prominent ribs; in transverse section widely and irregularly V-shaped, 0.7–1.1(1.3) mm wide, with 7–9 vascular bundles, 7–9 sclerenchyma strands, unequal in shape and size, the median and the marginal larger than the others, and 5–9

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prominent, adaxial ribs, usually with thick sclerenchyma strands; epidermis cells large to very large, with antrorse prickle-hairs. Panicles up to 20 cm long, wide, contracted, rigid, only rarely lax. Spikelets 8–10(12) mm; lower glume 2.5–4 mm, 1-veined, upper glume 4–5 mm, 3-veined; lemmas 5–6(7) mm, 5-veined, awn 1.5–2.5 mm. Anthers 3–3.5 mm.

Distribution

Mountains of S Europe. In Italy, the species was only reported from the southern regions (Markgraf-Dannenberg 1982), but is now also recorded for the whole range of the N Apennines.

Ecology

F. trichophylla subsp. *asperifolia* grows on acidic soils, but may sometimes be found on basic soils of the Apuan Alps. In the Tuscan-Emilian Apennines it occurs mostly in *Nardus stricta* communities and *Brachypodium genuense* grasslands (Nardion). In the Apuan Alps it is found in grasslands dominated by *Brachypodium genuense* and, rarely, by *Sesleria tenuifolia*.

Specimens studied

Tuscan-Emilian Apennines: Prov. Parma: Radure delle faggete di Rif. Lagdei al Lago Santo Parmense, su arenaria, 1200–1500 m, 21.7.1986, *PVA*, *BF & CR* (FI); zona di cresta del M. Malpasso, su arenaria, 1700 m, 22.7.1986, *PVA, BF & CR* (FI); cresta M. Bocco-M. Bargalata, in brachipodieto, 1690 m, esp. SE, 27.7.1992, *GR & MT* (PAV – Fig. 9b); ibid., in brachipodieto, 1720 m, esp. SE, 27.7.1992, *GR & MT* (PAV). — Prov. Reggio-Emilia: Pascoli cresta rocciosa M. La Piella-M. Cusna, 2000–2070 m, su arenaria, 29.7.1987, *BF & CR* (FI); M. Alto (gr. Succiso), in brachipodieto, 1720 m, esp. N, 26.7.1992, *GR & MT* (PAV); M. Alto brachipodieto, 1830 m, esp. SSE, 26.7.1992, *GR & MT* (PAV); verso M. Alto, in brachipodieto-festuceto a *F. paniculata*, 26.7.1992, *GR & MT* (PAV); M. Prado, nei pressi del lago, in nardeto, 1760 m, 19.8.1992, *M. Gentilini & GR* (PAV); cresta M. Prado - M. Vecchio, in nardeto, 19.8.1992, *M. Gentilini & GR* (PAV); Le Porraie (gr. M. Prado), in brachipodieto, 1800 m, esp. SW, 31.7.1993, *GR* (PAV); Alpe di Succiso, in brachipodieto, 1600 m, esp. E, 1.8.1993, *GR* (PAV); M. Prado, in vaccinieto rado erboso, 1840 m, 24.7.1994, *GR* (PAV – Fig. 9c); M. Prado, sopra Rif. Bargetana, in nardeto rado sassoso, 1800 m, esp. NE, 24.7.1994, *GR* (PAV).

Apuan Alps: Pania Secca, in seslerieto, 1550 m, esp. NW, 9.7.1994, *GR & MT* (PAV); M. Sumbra, in brachipodieto, 1670 m, esp. SW, 15.7.1994, *GR & MT* (PAV); sella che porta alla vetta più alta di M. Cavallo, in brachipodieto, 1850 m, esp. S, 16.7.1994, *GR & MT* (PAV); M. Cavallo, sella per la vetta, 1830 m, brachipodieto, 16.7.1994, *GR* (PAV – Fig. 9a).

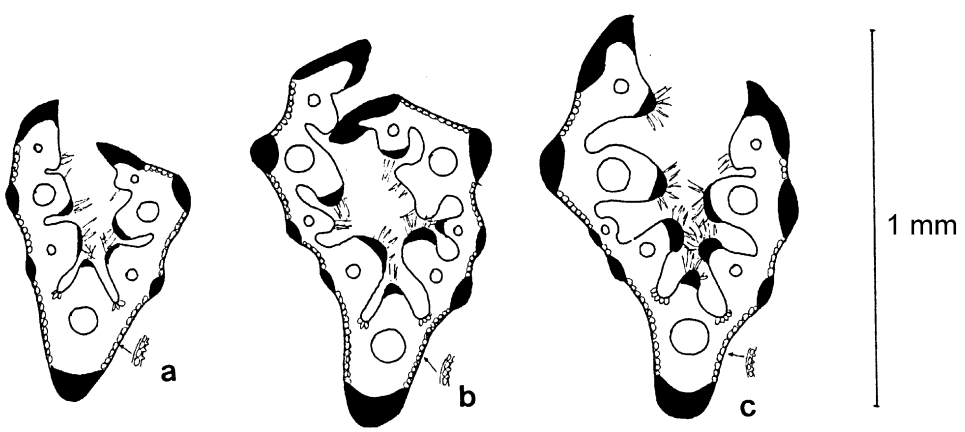


Fig. 9. *Festuca trichophylla* subsp. *asperifolia* – transverse sections of tiller leaf blades; a: Apuan Alps, 16.7.1994, *GR* (PAV); b: Prov. Parma, 27.7.1992, *GR & MT* (PAV); c: Prov. Reggio-Emilia, 24.7.1994, *GR* (PAV) .

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Festuca* sect. *Festuca

Lemmas never scarious; ligule always very short; caryopsis adnate to palea; vegetative tillers intravaginal.

(7) ***Festuca halleri*** subsp. ***yvesii*** Kerguélen & Plonka in Bull. Soc. Bot. Centre-Ouest 19: 1. 1988.

Densely tufted grass, 15–20 cm tall. Vegetative tillers intravaginal. Tiller leaf sheaths overlapping, closed up to the mouth; ligule very short, auriculate, with short hairs. Tiller leaf blades setaceous, smooth, never longer than half of the shoot; in transverse section irregularly V-shaped, 0.6–0.75 mm wide; with (5)7 vascular bundles, 3 stout sclerenchyma strands (± evident when dry) and two small submarginal accessory sclerenchyma strands; with (1)3 sparsely hairy adaxial ribs. Panicle dense, 2.5–5 cm long. Spikelets 7–8 mm; lower glume 2.5–3.5 mm, 1-veined, upper glume 4–4.5 mm, 3-veined; lemmas 4.5–5.5 mm, 5-veined, sometimes scabrid in the distal part, awn 2–2.5 mm. Anthers 2.5–3 mm.

Distribution

W Alps (France) and Tuscan-Emilian Apennines, in the latter region confined to a few localities in the southern part (see notes, below).

Ecology

F. halleri subsp. *yvesii* occurs only on acidic soils in rocky habitats.

Notes

In the past, *F. halleri* was repeatedly reported for the Apennines: from the N and Central Apennines to the Abruzzo Region (Cesati & al. 1867, Arcangeli 1882, Gibelli & Pirotta 1882, Fiori 1923), from M. Sagro and M. Pisanino in the Apuan Alps (Bertoloni 1833, Parlatore 1850), and from the Tuscan-Emilian Apennines (Bolzon 1921, Negodi 1944). However, the respective specimens housed at GE-DOR (Bertoloni), FI (Parlatore, Bolzon) and MOD (Negodi), as far as examined by us, must be referred to *F. alpina* subsp. *briquetii*, whereas the Puccinelli collection at FI determined as *F. halleri* represents the type of *F. puccinellii*. Recently, Foggi & Ricceri (1988) and Foggi (1990) reported *F. halleri* for new localities in the Tuscan-Emilian Apennines (M. Rondinaio, M. Cimone and M. Corno alle Scale), these records actually represent *F. halleri* subsp. *yvesii*, as confirmed by Kerguélen & Plonka (on specimens at FI) .

