Istanbul Ecz. Fak. Derg. / J. Fac. Pharm. Istanbul
41 (2010-2011)

TAXONOMIC REMARKS ON EIGHT *ALLIUM* SPECIES (SECT. *CODONOPRASUM*) FROM SOUTH ANATOLIA

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SUMMARY

The medicinally and economically valuable genus *Allium* is represented by 187 species in Turkey. In the study, eight species belonging to the Sect. Codonoprasum which have some taxonomical problems and distributed widely in south Anatolia have been investigated. Morphological features, photos, karyotype and outline of leaf anatomy have also been given.

ÖZET

Tıbbi ve ekonomik değeri yüksek olan *Allium* cinsi, Türkiye'de 187 türle temsil edilmektedir. Bu çalışmada taksonomik açıdan problemli olan ve çoğunlukla güney Anadolu'da yayılış gösteren ve Codonoprasum seksiyonunda yer alan 8 tür tanıtılmıştır. Tanıtıcı özellikler, fotoğraflar, kromozom sayıları ve morfolojileri ile yaprak anatomisinin genel şekilleri verilmiştir.

Keywords: *Allium*, Codonoprasum, taxonomy, south Anatolia

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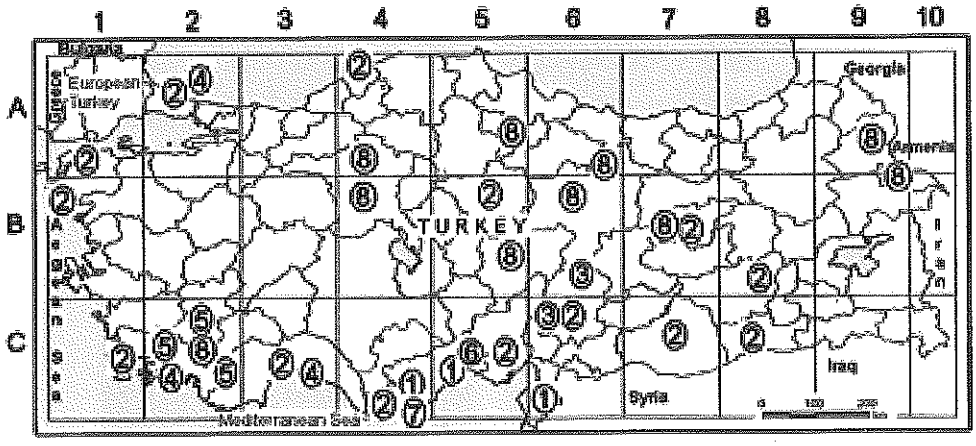
INTRODUCTION

Since ancient time, many *Allium* species have been used as foods, spices and herbal remedies in widespread areas of the World. It is well known that the *Allium* genus with about 500 species, is a rich source of steroidal saponins, alkaloids, as well as sulfur-containing compounds (1, 2, 3).

The genus *Allium* L. consists of about 800 species naturally distributed only in the Northern Hemisphere, and it is the largest genus of petaloid monocotyledons (4). The section Codonoprasum, the largest and the most complicated one and it is characterized by long spatha with 2 unequal valves. This section consists of 49 taxa of which 21 are endemics for Turkey (5, 6, 7, 8, 9, 10, 11).

The following taxa have been added recently to the flora of Turkey: *A. dentiferum* Webb & Berthel, *A. dodecanesii* Karavokyrou & Tzanouda. *A rumelicum* M. Koçyiğit & N. Özhatay is the new species of science (12). In this study, 8 taxa distributed mainly Southern Anatolia have been presented (Map). Two of them new records for Turkey, three taxa are endemics to Turkey, other species are grown in Turkey and neighboring countries. Drawings of outer-inner morphological characteristics and photos taken from wild habitat are presented.



Map: Distribution of the examined 8 *Allium* species: 1. *A. dodecanesii*, 2. *A. pseudoflavum*, 3. *A. deciduum*, 4. *A. retrorsum*, 5. *A. glumaceum*, 6. *A. dentiferum*, 7. *A. bassitense*, 8. *A. pallens* subsp. *pallens*

