



Holcus mollis L. var. *parviflorus* Parn. (Poaceae): an erroneous interpretation of abnormal morphology caused by fungi

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During biometric studies it was observed that several specimens of *Holcus mollis* L. presented a peculiar but constant morphology caused by the presence of *Tilletia holci* (Westend.) J. Schröt. These changes in morphology were very clear in the spikelet where glumes were shorter and larger and both florets were awned. This morphology closely matches the description of *Holcus mollis* L. var. *parviflorus* Parn. The type material was also infected with *Tilletia holci*. Taxonomic distinction of infected plants is not acceptable. © 2001 The Linnean Society of London

ADDITIONAL KEY WORDS: Biometry – florets – infection – spikelet – taxonomy – *Tilletia holci*.

INTRODUCTION

Gay (1858) reported taxonomic problems caused by *Tilletia* in Poaceae. The changes in the structure of anthers and ovaries he described for *Aira subtriflora* Lag. (\equiv *Deschampsia caespitosa* (L.) P. Beauv. subsp. *subtriflora* (Lag.) Ehr. Bayer & G. López (Bayer & López, 1994) correspond to our observations in all the infected specimens of *Holcus mollis* L. Deformations caused by *Tilletia* are well documented. Viennot-Bourgin (1937) described several deformations on the vegetative and reproductive structures of *Triticum*; these deformations were also anatomical.

Examples of taxonomic assumptions based on infected specimens include *Agrostis pumila* L. Linnaeus (1767) described *A. pumila* based on, among other characters, the large size of the ovaries ("semian majuscula"). Roemer & Schultes (1817) recognized that the morphology described by Linnaeus was caused by fungal infection and they included *A. pumila* under a varietal category of *A. vulgaris* Schrad. ("... spiculis ovatis, seminibus conspicuis turgidiculis ustilagine corruptis, stylus persistentibus ..." p. 351).

MATERIAL AND METHODS

Studied material came from loans from E (Edinburgh, Scotland), COI (Coimbra, Portugal), RO (Rome, Italy) and MPU (Montpellier, France) herbaria.

SPECIMENS EXAMINED

Holcus mollis L. var. *parviflorus* Parn.
Scotland: "Near Prestonpans" R. Parnell, 20.vii; E 00037488.

Holcus mollis L. (infected).

Portugal: "Caramulo, Vale do Caramulinho, nos cultos, entre Rubus sp." J. Matos, A. Matos & A. Marques, 18.vi.1954, COI 5071. France: "Serra di Scopaméne, par Sarténe. Marais de Quenza. (Forme remarquable)" E. Reverchon, 15.vii.1879, MPU; "Haute prairie sur les Crazes prés Aguical" J. Lasalle, 4.viii.1888, MPU; Italy: "Fiumalbo prati falde del Cimone Apen. Modenese" Adr. Fiori, 24.vii.1884, FI; "Prati alle falde del Cimone, Appen. Modenese" Adr. Fiori, 24.vii.1884, RO.

Macroscopic analysis and photography were undertaken with a binocular microscope Zeiss model SV 11 APO. Microscope slides mounted in PVA (Omar, Bolland & Heather, 1979) were made for all specimens.

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Table 1. Morphological differences between infected (FI, MPU and E) and uninfected specimens of *Holcus mollis*. All measurements in mm

	Spikelet	Lower glume	Upper glume	
FI	4.35	3.87	4.16	
MPU	3.87	3.34	3.68	
E	3.87	3.68	3.68	
(min.) average (max.)	(4.26) 5.54 (7.16)	(3.68) 4.91 (6.58)	(4.11) 5.29 (6.58)	
	Second rachis	First flower lemma	First flower palea	Second flower palea
FI	0.55	1.79	1.67	1.59
MPU	0.52	1.74	1.64	1.72
E	0.52	1.76	1.72	1.72
(min.) average (max.)	(0.59) 0.75 (0.96)	(1.89) 2.42 (3.92)	(1.69) 2.17 (2.89)	(1.64) 2.16 (2.70)

FI [Adr. Fiori, 24.vii.1884]; MPU [E. Reverchon, 15.vii.1879]; E [E00037488].

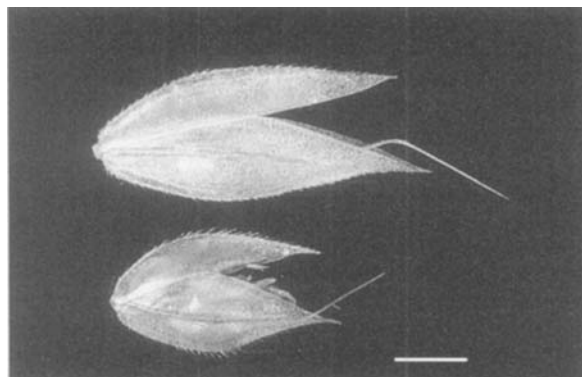


Figure 1. Normal spikelet (A, MA444984) and infected spikelet (B, FI Fiori). Apart from a difference in size and shape, abnormal ovary development can be observed in infected spikelet. Scale bar = 1 mm.