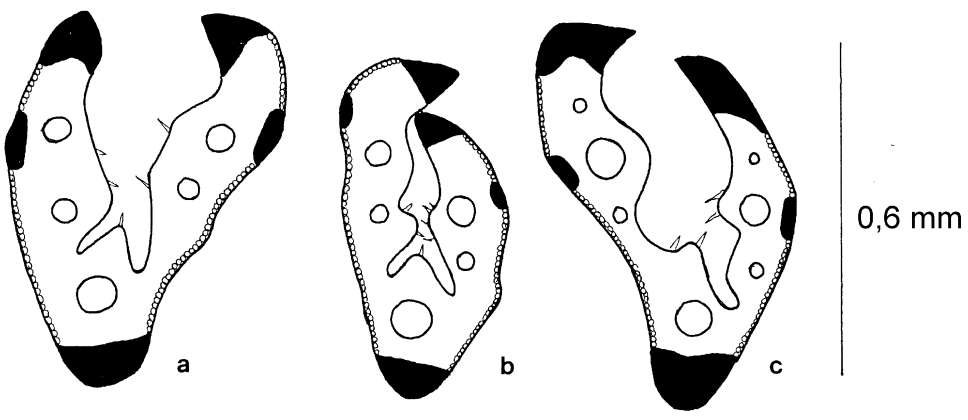


Fig. 10. *Festuca halleri* subsp. *yvesii* – transverse sections of tiller leaf blades; a: Prov. Modena, 30.7.1987, *BF & RC* (FI); b: Prov. Modena, 12.8.1988, *BF & CR* (FI); c: Prov. Bologna, 6.8.1987, *BF* (FI).

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Specimens seen

TUSCAN-EMILIAN APENNINES: PROV. MODENA: Pievepelago, M. Rondinaio, tra Fonte Rondinaio e Lago Turchino, vaccinieti, su arenaria, 1600–1800 m, 30.7.1987, *BF & R*C (FI – Fig. 10a); Fiumalbo, M. Cimone, da Pian Cavallaro alla vetta, prati rocciosi, su arenaria, 1850–2150 m, esp. N-NW, 12.8.1988, *BF & CR* (FI – Fig. 10b). — PROV. BOLOGNA: Lizzano in Belvedere, M. Corno alle Scale, rupi e vaccinieti dall'arrivo della seggiovia a punta la Sofia, su arenaria, 1700–1939 m, esp. N-NE, 6.8.1987, *BF* (FI – Fig. 10c).

(8) ***Festuca alpina*** subsp. ***briquetii*** (St.-Yves ex Litard.) Markgr.-Dann. in Veröff. Geobot. Inst. ETH Stiftung Rübel Zürich 56: 134. 1976.
= *F. vizzavonae* Ronniger (Markgraf-Dannenberg 1980, 1982).

Densely tufted grass, 10-30 cm tall. Vegetative tillers intravaginal. Tiller leaf sheaths overlapping, closed up to the mouth, decaying into greyish fibres; ligule very short, acuminate, auriculate. Tiller leaf blades setaceous, glabrous, smooth, soft, erect; in transverse section irregularly V-shaped, ± closed, (0.25)0.3–0.5 mm wide, with (3)5(6) vascular bundles, 3 small sclerenchyma strands, only rarely also with 2 very small submarginal accessory sclerenchyma strands; with 1(3) scarcely pronounced and sparsely hairy adaxial ribs. Panicles only 1.5–5 cm long, with ± spreading short branches. Spikelets 5.5–8.5 mm, sometimes tinged violet, with 2–4 florets; lower glume 2–2.5 mm, 1-veined, subulate, upper glume 3–3.5 mm, 3-veined, subulate; lemmas 4–6.6 mm, 5-veined, subulate, awn (3)4–5.5(6) mm. Anthers 1.5–2.5 mm.

Distribution

Corsica, Sardinia, Apennines, mountains of the Balkan peninsula (Markgraf-Dannenberg 1976, 1980, 1982, Kerguélen & Plonka 1989, Strid 1991). In the N Apennines, *F. alpina* subsp. *briquetii* is widespread throughout.

Ecology

F. alpina subsp. *briquetii* locally grows on both acidic and basic substrata confined to rock faces: in Artemisio nitidae-Silenetum lanuginosae (Tomaselli 1994) in the Apuan Alps, and Drabo aizoidis-Primuletum apenninae (Tomaselli 1994) in the Tuscan-Emilian Apennines. Moreover, in the Apuan Alps it occurs on limestone on fine debris cover occurring along the summit ridges.

Notes

F. alpina subsp. *briquetii* can be considered the southern vicariant taxon of *F. alpina* subsp. *alpina* of the Alps. In the N Apennines subsp. *briquetii* has a wide ecological range, growing on several substrata and in different phytocoenoses. Due to this situation it shows a considerable

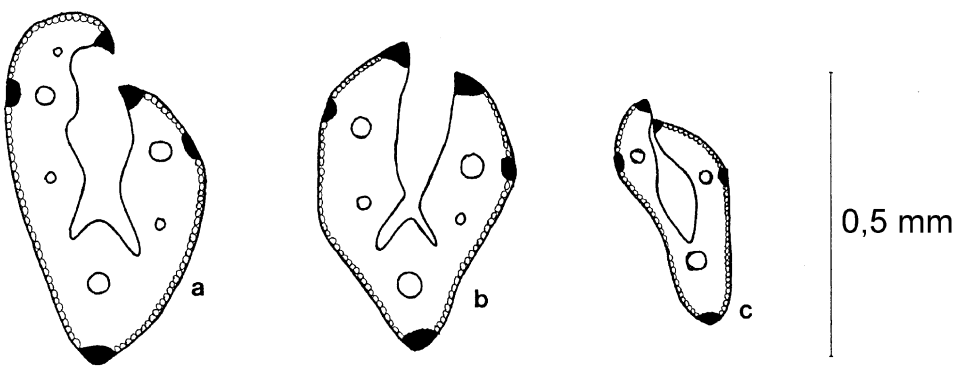


Fig. 11. *Festuca alpina* subsp. *briquetii* – transverse sections of tiller leaf blades; a: Prov. Modena, 12.8.1988, *BF & CR* (FI); b: Prov. Parma, 21.7.1986, *PVA, BF & CR* (FI); c: Apuan Alps, 31.7.1992, *Di Fazio & B*F (FI) .

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morphological variability. Particularly, the individuals growing in the Apuan Alps, on fine limestone debris, deviate from the plants of the Tuscan-Emilian Apennines by shorter leaves, taller culms (to 30–35 cm), shorter upper glume (2.5(3) mm), and mostly somewhat longer anthers ((2)2.5–3 mm).

Specimens studied

TUSCAN-EMILIAN APENNINES: PROV. PARMA: Corniglio, vaccinieti e rupi della cresta rocciosa tra il M. Marmagna e il M. Braiola, su arenaria, 1600–1800 m, 21.7.1986, *PVA, BF & CR* (FI – Fig. 11b); Monchio di Corti, zone di cresta del M. Malpasso, su arenaria, 1700 m, 22.7.1986, *PVA, BF & CR* (FI); M. Paitino, rupe di arenaria macigno, 1770 m, esp. NNW, 29.7.1992, *GR & MT* (PAV). — PROV. REGGIO-EMILIA: Salita all'Alpe di Cusna, 28.6.1880, *coll. ignot.* (MO); rupi del Ventasso, 3.8.1888, *Fiori* (MO); M.Ventasso, rupi di arenaria, 1640 m, esp. W, 2.6.1986, *MT* (PAV); Fivizzano, rupi e pendici settentrionali del M. Scalocchio, su arenaria, 1600–1815 m, 15.7.1987, *BF & CR* (FI); Ligonchio, M. Prado, pendici rocciose settentrionali fra il Lago di Bargetana e Sella Sprone di Prado, prati e vaccinieti, 1800–1950 m, 28.7.1987, *BF & CR* (FI); Collagna, dal M. Alto al Passo Pietratagliata, rupi esp. N, su arenaria, 1600–1800 m, 14.7.1987, *BF & CR* (FI); M. Cusna, rupe su substrato marnoso, 1855 m, esp. NW, 31.8.1991, *GR & MT* (PAV); M. Scalocchio, su rupe di arenaria macigno, nel Drabo aizoidis-Primuletum apenninae, 1820 m, esp. N, 30.7.1992, *MT & GR* (PAV); M. Casarola, rupi, esp. NW, 2.8.1993, *GR & L. Bolognesi* (PAV). — PROV. MODENA: Cima Tauffi, rupi su arenaria di M. Cervarola, 1720 m, esp. N, 17.7.1983, *MT* (PAV); Lago Scaffaiolo, rupi, su arenaria, 1790 m, esp. ENE, 28.9.1983, *MT* (PAV); Fiumalbo, M. Cimone, da Pian Cavallaro alla vetta, prati rocciosi, su arenaria, 1850–2150 m, esp. N-NW, 12.8.1988, *BF & CR* (FI – Fig. 11a); su rupe di arenaria di M. Cervarola, in vegetazione a *Calamagrostis varia* e *Laserpitium gallicum*, 1560 m, esp. SE, 24.6.1990, *GR & MT* (PAV); M. Giovo, su rupe di arenaria di M. Modino nel Drabo aizoidis-Primuletum apenninae, 1900 m, esp. NE, 7.8.1991, *MT* (PAV); M. Balzone (Cimone), rupi, 1818 m, esp. N, 29.6.1993, *GR* (PAV); Lago Scaffaiolo, detriti, esp. W, 18.7.1993, *GR* (PAV). — PROV. BOLOGNA: Corno alle Scale, rupi, su arenaria, 1900 m, esp. N, 18.7.1993, *GR* (PAV); M. Spigolino, su rupe di arenaria di M. Cervarola, nel Drabo aizoidis-Primuletum apenninae, 1720 m, esp. NW, 9.7.1989, *GR & MT* (PAV); M. Spigolino, rupe, esp. N, 18.7.1993, *GR* (PAV). — PROV. PISTOIA: Alpe Tre Potenze, rupi, esp. N, 17.7.1983, *GR* (PAV); al Cigliarone, sopra Cutigliano, 8.7.1868, *coll. ignot.* (FI). — PROV. MASSA: Fivizzano, fra il bivacco Rosaro e il M.La Nuda, rupi in esp. N, su arenaria, 1600-1895 m, 15.7.1987, *BF & CR* (FI).

