



Morphological and Anatomical Notes on a Local Endemic Species: *Grammosciadium confertum* Hub.-Mor. & Lamond (Umbelliferae)

Barış BANI ^{*1}, Özlem MAVİ ², Nezaket ADIGÜZEL ¹

¹Gazi University, Arts and Sciences Faculty, Biology Department, 06500, Teknikokullar, Ankara, Turkey

²Middle East Technical University, Department of Biological Sciences, Ankara, Turkey

Abstract

G. confertum is one of the two endemic members of the genus *Grammosciadium* in Turkey. It is distributed in a very small area between Adana and Kayseri provinces. Morphological description of this species has not been sufficiently clarified in Flora of Turkey. In this article, detailed morphological and anatomical characters of this species were determined and its description was completed.

Key words: Anatomy, Endemic, *Grammosciadium confertum*, Morphology, Turkey

----- * -----

Lokal endemic *Grammosciadium confertum* Hub.-Mor. & Lamond (Umbelliferae) türünün morfolojik ve anatomik özellikleri

Özet

Grammosciadium cinsinin Türkiye için endemik 2 türünden biri olan *Grammosciadium confertum*, Adana ve Kayseri illeri arasındaki küçük bir alanda yayılış göstermektedir. Bu türün Türkiye Florasındaki morfolojik betiminde eksiklikler bulunmaktadır. Bu makalede, türün detaylı morfolojik ve anatomik karakterleri belirlenmiş ve elde edilen bulgularla, bilinmeyen özellikleri tamamlanmıştır.

Anahtar kelimeler: Anatomi, Endemik, *Grammosciadium confertum*, Morfoloji, Türkiye

1. Introduction

Grammosciadium was established by De Candolle as a new genus containing two species, *G. daucooides* DC. and *G. m eoides* DC., in 1829 (Tamamschian and Vinogradova, 1969). The Genus endemic to Irano-Turanian phytogeographic region is represented by 8 species in Turkey (Hedge and Lamond, 1972; Takhtajan, 1986; Pimenov and Leonov, 2004). All the members of genus *Grammosciadium* are distributed in Turkey, Transcaucasica, N., Iraq, N., NW. and W. Iran (Hedge and Lamond, 1972).

G. confertum, published as a new species by Hub.-Mor and Lamond in 1971, is an insufficient member of the genus. It is pointed out in the Flora of Turkey that this species is firstly gathered by Post in 1906 and second collection by Hub-Mor were done in 1954 (Hedge and Lamond, 1972).

Townsend (1966) indicated that fruit anatomy of the genus *Grammosciadium* is significant at specific rank. Anatomical characters could be used for the some species to separate readily. The most important anatomical characters are the position and the number of vascular bundles in the mericarp of the fruits.

Although Hedge and Lamond (1972) present a brief morphological description of *G. confertum* in Flora of Turkey, they reported that the additional materials with leaves and flowers are needed to complete its description. From this point of view, this article will help to complete needed anatomical and morphological characters.

* Corresponding author / Haberleşmeden sorumlu yazar: Tel.: :+905325462781; E-mail: barisbani@yahoo.com

2. Materials and methods

The type photo of the species and also the first collected specimen by Post have been seen by the first author at Edinburgh Herbarium (E). Authorities for all cited plants are given according to Authors of Plant Names (Brummit and Powell 1992). The herbarium vouchers were preserved in GAZI.

To obtain transverse sections of the specimens, herbarium specimens were watered for 24 h before cutting. The specimens were fixed in formalin-acetic acid-alcohol (F.A.A.) solution for 48 hours to be sectioned. Then, all the specimens were dehydrated with increasing strength of ethyl alcohol solutions. With the help of modified Johansen (1944)'s Paraffin Sectioning Method, 10 μ - 15 μ thick slices were gathered. After sectioning, the slices were stained with safranin and mounted with Entellan. The observations were obtained by using Leica DM1000 type of microscope and photographed by using Leica DFC280 type of camera.

