

**MORPHOLOGICAL, PALYNOLOGICAL and
PRELIMINARY CHEMICAL STUDIES on
*TRACHYSTEMON ORIENTALIS*¹**

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S U M M A R Y

Trachystemon orientalis (L.) G. Don fil., *Boraginaceae*, is a monotypic genus distributed in Northern Turkey. It is known mainly as "hodan or kaldırık" in Turkish and it is widely used as food. This perennial species distinguished by having spirally contorted corolla lobes and hairy long filaments. Anatomical features of rhizome, stem and leaf are given with line drawings. Pollen grains are stephanocolporate, spheroidal/subprolate, tectate and granulate-scabrate. According to preliminary chemical analysis, saponins and catechic tannins were determined, cholin and β -sitosterol were reported for the first time.

Ö Z E T

Trachystemon orientalis (L.) G. Don fil., (*Boraginaceae*), Türkiyenin kuzeyinde yayılmış monotipik bir cinstir. Türkçe adı "hodan veya kaldırık" olan tür, sebze olarak

^{1&**} This is a summary of Master thesis of late Msc. Müesser ÖKSÜZ carried out in Marmara University, Faculty of Pharmacy, Department of Pharmaceutical Botany on 1985.

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kullanılır. Çok yıllık bir türdür. Korolla loplalarının spiral şeklinde kıvrık, filamentlerinin uzun tüylü olmasıyla ayırt edilir. Bu çalışmada rizom, gövde ve yaprağın anatomik özellikleri, çizimler ile birlikte verilmiştir. Polenler stefenokolporat, sferoid/subprolat; tektat ve granulat-skabrit'dir. Ön kimyasal çalışmalara göre, saponin ve kateşik tanen'in varlığı saptanmıştır. Kolin ve β sitosterol'un varlığı ilk kez bu çalışmada rapor edilmiştir.

Key words: *Trachystemon orientalis*, pollen, morphology, Turkey.

I N T R O D U C T I O N

Trachystemon D. Don, is a monotypic genus "*T. orientalis* (L.) G. Don fil." and it is distributed along the Black Sea coast (50-1300 m) Bulgaria-Caucasia. In Turkey, it is very well spread moisty places, under trees mainly Northwest Turkey and it is used as vegetable by local people and it is getting more popular. Its young stems, rhizomes and leaves are sold in the open markets in the small town even in the big cities like Kırklareli, İstanbul, İzmit, Adapazarı, Bolu etc. where it grows. It is known as Kaldırık, Hotan, Ispit, Kandirik, Hotan etc. vernacular names and it is used after cooked like vegetable.

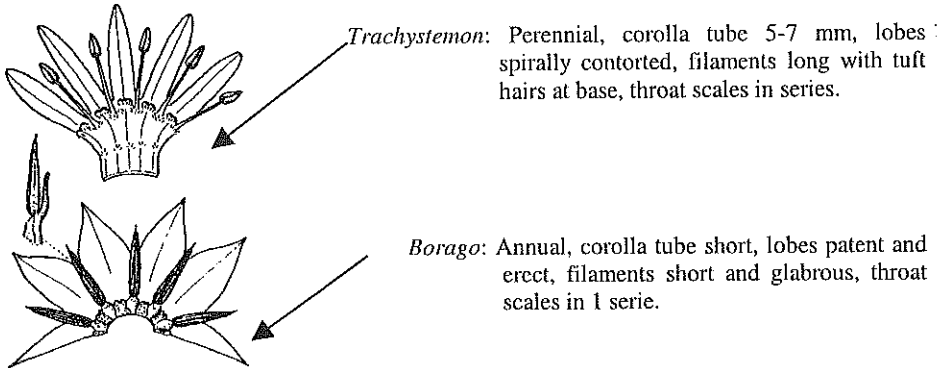
This species has similar appearance with *Borago officinalis* which is a medicinal plants used as laxative and diuretic. It is widely cultivated in Europe for its diuretic effect.

The aim of this work to find out morphological, anatomical and palynological characteristics also its basical chemical constituents of *Trachystemon orientalis*.

R E S U L T S

TAXONOMICAL STUDIES

The family *Boraginaceae* is represented by 34 genera and 316 species in Turkey (vol. 6 & vol. 11). Monotypic genus *Trachystemon* and alien genus, *Borago officinalis*, have similar appearance. They are distinguished by the following characteristics:



Trachystemon orientalis (L.) G. Don fil., Gen. Syst. 4: 309 (1837).