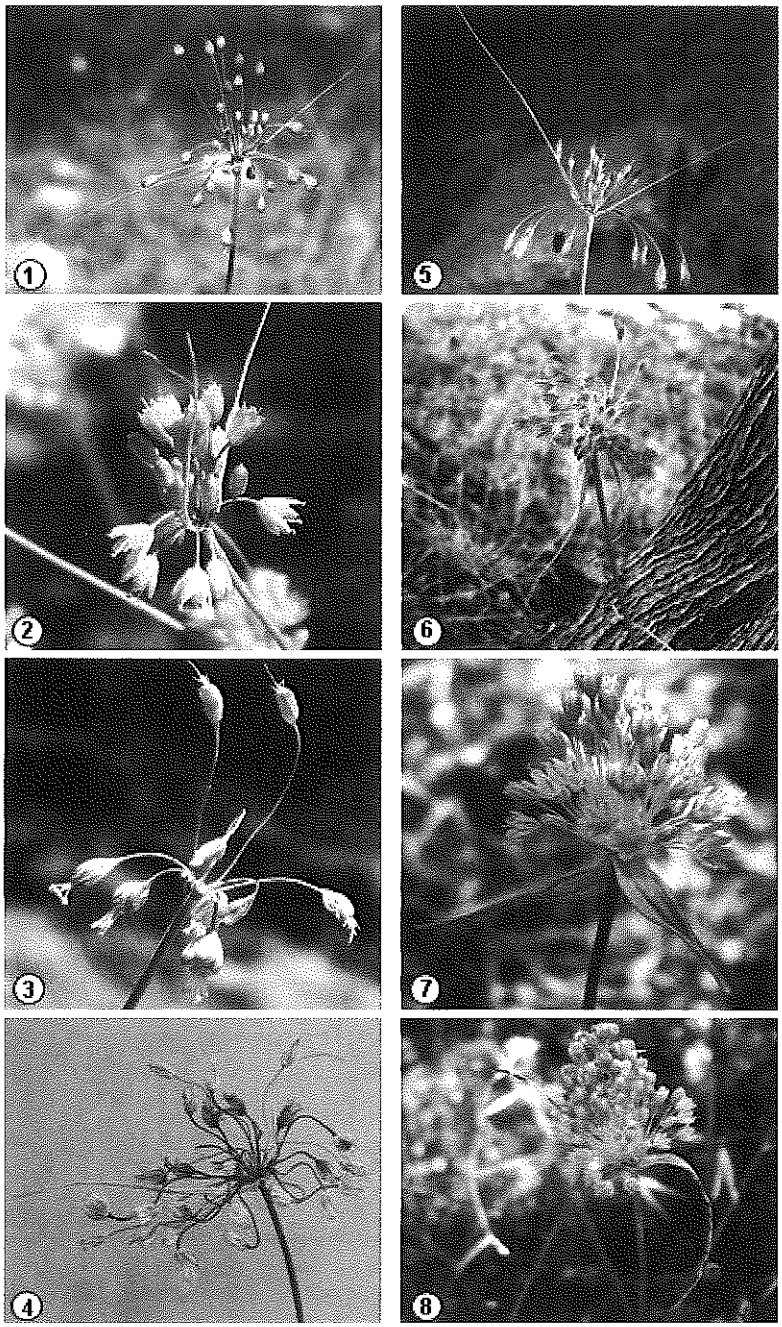


Photo: Inflorescence of the *Allium* species: 1. *A. dodecanesii,* 2. *A. pseudoflavum,* 3. *A. deciduum,* 4. *A. retrorsum,* 5. *A. glumaceum,* 6. *A. dentiferum,* 7. *A. bassitense,* 8. *A. pallens* subsp. *pallens*

RESULTS AND DISCUSSION

Investigated 8 *Allium* species belong to Sect. Codonoprasum are listed. Dichotomical key and short descriptions of the species are as follows:

1. *A. dodecanesii* Karavokyrou & Tzanoudakis (**new record**)
2. *A. pseudoflavum* Vved.
3. *A. deciduum* N. Özhatay & Kollmann (**endemic**)
4. *A. retrosum* (Özhatay & Kollmann) Brullo, Guglielmo, Pavone & Salmeri (**endemic**)
5. *A.glumaceum* Boiss.& Hausskn. (**endemic**)
6. *A. dentiferum* Webb&Berthel (**new record**)
7. *A. bassitense* Thiéb.
8. *A. pallens* L. subsp. *pallens*

Identification Key of the Examined Species

1. Stamens included, or only anthers exserted.
   2. Filaments with entire or bifid interstaminal teeth..... *A. dentiferum*
   2. Filaments not as above
      3. Pedicels distinetly unequel; longer pedicels 3-6 x perigon, umbella lax; tepals straw-coloured with margins convolute at apex; perigon subconstricted above middle after anthesis..... *A. glumaceum*
      3. Pedicels distinetly subequal; to 2-3 x perigon; umbella danse; tepals white or pink; perigon not as above..... **4**
         4. Tepals oblong-lanceolate, obtuse or retuse at apex... *A. bassitanse*
         4. Tepals oblong, slightly broader above middle, truncate at ap ex..... *A. pallens*
1. Stamens exserted
   5. Tepals yellow or greenish-yellow..... *A. pseudoflavum*
   5. Tepals clear pink, purplish-pink, mauvish..... **6**
      6. Valves of spathe persistent, opposite; tepals yellowish-brown, obtuse-irregularly toothed..... *A. dodecanesii*
      6. Valves of spathe usually deciduous;tepals pale lilac with a green midvein, obtuse or truncate..... **7**
         7. Tepals with an abrupt retrorse apex..... *A. retrorsum*
         7. Tepals without an abrupt retrorse apex..... *A. deciduum*

Descripsitons of the species

1. ***A. dodecanesii*** Karavokyrou & Tzanouda., in Ann. Muse. Goulandris 9: 141, f. 1 (1994). (Photo:1; Figure:1).