2.1. Examined specimens

Turkey B5 Kayseri; pass between Alayli Da. and Bey Da., Bakirdag to Saimbeyli, 1920 m, 19 vi 1951, *A. Huber-Morath* 10909 (photo E).

S. Anatolia (Anti-Taurus). B6 Adana/Maraş: Saimbeyli to Karakilise, 9 vii 1906, *B. Post* 207 (E).

Turkey B6 Adana; by road at the top of pass North of Saimbeyli to Doğanbeyli, very wet flush, 1900 m, 18 v 2000, *Pearman* 2A (E); *ibid.*, Tufanbeyli, Güzelim village, Kumlupınar district, wet places in black pine forest, 1450 m, 28 v 2008, *B.Bani* (B.B.5991), *B.Şahin*; *ibid.*, 22 vi 2008, *B.Bani* 6204; *ibid.*, 20 v 2009, *B.Bani* 6692.

3. Results

3.1. Morphology

This purely known species has not been studied in detail, until now. According to Hedge and Lamond (1972), to complete the description of *G. confertum*, the specimens with leaves and flowers are needed. Also the life span of the species was doubtfully mentioned as biennial in the Flora of Turkey (Hedge and Lamond, 1972). Depending on our recent collections with the leaves and the flowers, the morphological description of this species has been expanded. Furthermore, the life span has been determined as biennial with the help of the root sections (Figure 4D).

***Grammosciadium confertum* Hub.-Mor & Lamond** in Notes R.B.G. Edinb. 31:75 (1971) (Figure 1).

Erect, unbranched, glabrous, biennial with \pm grooved stem (narrowly winged) to 40 cm. Leaves linear-oblong, 10-17 x 0.5-2.2 cm, 1-3 pinnate, ultimate segments linear, filiform, 2-5 mm. Stipules leaf like up to 1 cm. Central umbel fertile only, \pm sessile. Rays 4-9, very unequal, 0-9 cm, those of central umbel conferted, thickend in fruit. Bracts leaf-like or linear setaceous, 2-10 mm. Bracteoles up to 11, linear setaceous, 1-6 mm, arising from base of outer series of pedicels. Pedicels equal, 1-3 mm. Number of flowers up to 25. Sepals subulate, unequal, 0.5-2 mm. Petals obcordate, 1-2.5 mm, white. Stamens 1.5-2 mm. Anthers dark green. Umbellules 8-20-fruited. Fruits linear-oblong, narrowed towards base, \pm terete, unwinged, 7-11 x 1.5 mm. Mericaps dissimilar, each with 4 filiform secondary ridges, outer with 5 conspicuous primary ridges, inner with 3 conspicuous, 2 inconspicuous primary ridges. Style less than 0.5 mm in flower, 1 mm in fruit.

Fl. 5-6, wheatfields, wet places, under and clearings of *Pinus* and *Juniperus* forests, 1450-1900 m.

Type Turkey B5 Kayseri; pass between Alayli Da. and Bey Da., Bakirdag to Saimbeyli, 1920 m, 19 vi 1951, *A. Huber-Morath* 10909 (holo. E, photo!).

