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A Morphological and Systematical Study on *Nepeta cataria* L. (Lamiaceae) Distributed in the Adıyaman Province

Ömer KILIÇ[1]

ABSTRACT: In this study morphological characters of *N. cataria* L. was examined which has distributed in Adıyaman province for the systematic purposes. At the result of the morphological studies leaf shape, leaf indumentum, gynoecium, androecium, corolla, calyx, seed and connection filaments to theca was determined by stereo microscope and compared with characters in Flora of Turkey. In addition, stem indumentum, leaf indumentum, pollen and seed characters of *N. cataria* is examined by SEM.

Keywords: Taxonomy, *Nepeta*, morphology, systematic

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Adıyaman'da Yayılış Gösteren *Nepeta Cataria* L. (Lamiaceae) Türü Üzerinde Morfolojik ve Sistematik Bir Çalışma

ÖZET: Bu çalışmada Adıyaman ilinde yayılış gösteren *N. cataria L.* türünün morfolojik özellikleri sistematik açıdan araştırıldı. Stereo mikroskop ile yapılan morfolojik çalışmalar sonucu türlerin yaprak şekli, yaprak tüy örtüsü, ginekeum, androkeum, korolla, kaliks, tohum ve filamentin tekalara birleşme özellikleri belirlendi ve Türkiye Florası'nda ki özellikleriyle karşılaştırıldı. Ek olarak *N. cataria* türünün gövde ve yaprak tüy örtüsü, polen ve tohum özellikleri SEM ile incelenmiştir.

Anahtar Kelimeler: Taksonomi, *Nepeta*, morfoloji, sistematik

[1] Bingöl Üniversitesi, Teknik Bilimler M.Y.O, Park ve Bahçe Bitkileri Bölümü, Bingöl, Türkiye
Sorumlu yazar/Corresponding Author: Ömer KILIÇ,

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INTRODUCTION

The genus *Nepeta* L. belongs to the Lamiaceae family, rarely annual, perennial and often pleasantly aromatic herbs found in temperate Europe, Asia, North Africa, in mountains of tropical Africa and comprises of approximately 250 species (Mabberley, 1997). *Nepeta* represented in Turkey by 40 taxa, 16 of them are endemic (ca. 40%) (Davis, 1982; Ozhatay and Kultur, 2006; Ozhatay et al., 2009). *Nepeta* taxa growing in Turkey can be divided into 2 groups: Mediterranean and Irano-Turanian. The Irano-Turanian taxa are found in the central, south-east and east Anatolia, whereas the Mediterraneae taxa grow mainly in the Mediteranean, Marmara and Aegean regions. The other taxa are widely distributed throughout Turkey. Eighteen taxa out of the 40 are endemic to Anatolia (12 taxa are Mediteranean and 6 are Irano-Turanian), and some of them are very local and endangered. Stems erect or procumbent, eglandular or glandular. External nutlet characters very important in the Iranian and Afghan species, are of limited taxonomic value in Turkey; however, detailed anatomical investigation of the pericarp might well yield useful new information. The exiting infra-generic classifications are extremely unsatisfactory (Guner et al*.,* 2000; Aytaç and Yıldız, 1996; Budantsev and Lobova, 1996). *Nepeta* have not recognised any sections but have placed the species in three informal groups (designated A, B and C) based largely on flower colour and inflorescence characters in Flora of Turkey. Group A (consists of 14 species): flowers white, yellow or pinkish, nutlets tuberculate throughout or at apex; group B (consists of 16 species): flowers lilac or deep blue, nutlets tuberculate or smooth; and group C (Sect. Oxynepeta Benth., consists of 3 species): flowers white, lilac or purple, nutlets tuberculate, ± spherical (2). *N. cataria* is belongs to group A.

