

Pollen Morphology of *Hedera helix* L.

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A B S T R A C T

Hedera helix (Ivy) is an evergreen dioecious wood and liana. It is one of the best species of *Hedera* (Araliaceae). In traditional use, many parts of this plant have been used for treatment of various diseases. In this study, pollen morphology of *H. helix* L. belonging to the genus *Hedera* (Araliaceae) were examined with light microscopy (LM). According to the investigation by LM, pollen grains of the species are monad, radially symmetrical, isopolar, tricolporate, oblate-spheroidal or prolate-spheroidal, colpi, reticulate and rugulate.

In my opinion, the palynological features of the taxon might be helpful to investigate the taxa various palynological, taxonomical, melissopalynological and pharmaceutical researches.

Keywords: Araliaceae, light microscope, palynology, taxonomy

Introduction

H. helix L. is one of the best species of *Hedera* (Araliaceae). This plant (Figure 1) has been used as medicinal plant for curing several human and animal diseases. Also, it has shown several biological activities which can be used for agricultural or medicinal purposes. It is woody, climbing or creeping perennials, the stems clinging by adventitious roots. Leaves simple, petiolate, elliptic to palmately lobed, exstipulate. Flowers are yellowish-green, in umbels which are arranged in racemose panicles or which are solitary. Its fruit resembles small berries and black as it matures. These rounded fruit contain 2-3 whitish seeds [1].

In the mostly production of autumnal honeys, usually, beekeepers determined that *Apis mellifera* L. visits flowers of *Ceratonia siliqua* L., *Erica multiflora* L.,

Diplotaxis eruroides (L.) DC., *Dittrichia viscosa* (L.) Greuter, *Hedera helix* L. and *Rosmarinus officinalis* L.[2]. This blooming time is good period because other food sources for honey bees are limited. *H. helix* blooms from mid-September to early November; one of the main pollinators is honey bee (*Apis mellifera*) [3].

H. helix (Ivy) honey is monofloral and rarely found in Spain, Italy, France, Croatia or Ireland [4, 5]. Besides, this honey is crystallizes in a short period of time. It is occurring mostly in consequence of the high content of glucose. The ivy honey contain usually up to 80% of it [2, 6]. The colour is dark (brown leather, toffee dark brown) and with an odour of liquorice and forest that is intense. The taste is acidic, bitter, medicines, roasted

and coffee [2]. Kaya et al. (2005) determined that pollen grains of *H. helix* L. are dominant in Kırklareli [7]. Özler

(2018) determined *H. helix* pollen in honey from Ereğli-Namık Kemal neighborhood [8].



Figure 1. Flowers of *H. helix*

H. helix grows dry and wet sclerophyll forest, woodlands, riparian vegetation, rocky outcrops and warm temperate rainforest. *H. helix* naturally grows in Giresun (A7) and Turkey [1]. In addition, it is grown as ornamental plant.

There is insufficiency of literature on pollen morphology of *H. helix* in Turkey.

Materials and Methods

Locality

For the preparation of *Hedera* extract, flowers of the plant in October 2017 were collected and were identified at the Research Laboratory of Department of

Therefore, the present study aims to fill this gap in literature by palynological analyses. Consequently, it provides information that help plant taxonomy, mellisopalynological and aeropalynological analyses.

Health Care Services and Techniques of Giresun University, Giresun. It is located in the eastern part of the Black Sea region (40°54'K and 38°25'D) [9]. According to the grid system applied by Davis [1], Gure (Giresun) is located in the A7 frame (Fig. 1).

