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A new species of *Astragalus* L (Leguminosae) from south Anatolia

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A new species ***Astragalus yilmazii*** Aytaç & M. Ekici **sp. nov.** (Leguminosae) is described and illustrated from South Anatolia, Turkey. Diagnostic, morphological and molecular data are discussed for the new taxon. In addition its pollen structure is examined. © 2001 The Linnean Society of London

ADDITIONAL KEY WORDS: PCR – phylogeny – pollen – systematics – Turkey.

INTRODUCTION

Astragalus L, which is the largest genus of vascular plants on Earth, is distributed around semiarid steppe regions. It is represented by *c.* 2500 species (Maassoumi, 1988). It is also the largest genus in Turkey, where it is represented by *c.* 400 species in 62 sections (Chamberlain & Matthews, 1970).

The new species was found ten years ago by an amateur plant collector, Ali Yilmaz, who has travelled extensively and collected in Anatolia. On examining his specimens using the *Flora of Turkey* (Chamberlain & Matthew, 1970) and *Check-List* (Özhatay *et al.*, 1994, 1999), we decided that one of his samples was a new species. In that it was not clear whether the rootless *Astragalus* specimen was an annual or perennial, the plant was re-collected from the same locality in 1999. The new species grows in chick-pea fields near Suğla lake.

We have also studied and compared morphological and molecular aspects of the new species with other members of the section *A. simonii* Hub.-Mor.

PCR amplified chloroplast DNA and nuclear ribosomal sequences have been applied to a number of molecular taxonomic studies (Liston & Wheeler, 1994). Chloroplast genes RNA polymerase C1 (*rpoCl*) and RNA polymerase C2 (*rpoC2*) were used for these techniques. These genes are located in the large single copy region of the chloroplast genome. The gene *rpoCl* contains and intron and is separated from *rpoC2* by an intergenic space. The utility of these genes in phylogenetic analysis of *Astragalus* has been demonstrated by Liston & Wheeler (1994).

MATERIAL AND METHODS

The plants were collected around Suğla Lake (Seydişehir-Bozkir) in 1989 and 1999, and deposited at GAZI. The specimen was compared with similar material also at GAZI, ANK and HUB.

Pollen structure was examined using a light microscope and SEM (Wodehouse, 1935; Sokal & Rohlf, 1969).

PCR analysis. Total DNA was isolated using the protocol of Açik *et al.* (1996), PCR analysis followed Liston & Wheeler (1994). Strain similarities were measured according to Wolf & Rijn, 1993.

Astragalus yilmazii Aytaç & M. Ekici **sp. nov.**
Sect. *Glycyphyllos* Bunge
(Figs 1–5)

Holotype: C4 Konya: Seydişehir-Bozkir; Suğla Lake, around Kayacik köyü suğlasi, 1150 m, N37°16′55″, E32°03′28″, chick-pea field, 30.vii.1989, *Yilmaz* (8989). (holo. GAZI).

Paratype: C4 Konya: Seydişehir-Bozkir; Suğla Lake, around Kayacik köyü suğlasi, 1150 m, 26.vi.1999,

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Figure 1. ***Astragalus yilmazii*** **sp. nov.** A, habit; B, calyx; C, standard; D, keel; E, stamens.