Bulb 0.8-1.5 x 1.5-2 cm, stem 20-40 (-50) cm, umbel diffuse, perigon oblong, cup-shaped, tepals straw-coloured or purplish, filaments purple, long exserted. Spathe valves opposite. The taxa was reported to be found in The Islands Lipsos and Kalimnos in the Flora of Turkey (13). The Aegean Islands are considered as parts of Anatolia so the new locality is not a confusing result.

Flowering time: May-June.

Habitat: Pine forests, dry slopes, rocky places, 400-1000 m.

Type: [Greece] Cultivated. Prov. Dodecanissos, island Lipsos, 01.04.1991, Panitsa 2466 (holo. UPA).

Distribution: Mediterranean element. Greece and South Anatolia.

Chromosome numbers: Diploid 2n=16 (ISTE 86054).

Outline of leaf: Fistular, subcylindrical (ISTE 86054).

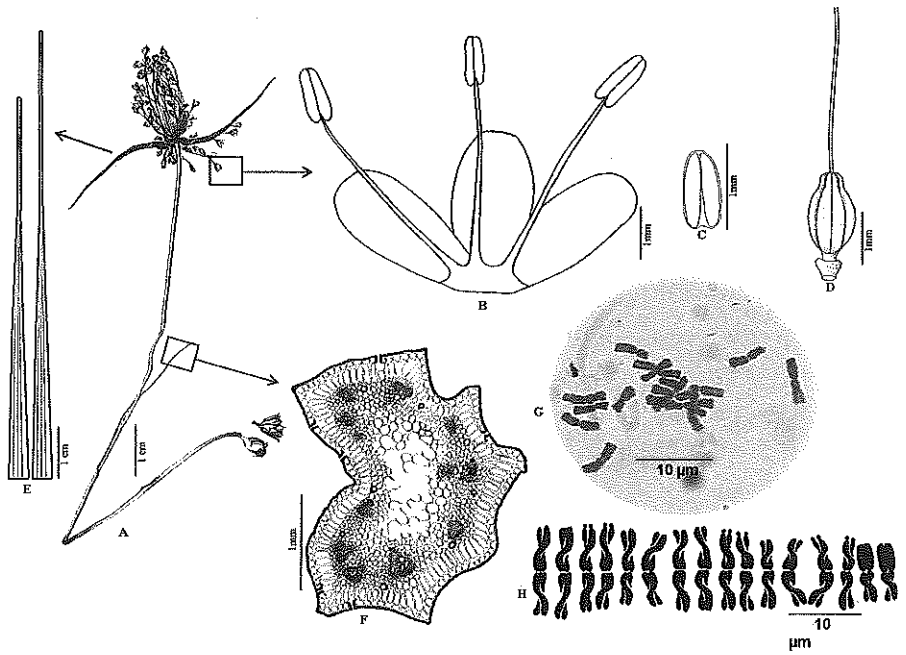


Figure 1: Illustrated of *Allium dodecanesii*; General (A), perigon with stamens (B), anther (C), ovary (D), spatha valves (E), cross section of leaf (F), metaphasic plate (2n=16) (G), karyogram (H).

2. A. pseudoflavum Vved. In Byull.Sredneaz. Gosud. Univ. 19:123(1934). (Photo:2; Figure:2).

Bulb 0.8-1.2 (-1.5) x 1.5-2 cm, stem 20-50 cm, umbel globose, perigon ellipsoid-campanulate, tepals pale yellow, filaments exserted. Allied to *A. flavum* subsp. *flavum*.

Flowering time: June-August.

Habitat: Pine forests, dry slopes, rocky places,130-2000 m.

Type: [Transcaucasia] Armenia, distr. Nor-Bajazat, in montibus prope pag. Subbotan, 07.08.1928, Zedelmejer & Gejdeman (holo. LE).

Distribution: Iran-Turan element. East and south Transcaucasia, north Iran, Turkey.

Chromosome numbers: Diploid 2n=16 (ISTE 87778).

Outline of leaf: Fistular, subcylindrical, canaliculate (ISTE 87766).

