

Morphological And Anatomical Studies on Medicinally and Economically Important *Anemone narcissiflora* L. subsp. *narcissiflora* (*Ranunculaceae*)

Cânan Özdemir, Yâsin Altan, Pelin Baran, Kâmuran Akta

Celal Bayar University, Faculty of Art and Science, Department of Biology, Manisa/Turkey.

Abstract: The study is based on anatomical and morphological investigations of *Anemone narcissiflora* L. subsp. *narcissiflora* an important plant because of its value for medicine and as a dye-stuff. Plant samples were collected from the northeastern part of Turkey. Morphological and anatomical features of various plant parts such as root, stem, leaf and fruit were investigated in detail and demonstrated by illustrations.

Key word: *Anemone narcissiflora*, Morphology, Anatomy, medicinally plant, Turkey

INTRODUCTION

The *Ranunculaceae*, a large and varied family, consist of approximately 66 genera and 2000 species. Members of the family are distributed throughout the world, but are centered in the temperate and cold regions of both hemisphere; representatives are uncommon in tropical and subtropical zones except in montane regions. The *Ranunculaceae* is often regarded as the most primitive of herbaceous angiosperms^[18]. About 150 species of *Anemone* L. are widespread on all continents except Antarctica, mainly in North temperate regions^[31]. In Turkey, the genus *Anemone* L. (*Ranunculaceae*) is represented by 8 species^[23]. One of them is *A. narcissiflora* with two subspecies *narcissiflora* and *willdenowii*^[11]. According to the literature, the two subspecies *protracta* and *crinita* occur in China, while *Anemone narcissiflora* subsp. *narcissiflora* is distributed in Europe, subsp. *faciculata* (Linnaeus) Ziman & Fedoronzuk in SW Asia (Caucasus), and both subsp. *alaskana* Hulten and subsp. *zephyra* (A. Nelson) A. Love et al. in North America^[31].

Some of *Anemone* species are used as an expectorant and diuretic in Turkey^[4]. It is recorded that some species of *Anemone* has been used as an antihemorrhagic, antirheumatic, rubefacient and tonic^[9,25,29]. In our country, the upper ground parts of the investigated species are gathered fresh and boiled in double the amount of water. Then whey is added to the boiled liquid. The whole mixture is put waiting for two days and is filtered. After all, sheep's wool is put

into the colored liquid obtained after filtering process and this mixture is kept at the boiling level for half an hour. Then it is observed that the strings of wool are dyed bright khaki color. The strings never become pale for about years.

A. narcissiflora belongs to the subgenus *Omalocarpus* (DC.) based on the characters of achenes, inflorescence^[36]. There have been many studies on the genus *Anemone* L. Most of them focus on the ecology, allelopathy, population and colonization of the genus and the revision of some subgenera^[26,32,5,20,35,30,27,28,17,16,10]. In addition, some *Anemone* species as host plants of some fungi are recorded in the literature^[15,33]. Few studies on *Anemone narcissiflora* have been found^[21,34,6,19,2,35]. Any study has not been found on *A. narcissiflora* subsp. *narcissiflora* that is the subject of this paper. Except for the main morphological knowledge in the "Flora of Turkey"^[11] and fruit morphology and comparative anatomy of pericarp and seed coat in *Anemone* spp^[8], any anatomical investigations in detail have not been found on the genus *Anemone*. Therefore, in this study we aimed to present the morphological and anatomical features of *Anemone narcissiflora* subsp. *narcissiflora* and emphasize its economical value.

MATERIALS AND METHODS

Plants materials for this study were collected from Erzurum enkaya- Gülveren yaylası, igneous slopes, 2600m. (07.07.1986, Altan 3985) and preserved at the herbarium of Celal Bayar University. Taxonomical

Table 1: Measurements of Various Tissue of *Anemone narcissiflora* L. subsp. *narcissiflora*

	Width (m) min max	Length (m) min max
Root		
Peridermis cell	14 - 51.4	5.4 - 16
Endodermis cell	14 - 40	21.5 - 9.3
Diameter of trachea	9.3 - 38	
Diameter of cortex cell	16 - 60.7	
Stem		
Epidermis cell	25.8 - 57.7	11.3 - 20.6
Diameter of cortex cell	20.6 - 46.4	
Diameter of trachea	20.6 - 37.1	
Diameter of pith cell	30.9 - 77.3	
Leaf		
Thickness of cuticle	6 - 15.5	
Adaxial epidermis cell	86 - 28.4	25.8- 47.3
Abaxial epidermis cell	30 - 58.5	22.4 - 34.4
Palisade parenchyma cell	17.8 - 21.5	94.6 - 43
Spongy parenchyma	21.4 - 55.9	

description of the plant followed to Davis^[11]. Anatomical works were carried out on fresh samples preserved in 70 % alcohol. Paraffin method was used for preparing the cross-sections of the tissues^[1]. Some of the cross-sections were stained with Sartur reagent^[3].