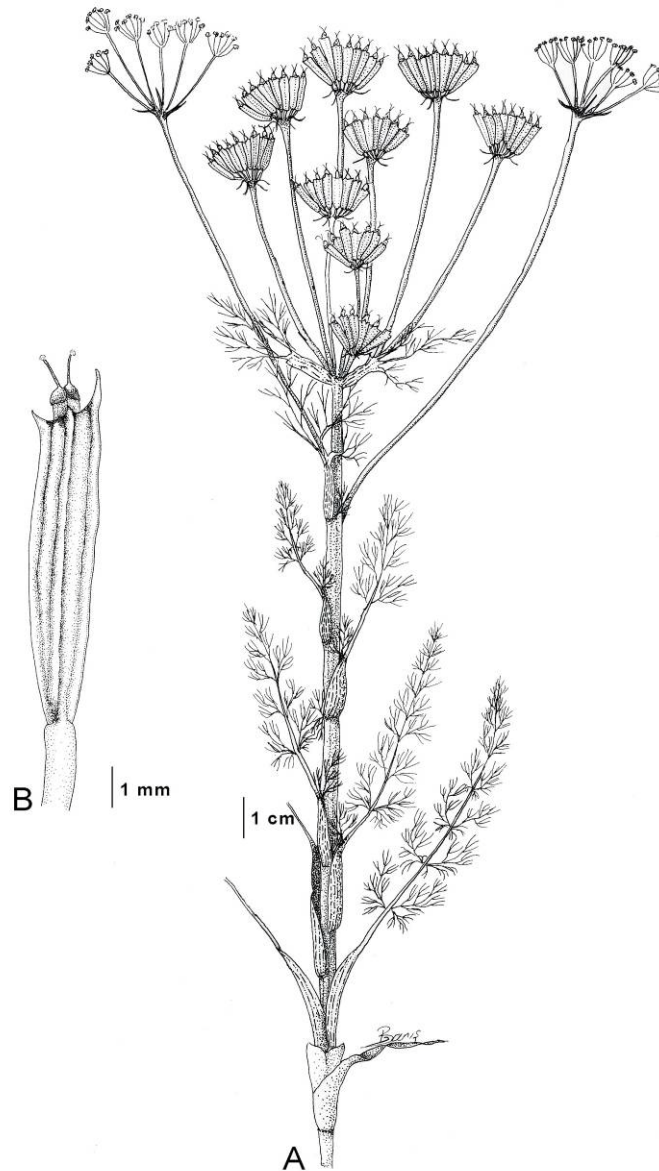


Figure 1. General view of *Grammosciadium confertum*: A) habit, B) fruit

This species is distributed in a very small area from Kumlupınar district near Güzelim village in Tufanbeyli town (Adana) to Gezbeli pass between Tufanbeyli and Develi towns (Kayseri) (Figure 2). Its altitudinal range changes from 1450 to 1950 m. Flowering time is between mid May and late June, while fruiting period varies from mid June to late July.