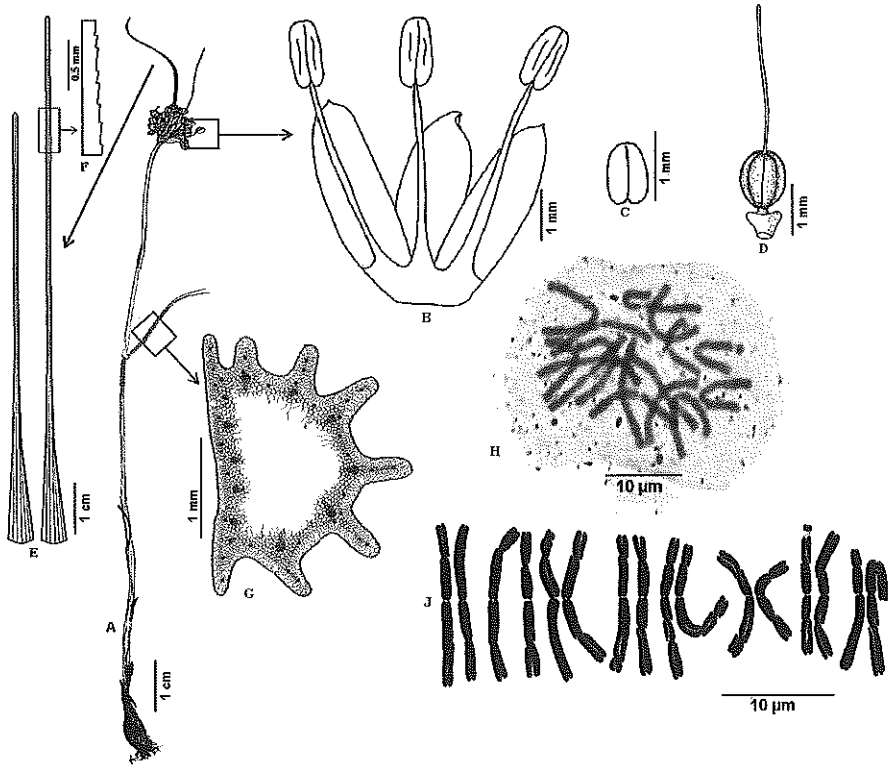


Figure 2: Illustrated of *Allium pseudoflavum*; General (A), perigon with stamens (B), anther (C), ovary (D), spatha valves (E), cross section of leaf (F), metaphasic plate (2n=16) (G), karyogram (H).

3. *A. deciduum* N.Özhatay&Kollmann in Notes R.B.G. Edinb. 41:246 (1983). (Photo: 3; Figure: 3).

Bulb 1-1.5 x 1.5-2 cm, stem 15-30 (-75) cm, umbel diffuse and fastigate, perigon campanulate, tepals pale lilac with green mid vein, filaments white or purple, 1.5 x perigon, exserted. It differs from the vast majority of species which belong to section Codonoprasum in having a deciduous spathe, though a persistent spathe is one of the characteristic traits of the section.

Flowering time: July-August.

Habitat: Dry stony slopes, *rocky places,* 550-2000 m.

Type: [Turkey C2 Muğla] Köyceğiz, Sandras Da., nr Böceli, 1670 m, 24.07.1977, E. Özhatay 1219 (holo. ISTE 43971!)

Distribution: Endemic. Mediterranean element. South Anatolia.

Chromosome numbers: Diploid 2n=16 (ISTE 87693).

Outline of leaf: Fistular, cylindrical (ISTE 87742).

Figure 3: Illustrated of *Allium deciduum*; General (A), perigon with stamens (B), anther (C), ovary (D), cross section of leaf (E), metaphasic plate (2n=16) (F), karyogram (G).

4. ***A. retrosum*** (Özhatay & Kollmann) Brullo, Guglielmo, Pavone & Salmeri in Bocconea 21:325-343, f.1, 2 (12) (2007). (Photo: 4; Figure: 4).

Bulb 1-1.5 x 1.5-2 cm, stem 15-25 cm, umbel diffuse, perigon campanulate, tepals pale lilac with green mid vein, filaments white or purple, 1.5 x perigon, exserted. Allied to *A. deciduum,* spathe sometimes deciduous, tepals with an abrupt retrorse apex.

Flowering time: July-August.

Habitat: Dry stony slopes, rocky places, 500-2000 m.

Type: [Turkey C5 İçel] Bolkar Da. Arslanköy, Boğazağzı etekleri, 1750 m, 06.08.1976, K. Alpınar (holo. ISTE 35799!)

Distribution: Endemic. Mediterranean element. South Anatolia.

Outline of leaf: Fistular, cylindrical (ISTE 35799).