APUAN ALPS: [sine data] (GDOR); pascoli della regione nuda e di quella del faggio, vertice della Pania M. Corchia Palagnana, ex herb. AE. Simi (FI); sopra Rasceto verso la Tambura a Zucco dell'Altare, 29.7.1888, *S. Sommier* (FI); M. Cavallo, 1800 m, 29.6.1909, *Vaccari* (MO); tra Levigliani e vetta del M. Pania della Croce, 800–1858 m, 4.6.1950, *R. Pichi Sermolli, R. Bavazzane & A. Contardo* (FI); M. Fiocca, rocce, 1700 m, 21.6.1961, *E. Ferrarini* (herb. Ferrarini, Museo S. Nat. Lunigiana, Aulla, MS); sotto Foce di Cardeto, rupi, su diaspri, 1600 m, 29.10.1981, *MT* (PAV); M. Pisanino, vetta, rupi, su calcare selcifero, nel Artemisio nitidae-Silenetum lanuginosae, 1900 m, esp. S, E, W, 27.6.1982, *MT* (PAV); Passo Tambura, presso miniera, rupe, substr. siliceo, 1620 m, esp. E, 26.6.1983, *MT* (FI); M. Contrario, vetta, rupi, su calcare selcifero, 1785, esp. SE, 10.7.1983, *MT* (PAV); Pania della Croce, clastiti di vetta, su calcare madreporico, 1859 m, 7.1984, *MT* (PAV); Pizzo Saette, clastiti di vetta, su calcare madreporico, in seslerieto, 1720 m, 8.7.1984, *MT* (PAV); Pania della Croce, su calcare madreporico, in seslerieto di cresta, nel Seslerio tenuifoliae-Caricetum sempervirentis, 1800–1850 m, esp. W, 1.8.1984, *MT* (PAV); Tambura, macereti pi aridi, su marmo, 1750 m, esp. S, 15.9.1985, *MT* (PAV); Pania della Croce, cresta sommitale, clastiti di vetta su calcare madreporico, nel Seslerio tenuifoliae-Caricetum sempervirentis, 1800 m, 1.7.1992, *MT* (PAV); M. Pisanino (MS)-M. Cavallo, presso Foce di Cardeto, 1600 m, esp. N, 31.7.1992, *L. Di Fazio & BF* (FI – Fig. 11c); M. Grondilice, clastiti di vetta, su dolomia, Seslerio tenuifoliae-Caricetum sempervirentis, 1809 m, 14.9.1992, *MT* (PAV); vetta M. Sagro, ambienti rupestri, 1700 m, esp. N, 29.7.1993, *GR & MT*

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(PAV); Pania Secca, appena sotto la vetta, prati sassosi su calcare, seslerieto, 1600 m, 9.7.1994, *GR & MT* (PAV); M. Tambura, su rocce nere ferrose, prati sopra alla miniera, 1580 m, 11.7.1994, *GR* (PAV); M. Tambura, cresta sud, su marmo, pratelli sassosi, 1800 m, 11.7.1994, *GR* (PAV); M. Sumbra, zone di vetta, seslerieto, 1470 m, esp. S, 15.7.1994, *GR & MT* (PAV).

(9) *Festuca circummediterranea* Patzke in Österr. Bot. Z. 122: 26. 1973.

More or less densely tufted grass, 10–70 cm tall. Vegetative tillers intravaginal, decaying into reddish fibres. Tiller leaf sheaths overlapping, closed for 1/2–3/4; ligule very short, auriculate. Tiller leaf blades smooth, usually soft, more than half as long as shoot, laterally flattened, with cartilagineous prominent abaxial ribs in correspondence with the sclerenchyma strands, quite visible also in the field; in transverse section U-shaped with long arms, slightly waved, 0.9–1.2(1.5) mm wide, with 7(9) vascular bundles, 3 very stout sclerenchyma strands, the marginal sometimes slightly decurrent, and sometimes with two very small accessory submarginal sclerenchyma strands; with 3 adaxial ribs with sparse short hairs. Panicles 3–9.5 cm long, wide, lax, with the lower branch spreading. Spikelets 6–8 mm, sometime tinged violet, with 3–7 florets; lower glume 2.5–3 mm, 1-veined, upper glume 3.5–5 mm, 3-veined; lemmas (4)4.5–5 mm, 5-veined, margin rarely ciliate, awn (1)1.5–2.5 mm. Anthers 2–2.8 mm.

Distribution
S France, Italy, Balkan peninsula, E Mediterranean Isles, N Africa. In Italy it is reported from the whole territory, Sardinia excluded (Markgraf-Dannenberg 1982). In most parts of the N Apennines it occurs very scatteredly, only in the Apuan Alps it is more common.

Ecology
F. circummediterranea locally grows on both basic and acidic substrata. It grows mostly in xeric grasslands dominated by *Brachypodium genuense* and, located close to the timberline.

Notes
F. circummediterranea is a polymorphic species. However, carriage, dimension and rigidity of leaves and length of the awn does not seem, at the current state of our knowledge, to be correlated with any ecological or geographical features.

Specimens seen
Tuscan-Emilian Apennines: Prov. Reggio-Emilia: Prati del Cusna, 6.7.1882, *Pirotta* (MO); Collagna, M. Alto, faggeta rada fra le Fonti del Secchia e i vaccinieti, su arenaria, 1500–1600 m,

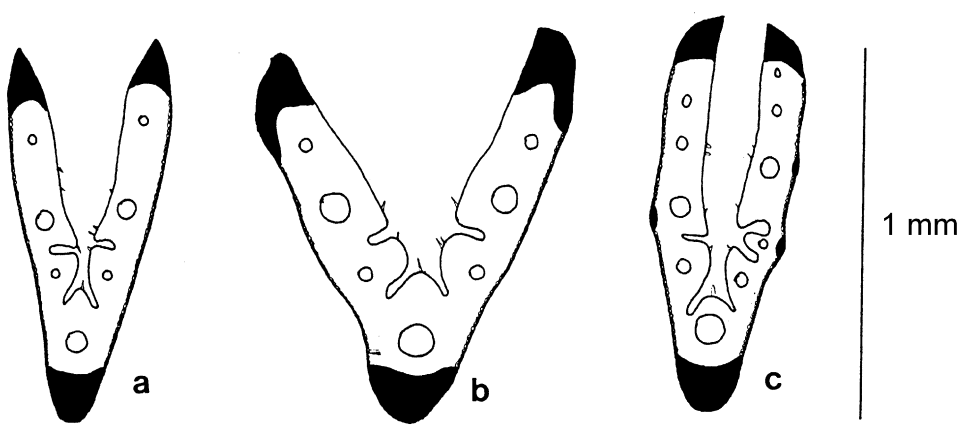


Fig. 12. *Festuca circummediterranea* – transverse sections of tiller leaf blades; a: Apuan Alps, 15.7.1994, *GR & MT* (PAV); b: Apuan Alps, 28.7.1993, *GR & MT* (PAV); Apuan Alps, 11.7.1994, *GR & MT* (PAV).