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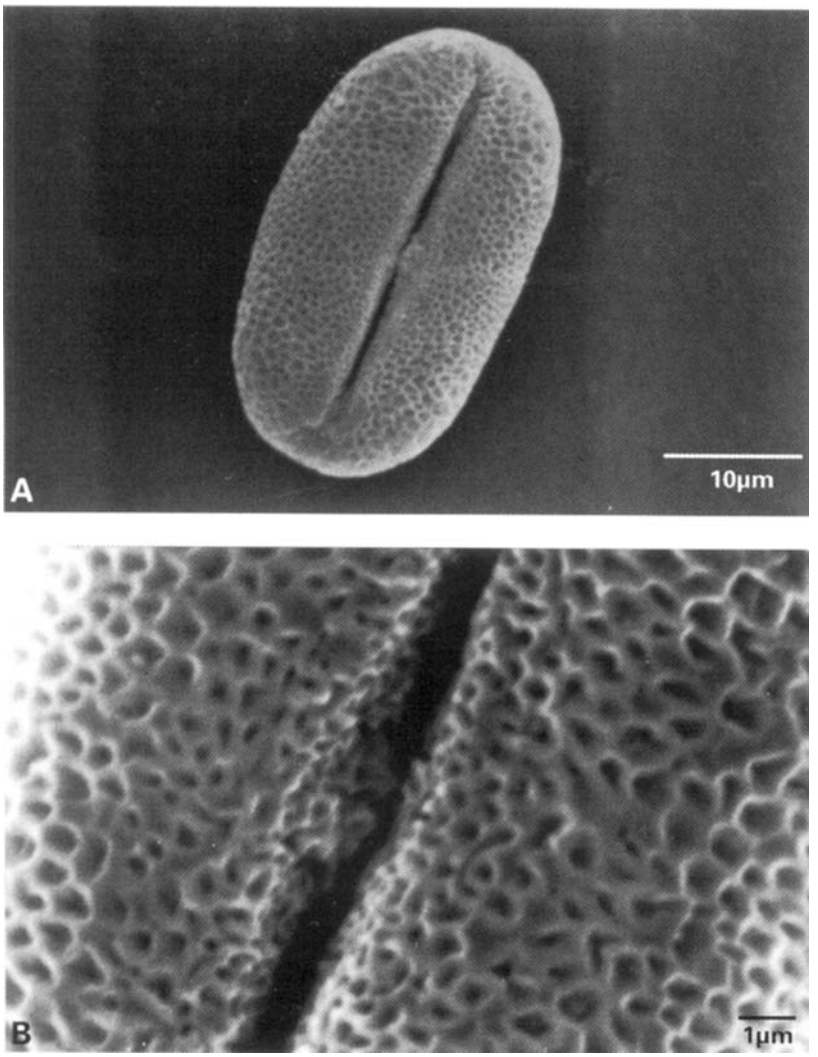


Figure 2. Scanning electron micrographs of pollen grains. A, general view of pollen grain; B, close up of pollen grain.

N37°16′55″, E32°03′28″, chick-pea field. *Aytaç* (7952) & *Ekici.*, GAZI, ANK, HUB, Yildirimli herb, E, K, EGE.

Diagnosis: Differt ab *A. simonii* Hub.-Mor. sed planta basi tantum ramosa, annua vel biennis, caulibus nonnullis, basi usque 2.5 (nec 8) mm crassis, foliolis minoribus, 5–14 × 1.5–3 (nec 5–25 × 1.5–8) mm, apice plerumque distincte emarginatis vel incisis vel fere bilobatis, racemis tempore fructificanti usque (nec 25) cm elongatis, bracteis minutis, 1–2 (nec 3–7) m longis.

Description: Plantae basi tantum ramosae, subglabrae. Caules nonnulli, usque 30 cm longi, basi usque 2.5 cc crassi. Stipulae triangulares, 3–6 mm longae, basi petiolo per *c.* 1 mm adnatae. Folia 5–10 cm longa, petiolo 1–3 cm longo. Foliola 7–9 juga, anguste obovata, apice emarginata vel fere biloba, 5–14 × 1.5–3 mm. Racemi in statu fructificanti axe usque 5 cm longo, cum fructibus 5–10, pedunculo 3–5 cm longo suffulti. Bracteae albo-hyalinae, 1–2 mm longae. Calyx 5–6 mm longus, tubulosus, pilis perbrevibus nigris sparsis instructus, dentibus *c.* 1 mm longis. Corolla lilacina. Vexillum 12–15 mm longum. Legumina erecta, sessilia, linearia, curvata, 25–30 mm longa, 2–3 mm lata, a latere leviter compressa, bilocularia, valvis tenuibus, glabris. Semina numerosa.

