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Vascular plants of Poaceae (II) new to Korea: *Holcus mollis* L. and *Aira elegantissima* Schur

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Recent herbarium reexamination and field studies yielded two monocotyledonous plant taxa of the family Poaceae that could be documented in the national inventory list of species of Korea. These species, collected from Jeollabuk-do and Gyeongsangnam-do, were introduced and naturalized in Korea. Two species were identified as *Holcus mollis* L. and *Aira elegantissima* Schur. We provided the descriptions and descriptive photos of these species. Keys to the newly recorded species and related taxa were also provided.

Keywords: *Aira elegantissima*, *Holcus mollis*, introduced, naturalized, Poaceae

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Introduction

Poaceae Barnhart, a family of monocotyledonous flowering plants, includes approximately 780 genera and 12,000 species found in most terrestrial habitats globally (Christenhusz and Byng, 2016). The Poaceae, also known as the grasses, is the fifth-largest plant family in terms of species diversity followed the families Asteraceae, Orchidaceae, Fabaceae, and Rubiaceae (Heywood, 1978). In eastern Asia, China has the largest number of species, with 1,795 species of the Poaceae and in Japan (excluding Bonin, Amami and Ryuku islands), grass species consist of 330 taxa (Osada, 1989; Chen *et al*., 2006). In Korea, the number of grass species have been estimated at 212 (Lee, 2007), 252 (Korea National Arboretum, 2011) and 305 (Lee *et al*., 2011). The discrepancy of Korean grass taxa is likely due to differences in the criteria applied to establish species numbers. For example, Lee *et al*. (2011) included native Korean grasses as well as those that were naturalized and cultivated. The current study describes two species of Poaceae that are newly reported as Korean vascular plants. We also provide taxonomic keys to the Korean species of the genera *Holcus* and *Aira*.

Materials and Methods

The two species were collected at the southern region of the Korea peninsula. *Holcus mollis* L. was collected at mountain roadsides at Mt. Keumwon-san, Wicheon-myeon, Geochang-gun, Gyeongsangnam-do, and *Aira elegantissima* Schur was collected at disturbed areas in Saimankeum-Bieung Park, Gunsan-si, Jeollabuk-do, respectively. These two species were identified and checked against original descriptions (Linnaeus, 1759; Schur, 1853). Habits, spikelets and florets of these species were photographed (Figs. 1, 2). Orders of descriptions of the species followed those in "The genera of vascular plants of Korea" (Lee, 2007). All the voucher specimens were deposited at the Herbarium (KB) of the National Institute of Biological Resources (NIBR), Korea.

Description and Discussion

1. *Holcus mollis* L., Syst. Nat. (ed. 10) 2: 1305. 1759.
LT: (LINN-1212.9) LT designated by Cope in Cafferty *et al*., Taxon 49(2): 251 (2000).
Korean name: Gin-hin-teol-sae (긴흰털새)

Perennial; rhizomatous, creeping to 40-50 cm, forming a dense network near the soil surface. Culms erect or geniculately ascending, usually decumbent at the base, 20-100 cm tall with 4 to 7 bearded nodes, noded; lower internodes glabrous or sparsely pubescent retro-