RESULTS AND DISCUSSION

Results:

Morphological Properties: This plant was 35-55cm high, perennial herb. Collar was strongly fibrous. Basal leaves were palmately 3-5 partite into incised cuneate segments and 4-7cm in length, dark green. Involucral leaves were sessile, deeply tripartite into incised segments. These leaves were 2.5-3.5cm long and clearly green. Inflorescence was umbellate, 3-7 flowered. Tepals were 5 in number, obovate-elliptic, white or flushed pink. Achenes were glabrous, compressed laterally. Their size was 5-7x3.5-4.5mm. The plant was distributed at the 1800-2600m altitude and occurred in scrub on igneous slopes near streams (Fig. I).

Anatomical Properties:

Root: The outer of herbaceous young root was covered 1-2 layered epidermis. The cortex consisted of 4-5 layers of round or cylindrical parenchymatous cells. Endodermis was single layered and circular. It consisted of thick walled cells. Pericycle was single layered. Its cells were parenchymatic and thin walled.

The pith of vascular cylinder was sclerenchymatous. The outer of old root was covered 5-8 layered peridermis. Its cells were dark colored, crushed and sometimes broken. Cortex was 2-4 layered and it consisted of ovoidal, parenchymatous and thin walled cells. Cambium cells were distinguishable between phloem and xylem elements. Tetrad xylem bundles were observed in the old root. The pith especially in the young root was occupied by xylem elements (Fig. IIA-B, Tab. I).

Scape: Epidermis consisted of a single layer of thin walled cells. The cortex consisted of 2-4 layers of round parenchymatous cells. Some of these cells had thick walls. The vascular bundles of the scape were arranged so as to form a ring. Only a few strands of cambium were observed between phloem and xylem. Sclerenchymatic cells located on the vascular bundles had lignified and thickened walls. Pith region with a big cavity in the centre was too large. Its cells were parenchymatous cells (Fig.IIC, Tab. I).

Leaf: The upper epidermis was composed of more or less flattened cells of various sizes. The lower epidermis cells were smaller than the upper and they were approximately the same sized. The upper epidermis cells seen in surface view had slightly undulating walls, while walls of the lower epidermis cells were almost straight. The stomata were present on upper surface of the leaves. The palisade parenchyma had one layer of cylindrical cells. The spongy