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14.7.1987, *BF & CR* (FI). — Prov. Pistoia: Boscolungo, Sestajone, 6.8.1886, *E. Levier* (FI). Apuan Alps: M. Cavallo, 1800 m, 29.6.1909, *Vaccari* (MO); Garfagnana, Valle della Fegana, Foce al Cavallaio, 1100 m, 25.6.1955, *PVA* (FI); M. Corchia, brachipodieto, 28.7.1993, *GR & MT* (PAV – Fig. 12b); Ai Pozzi, nelle pendici del Monte Borla, 1200 m, 21.5.1993, *D. Marchetti* (PAV); M. Corchia, in brachipodieto, 28.7.1993, 1610 m, esp. ESE, *GR & MT* (PAV); Pania Secca, brachipodieto sassoso, 1320 m, 9.7.1994, *GR* (PAV); nei pressi del Rifugio CAI Donegani, brachipodieto, 1100 m, esp. NE, 10.7.1994, *GR & MT* (PAV); M. Fiocca, a lato del sentiero per M. Tambura, luoghi aridi, 1300 m, 11.7.1994, *GR* (PAV); M. Fiocca, cresta est, brachipodieto, 1630 m, esp. S, 15.7.1994, *GR & MT* (PAV – Fig. 12a); lungo il sentiero che porta alla Tambura e al Sumbra, 1300 m, luoghi aridi, 11.7.1994, *GR & MT* (PAV – Fig. 12c).

(10) ***Festuca filiformis*** Pourr. in Hist. & Mém. Acad. Roy. Sci. Toulouse 3: 319. 1788.
= *F. tenuifolia* Sibth. (Markgraf-Dannenberg 1980, 1982).

Densely tufted grass with erect thin shoots, 10–30 cm tall. Vegetative tillers intravaginal. Tiller leaf sheaths overlapping, open to the base; ligule very short, with rounded auricles. Tiller leaf blades smooth, scarsely scabrid on the distal part, in transverse section regularly rounded-elliptical, 0.25–0.45 mm wide, with 5(7) vascular bundles and the sclerenchyma in a thin continuous band; adaxially densely and minutely hairy, with 1 slightly prominent rib. Panicle 2–5 cm long, linear-erect, narrow with very short branches sometimes with minute hairs, sometimes slightly interrupted. Spikelets 4–5.5 mm long, with 3–6 florets; lower glume (1)1.5–2(2.5) mm, 1-veined, upper glume 1–2.5 mm, 3-veined; lemmas 2.5–3 mm, 5-veined, awnless or with an awn up to 0.5 mm. Anthers 1–2 mm.

Distribution
Boreal. In Italy it is confined to the Alps and N Apennines (Markgraf-Dannenberg 1982). In the N Apennines *F. filiformis* occurs with a very scattered distribution along the whole range; common at low altitudes in xeric habitats, it becomes a rare species above the timberline.

Ecology
F. filiformis locally grows on acidic substrata, mostly in grasslands characterized by a discontinuous vegetation cover and on screes.

Notes
Some specimens have a very shortly mucronate lemma (up to 0.5 mm) and could be referred to *F. filiformis* f. *mucronata* (Auquier) Kerguélen & Plonka.

Specimens studied
Tuscan-Emilian Apennines: Prov. Parma: Salendo da Pracchiolo al monte Orsaio, pascoli montani, 28.6.1903, *S. Sommier* (FI). — Prov. Reggio-Emilia: M. Prado, vicino lago, dosso

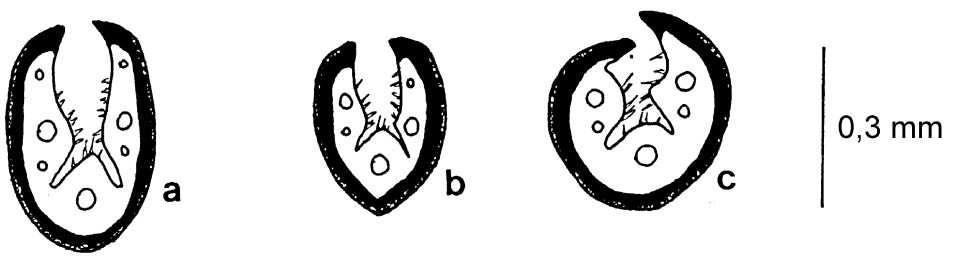


Fig. 13. *Festuca filiformis* – transverse sections of tiller leaf blades; a: Prov. Reggio-Emilia, 19.8.1992, *GR & M. Gentilini* (PAV); b: Prov. Modena, cima Tauffi, 8.7.1990, *GR & MT* (PAV); c: Prov. Modena, Balzoni, 8.7.1990, *GR & MT* (PAV).

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sassoso, in variante a *Cetraria islandica* del Sileno exscapae-Trifolietum alpini, 1790 m, esp. NE, 19.8.1992, *GR & M. Gentilini* (PAV – Fig. 13a). — PROV. MODENA: Cima Tauffi, in brachipodieto, 1700 m, esp. E, 8.7.1990, *MT & GR* (PAV – Fig. 13); Balzoni, su arenaria macigno, detriti con *Alchemilla saxatilis*, 1720 m, esp. N, 8.7.1990, *GR & MT* (PAV – Fig. 13c).
APUAN ALPS: M. Cavallo, su calcari selciferi, in prateria mesofitica, nel trifolio-festuceto, 1700 m, esp. NNW, 31.7.1992, *MT & GR* (PAV).

(11) ***Festuca inops*** De Not., Repert. Fl. Ligust.: 500. 1844.

Densely tufted grass with erect culms, 25–40(50) cm tall. Vegetative tillers intravaginal. Tiller leaf sheaths overlapping, closed for 1/4–1/2, shining-papery-membranaceous at the base; ligule very short with evident obtuse auricles. Tiller leaf blades pruinose (maintained under cultivation), rigid, smooth, ± laterally flattened; in transverse section regularly oval-elliptic, 0.7–0.9(1) mm wide, with 7 vascular bundles, with the median and the submarginal larger than the others, and the sclerenchyma in a ± thick, continuous band; with 3–5 sparsely hairy adaxial ribs; bulliform cells often present. Panicles 3–6.5 cm long, dense or slightly interrupted. Spikelets dense, 6–6.5 mm, with 4–7 florets, often pruinose, sometimes tinged violet; lower glume (2)2.5–3 mm, 1-veined, upper glume 3.5(4) mm, shortly acuminate, 3-veined; lemmas (4)4.5 mm, 5-veined, sometimes hairy-scabrid in the distal half, awn 0–0.5(1) mm. Anthers 2 mm.

Distribution
Apennines. Markgraf-Dannenberg (1982) reported *F. inops* only from the N and Central Apennines. In the study area, *F. inops* is confined to the Apuan Alps; common at low altitudes it becomes a rare species above the timberline.

Ecology
F. inops locally grows on basic and, more rarely, acidic substrata, in rocky and xeric habitats, mostly in grasslands dominated by *Sesleria tenuifolia* or *Brachypodium genuense*.

Notes
Bechi & Miceli (1995: 25) reported a chromosome number of 2n = 14 on material from several Tuscanian localities.

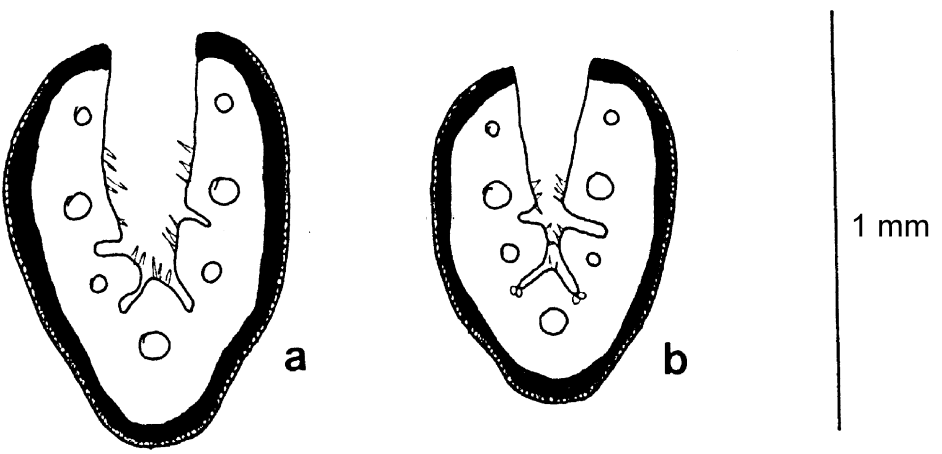


Fig. 14. *Festuca inops* – transverse sections of tiller leaf blades; a: Apuan Alps, 28.7.1993, *GR & MT* (PAV); b: Apuan Alps, 29.7.1993, *GR* (PAV).