Fungal spores were observed by light microscopy (Reichert-Jung MicroStar 110), photographed using a SEM after 'critical point' drying, and identified following Vánky (1994).

RESULTS AND DISCUSSION

Biometric studies included 64 uninfected and three infected specimens (FI [Adr. Fiori, 24.vii.1884]; MPU [E. Reverchon, 15.vii.1879]; E [E00037488]), and 54 characters. Table 1 summarizes the results obtained for seven key characters.

All infected specimens of *Holcus mollis* L. studied presented a constant morphology with a general reduction in habit and vegetative characters, and a very clear change in spikelet morphology (Table 1, Figs 1

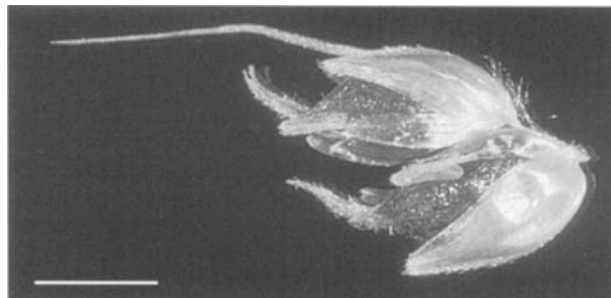


Figure 2. *Holcus mollis* L. (FI Fiori) spikelet (without glumes) infected with *Tilletia holci*. Abnormal development of both ovaries and styles can be observed; dark spots correspond to spores. Scale bar = 1 mm.

& 2). This abnormal morphology is consistent with the description of *Holcus mollis* L. var. *parviflorus* Parn. and we confirm that the type of *Holcus mollis* L. var. *parviflorus* Parn. was also infected with *Tilletia holci* (Figs 3 & 4). Parnell (1842) refers to *Holcus mollis* var. *parviflorus* as "(. . .) a variety from nine to twelve inches high with very small spikelets (. . .), being not more than half the size of those of *Holcus mollis*."

The following nomenclatural treatment should thus be adopted:

Holcus mollis L., Syst. Nat. ed. 10,2: 1305 (1759) = *Holcus mollis* L. var. *parviflorus* Parn., Grass. Scotland: 51 pl. 22 (1842). Typus in E: "Near Prestonpans July" R. Parnell, 20.vii; E 00037488.

CONCLUSIONS

Specimens of *Holcus mollis* L. infected with *Tilletia holci* show a constant change in their morphology

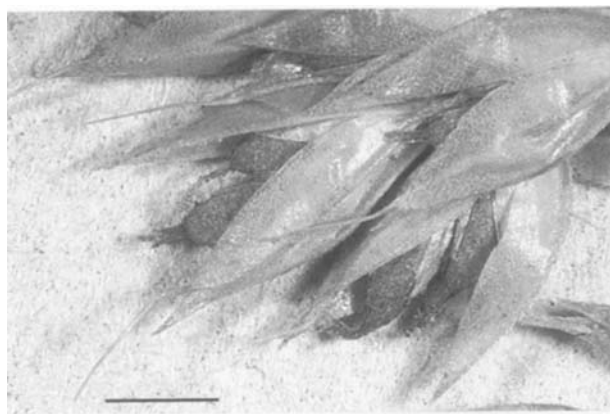


Figure 3. Type specimen of *Holcus mollis* L. var. *parviflorus* Parn. (E00037488), infected with *Tilletia holci*. Note an abnormal structure of spikelets (short and wide glumes, bi-aristated, large dark ovaries, long styles). Scale bar = 1 mm.

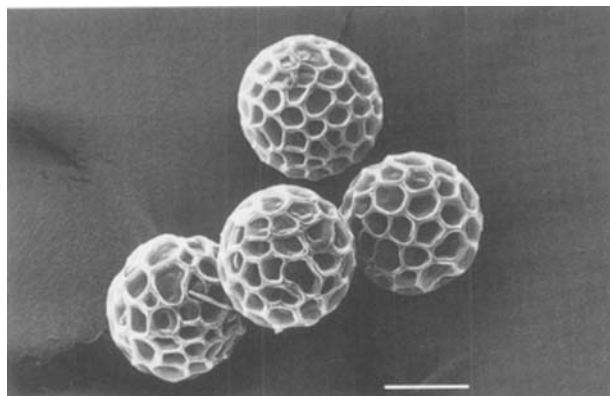


Figure 4. SEM of spores of *Tilletia holci*. Collected from type material of *Holcus mollis* L. var. *parviflorus* Parn. (E00037488). Scale bar = 10 μ m.

corresponding to *Holcus mollis* L. var. *parviflorus* Parn. Taxonomic distinction of infected plants is not acceptable. Several infraspecific taxa have been described for *Holcus mollis* L. In *Flora Europaea* (Tutin, 1980), only *Holcus mollis* L. ssp. *reuteri* (Boiss.) Tutin is accepted. Several of these infraspecific taxa are based on characters resulting from fungal infections. Future investigations will attempt to resolve their position.

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