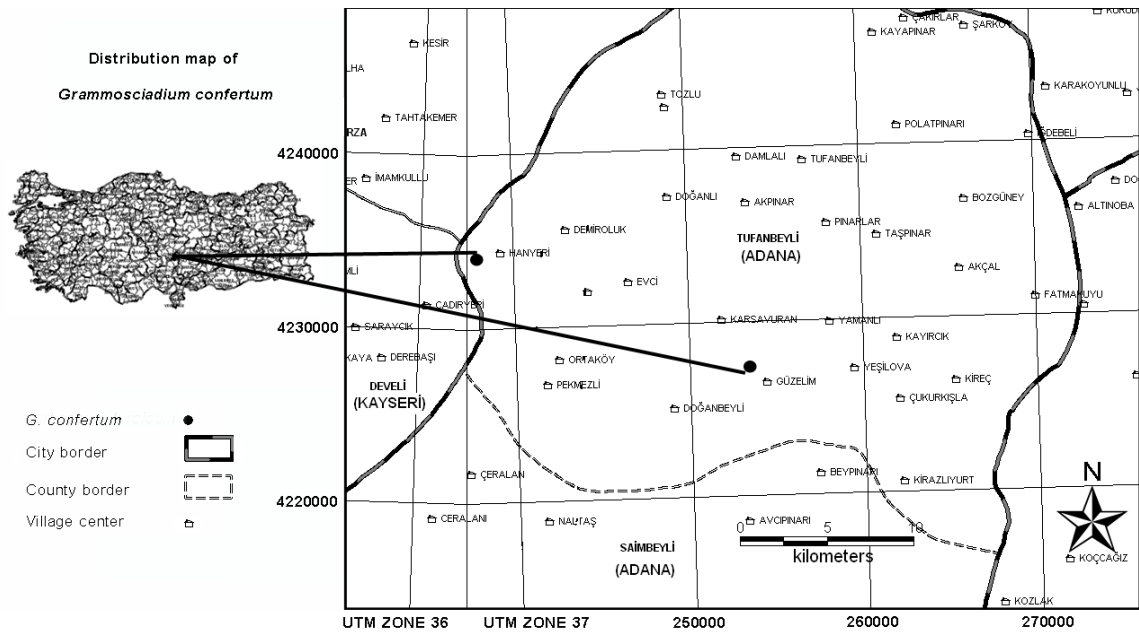


Figure 2. Distribution map of *Grammosciadium confertum* in Turkey

3.2. Fruit anatomy

The fruit anatomy acts an essential role in achieving to the reliable results at the specific rank in genus *Grammosciadium*. Also the position and the number of vascular bundles of the mericarps seem to be the most important anatomical characters (Townsend, 1966).

The mericarp of *G. c confertum* has continuously exocarp includes regularly arranged cells. The fruit of this species is included in the heterocarpic type (Figure 3A). Inner mericarps have two inconspicuous lateral ribs and three prominent dorsal ribs. Whereas, outer mericarps have also five conspicuous ribs, one of which seems to be more prominent. All the ribs have distally located totally five vittae (secretory canals). The vascular bundles of these ribs all combine with four vallecular vascular bundles. The vallecular vascular bundles also have vallecular vittae underside of them. Each mericarp has two commissural vittae (Figure 3B). There are also scattered oil ducts upside of the combination regions of the dorsal and vallecular vascular bundles.

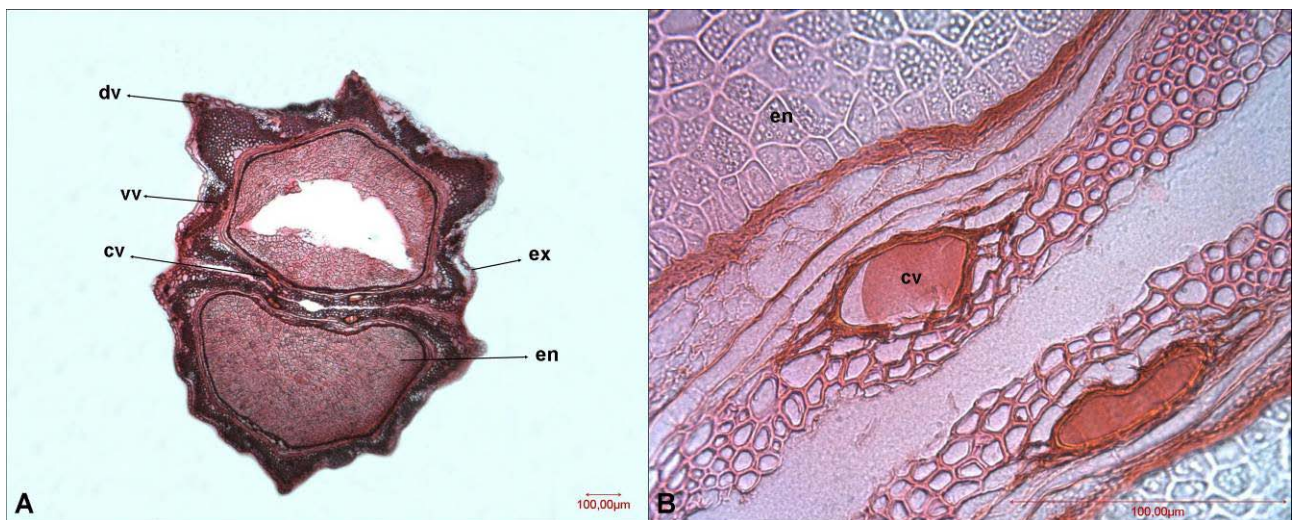


Figure 3. Fruit anatomy of *G. confertum* A) General view (X4) B) Commissural vittae (X40)
 cv: commissural vittae, dv: dorsal vittae, en: endosperm, ex: exocarp, vv: vallecular vittae