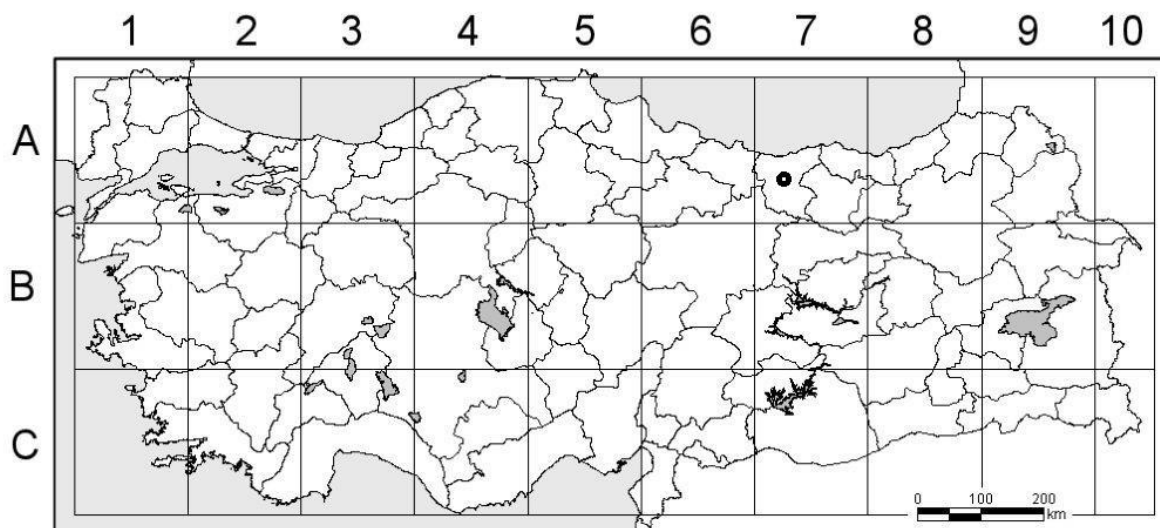


Figure 2. The picked flowers of *H. helix*

Pollen Sample

The light microscopy (LM) observations with their measurements were made on pollen from mature anthers, which have been prepared according to the Wodehouse method [10]. The measurements of the pollen grains of *H. helix* were taken on 30 pollen grains from the species. P: polar axis, E: equatorial diameter, Amb: diameter of pollen at the polar view, t: distance between colpi ends, were measured from 30 fully developed grains per sample under the Nikon Eclipse Ci microscope (1000 \times).

Additionally, 15 measurements of Clg: length of colpus, Clt: latitude of colpus, Plg: length of porus, Plt: latitude of porus. Results are provided as minimum, maximum and mean \pm standard deviations. P/E ratios were also calculated. In addition, the ornamentation was established. All the statistical analyses of the palynological characters were made by the SPSS package program. The arithmetic mean, standard deviation and variation were calculated for sample. The statistical results are shown in tables. The terminology used is of Erdtman [11], Kremp [12] and Punt et al. [13].

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Results and Discussion

Palynological description of *H. helix* was made based on the quantitative and qualitative morphologic results. It is monad, radially symmetric, isopolar, 3-colporate, medium-sized, Prolate-spheroidal or oblat spheroidal (P/E 0.93-1.01) (Fig. 3). Polar axis (P) 30.73 \pm 0.9 μ m, equatorial axis (E) 30.23 \pm 0.77 μ m. Amb trinagular-round, Exine 2.21 \pm 0.56 μ m thick, nexine is thinner than or as thick as

sexine. Exine ornamentation is reticulate or rugulate; distance between colpi ends 12.23 \pm 1.86 μ m. Apertural system 3-colporate: three colpus 21.37 \pm 1.45 μ m long, 4.56 \pm 0.89 μ m wide, pore 6.87 \pm 0.95 μ m long, 6.43 \pm 0.51 wide; distinct margin and terminal edges acute with margo, the pori situated at midpoint of colpus, are prolate-

spheroidal(plg/plt 1.06) and with distinct margin. (Fig. 3, Table 1).