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Specimens studied
APUAN ALPS: Cima del Procinto, Vulgata, 29.6 e 10.7.1893, *S. Sommier* (FI); M. Matanna e M. Procinto, 7.1934, *A. Chiarugi* (FI); Passo Uomini della neve, Pania della Croce, in seslerieti, 1600 m, esp. ENE, 1.8.1984, *MT* (PAV); M. Corchia, in brachipodieto, 28.7.1993, *GR & MT* (PAV – Fig. 14a); M. Sagro, in prati aridi sassosi, 1350 m, 29.7.1993, *GR & MT* (PAV); M. Sagro, prati rocciosi, 1280 m, 29.7.1993, *GR* (PAV – Fig. 14b); Pania Secca, su calcare madreporico, in brachipodieto, 1710 m, esp. S, 9.7.1994, *GR* (PAV); M. Tambura, su calcare, brachipodieto, 1420 m, esp. SE, 11.7.1994, *GR & MT* (PAV); tra Passo Fiocca e M. Sumbra, su calcare selcifero, zone rocciose, tra 1600 e 1630 m, esp. SSW, 15.7.1994, *GR* (PAV).

(12) ***Festuca cinerea*** Vill. in Gilibert, Syst. Pl. Eur. 1: 8. 1786.

More or less densely tufted grass, 20–40 cm tall. Vegetative tillers intravaginal. Tiller leaf sheaths overlapping, closed for 1/5–1/4; ligule very short with evident auricles. Tiller leaf blades generally pruinose (maintained under cultivation), rather rigid, generally scabrid in the distal part, often short; in transverse section regularly oval-elliptic to opened V-shaped, 0.7–0.9 mm wide; with 7(9) vascular bundles and the sclerenchyma in a laterally thickened, continuous to sometimes slightly interrupted band; adaxially minutely hairy and with 3 rather low ribs; bulliform cells often present. Panicles only 2–4 cm long, dense. Spikelets 7–7.5(8) mm, ± pruinose; lower glume 3–3.2 mm, 1-veined, upper glume 4 mm, 3-veined; lemmas 5 mm, sparsely hairy in the distal half and bearded at the margin, 5-veined, awn 1–2 mm. Anthers 3 mm.

Distribution
SE France, NW Italy. In Italy, *F. cinerea* was known only from the W Alps (Markgraf-Dannenberg 1982), but is now also reported for the N Apennines, where it is confined to the Apuan Alps, growing in a few localities mostly at low altitudes

Ecology
F. cinerea locally grows on base-rich substrata, in rocky and xeric habitats.

Specimens studied
APUAN ALPS: Pizzo Saette, clastiti di vetta, 8.7.1984, *MT* (PAV – Fig. 15b); M. Tambura, cresta sud, su detriti, 11.7.1993, *GR & MT* (PAV); M. Sagro, ambienti sassosi, 1380 m, esp. W, 29.7.1993, *GR* (PAV); Pania Secca, clastiti di vetta, 1740 m, esp. SW, 9.7.1994, *GR* (PAV –

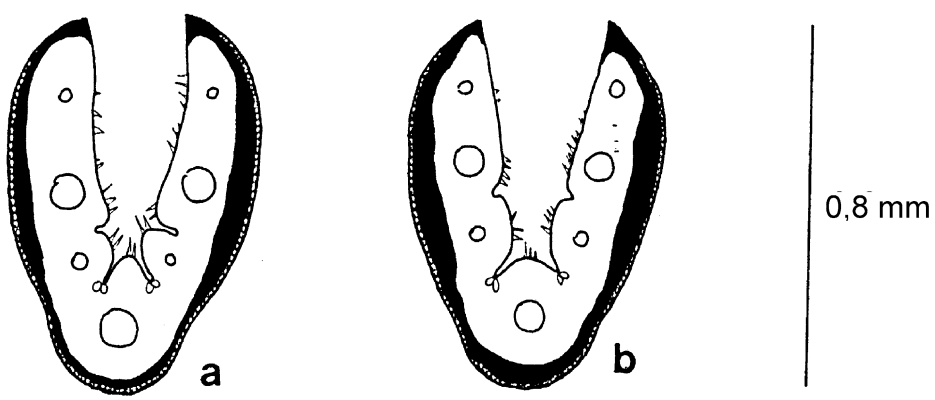


Fig. 15. *Festuca cinerea* – transverse sections of tiller leaf blades; a: Apuan Alps, 9.7.1994, *GR & MT* (PAV); b: Apuan Alps, 8.7.1984, *MT* (PAV).

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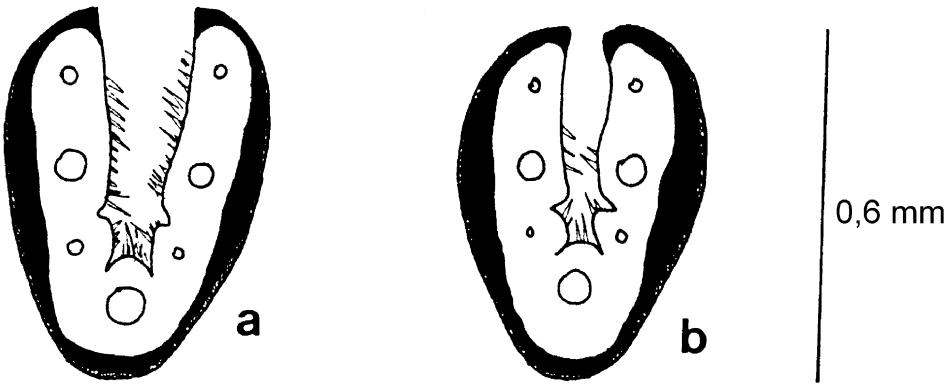


Fig. 16. *Festuca gracilior* – transverse sections of tiller leaf blades; a: Apuan Alps, 11.7.1994, *GR & MT* (PAV); b: Apuan Alps, 28.7.1993, *GR* (PAV).

Fig.15a); M. Tambura, cresta sud, detriti, su marmo, 1800 m, 11.7.1994, *GR* (PAV); M. Tambura, nei pressi della miniera, pareti con rocce nere ferrose, 1580 m, 11.7.1994, *GR* (PAV); tra Passo Fiocca e M. Sumbra, su calcare selcifero, zone rocciose, 1630 m, esp. SSW, 15.7.1994, *GR* (PAV); M. Sumbra, luoghi sassosi, 1680–1730 m, esp. SSE, 15.7.1994, *GR* (PAV).

(13) *Festuca gracilior* (Hack.) Markgr.-Dann. in Bot. J. Linn. Soc. 76: 325. 1978.

Densely tufted grass, (10)15–25(30) cm tall. Vegetative tillers intravaginal. Tiller leaf sheaths overlapping, closed for 1/2; ligule very short with scarcely evident auricles. Tiller leaf blades smooth, generally pruinose, rather rigid, often short and recurved; in transverse section regularly oval-elliptic, 0.5–0.7 mm wide, with 7 vascular bundles and the sclerenchyma in a continuous, laterally very thickened band; adaxially minutely, sometimes densely, hairy and with (1)3 rather low ribs. Panicles 3–7 cm long, narrow, linear, sometimes interrupted, rather dense. Spikelets 6–7(7.5) mm, ± pruinose; lower glume 2–3 mm, 1-veined; upper glume 3–3.5 mm, 3-veined; lemmas 4–4.5 mm, 5-veined, awn 0–1 mm. Anthers 2–2.5 mm.

Distribution
SE France, NW Italy. Markgraf-Dannenberg (1982) reported *F. gracilior* only from Liguria and NW Tuscany, but it is also found in the Apuan Alps, in few localities mostly at low altitudes, like *F. cinerea*.

Ecology
F. gracilior locally grows on basic substrata, in rocky and xeric habitats.

Specimens studied
Apuan Alps: Salendo al M. Corchia, rupi su dolomie, 1490 m, esp. S, 28.7.1993, *GR* (PAV – Fig. 16b); M. Corchia, anticima, praterie sassose con *Brachypodium genuense*, 1630 m, 28.7.1993, *GR* (PAV); lungo il sentiero che porta alla Tambura prima dell biforcazione per il Fiocca-Sumbra, 1200 m, esp. N, 11.7.1994, *GR & MT* (PAV – Fig. 16a); M. Fiocca, cresta NW, su rocce affioranti, 1550 m, 15.7.1994, *GR* (PAV).

(14) *Festuca riccerii* Foggi & Graz. Rossi, **sp. nova** – Fig. 17.
Holotypus: Italy, Emilia Romagna, Ligonchio/ M. Prado, cresta rocciosa fra lo Sprone di Prado e la vetta, prati e vaccinieti, 1955–2054 m, arenaria, 28.7.1989, *B. Foggi & C. Ricceri* (FI; isotypi: FI, PAV).