Syn.: *Borago orientalis* L., Sp. Pl. 138 (1753); *B. constantinopolitana* Hill, Veg. Syst. 7: 90, t. 42, f. 3 (1764); *Nordmannia cordifolia* Steven in Bull. Acad. Imp. Sci. Petersb. 2: 312 (1837); *Ptilostemon orientale* (L.) DC., Prodr. 10: 36 (1846); *Nordmannia orientalis* (L.) Steven in Bull. Soc. Nat. Mosc. 24: 577 (1851); Ic: Jaub & Spach, Ill. Pl. Or. 5: t. 419 (1857); Kolak., Fl. Abkhazya 4: t. 3 (1949) as *N. orientalis*.

Perennial, robust, sparsely hispid, stoutly rhizomatous herbs. Rhizome tuberous, blackish, far-creeping. Stem (17-)34(-60), erect, few-branched, sparsely retrorse-hispid and glandular hairy, leaves sparsely hispid; basal with 7-22 cm petiole and ovate-cordate, acute-acuminate, lamina to 8-20 x 7-18 cm; cauline leaves panduriform-lanceolate, 2.5-9 x 1.4-5 cm, sessile, amplexicaul. Inflorescence a lax panicle; cymes bracteate, flowers nodding at anthesis. Bracts elliptic-lanceolate to oblanceolate, sessile, acute. Calyx hairy, cup-shaped 3-5mm, 5-sect to middle, somewhat accrescent 6-9 mm in fruit, lobes ovate, obtuse. Corolla purplish-blue, infundibular, tube 5-7 mm, lobes 8-12 mm, limb divided into 5 linear revolute, scales in 2 series of 5, lower villous, upper papillose, white, very short, blunt, emarginate. Stamens 5, long-exserted; filaments pink, hairy at base, 7-12 mm, attached above middle of corolla tube. Style long exserted, 13-15 mm. Nutlets with a thickened collar-like ring at base, obliquely ovoid, keeled, rugose-reticulate.

FLOWERING TIME: March-May

HABITAT: *Fagus* forest, shady riverbanks, moist ravines.

ALTITUDE: 50-1300 m

TYPE: Described from "around Istanbul" (Hb. Linn. 188/5).

DISTRIBUTION IN TURKEY: **A1(E)** KIRKLARELİ: Kırklareli-Demirköy, Velika bridge, 26.vi.1968, A.Baytop, ISTE 13883! Dereköy, under *Fagus* forest, 620 m, 9.v.1973, A.Baytop & E.Tuzlacı, ISTE 24474! Dereköy, 1.v.1973, G.Ertem, ISTE 24272! Dereköy-Gümüşalan, 26.iv.1974, N. & E.Özhatay, ISTE 27637! **A2(E)** İSTANBUL: Above Terkos, 10.iv.1972, A.Baytop, ISTE 21385 a! Above Arnavutköy, Robert Collage Garden, 4.iv.1984, E.Özhatay, 84-1! Belgrat Forest, 4.iv.1964, A. & T.Baytop, ISTE 7531! Belgrat Forest, 14.iv.1963, A.Baytop, ISTE 7210! Belgrat Forest, 29.iv.1971, G.Ertem, F.Öktem, N. & E.Özhatay, ISTE 19390! **A2(A)** İSTANBUL: Beykoz, Hills back of Karakulak, 12.iv.1964, N.Tanker, ISTE 7568! Beykoz, 26.iv.1950, T.Baytop & A.Berk, ISTE 2911! Beykoz, Karakulak, 22.iv.1984, M.Öksüz, 146! Şile-Ömerli, near Şile, 22.iv.1984, M.Öksüz 147! Şile-Ömerli, near Ömerli, 13.iv.1985, M.Öksüz, 148! **A2(A)** BURSA: Foot of Uludağ, 9.iv.1951, A.Berk, ISTE 152! **A3** KOCAELİ: Maşukiye, Keltepe, 600 m, 29.iv.1974, A.Baytop & E.Tuzlacı, ISTE 27779! **A3** KOCAELİ: Kuzuyayla-Keltepe, near top, 20.v.1973, N. & E.Özhatay, ISTE 24632! **B3** ESKİŞEHİR: A.Ü. Garden, 8.v.1984, A.Baytop, ISTE 52887! **A4** KASTAMONU: Azdavay-Cide, Gökçeadaç-Kızılcasu, 1275 m, 20.v.1972, A. & T.Baytop, ISTE 21804! **A8** TRABZON: Çaykara-Uzungöl, near Çambaşı, 750 m, 16.iv.1982, A. & T.Baytop, ISTE 48544! **A8** RİZE: Ardeşen, Işıklı-Zenimoz, 30-500 m, 27.ii.1981, A.Güner, ISTE 50136!