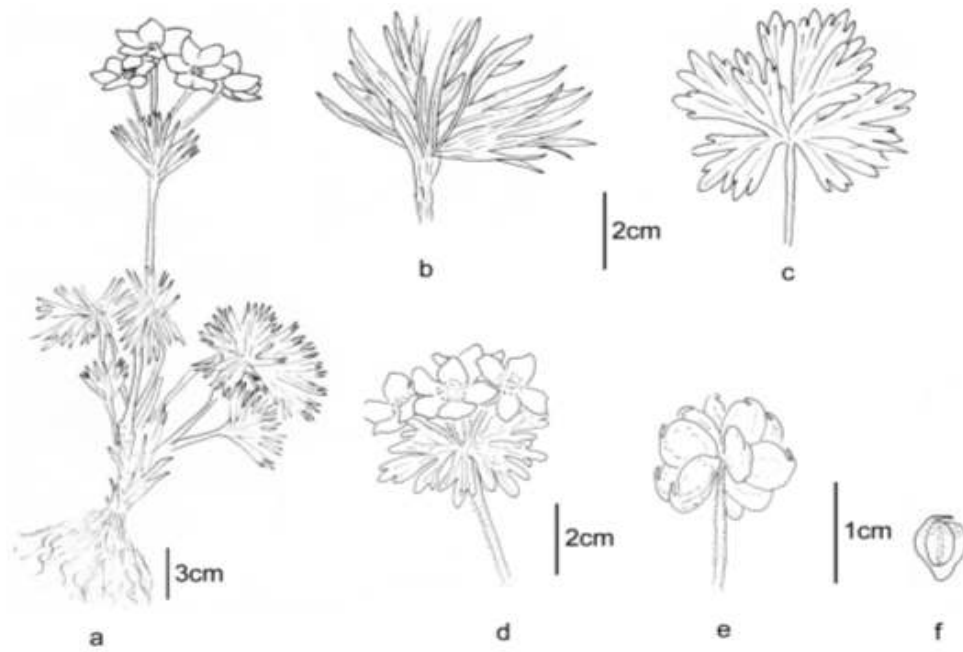


Fig. 1: General appearance of *Anemone narcissiflora* subsp. *narcissiflora* L.
a. flowering plant b. involucre leaf c. basal leaf d. flowering branch e-f. fruit

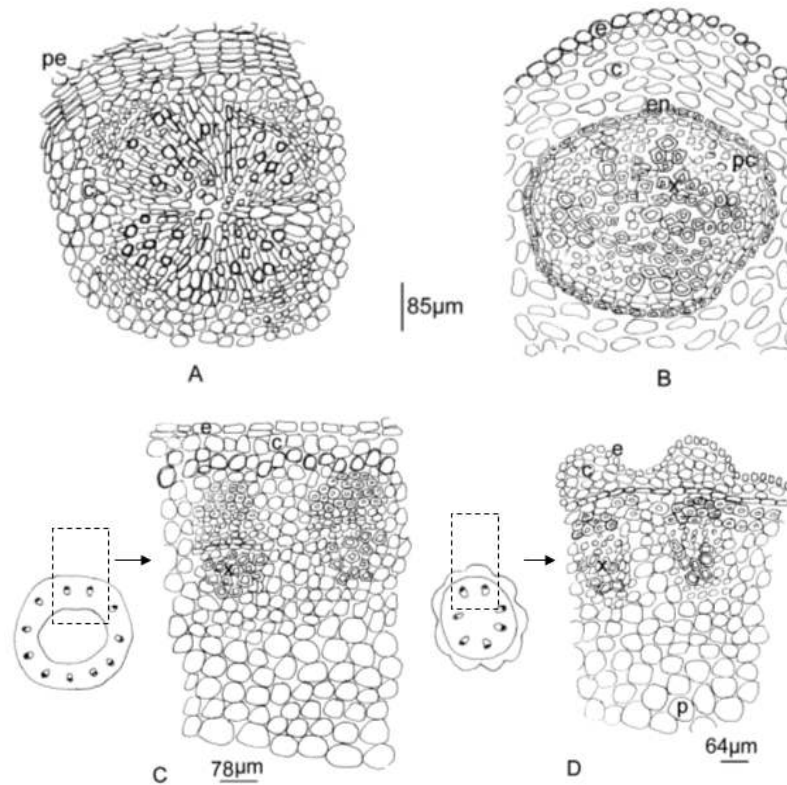


Fig. 2: Cross-sections of root and scape of *Anemone narcissiflora* subsp. *narcissiflora* L.
A. Old root, B. Herbaceous young root, C. Scape, D. Pedicel pe. periderm e. epidermis c. cortex p. pith ray pr. pith ray en. endodermis pc. pericycle x. xylem

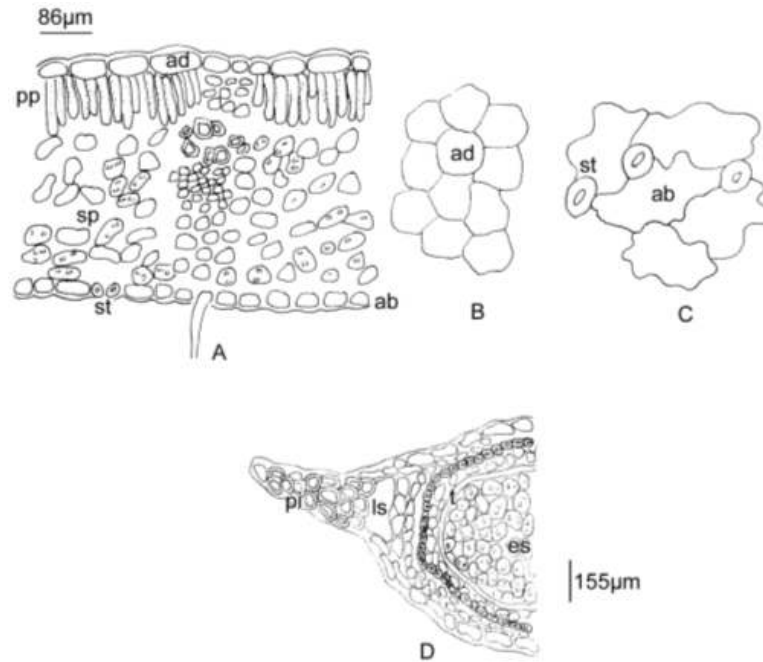


Fig. 3: Sections of leaf and fruit of *Anemone narcissiflora* subsp. *narcissiflora* L.