N. cataria generally similar in apperance with *N. nuda* L., but *N. cataria* differ from *N. nuda* with curved calyx tube and petiolate leaves (Davis, 1982). With this study new diagnostic characters of *N. cataria* were found. *Nepeta* species are herbaceous perennial, rarely annual. Many of these species are often pleasantly aromatic, rich in essential oils, and of potential economic interest. Several *Nepeta* species are used in folk medicine as diuretic, diaphoretic, antitussive, antispasmodic, antiasthmatic, febrifuge, emmenagogue, and sedative agents (Tzakou et al*.,* 2000; Rapisarda et al*.,* 2001). In addition, many reports on phytochemical analysis of these genus, including essential oil analysis are found in the lirerature (Kilic et al., 2011; Kilic and Bagci, 2013). Many morphological characters in *Nepeta* are variable and some of these, such as indumentum, leaf shape and size, calyx and corolla characters can vary among closely related species (Hedge and Lamond, 1968). As a result, diagnostic use of such characters above the species level is problematic. Nutlets are good characters for species recognition (Jamzad et al., 2003). In the present work, SEM and light microscop was used to determine the micromorphology of *N.cataria* from Adıyaman (Turkey) province, to improve the present knowledge and to evaluate the usefulness feature for systematic purposes.

Plant Materials

N. cataria (Kilic-3010) was collected from in an island which behind the Atatürk dam wall, from Adıyaman / Turkey, on June 2011 at an altidude of 1100-1200 m. The taxonomic description of *N. cataria* was made according to Davis (1982) and all measurements were made directly on dried plant samples. Morphological studies of *N. cataria* was determined and compared figure of leaf shape, leaf indumentum, gynoecium, androecium, corolla, calyx, seed and connection of the filaments to theca by stereo microscope. In addition, the pollen characters, stem indumentum and leaf indumentum of *N. cataria* is examined with a Hitachi SU-1500 scanning electron microscope (SEM), coated with gold, in Wilfrid Laurier University (Canada) Herbarium (Biology).

RESULT AND DISCUSSION

Systematic specifications of *N. cataria* L. from Flora of Turkey

Perennial; stem erect, 50 cm-1 m, branched above, retrorsely eglandular pilose with short hairs and sessile glands. Leaves ovate, 3.5-8 x 2.5 cm, finely adpressed pilose with many sessile glands, greyish beneath, serrate, truncate or cordate. Petiole 0.7-2.2 cm. Inflorescence widely paniculate; verticillasters ± distant below, condensed above, to c. 35-flowered. Bracteoles linear-oblong, clearly shorter than calyx. Calyx tubular, 5-6 mm, ± curved, scarcely oblique, or not at mouth, ± densely pilose-pubescent and with sessile glands; teeth ± spreading, c. 2 mm. Corolla white with blue violet spots, 6,7 (-10) mm; tube just exceedind calyx teeth. Nutlets broadly ellipsoid, c. 1.5x1 mm, dull, matt, obsoletely tuberculate at apex; areole straight. Fl. 7-8. Fallow fields, waste ground, etc., 1200-1500 m.

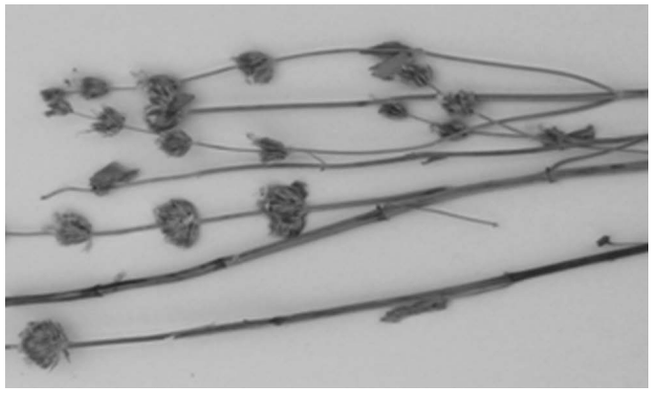


Figure 1. General view of *N. cataria*.