GENERAL DISTRIBUTION: E Bulgaria, W Caucasia, N. Turkey. Euxine element.

ANATOMICAL STUDIES

EXAMINED SPECIMENS: **A2(A)** İSTANBUL: Beykoz, Karakulak, 22.iv.1984, M.Öksüz, 146!

METHODS: Mainly cross section of the rhizomes, stems and leaves kept in 70 % alcohol is used for anatomical studies, and examined in Sartur reactive. Drawings are made using Olympus BH Trinoküler microscope.

Anatomy of the leaf (Fig.1)

The leaf of *T.orientalis* is isobilateral and amphistomatic. The lamina of leaf in cross section is composed of adaxial and abaxial epidermis enclosing several layers of mesophyll cells which are more or less similar on both surfaces. The stomata are of anomocytic type and present on both surfaces of the leaves being much more frequent on lower surface. The number of the stomata per mm² was calculated, it was found that stomata are c. 360 per mm² on the lower surface, on the other hand c.10 on the upper surface. Simple and glandular hairs are present on both surfaces mainly on the veins.

Long and short simple hairs are unicellular and thick walled. Glandular hairs with unicellular head and uni-multicellular stalked, are present on the both surfaces being more frequent on the lower surface.

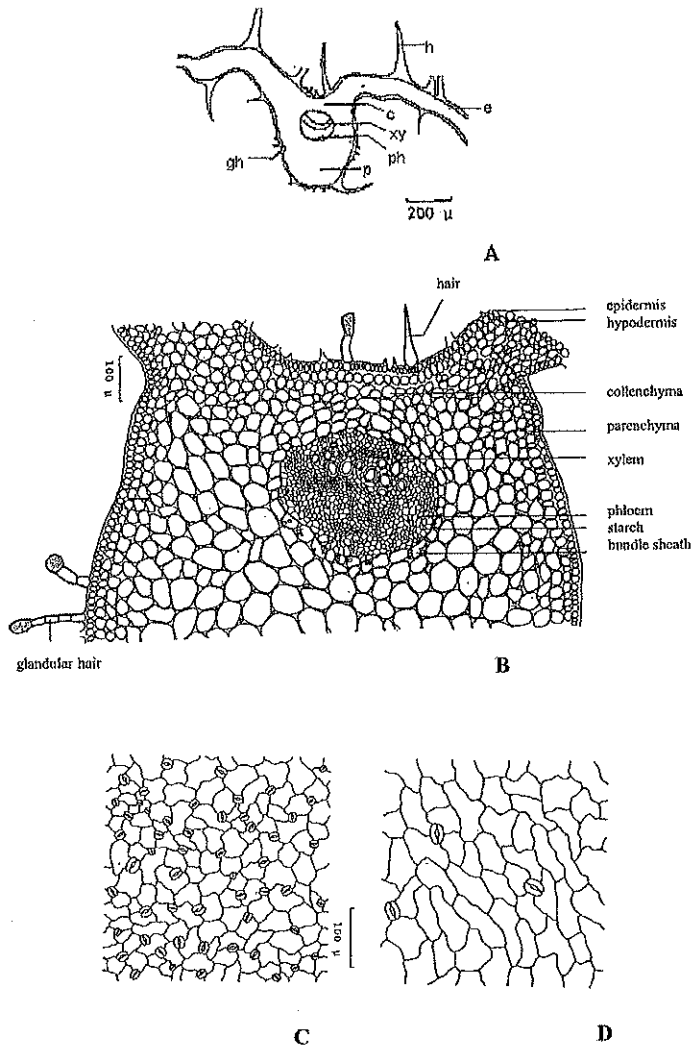


Fig. 1: Transverse section in the leaf, h. hair, e. epidermis, c. collenchyma, xy. xylem, ph. phloem, p. parenchyma, gh. glandular hair (A,B); lower (abaxial) surface view in the leaf (C), upper (adaxial) surface view in the leaf (D).

Anatomy of the stem (Fig. 2)

The cross sections of the stem of *Trachystemon orientalis*: Epidermis, one-layered cells; hypodermis consists of larger and regular cells, one-layered; cortex many-layered, collenchymatic tissue 5-6 layered, then larger parenchyma cells with thin walls and they don't have chloroplast and crystals. The inner boundary of the cortex is endodermis one layered and circular. It contains starch grains. Vascular bundles are collateral types, app. 20-23 and arranged as circular. Pith is parenchymatous and consists of large and thin walled cells and covers c.70% space of the stems.