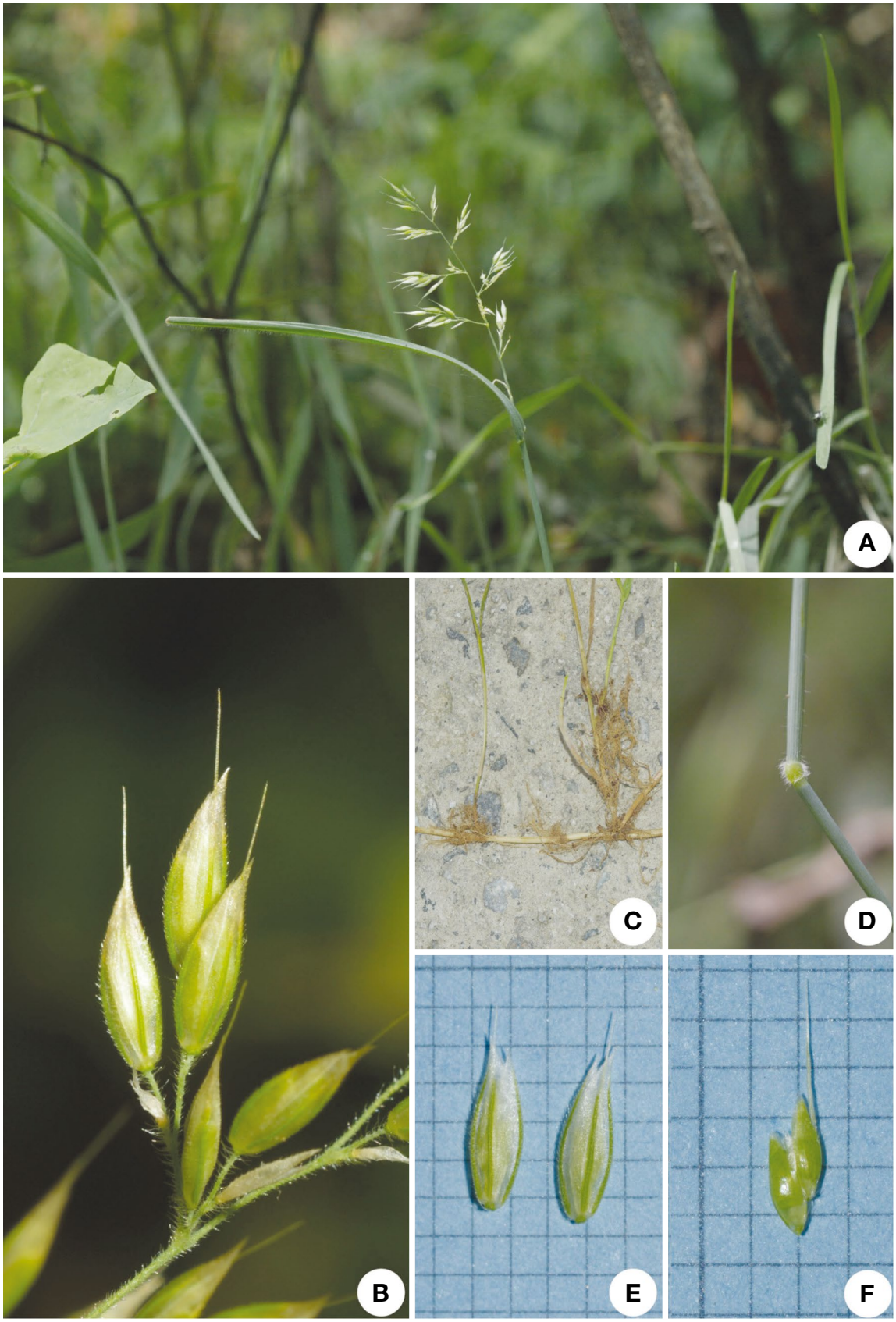

Fig. 1. *Holcus mollis* L. A. Habitats, B. Spikets, C. Rizomes, D. Node with bearded, E. Glumes, F. Lemmas.