Annual to biennial *c.* 35 cm tall; vegetative parts with scattered, subappressed white hairs 0.2–0.3 mm long, inflorescence with black hairs. Stem erect, up to 30 cm long, hollow, up to 2–3 mm thick at the base, finely striate-sulcate, branching only at the base. Stipules greenish, 3–6 mm long, triangular, shortly acuminate adnate to the petiole for 1 mm, sparsely ciliate at the margins. Leaves 5–10 cm long; petiole 1–3 cm long; leaf and rachis grooved on upper side, glabrous or with scattered hairs. Leaflets in 7–9 pairs, narrowly

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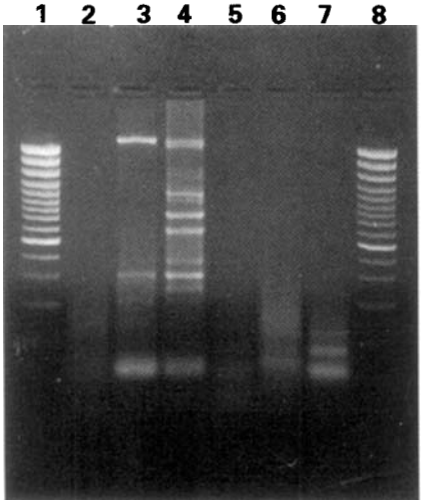


Figure 3. PCR product of *Astragalus* species. Lane 1 & 8: DNA Ladder plus, Lane 3: *A. simonii*, Lane 4: *A. yilmazii*.

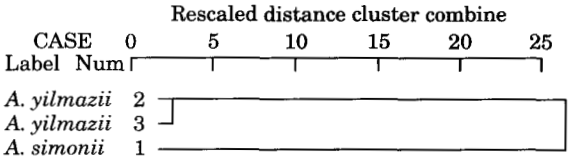


Figure 4. Dendrogram generated by cluster analysis of genetic distances between *A. yilmazii* and *A. simonii*.

elliptic to narrowly obovate, 5–14 × 1.5–3 mm; at the apex slightly to distinctly emarginate or incised, sometimes nearly bilobed, glabrous or with scattered hairs. Peduncles mostly in axils of upper leaves, with 5–10 fruits, the axis 1–5 cm long. Bracts whitish-hyaline, narrowly triangular to ovate-triangular, acute, 1–2 mm long, ciliate at the margins. Pedicels 1–2 mm long, glabrous or with few black hairs. Calyx 5–6 mm long, tubular, straw-coloured, sparsely covered with very short subappressed black hairs, sometimes subglabrous; teeth narrowly triangular to linear-acute, *c.* 1 mm long, loosely black-haired on innerside. Petals lilac. Standard 12–15 mm long, claw 3.5 mm long. Keel *c.* 9 mm long; blades oblong, obtuse at the apex, 4.5 × 2.2 mm, auricle short, claw 4.5 mm long. Staminal tube truncated. Pods sessile, linear, erect, slightly to strongly curved, 25–30 × 2–3 mm, sharply carinate ventrally, narrowly and deeply grooved dorsally, shortly acuminate at apex, fully bilocular, valves straw-coloured, thin but tough, slightly reticulate-veined, glabrous. Seeds 10–12 in each locule, subquadrangular, *c.* 1 × 1 mm. Flowering 6–7.

Pollen morphology. Pollen grains are prolate tricolporate, P/E:1.79. Polar axis 34.4 μm, equatorial axis 19.2 μm. Amb shape triangular, obtuse, convex. Equatorial shape elliptic. Colpi narrow and long, Clg/Clt 5.1 μm, pore shape oblate spheroidal Plg/Plt: 0.89 μm, exine 1.13 μm, intine 0.59 μm, structure tectate. Sculpture reticulate (Fig. 2).

Habitat. Chick-pea fields.

Distribution. South Anatolia (Konya). Endemic. East Mediterranean element.

Status. Known only at type locality. Because of heavy agricultural pressure, it must be regarded as in the CR category (IUCN, 1994).