Stem:

Stem of *N. cataria* is erect, 60-100 cm, branched above, retrorsely eglandular pilose with sessile glands and glandular papillate.

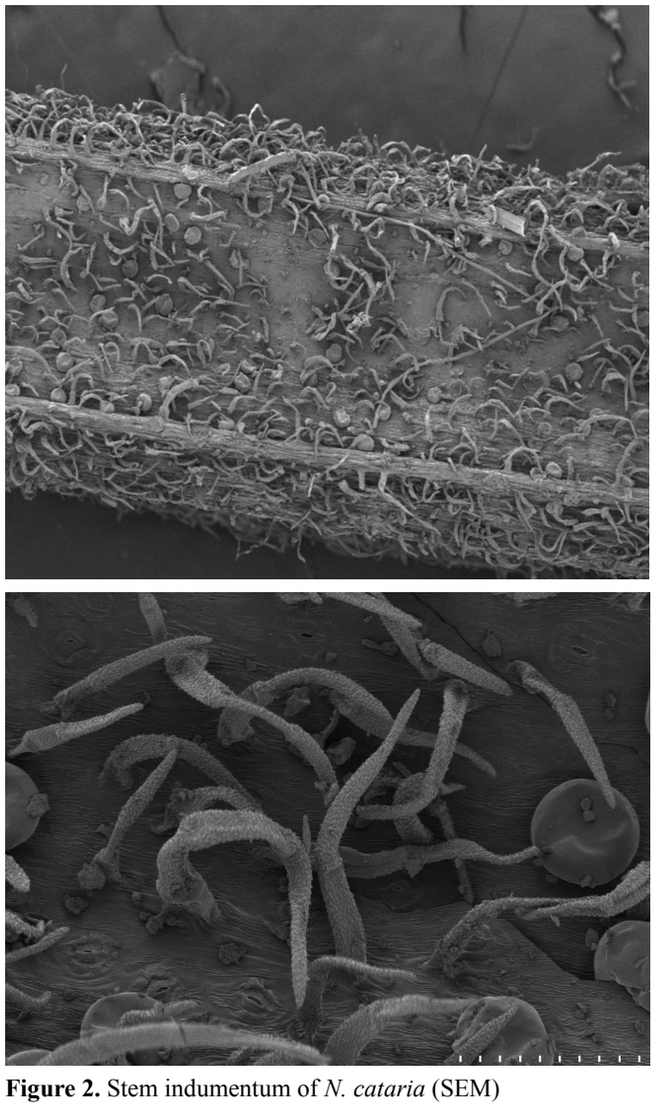
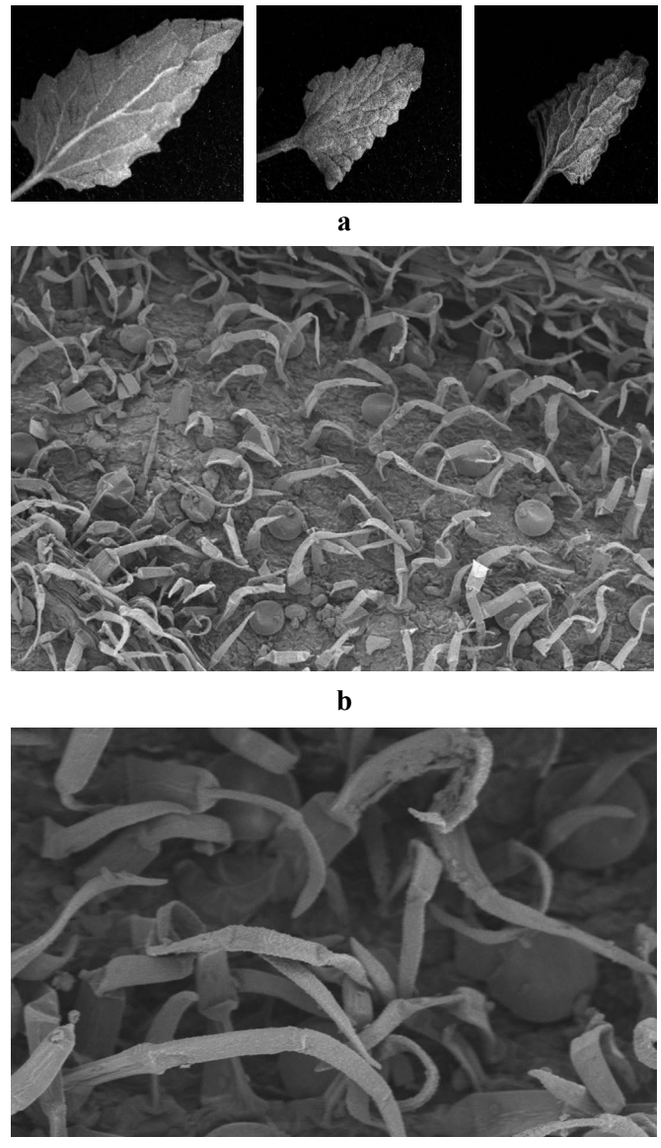