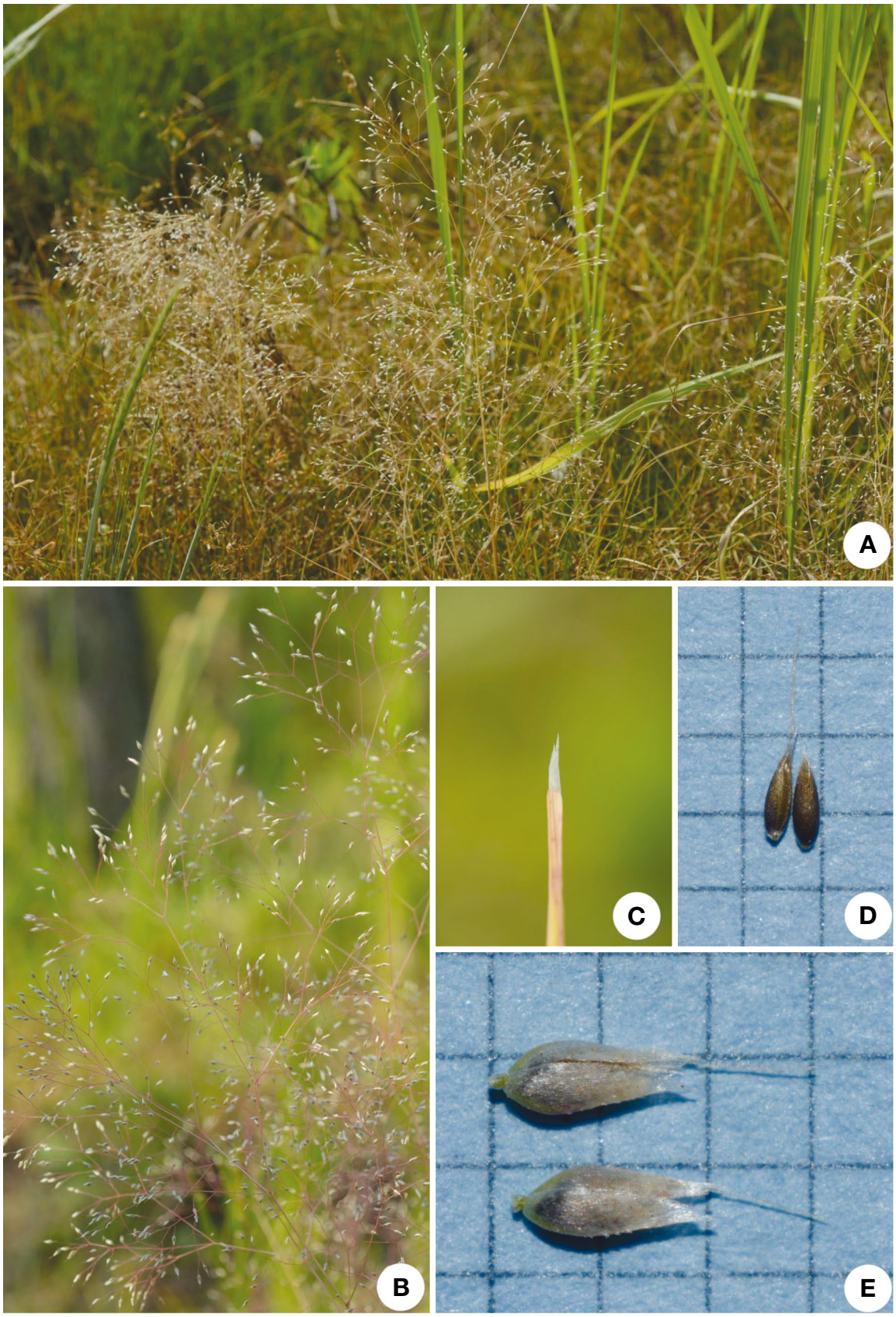

Fig. 2. *Aira elegantissima* Schur A. Habitats, B. Spikets, C. Ligule, D. Fruits, E. Glumes.