Trichomes of the stem: simple, one-celled aglandular hairs and a few short and long stalked glandular hairs.

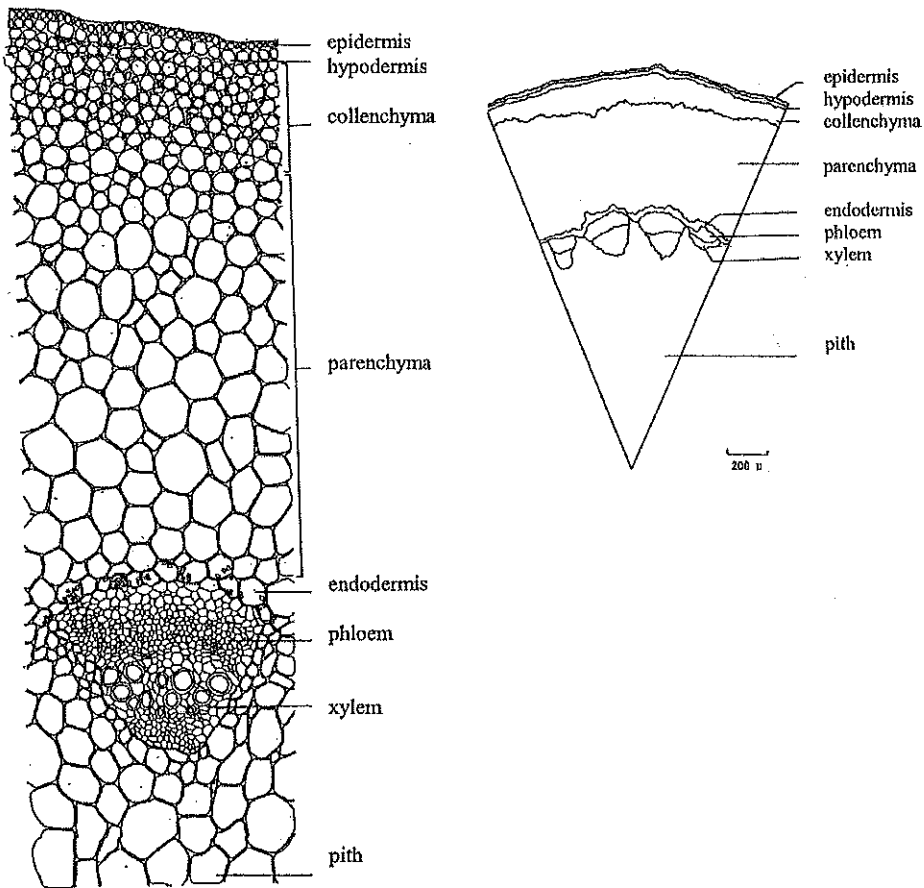


Fig. 2: Cross section of stem

Anatomy of the rhizome (Fig.3)

It has typical anatomical features of dicotyledonous stem (4): epidermis (one-layered), hypodermis (one-layered), cortex (parenchymatous, 15-20 layered) with a numerous starch grains. Vascular bundles are collateral and arranged as regular circle. Pith is composed of larger parenchymatous cells.

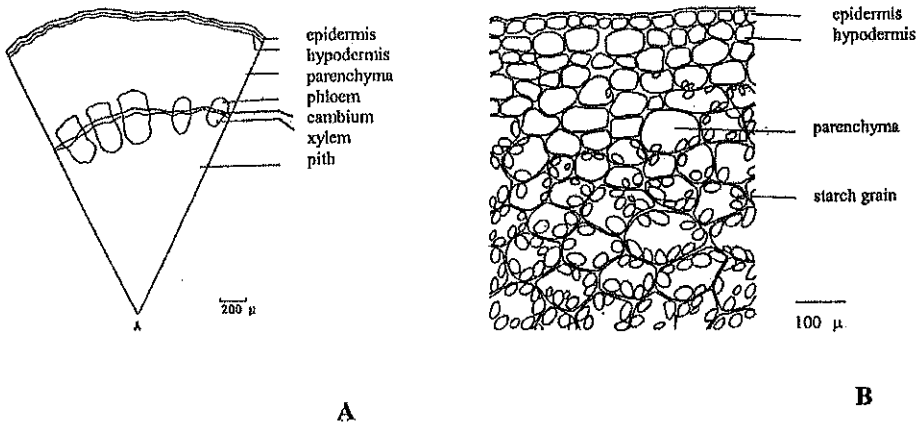


Fig 3. Cross section of rhizome, A. general view; B. part of cortex.