3.3. Vegetative anatomy

Figure 4 shows the anatomy of the vegetative organs of the species. As seen in the transection of the lamina (Figure 4A), large and irregularly shaped epidermal cells are covered by thin layer of cuticle. Parenchymatic cells under the single layer of epidermis, surround the vascular bundle and secretory canal in mesophyll of the leaf. The cross section of petiole is shown in Figure 4B. The epidermis of the petiole has irregularly shaped cells as in the leaf. Parenchymatic cells with small intercellular spaces cover the secretory canals and vascular bundles between the upper and lower sides of the petiole. There are wide open spaces between the vascular bundles of the petiole.

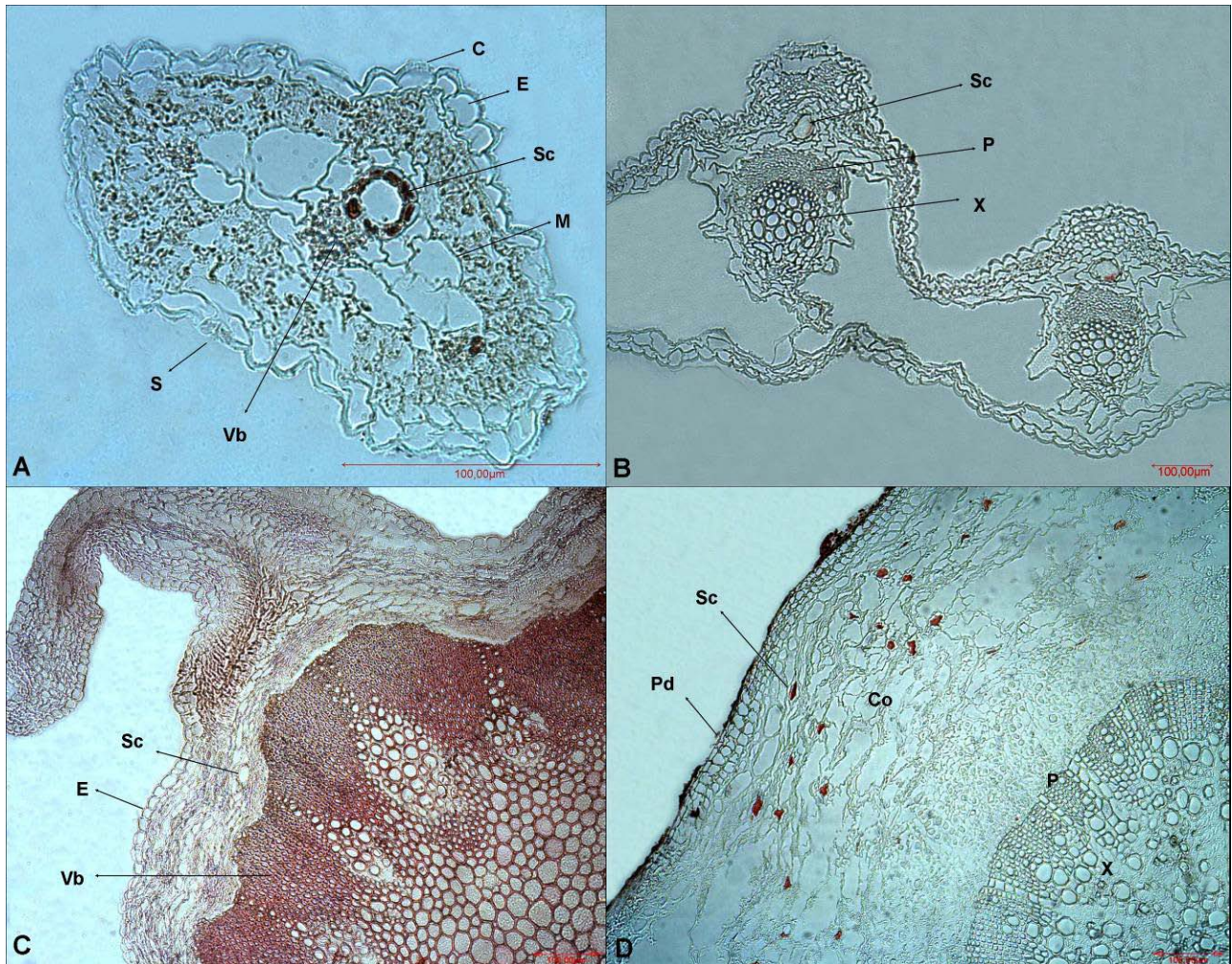


Figure 4. Vegetative anatomy of *G. confertum*; A) Leaf (X40) B) Petiole (X10) C) Stem (X10) D) Root (X10)
C: Cuticle, Co: Cortex, E: Epidermis, M: Mesophyll, P: Phloem, Pd: Periderm, S: Stoma, Sc: Secretory canal, Vb: Vascular bundle, X: Xylem

Regularly arranged epidermal cells make the outermost layer of the stem (Figure 4C). The inner part of the epidermis consists of thin-walled compact tissue with secretory canals embedded in it. In cross sections of stem, it is obviously observed that there are 11 marginal parts (wings) filled with this compact tissue encircle the stem. Under this tissue, the vascular bundles are arranged in a ring. Bundles are wholly embedded in sclerenchyma and the xylem portions of the bundles united to one another in the ground tissue. The centre of pith is composed of thick walled parenchymatous cells.