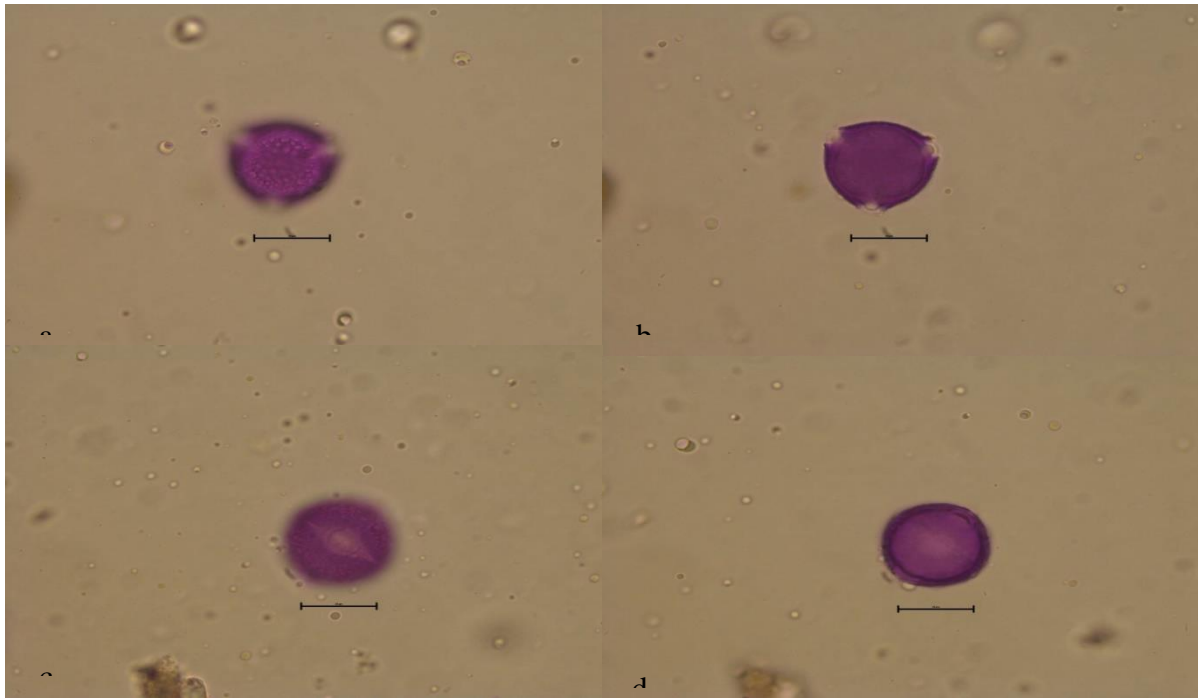


Figure 3. *H. helix* a-b: polar view; c-d: equatorial view (10x100) (20µm)

Table 1. The palynological measurements of *H.helix* (M: median, Var.: variation, S: standarddeviation).

P/E	Oblate spheroidal	0.99	Exine (µm)	M	2.21
				S	0.56
				Var.	1.5-3
P(µm)	M	30.23	Sexine (µm)	M	1.28
	S	0.77		S	0.48
	Var.	28-33		Var.	1-2
E (µm)	M	30.73	Nexine (µm)	M	0.85
	S	0.90		S	0.24
	Var.	28-32		Var.	0.5-1
Clt (µm)	M	4.56	Amb (µm)	M	29.16
	S	0.89		S	1.98
	Var.	3-7		Var.	26-33
Clg (µm)	M	21.37	t (µm)	M	12.23
	S	1.45		S	0.77
	Var.	20-24		Var.	9-16
Plt (µm)	M	6.45			
	S	0.51			
	Var.	6-7			
Plg (µm)	M	6.87			
	S	0.95			
	Var.	5-8			

In MediaWiki [14], *H. helix* pollens are 28 (26.2-31) μm (medium), tricolporate and mit reticulate, microreticulate or fossulate. triangular, spheroid (0.96), isopolar, heterobrochate, lumens are getting small toward the colpus. Apertur membranen are no ornamentation. Pore wide is 5.7 (5.2-6.4) μm . Apocolpium is broad.

In Pal dat [15], *H. helix* pollens are monad, medium-sized (26-50 μm), isopolar, spheroidal, outline in polar view: circular, shape (dry pollen): prolate, outline in polar view (dry pollen): triangular, aperture 3 colporate, ornamentation reticulate, heterobrochate.

palynological results are concordant to previous research about *H. helix* pollen investigations. Pollen grains of *H. helix* are radially symmetric, isopolar, 3-colporate with margo, reticulate and regulate (LM).

Conclusion

H. helix has common name “ivy” and has been traditionally used as medicine all

over the World. Pollen morphology of *H. helix* is determined. The remarkable property of this species, amb view is triangular-round and colpus margins regular, with a well-developed margo.

Hedera helix L.'nin Polen Morfololojisi

Öz: Bu çalışmada, *Hedera* L. (Araliaceae) cinsine ait *H. helix* L. polen morfolojisi ışık mikroskobu (LM) ile incelenmiştir. Yapılan incelemelere göre, bu taksona ait polenler tek, radyal simetrik, izopolar, oblat-siferoid ya da prolat siferoid, kolporat, retikülat and rugulat özellik göstermektedir.

Bu taksonlara ait palinolojik özelliklerin çeşitli palinolojik, taksonomik, melissopalinojik ve farmasötik botanik çalışmalarında taksonların daha doğru teşhis edilmesine yardımcı olacağını düşünmekteyiz.

Anahtar Kelimeler: Araliaceae, ışık mikroskobu, palinoloji, taksonomi

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