Figure 2. Stem indumentum of *N. cataria* (SEM)

Leaves:

Leaves of *N. cataria* are ovate, 2-6 x 2-4 cm, serrate, cordate and nearly truncate, both surface adpressed pilose, densely sessile glands and greyish beneath; leaves are petiolate, petiole 0.7-1.5 cm.



a

b

c

Figure 3: Leaves (a: stereo microscop) and leaf indumentum (b: SEM) of *N. cataria*

Inflorescence

Flowers are born in verticillaster, has broad paniculate, verticillasters are near each other at apex, with many flowers.Bracteoles are linear-oblong, clearly shorter than calyx. *N. cataria* has nearly curved calyx tube. Corolla colour and lenght of *N. cataria*; white-sometimes lower lip blue to purple and 6.5-8 mm.

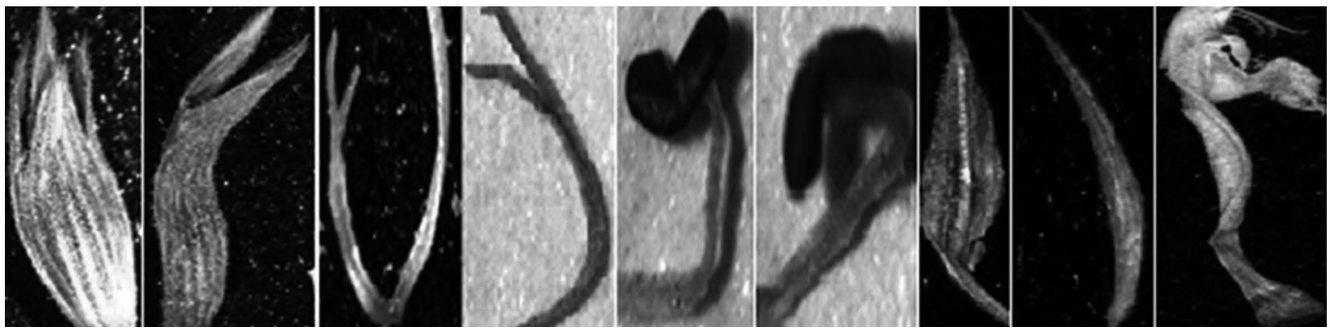


Figure 4: Plant parts of *N. cataria* (stereo microscop)

Seed and Pollen

Nutlets of *N. cataria* is broadly ellipsoid - oblong c. 1.2x0.8 mm and nutlets colour is blackish- brown. Pollen shape was found subprolate, pollen surface is microreticulate