versally with node pubescent. Leaves: sheath glabrous or hairy; ligule eciliately membranous, 1-5 mm long, obtuse; blade linear-lanceolate, 4-20 cm long, 3-10 mm wide, surface pubescent at early stage but caducous at age, margins scabrous. Panicles open, oblong, or ovate, loose, 4-10(-20) cm long, 1-3 cm wide; branches puberulent or ciliate. Spikelets solitary, elliptic, laterally compressed, 4-6(7) mm long, sterile with sessile or fertile with pedicels, falling entire; pedicels 1-4 mm long, pilose, 0.3 mm long; rhachilla hairy; glumes subequal, exceeding and enclosing the florets, ovate, membranous, whitish green when young, straw-colored with age; lower glume lanceolate, (3.5-)5-7 mm long, as long as upper glume, chartaceous, 1-keeled, 1-veined with ciliate, surface asperulous, apex acute; upper glume elliptic, (3.5-)5-7 mm long, 2 times longer than adjacent fertile lemma, chartaceous, 1-keeled, 3-veined with primary vein ciliate, surface asperulous, pubescent, apex acute, mucronate. Floret single per spikelet, internodes elongated below; fertile lemma thicker than glume, elliptic, cartilaginous, shiny, (2-)2.5-3 mm long, keeled above, 5-veined, lateral veins obscure, surface glabrous or puberulous, hairy above, apex obtuse; palea as long as lemma. Apical sterile florets 1 in number; male; elliptic; bifid, 2.5-3 mm long; 1-awned; awns subapical; straight; 3.5-5 mm long, exserted. Anthers 3; 1.5-2.5 mm long. Ovary glabrous.

Habitats. Disturbed areas near mountain roadsides.

Distribution. Europe: northern, central, southwestern, southeastern, and eastern. Africa: north and Macaronesia. Asia-tropical: India. Australasia: Australia and New Zealand.

Specimens examined. Sangcheon-ri, Wicheon-myeon, Geochang-gun, Gyeongsangnam-do N 35°43′27.74″ E 127°46′46.38″, 21 Jun. 2014. J. H. Kim and Y. H. Cho 141238 (2 sheets, KB).

Holcus, a genus of Poaceae, is native to Europe, North Africa, and the Middle East, comprising 10 species (Lee, 2007). Among members of the genus, two species, *H. lanatus* L. and *H. mollis* L. are well known as invasive and troublesome weeds in other continents and thus management controls are needed. In North America, *H. lanatus* is distributed densely and does not co-exist with other plant species, and thus is controlled for habitat restoration (DiTomaso and Healy, 2007). In Australia, *H. lanatus* is thought to be a serious threat to wetland biodiversity and a number of endangered plant communities by densely inhabiting at moist sites such as along watercourses and swamps (Beddows, 1961). In Korea, *H. lanatus* have been already introduced and naturalized mostly in southern parts of the Korea peninsula and Jejudo (Lee *et al*., 2011; Cho *et al*., 2016). Another species, *H. mollis* is native to Europe, the Mediterranean and nearby areas, but the species was naturalized at Australia and North America (Standley, 2007). In Britain, *Holcus mollis* is a common and troublesome weed growing in a wide range of moisture and soil conditions (Hubbard, 1984). In Korea, the grass has been introduced in roadsides of mountain Keumwon-san. The arrival of this grass in such a remote area probably occurred during the development and construction of the forest roads in the 1980's. *Holcus mollis* is easily distinguished from the only other member of the genus naturalized in this flora region, *H. lanatus* L., by the extensive creeping rhizomes (not caespitose), glabrous culm (not villous), a geniculate (not hooked, or curved) awn from the upper lemma and the bearded nodes like hairy knees on the culm.

A Key to *Holcus* in Korea

1. Plants cespitose, culms densely pilose adjacent to the lower nodes, awns 1-2 mm long, forming a curved hook at maturity and shortly exserted from spikelet ··· ····· *H. lanatus* L., Hin-teol-sae (흰털새)
1. Plants rhizomatous, culms glabrous or sparsely pubescent adjacent to the lower nodes, awns 3-5 mm long, straight or geniculate at maturity and somewhat exserted from spikelet ····· ····· *H. mollis* L., Gin-hin-teol-sae (긴흰털새)

2. *Aira elegantissima* Schur, Verh. Mitth. Siebenburg. Vereins Naturwiss. Hermannstadt 4: 85. 1853.