Secretory canals, similar to those of the stem and leaf, also occur in the root (Figure 4D). Under the multilayered periderm, cortex is composed of disordered parenchymatic cells. The secretory canals are embedded in this parenchymatic tissue, which occupies a wide arcade up to the endodermis. In the lower part of the root secretory canals are not present. There is a considerable zone of radially seriate xylem and phloem elements in the central part of the root.

This study was performed for contributing to the description of *G. confertum*, which was purely known, in the Flora of Turkey (Hedge and Lamond, 1972). Also, some characters such as length of style in flowering and fruiting time; number of flowers; shape and size of petals; length of stamens and colour of anthers were added. Moreover, both fruit and vegetative anatomy of the species in detailed are given for the first time.

Acknowledgements

The authors are grateful to Curator of Edinburgh Herbarium (E) who allow us to study the specimens.

References

- Brummitt, R. K., Powell, C. E. 1992. *Authors of Plant Names*. Royal Botanic Gardens, Kew, UK.
- Hedge, I. C., Lamond, J. M. 1972. *Grammosciadium* DC., In (Ed.) Davis, P. H., *Flora of Turkey and East Aegean Islands*. Volume IV, 318-321.
- Johansen, D. A. 1944. *Plant Microtechnique*. McGraw-Hill, New York.
- Pimenov, M. G., Leonov, M. V. 2004. The Asian Umbelliferae Biodiversity Database (ASIUM) with Particular Reference to South-West Asian Taxa. *Turk J Bot.* 28. 139-145.
- Tamamschian, S. G., Vinogradova, V. M. 1969. *Grammosciadium* and *Caropodium* (Umbelliferae-Apioideae). *Taxon.* 18/5. 546-548.
- Takhtajan, A. L. 1986. *Floristic Regions of the World*. University of California Press, Ltd. London. 139.
- Townsend, C. C. 1966. Notes on the Umbelliferae of Iraq. *Kew Bulletin*. Volume 20/1. 77-85.

(Received for publication 6 January 2010; The date of publication 01 April 2011)