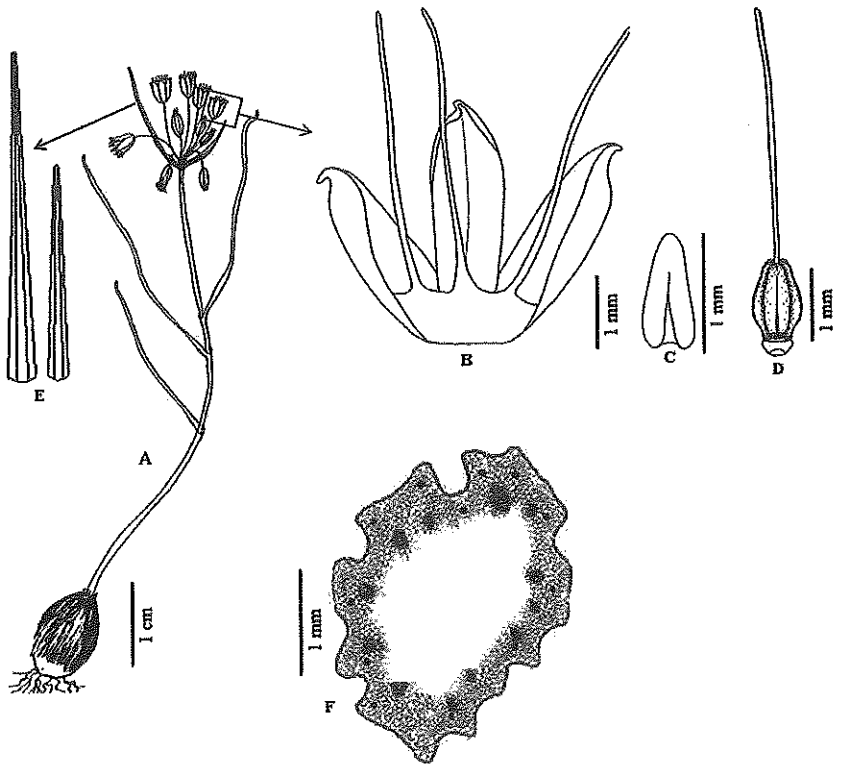


Figure 4: Illustrated of *Allium retrorsum*; General (A), perigon with stamens (B), anther (C), ovary (D), spatha valves (E), cross section of leaf (F).

5. *A. glumaceum* Boiss.& Hausskn. in Boiss., Fl. Or. 5: 260 (1882). (Photo: 5; Figure: 5).

Bulb 1-2 x 1.5-2.5 cm, stem 15-20 (-35) cm, umbel diffuse, perigon cylindrical-campanulate, tepals straw-coloured, filaments 3/4 as long as perigon, included.

Flowering time: August.

Habitat: Rocks, Alt: 1800-2200 m.

Type: [Turkey C6 Kahramanmaraş] in monte Berytdagh Cataoniae (Berit Da.), 2134 m. Haussknecht 1082 (holo. G! iso. JE).

Distribution: Endemic. Iran-Turan element. South Anatolia.

Chromosome numbers: Diploid 2n=16 (ISTE 87779).

Outline of leaf: Flat, fistular, revolute (ISTE 87779).

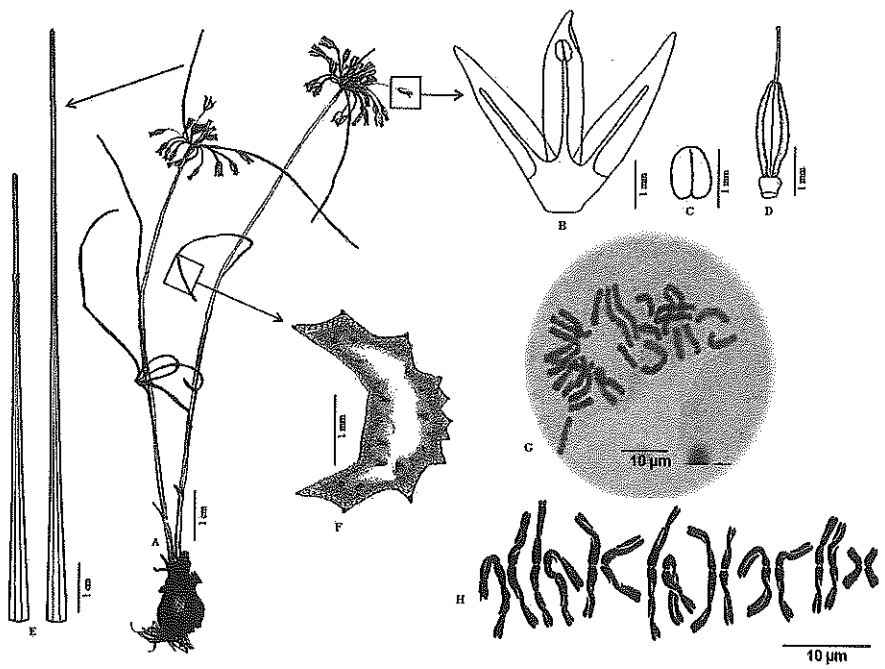


Figure 5: Illustrated of *Allium glumaceum*; General (A), perigon with stamens (B), anther (C), ovary (D), spatha valves (E), cross section of leaf (F), metaphasic plate (2n=16) (G), karyogram (H).