PALYNOLOGICAL STUDIES

EXAMINED SPECIMENS: A2(E) ISTANBUL: above Arnavutköy, in the garden of Robert College, 4.iv.1984, E.Özhatay 84-1!

METHODS: The pollen grains were prepared for light microscope using the standard methods Wodehouse (5) and Erdtman (6). The measurements were based 30 readings for each characteristic. An Olympus microscope was used for taking the pictures. The terminology used is in accordance to Faegri & Iversen (7).

RESULTS

Pollen type: stephanocolporate
 Pollen shape: spheroidal (1.124) W;
 subprolate (1.333) E
 Exine
 main thickness: 1.79 μ (W)
 1.61 μ (E)
 Apertures: usually 6 colporate,
 colpus narrow-long,
 boundary inconspicuous,
 acute at tips.
 boundary of porus
 conspicuous,
 elliptical in shape.
 Structure: tectate
 Sculpture: granulate-scabrate
 Intine: main thickness:0.50 μ (W)

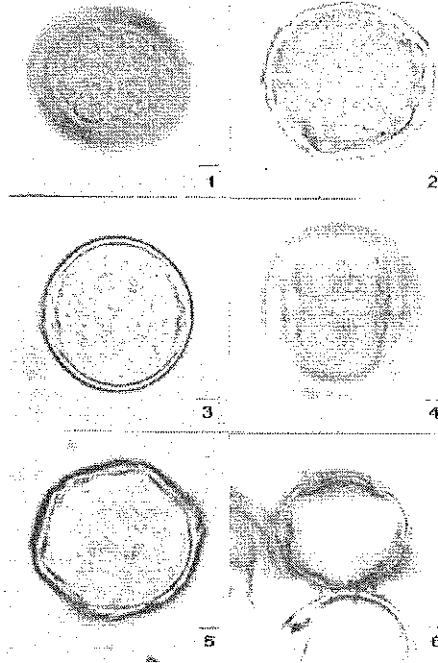


Table 1: Pollen grains ($\times 100$); 1-2 Non-acetolysed pollen, 1.Equatorial view, 2. Polar view; 3-6 Acetolysed pollen, 3-4 Equatorial view, 5-6 Polar view.

Pollen dimensions (μ):

	Fresh pollen grains (W)		Folysize pollen grains (E)	
	M	$\pm\sigma$	M	$\pm\sigma$
P	26.31	1.627	25.29	1.57
E	23.40	1.44	18.97	1.47
Ex	1.79	0.14	1.615	0.169
In	0.50	-	-	-
clg	-	-	11.26	1.60
clt	-	-	0.67	0.162
plt	-	-	6.27	0.65
plg	-	-	3.13	0.136

PHYTOCHEMICAL STUDIES

Preliminary phytochemical analysis has been performed on 5% infusion for the identification of alkaloids, antraquinones, flavons, saponins, tannins and sugar. Table 1 shows the results obtained with 5% infusion. 20 g of plant material was extracted in a soxlet apparatus with petroleum-ether, chloroform and ethanol respectively. In the extracts, so obtained the existence of cholin, β -sitosterol and also alkaloids has been examined by TLC. Table 2 summarizes the yield of the extracts together with the above mentioned compounds.

Table 1: The results of the preliminary phytochemical analysis on the 5 % infusion

Glycosides			Tannins		Catechine	Alkaloid	Sugar
Saponins	Flavons	Anthraquinons	Gallic	Catechic			
+	-	-	-	+	-	-	-

Table 2: The results obtained with the extracts of organic solvents.

Extracts	Yield (%)	Cholin	β -sitosterol	Alkaloid
Petroleum-ether	1.25	-	+	-
Chloroform	1.05	-	-	-
Ethaunol	5.35	+	-	-

Special apparatus were used for the determination of moisture and valotile oil by distillation in the plant. Total ash and acid insoluble ash values were also determined according to BP. The results were given below:

Total ash assay: 17.2 %

Ash insoluble in HCl: 2.28 %

Loss on drying: 9.8 %

Essential oil: 0.2 % ml.

The existence of saponins and catechic tannins were determined from in 5 % infusion (9, 10).The presence of cholin and β -sitosterol (11) were reported for the first time from this plant.

Acknowledgement

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