Type Locality: Rumania

Korean name: Gin-eun- teol-sae (긴은털새)

Annual; caespitose. Culms erect or geniculately ascending, slender; 5-40 cm long, 0.3 mm in diameter, internodes glabrous. Leaves: sheath submembranous, distinctly ribbed, ribs minutely scabrid almost to base; ligule eciliately membranous, 1.5-4 mm long, acute, tapered, minutely denticulate, abaxial surface with scabrid sparsely distributed; blade filiform, flat or convolute, 2-4 cm long, 0.5-1 mm wide, abaxial surface glabrous or scaberulous on ribs, adaxial surface with minute hairs, margins minutely scabrid, apex subacute to otuse. Panicle very delicate loose, open, ovate, effuse, 4-10 cm long, 2-5 cm wide, branched dichotomously; branches capillary, gradually thickening to the apices, terete, smooth. Spikelets solitary, oblong, laterally compressed, 1.5-2.5 mm long, breaking up at maturity, disarticulating below each fertile floret, silvery green; pedicels filiform, terete, longer than spikelets, 5-13 mm long, tip pyriform; rhachilla minute, glabrous with internodes suppressed between florets; glumes subequal, exceeding florets, persistent, shining; lower glume ovate, 1.5-2.5 mm long, as long as upper glume, membranous, 1-keeled, 1-veined

with scaberulous, apex acute; upper glume ovate, 1.5-2.5 mm long, 1.5 times longer than adjacent fertile lemma, membranous, 1-keeled, 1-veined with scaberulous, apex acute. Floret all alike, or with the lowest dissimilar; fertile lemma thicker than glume, ovate, laterally compresed, 1.2-1.5 mm long, covering most of palea, apex dentate, 2-fid, cartilaginous or firmly membranous, 5-veined, lateral veins obscure, awn arising 0.3-0.4 way up back of lemma, geniculate, 1.5-2 mm long, exerted from spikelet. Anthers 3; 0.3-0.5 mm long. Ovary glabrous. Caryopsis ca. 1 × 0.3 mm.

Habitats. Sunny, dry waste areas.
Distribution. Europe, Mediterranean, western Asia.
Specimens examined. Bieungdo-dong, Gunsan-si, Jeollabuk-do N 35°56′38.25″ E 126°32′15.11″, 10 Jun. 2015. J. H. Kim and Cho Y. H. 152058 (2 sheets, KB).

Aira, a genus of Poaceae, is native to Europe, the Mediterranean and western Asia including 10 species (Mabberley, 1997; Clayton *et al*., 2016). Some species of the genus are frequently introduced and widespread as weeds outside of their native ranges, but were not thought to be troublesome environmentally. In North America, two species of the genus, *A. caryophyllea* and *A. praecox* were introduced from southern Europe and North Africa and grow in mesic, open habitats in disturbed areas such as the edge of roads, railways, and airports or woodland (Wipff, 2007). *A. caryophyllea* and *A. elegans* were reported to inhabit sunny and dry waste areas in Japan (Osada, 1989), and the former is known to be vegetated in Korea (Lee *et al*., 2011; Cho *et al*., 2016). In the current paper, we reported the latter species also inhabits Korea by discovering the domestic locality around a southwestern port of Gunsan-si. However, *A. elegans* has a nomenclature problem which was first suggested by Tutin (1980). He accepted *Aira elegantissima* Schur as the correct name for this taxon and treated *A. capillaris* Host (non Savi) and *A. elegans* Willd. ex Gaudin as illegitimate names without any elaboration. Later, the authorship of the species was discussed in detail by Kartesz and Gandhi (1990). While reviewing Gaudin's (1811) work, they found the name of *A. elegans* Willd. was incorrect because this taxon name was included under *Aira caryophyllea* without any accepted number as a legitimate name. Therefore, *Aira elegantissima* should be an accepted name for this taxon.

A Key to *Aira* in Korea

1. Spikelets 2.2-3.5 mm long, clustered at and near the tips of branches; pedicels usually 1-2 times as long as the spikelets ····· *A. caryophyllea* L., Eun-teol-sae (은털새)
2. Spikelets 1.7-2.5 mm long, scattered all over the panicle; pedicels usually 2-5 times as long as the spikelets ··· *A. elegantissima* Schur., Gin-eun-teol-sae (긴은털새)

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