6. ***A. dentiferum*** Webb & Berthel. Phyt. Canar. 3: 345 (1848). (Photo: 6; Figure: 6).

Bulb 1-2 x 1.5-2.5 cm, stem 40-90 cm, umbel ovoid-diffuse, perigon campanulate, tepals purplish-green suffused with brown, stamens as long as or shorter than perigon, included. The presence of interstaminal teeth on the specimens was identified and thus the previous identification was revised (11, 14, 15).

Flowering time: June-July.

Habitat: Ruderal places, roadsides and cultivated fields. s. l.-400 m.

Type: Les champs los Saurces, La Palma, 27.07.1845, Despereaux 1003 (lecto. FI-W, G!)

Distribution: Mediterranean element. Portugal, Spain, France, Italy, Slovenia, Greece, Israel, Turkey.

Chromosome numbers: Diploid 2n=16 (ISTE 86053).

Outline of leaf: Flat, solid (ISTE 86053).

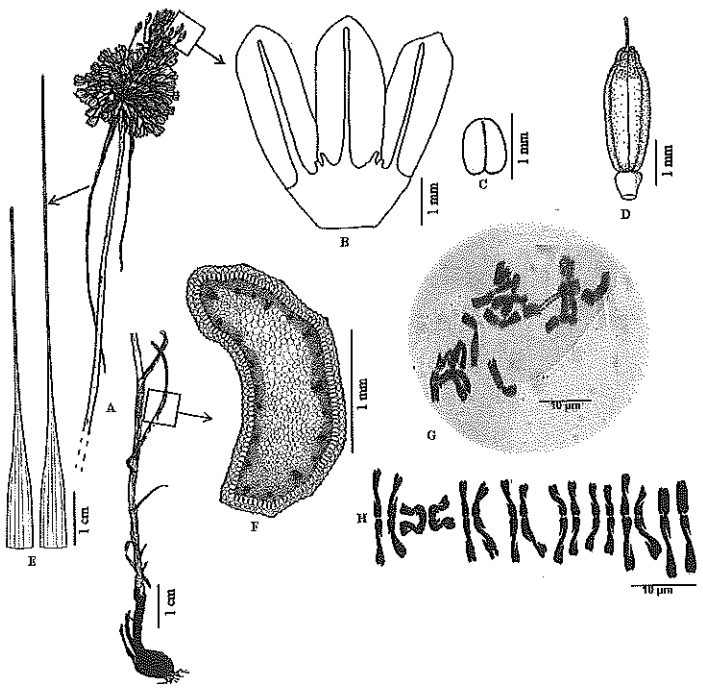


Figure 6: Illustrated of *Allium dentiferum*; General (A), perigon with stamens (B), anther (C), ovary (D), spatha valves (E), cross section of leaf (F), metaphasic plate (2n=16) (G), karyogram (H).

7. ***A. bassitense*** Thiéb. in Mouterde, Nouv. Fl. Lib. Syr. 1: 272, Atlas t. 86 f. 1 (1966). (Photo: 7; Figures: 7)

Bulb 0.6-1.5 x 1-1.5 (2) cm, stem 25-65 cm, umbel hemispherical, perigon tubulate-campanulate, tepals pale pink, filaments shorter than tepals. Allied to *A. pallens,* differing by oblong-lanceolat periant segments.

Flowering time: July-August.

Habitat: Pine forests, maquis, scrubs, fields and field margins, limestone slopes, 150-1500 m.

Type: [Latakia] bois du Bassit, vers'Ain-el Haramiye, Thiebaout (holo. G!)

Distribution: East Mediterranean element. Latakia and south Anatolia.

Chromosome numbers: Diploid 2n=16 (ISTE 87030).

Outline of leaf: Fistular, cylindrical (ISTE 87030).