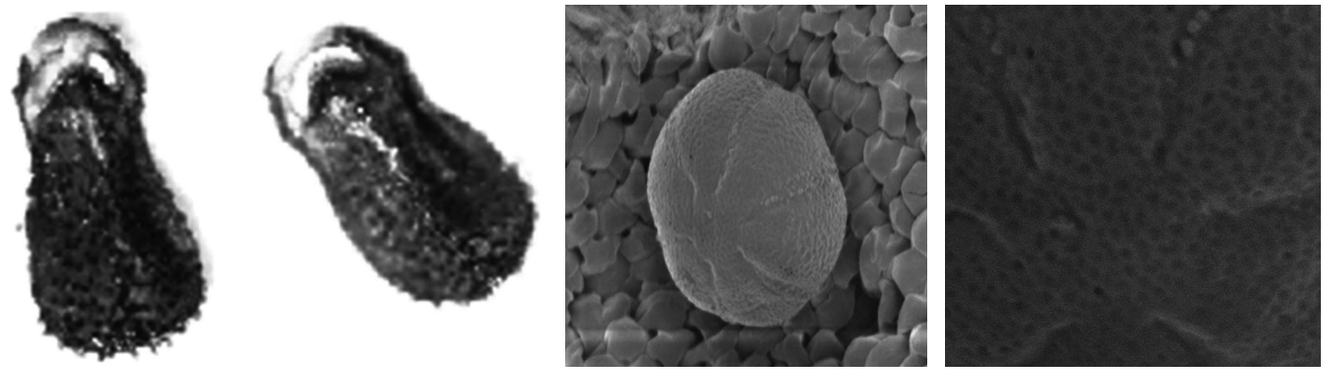


Figure 5: *N. cataria*, a) seed, b) pollen, c) pollen surface

N. cataria was investigated morphologically in order to assist in identification of this taxon. The results obtained from morphological studies were generally consistent with the description given in Flora of Turkey. Characters of *N. cataria* which we have determined, have new morphological properties for diagnosic purposes. Leaves of *N. cataria* cordate and nearly truncate, both surface adpressed pilose, densely sessile glands and greyish beneath. Stem, calyx, corolla, fruits, pollen characters and more detailed characters of *N. cataria* are shown in Table 1. *N. cataria* generally similar in apperance with *N. nuda* L., but *N. cataria* differ from *N. nuda* with curved calyx tube, petiolate leaves (Davis, 1982).

Furthermore, *N. cataria* is generally similar in apperance with *N. nuda* subsp. nuda but differ from with pungent fragrant, widely paniculate; verticillasters inflorescence and white with blue-violet spots corolla

Table 1. Characters of *N. cataria* from Flora of Turkey and our observations

CHARACTERS	FLORA OF TURKEY	OBSERVATIONS
Leaves lenght (cm) and shape	3.5-8 x 2.5, ovate.	2-6 x 2-4, cordate and nearly truncate.
Leaf indumentum	Finely adpressed pilose with many sessile glands, greyish beneath.	Both surface adpressed pilose, densely sessile glands and greyish beneath.
Stem	Erect, 50 cm-1 m, branched above, retrorsely eglandular pilose with short hairs and sessile glands.	Erect, 60-100 cm, branched above, retrorsely eglandular pilose with sessile glands and glandular papillate.
Calyx indumentum	Densely pilose-pubescent and with sessile glands.	Densely pilose, short smooth hairs with densely sessile glands.
Bracteoles	Bracteoles linear-oblong, clearly shorter than calyx	Bracteoles linear-oblong, clearly shorter than calyx
Calyx (mm)	5-6	4.5 - 6.5
Corolla (mm)	6,7 (-10)	6.5 - 8
Fruits	Nutlets broadly ellipsoid, c. 1.5x1 mm	Nutlets broadly ellipsoid, c. 1.5x1 mm
Petiole (cm)	-	0.7-1.5
Upper leaf	-	Petiolate, triangular.
Theca surface	-	granulate
Filamental connection	-	normally
Pollen (Polar axis)	-	32.50 um
Pollen (Equatorial axis)	-	25.70 um
Pollen shape and surface	-	Suboprolate, microreticulate.

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