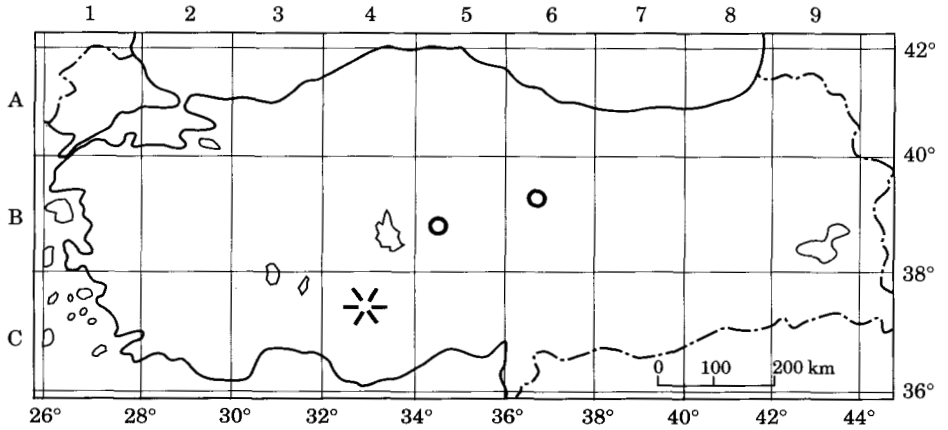


Figure 5. Distribution of ***Astragalus yilmazii*** (✲) and *Astragalus simonii* (○) in Turkey.

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DISCUSSION

Because it is closely allied to *A. simonii* Hub.-Mor., which is endemic to Central Anatolia, the type specimen of *A. simonii* (Simon 69–097) and *Vural* 7340 GAZI were compared with the new species. The differences are indicated below:

A. simonii Hub.-Mor.
Perennial
Stem 60–70 cm, branched from above.
Stem *c.* 8 mm diam.
Leaflets 10–25 × 1.5–8 mm, linear-lanceolate
Corolla 18–23 mm
Inflorescence up to 25 cm in fruit

A. yilmazii Aytaç & M. Ekici
Annual to biennial
Stem 30–30 cm, branched from base.
Stem 2–3 mm diam.
Leaflets 5–12 × 1.5–3 mm, narrowly elliptic to obovate
Corolla 12–15 cm
Inflorescence up to 5 cm in fruit

The primers *rpo* C1–195 and *rpo* C2–1364 were used to amplify genomic DNA from *A. yilmazii* and *A. simonii*. Figure 3 illustrates results from gel electrophoretic analysis of PCR products. Common bands were scored as present and absent. Resulting data were used to calculate and compare the genetic distances between the new species and *A. simonii*. Figure 4 shows the phylogenetic relationships between *A. yilmazii* and *A. simonii*. We could not find any genetic distances among individuals of *A. yilmazii*. However genetic distances were 50% between *A. yilmazii* and *A. simonii* (*Vural* 7340).

We have great pleasure in naming the new species in honour of Ali Yilmaz, the original collector.

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REFERENCES

Açik L, Samanci B, Duman H, Unal F. 1996. Polymorphism and phylogenetic relations among Turkish species in the genus *Sternbergia* (Amaryllidaceae) as determined by RAPD-PCR. *Turkish Journal of Botany* **21:** 265–268.

Chamberlain DF, Matthews VV. 1970. *Astragalus* L. In: Davis PH, ed., *Flora of Turkey and East Aegean Islands*. Edinburgh: Edinburgh University Press, 49–254.

IUCN Species Survival Commission, 1994. Red List Categories, Switzerland.

Liston A, Wheeler J. 1994. The phylogenetic position of the genus *Astragalus* (Fabaceae) evidence from the chloroplast genes *rpo*cl and *rpo*c2. *Biochemical Systematics and Ecology* **22**(4): 337–388.

Maasoumi AA. 1998. *Astragalus* L. *in the Old World Check-List*. Islamic Republic of Iran Ministry of Jahas-e Sazandgi Research Institute of Forest and Rangelands.

Özhatay N, Kültür Ş, Aksoy N. 1994. Check-list of additional taxa to the Supplement Flora of Turkey. *Turkish Journal of Botany* **23:** 155–156.

Özhatay N, Kültür Ş, Aksoy N. 1999. Check-list of additional taxa to the Supplement Flora of Turkey II. *Turkish Journal of Botany* **18:** 502.

Sokal RP, Rohlf JE. 1969. *The principles and practice of statistics in biological research*. San Francisco: W.H. Freeman and Company.

Wodehouse RP. 1935. *Pollen grains*. New York: McGraw-Hill.

Wolf K, Rijn JP. 1993. Rapid detection of genetic variability in *Chrysanthemum* using random primers. *Heredity* **71:** 335–341.

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