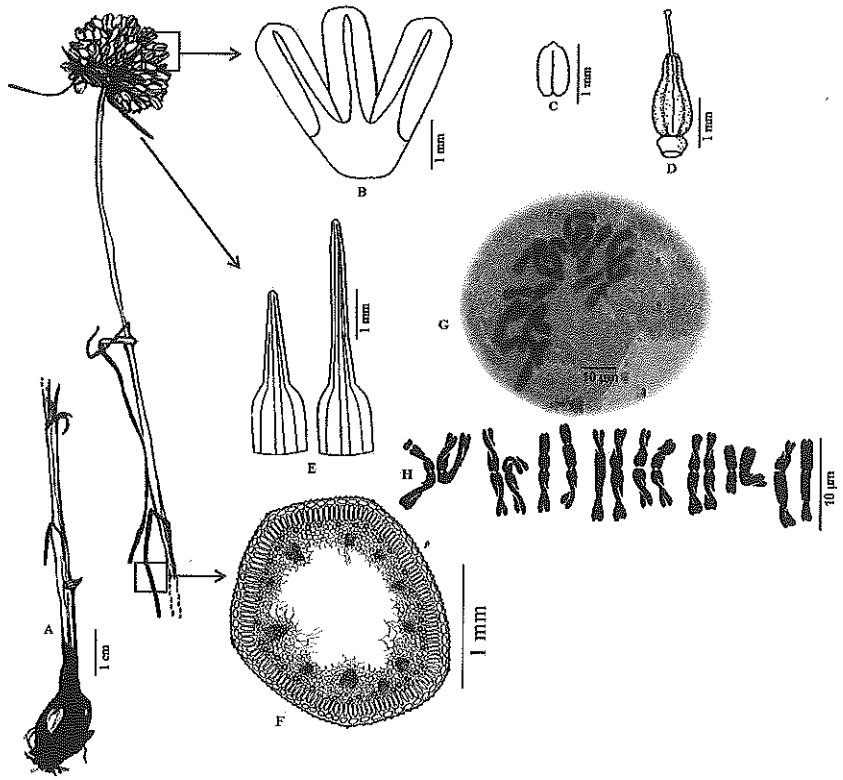


Figure 7: Illustrated of *Allium bassitense:* General (A), perigon with stamens (B), anther (C), ovary (D), spatha valves (E), cross section of leaf (F), metaphasic plate (2n=16) (G), karyogram (H).

8. *A. pallens* L. subsp. *pallens*, Sp. Pl. ed. 2: 427 (1762). (Photo: 8; Figure: 8).

Bulb 1-1.5 (2) x 1.5- 2 (-2.5) cm, stem 25-60 (-90) cm, umbel hemispherical, perigon narrowly-campanulate, tepals white with purple mid vein, filaments slightly longer than tepals, anthers exserted.

Flowering time: June-July.

Habitat: Pine forests, scrubs, fields and field margins, dry slopes, roadsides, sl-1600 m.

Type: [Italy] Brullo et al. in Bocconea 16 (2), 2003. 419.20. n. (lecto. Hb.-Linn) (photo!)

Distribution: Mediterranean element. South Europe, West Syria, Egypt, Turkey.

Chromosome numbers: Tetraploid 2n=32 (ISTE 87592).

Outline of leaf: Fistular, cylindrical (ISTE 87623).

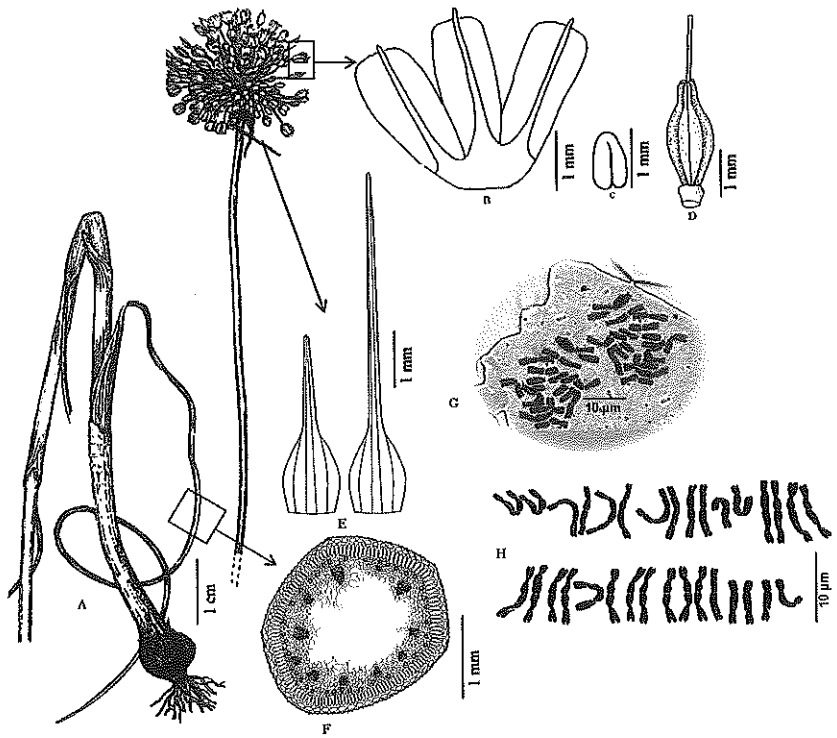


Figure 8: Illustrated of *Allium pallens* subsp. *pallens*; General (A), perigon with stamens (B), anther (C), ovary (D), spatha valves (E), cross section of leaf (F), metaphasic plate (2n=32) (G), karyogram (H).