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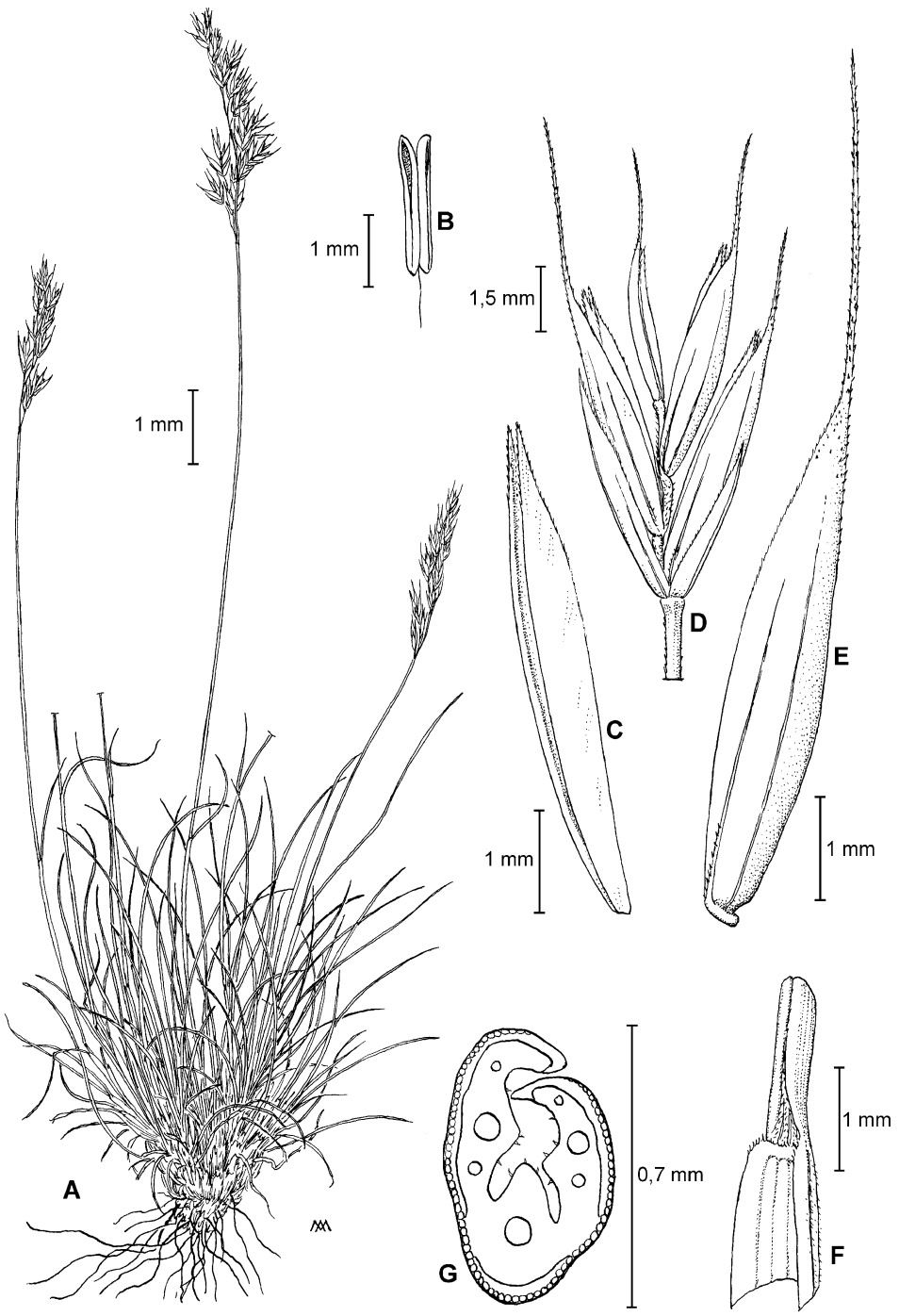


Fig. 17. *Festuca riccerii* – A: habit; B: anther; C: palea; D: spikelet; E: lemma; F: ligule; G: transverse section of tiller leaf blade. – Drawings by A. Maury, Florence, from the type collection.

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Differt a *F. robustifolia* statura minore, spiculis brevioribus, foliis non incurvatis annulo sclerenchymatis irregulariter spisso praeditis; a *F. cinerea* pruina nulla, annulo sclerenchymatis foliorum lateralibus tenuiore; a *F. billyi* spiculis brevioribus et statura minore.

Eponymy: Dedicated to Carlo Ricceri (*1933–), botanist at Florence.

Densely tufted grass, 10–25(30) cm tall. Vegetative tillers intravaginal. Tiller leaf sheaths overlapping, closed for 1/3–1/2; ligule very short with evident auricles. Tiller leaf blades smooth, green, never pruinose, never rigid, linear, not or only sometimes slightly recurved; in transverse section regularly oval-elliptic to opened V-shaped, (0.5)0.6–0.8(1) mm wide; with 7 vascular bundles and the sclerenchyma in a slightly interrupted or sometimes continuous but always irregular band; with (1)3(5) minutely hairy adaxial ribs. Panicles only 2.5(3)–5(6) cm long, dense. Spikelets 7–8(8.5) mm, ± pruinose; lower glume 2(2.8)–3.5 mm, 1-veined, upper glume 3.8–4.5(5) mm, 3-veined; lemmas 4.5–5.5 mm, 5-veined, awn 2–4 mm. Anthers 2–2.5 mm.

Distribution
F. riccerii is an endemic species of the Tuscan-Emilian Apennines.

Ecology
F. riccerii grows on arenaceous substrata in several communities. This species is quite common in the acidophytic grasslands belonging to the Caricion curvulae (Tomaselli & Rossi 1994), where the species locally becomes dominant in the so-called *F. robustifolia* community (Rossi 1994, Tomaselli 1995). The species also grows on E-facing sandstone outcrops.

Notes
Up to now the populations at the higher altitudes of Tuscan-Emilian Apennines were commonly referred to *F. robustifolia* Markgr.-Dann. (Gerdol & al. 1985, Tomaselli 1991). Our extensive field investigations proved that the populations growing above the timberline show significant differences from those of lower altitudes, and these are correlated with peculiar ecological and geographical features. As a consequence we treat these populations as representing a new species.

Specimens studied
TUSCAN-EMILIAN APENNINES: PROV. PARMA: Zone di cresta del M. Malpasso, su arenaria, 1700 m, 22.7.1986, *PVA, BF & CR* (FI – Fig. 18b); M. Orsaro, su arenaria macigno, rupe, nel Drabo aizoidis-Primuletum apenninae, 1720 m, esp. SE, 7.1992, *GR & MT* (PAV). — PROV. REGGIO-EMILIA: Negli erbosi su macigno della vetta del M. Buffanaro, nei Groppi di Camporaghena,

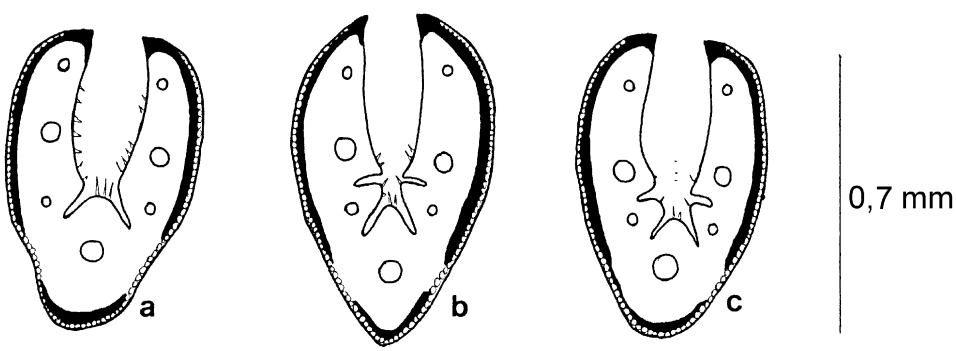


Fig. 18. *Festuca riccerii* – transverse sections af tiller leaf blades; a: Prov. Modena, 12.8.1988, *BF & CR* (FI); b: Prov. Parma, 22.7.1986, *PVA, BF & CR* (FI); c: Prov. Parma, 10.8.1991, *GR & MT* (PAV).