A. Cross-section of the leaf, B. The lower epidermis surface of leaf, C. The upper epidermis surface of leaf, D. Longitudinal section of the fruit ad. adaxial epidermis ab. abaxial epidermis pp. palisade parenchyma sp. spongy parenchyma st. stoma cell pi. pericarp ls. lysogenic space t. testa es. Endosperm

parenchyma occupied approximately three fourth of the mesophyll and had intercellular spaces. There were no sclerenchymatic or lignified walled cells surrounding the vascular bundle in leaf (Fig. IIIA-B-C, Tab. I).

Pedicel: In the cross-section of pedicel, regular prominent ridges at the outer region were visible where vascular bundles were located. Pedicel had a single layered epidermis of regular ovoidal cells. Parenchymatic cortex was present under epidermis cells. A sclerenchymatic ring surrounding vascular bundles was present in cortex region. The pith had a cavity in the centre (Fig. IID, Tab. I).

Fruit: A fruit containing a single seed was formed by one carpel. In anatomical section of fruit, there was pericarp tissue consisting of irregular shaped, parenchymatic cells, intercellular spaces and dense starch and fat cells (Fig. IIID, Tab I).

Discussion: In this study, we aimed to examine the morphological and anatomical features of *A. narcissiflora* subsp. *narcissiflora*. The size of basal and involucre leaves and achenes of *A. narcissiflora* subsp. *narcissiflora* were new observations which have been firstly determined in this research. Wang *et al.*^[31] recorded the morphological properties of *A.*

narcissiflora in China. According to Wang *et al.*^[31], *A. narcissiflora* always has glabrous achenes, sometimes with solitary hairs and the achene body is obovoid, 5-8 x 4-6mm. The achenes of *A. narcissiflora* subsp. *narcissiflora* were glabrous, flattened, 5-7x3.5-4.5mm. According to the Wang *et al.*^[31] the leaves are 4-9, the leaf blade is 3-sect, 3-7 x 4-12cm, central segment is 3-parted to 3-cleft, lateral segments are unequally 2- or 3-parted, obliquely flabellate. Scapes are 1 or 2, 10-50cm. Involucre bracts are 3 or more, bract blade is 3-parted to 3-cleft, 2-6cm. Sepals are 5 or 6 (or7), white or yellowish, rarely pinkish, 12-18 x 6-10mm. Our findings are similar with those of Wang *et al.*^[31] with some exceptions. *A. narcissiflora* subsp. *narcissiflora* had basal leaves palmately 3-5 partite into incised cuneate segments and 4-7cm in length, dark green. The involucre leaves were deeply tripartite into incised segments, 2.5-3.5cm long and clearly green. The inflorescence was umbellate, 3-7 flowered. The tepals were 5, obovate-elliptic, white or flushed pink.

It is stated that *A. narcissiflora* is distributed at *Picea* forests, bamboo thickets on slopes; 1800-4000m. N Hebei, W Nei Mongol, NW Ningxia, Xinjiang, W Yunnan [Afghanistan, Kazakhstan, N Korea, Mongolia, Pakistan, Russia (Siberia), Tajikistan; SW Asia, Europe, North America]^[31]. According to our study *A.*

narcissiflora subsp. *narcissiflora* was distributed at the 1800-2600m altitude and occurred in scrub on igneous slopes near streams.

Dittrich^[13] has observed large oil storing cells at the base of the fruit of *Anemone nemorosa*. We observed the same characteristic in our research. It is recorded that the anomocytic type of stoma was common in the *Ranunculaceae*^[22,14,17]. We detected that the same type of stoma was usual in the leaf of *A. narcissiflora* subsp. *narcissiflora*. No information on *A. narcissiflora* subsp. *narcissiflora* that is the subject of this paper has been found in the literature. For this reason, this plant species was aimed to introduce morphologically and anatomically in detail and also emphasize because of its economic and medicinal value.

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