Concluding Remarks

The examined species; *A. dodecanesii, A. pseudoflavum, A. deciduum, A. retrosum A. glumaceum, A. dentiferum, A. bassitense, A. pallens* subsp. *pallens* are distributed in the south Anatolia. *A. deciduum, A. retrosum A. glumaceum* are endemic species to Turkey and *A. dodecanesii A. dentiferum* are new record for Turkey. The taxonomy of *A. dentiferum* is frequently misinterpreted in the literatures and herbarium collections with *A. fuscum* Boiss., *A. paniculatum* L. (11). The previous identification was revised (14, 15). *A. dodecanesii* was previously reported from the Aegean Islands. It was collected during some field trips at the south Anatolia.

As regards karyological aspects, *A. pallens* is a tetraploid species, while others are diploid. Karyological study carried on living material, but *A. retrorsum* couldn't be assured living material.

The outline of leaf cross-section is an important characteristic for the genus *Allium*. Some terminology (flat, fiscular, solid, cylindrical) can be used for identification of the species.

Acknowledgement

We wish to thank the curators of following herbaria: AEF, BM, E, EGE, G, HUB, ISTF and K for allowing us to study their *Allium* collections and especially thanks to Prof. Dr. M. Koyuncu. This study is financially supported by Istanbul University, Dept. of Research Projects (Project number: 1442).

REFERENCES

1. Guohua, H., Yanhua, L., Rengang, M., Dongzhi, W., Zhengzhi, M., Hua, Z. Aphrodisiac properties of *Allium tuberosum* seeds extract. *Ethnopharmacology* 122: 579-582 (2009).

2. Kaya, D. *Allium sativum*: in Demirezer, Ö. (ed.) *Tedavide Kullanılan Bitkiler, FED Monografları*, 1-11, Medikal ve Nobel Tıp Kitabevi, İstanbul (2007).

3. Çubukçu, B., Sarıyar, G., Meriçli, A., H., Sütlüpınar, N., Mat, A., Meriçli, F. *Fitoterapi Yardımcı Ders Kitabı*, 13-14, İ.Ü. Basım ve Yayın Müdürlüğü, İstanbul (2002).

4. Fritsch, R., M., Blattner, F., R., Gurusedze, M. New classification of *Allium* L. subg. Melanocrommyum (Webb & Berthel.) rouy (Alliaceae) based on molecular and morphological characters. *Phyton Annales Rei*

Botanicae, 49, 145-320 (2010).

5. Kollmann, F. *Allium* L. in Davis PH (ed), *Flora of Turkey And The East Aegean Islands*, volume 8: 98-210, Edinburgh: Edinburgh Univ Press (1984).

6. Davis P.H., Mill, R., R. and Tan, K.. *Allium* L. -In: Davis P.H., Mill, R., R. and Tan, K. *Flora of Turkey and the east Aegean Islands.* Vol. 10, pp. 221-223- Edinburgh Univ. Press (1988).

7. Özhatay, N., Tzanoudakis, D. *Allium* L. in Güner A, Özhatay N, Ekim T, Başer KHC (eds.), *Flora of Turkey And The East Aegean Islands*, volume 11: 224-232, Edinburgh: Edinburgh Univ Press (2000).

8. Özhatay, N., Kültür, Ş. Check list of Additional Taxa to the Supplement Flora of Turkey III. *Turk J Bot* 30: 281-316 (2006).

9. Özhatay, N., Kültür, Ş., Aslan, S. Check list of Additional Taxa to the Supplement Flora of Turkey III. *Turk J Bot* 33: 191-226 (2009).

10. Özhatay, N., Kültür, Ş., Gürdal, B. Checklist of Additional Taxa to the Supplement Flora of Turkey V. *Turk J Bot* 35: 589-624 (2011).

11. Koçyiğit, M., Özhatay, N. A Contribution to the Genus *Allium* L. (Sect. *Codonoprasum*) in Turkey. *Turk J Bot* 30, 391-395 (2010).

12. Özhatay, N., Koçyiğit, M., Akalın, E. *Allium rumelicum*, Sect. Codonoprasum, a new species from European Turkey. *Phytologia Balcanica* 16 (3): 355-359 (2010).

13. Karavokyrou, E., Tzanoudakis, D. Two new species of *Allium* Sect. Codonoprasum Reichenb. From the East Aegean Islands (Greece). *Annales Musei Goulandris*, 9:141-145 (1994).

14. Brullo, S., Pavone, P., Salmeri, C. Cytotaxonomical notes on *Allium dentiferum* Webb & Berthel., an unknown species of the Mediterranean flora. *Botanika Chronika* 10: 785-796 (1991).

15. Brullo, S., Guglielmo, A., Pavone, P., Salmeri, C. Taxonomic study on *Allium dentiferum* Webb & Berthel. (*Alliaceae*) and its relations with allied species from the Mediterranean. *Taxon* 57 (1): 243-253 (2008).