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1878 m, 6.8.1980, *E. Ferrarini* (SI); M. Scalocchio, rupi, 6.11.1983, *MT* (PAV); M. Ventasso, su arenaria, 1695 m, esp. E, 25.8.1986, *MT* (PAV); M. Alto, rupi e pascoli cacuminali, su arenaria, 1600–1904, esp. NNE, 14.7.1987, *BF & CR* (FI); fra il bivacco Rosaro e il M. La Nuda, rupi settentrionali su arenaria, 1600–1895 m, 15.7.1987, *BF & CR* (FI); M. Cavalbianco, cresta e pendici rocciose, su arenaria, 1650–1850, 16.7.1987, *BF & CR* (FI); M. Prado, cresta rocciosa tra lo Sprone di Prado e la vetta, prati e vaccinieti, 1955–2054 m, 28.7.1987, *BF & CR* (FI); M. Cusna, rocce della vetta su arenaria, 2000–2100 m, 12.8.1987, *BF & CR* (FI); M. Cusna, su arenarie di M. Modino, nella stazione di ritrovamento di *Linum capitatum*, 2030 m, esp. S, 16.6.1988, *GR* (PAV); M. Prado, praterie sommitali, Sileno exscapae-Trifolietum alpini, 2030 m, esp. W, 10.8.1991, *GR & MT* (PAV – Fig. 18c); M. Cusna, su arenarie di M. Modino, in prateria aperta ad elevata petrosit superficiale, comunit a *F. robustifolia*, 2000 m, esp. SSW, 11.8.1991, *GR & MT* (PAV); M. Alto, gr. Succiso, in cresta, su arenaria macigno, in brachipodieto, 1690 m, esp. SE, 26.7.1992, *GR & MT* (PAV); M. Prado, vegetazione di cresta, nel Sileno exscapae-Trifolietum alpini, 1900 m, 19.8.1992, *GR* (PAV); M. Vecchio, in brachipodieto con *F. paniculata*, 1990 m, esp. S, *GR & M. Gentilini* (PAV); tra M. Prado e M. Sillano, Le Porraie, in brachipodieto, 1800 m, esp. SW, 31.7.1993, *GR* (PAV); negli erbosi aridi su macigno del crestone est del M. Alto, ai Groppi di Camporaghena, 1800 m, 1980, *E. Ferrarini* (SI). — Prov. Modena: M. Rondinaio, tra Fonte Rondinaio e Lago Turchino, su arenaria, 1600–1880 m, 30.7.1987, *BF & CR* (FI); da Passo al Giovo alla sella sopra Lago Torbido, su arenaria, prati e vaccinieti, 1600–1781 m, esp. N, 30.7.1987, *BF& CR* (FI); M. Lagoni (Libro Aperto), su arenaria macigno, vegetazione a festoni di *Alchemilla saxatilis*, 11.8.1988, *GR & MT* (PAV); M. Cimone, da Pian Cavallaro alla vetta, su arenaria, 1850–2150 m, esp. NNW, 12.8.1988, *BF & CR* (FI – Fig. 18a); in comunit a *F. robustifolia*, 1640 m, esp. NNW, 8.7.1990, *GR & MT* (PAV); Passo di Croce Arcana, 11.6.1991, *MT* (PAV); M. Giovo, in pietraia a felci, Cryptogrammo-Dryopteridetum oreadis, 1740 m, esp. NE, 7.8.1991, *GR & MT* (PAV); M. Cimone, su arenarie di M. Modino, in festuceto a *F. robustifolia*, 2000 m, esp. W, 9.8.1991, *MT* (PAV); M. Cimone, praterie sommitali, nel Sileno exscapae-Trifolietum alpini, 1870 m, esp. N, 9.8.1991, *GR & MT* (PAV); Gruppo di Libro Aperto, Pizzo Sassi Bianchi, su detriti marnosi, aggruppamento a *Calamagrostis varia*, 1620 m, esp. ESE, 7.9.1991, *MT* (PAV); verso M. Balzone (M. Cimone), nella stazione di *Sibbaldia procumbens*, 1810 m, 9.9.1991, *GR* (PAV); M. Rondinaio, in brachipodieto a *F. paniculata*, 1850 m, esp. S, 26.7.1993, *GR* (PAV). — Prov. Bologna: M. Corno alle Scale, su arenaria, cresta e pareti rocciose da Punta La Sofia al Corno alle Scale, 1939–1945 m, esp. NNE, 6.8.1987, *BF* (FI); Corno alle Scale, rupi e piccole cenge, 1900 m, esp. N, 18.7.1993, *GR* (PAV). — Prov. Pistoia: Abetone, Selletta, 21.6.1968, *De Dominicis* (SI); Abetone, da Foce Campolino a Diacceto al Bosco, prati e vaccinieti, su arenaria, 1840–1862 m, esp. NNW, *BF & CR* (FI); Alpe tre Potenze, Valle di Luce, 1600 m, esp. W, 28.6.1985, *F. Lucchese* (herb. F. Lucchese, Roma); Alpe Tre Potenze, su rupi di arenaria, 1800 m, esp. N, 17.7.1993, *GR* (PAV).

(15) ***Festuca apuanica*** Markgr.-Dann. in Bot. J. Linn. Soc. 76: 322. 1978.

Laxely or rather densely tufted grass, 35–60 cm tall. Vegetative tillers intravaginal. Tiller leaf sheaths overlapping, closed for 1/4–1/2; ligule very short with evident auricles. Tiller leaf blades rushlike, smooth or weakly scabrid, greyish-green, longer than half of shoot; in transverse section irregularly oval-elliptic to polygonal, 0.7–1(1.1) mm, with 7 vascular bundles and sclerenchyma in an interrupted band, thickened in places, or sometimes in a continuous but always irregular band; abaxially with large or very large epidermal cells, adaxially sparsely hairy and with 3–5 ribs. Panicles 6–14 cm long, wide, lax, often interrupted, with the lower branches spreading during flowering. Spikelets 8–9 mm, generally green, with 3–5 florets; lower glume 3–3.5 mm, 1-veined; upper glume 3.2–4(5.5) mm, 3-veined, with a distinct scarious margin; lemmas 5.2–5.5(6) mm, 5-veined, scabrid in the distal half, awn (1.5)2–2.5(3) mm. Anthers 2–2.5 mm.

Distribution

F. apuanica is an endemic species of the Apuan Alps.

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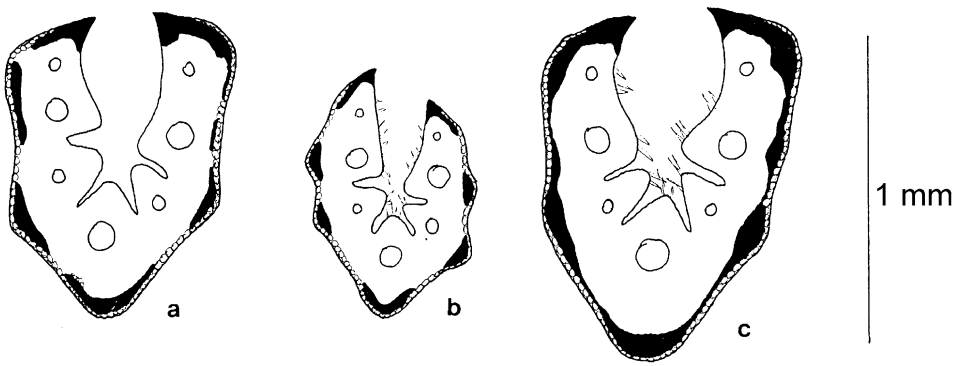


Fig. 19. *Festuca apuanica* – transverse sections of tiller leaf blades; a: Apuan Alps, 29.7.1993, *GR & MT* (PAV); b: Apuan Alps, 17.7.1991, *M. Clauser, L. Di Fazio & BF* (FI); c: Apuan Alps, 24.7.1994, *BF* (FI).

Ecology

F. apuanica occurs on acidic substrata, such as jaspers and porfyroids in rocky habitats and, more rarely, in xerophytic grasslands dominated by *Brachypodium genuense*

Notes

Bechi & Miceli (1995: 22) counted a chromosome number of 2n = 70 on material from several localities of the Apuan Alps.

Specimens studied

Apuan Alps: Altissimo, Felschett (Felsband) Perm. Si, 27.5.1961, *W. Lüdi* (FI); sopra galleria Cipollaio, rupi, 920 m, esp. SW, 10.7.1982, *MT* (PAV); Passo Tambura, presso miniera, rupe, 1620 m, esp. E, 26.6.1983, *MT* (PAV); Canà Regolò, su verrucano, 560–885 m, 23.6.1985, *MT* (PAV); fra Antona e il canale dell'Agnola, rupi calcaree, 900 m, esp. SSW, 17.7.1991, *M. Clauser, L. Di Fazio & BF* (FI – Fig. 19b); M. Sumbra, brachipodieto, 29.7.1993, *GR & MT* (PAV); M. Corchia, brachipodieto, 1610 m, esp. NNE, 28.7.1993, *GR & MT* (PAV); M. Sagro, su calcare selcifero, brachipodieto, 29.7.1993, *GR & MT* (PAV – Fig. 19a); sella a N di Pizzo Altare, Zucchi di Cardeto, su rupi, 1700 m, esp. N, 10.7.1994, *GR & MT* (PAV); sentiero per M. Tambura, nei pressi della miniera, pareti su rocce nere ferrose, 1580 m, 11.7.1994, *GR* (PAV); M. Sumbra, lungo sentiero con ferrata, luoghi sassosi,1680–1730 m, esp. SSW, 15.7.1994, *GR & MT* (PAV); M. Fiocca, affioramenti rocciosi, 1500 m, esp. W, 15.7.1994, *GR & MT* (PAV); M. Fiocca, affioramento roccioso su scisti, 1510 m, esp. N, 15.7.1994, *GR & MT* (PAV); M. Cavallo, rupi, 1750 m, esp. E, 16.7.1994, *GR & MT* (PAV); M. Fiocca, su scisti silicei, 1200 m, 24.7.1994, *BF* (FI – Fig. 19c); M. Corchia, su scisti silicei, rupi e cenge, 1200–1300 m, esp. NW, 17.6.1994, *BF* (FI).

(16) ***Festuca billyi*** Kerguélen & Plonka in Bull. Soc. Échange Pl. Vasc. Eur. Occid. Bassin Médit. 23: 87. 1991.

Laxly or rather densely tufted grass, (10)35–60 cm tall. Vegetative tillers intravaginal. Tiller leaf sheaths overlapping, closed for 1/8, sometimes slightly hairy; ligule very short with evident auricles. Tiller leaf blades rushlike, smooth or weakly scabrid, greyish-green, never pruinose; in transverse section irregularly oval-elliptic and slightly laterally flattened, (0.9)1–1.3(1.5) mm wide, with 7–9(11) vascular bundles and the sclerenchyma in a continuous, sometimes slightly interrupted, generally laterally thinned band; adaxially with sparse short hairs and 5–7 ribs; bulliform cells always present. Panicles 8–12 cm (exceptionally in one small individual 2–3 cm only) long, wide, lax, often interrupted. Spikelets 8–9(11) mm, with 4–7 florets; lower glume 3.5–4 mm, 1-veined, upper glume 5.5–6(6.5) mm, 3-veined; lemmas 5.5–7 mm, 5-veined, awn 2–3.5 mm. Anthers 3–3.5 mm.

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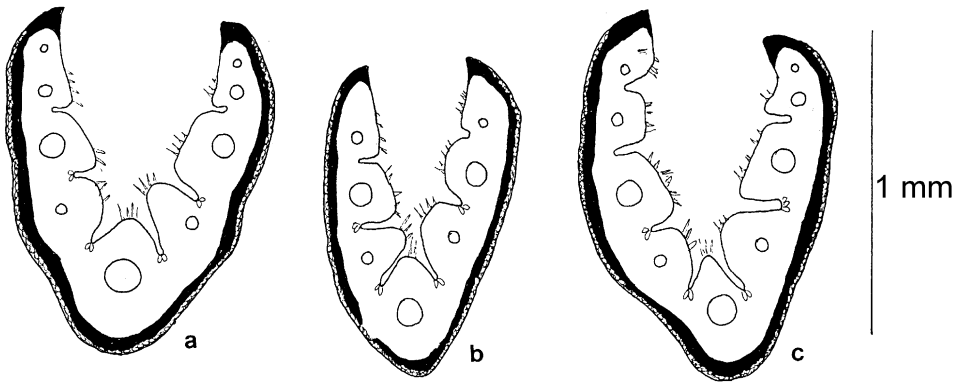


Fig. 20. *Festuca billyi* – transverse sections of tiller leaf blades; a: Prov. Reggio-Emilia, 29.7.1994, *GR* (PAV); b: Apuan Alps, 16.7.1994, *GR* (PAV); c: Prov. Reggio-Emilia, 29.7.1994, *GR* (PAV).

Distribution

The species was hitherto known from Central France only, and is now reported also from the N Apennines, where it was found very scatteredly in the Tuscan-Emilian Apennines and, only in one site on siliceous substrata at M. Cavallo, in the Apuan Alps.

Ecology

F. billyi locally grows on acidic substrata, mostly along the summit ridges, in communities dominated by *F. riccerii*, or in *Vaccinium* heath dominated by *V. gaultherioides* and with *V. myrtillus*, as observed at M. Prado (Tuscan-Emilian Apennines).

Notes

Festuca billyi is a species of the *F. laevigata* group. The specimens collected in the Tuscan-Emilian Apennines show strong morphological affinities to those from the locus classicus, at Puy-de-Dme (isotypus in FI!), and clearly differ from *F. laevigata* Gaudin (Typus in LAU!) by never being pruinose, having smaller spikelets, smaller anthers, and leaf blades with a continuous sclerenchyma band equal in size. Since *F. billyi* is moreover distinguished by its chromosome number (2n = 42) from the similar *F. laevigata* (2n = 56), we have tested also the chromosome number of the plants from the N Apennines, as requested by an unknown reviewer and suggested by M. Kerguélen (in litt. 19.4.1996), in order to confirm their identity. The counts in an origin from M. Prado, Prov. Reggio Emilia (25.7.1994, *GR* (PAV)), cultivated in the Botanical Garden of Florence all showed 2n = 42, as known from *F. billyi*.

Ecologically, *F. billyi* appears to be a silicicolous species, while *F. laevigata* prefers carbonatic substrates. In our opinion *F. laevigata* can be expected in the S Alps, and possibly also in the Central and S Apennines, from were *F. laevigata* subsp. *crassifolia* (Gaudin) Kerguélen & Plonka has been reported (sub *F. curvula* subsp. *crassifolia* (Gaudin) Markgr.- Dann. in FI and CAM).

Specimens studied

Tuscan-Emilian Apennines: Prov. Parma: M. Orsaro, versante occid., Berra del Sol, nelle fessure della roccia, insieme a *Primula apennina*, 1500–1600 m, 15.7.1951, *P. Davis & R. Pichi Sermolli* (FI). — Prov. Reggio-Emilia: Pascoli dell'Alpe di Cusna, 8.7.1888, *A. Fiori (FI);* M. Prado, arenaria-macigno, 29.6.1992, *MT & GR* (PAV); M. Sillano, prateria a *Festuca robustifolia*, 1870 m, esp. E, 31.7.1993, *GR* (PAV); M. Castellino, prateria a *Festuca robustifolia*, 1930 m, 24.7.1994, *GR* (PAV); cima di M. Vecchio, prateria a *Festuca robustifolia* con *Alchemilla alpina*, 1980 m, esp. SW, 25.7.1994, *GR* (PAV); M. Prado, vaccinieto a *Vaccinium gaultherioides*, 2000 m, esp. S, 25.7.1994, *GR* (PAV); M. Prado, spallone verso orlo del circo glaciale,

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vaccinieti su arenaria, 2020 m, esp. E-SE, 29.7.1994, *GR* (PAV – Fig. 20a); M. Prado - Sprone di Prado, versante SE, brachipodieto, 1940 m, 29.7.1994, *GR* (PAV – Fig. 20c); cresta M. Prado - M. Castellino, vegetazione con *Festuca robustifolia*, *Trifolium alpinum* e *Vaccinium gaultherioides*, 1910 m, 27.7.1994, *GR* (PAV). — PROV. MODENA: Verso il Libro Aperto o Cimone, 25.7.1881, *Sommier* (FI); M. Cimone, Pian Cavallaro, 1800 m, esp. N, 27.6.1985, *F. Lucchese* (herb. Lucchese, Roma). — PROV. BOLOGNA: Cupulino del Lago Scaffaiolo, 8.1883, *G. Pizzini 3* (RO); Corno alle Scale, 28.6.1985, *F. Lucchese* (herb. Lucchese, Roma); M. Giovo, sotto al circo glaciale, prateria ad *Alchemilla alpina* e *Festuca robustifolia*, 1770 m, 26.7.1994, *GR* (PAV).

APUAN ALPS: Cima del Procinto, 1170 m, 10.7.1893, *S. Sommier* (FI); M. Cavallo, clastiti di vetta, 1880 m, esp. W, 16.7.1994, *GR* (PAV – Fig. 20b).

Species excludenda

F. guestfalica Boenn. was reported from N Italy by Markgraf-Dannenberg (1982). However, according to Wilkinson & Stace (1987), *F. guestfalica*, is a Central European species (Germany and Switzerland), and it was not found by us in the study area; probably it is to exclude from the Italian flora at all.

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