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Original Research Article

Morphology and anatomy: leaf, petiole and seed of *Disospyros kaki* Thunb. (Ebenaceae)

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ABSTRACT

Background: *Disospyros Kaki* Thunb. is native in Asia has fleshy fruit. The anatomy of leaf, petiole and seed coat is the additional role for the phylogeny of the plant.
Methods: Plant material was *Dipospyros Kaki* Thunb. was selected and the experiment was done using the resin methods. For epidermal cell and stomata, we peeled the epidermal layer after that photograph was taken.
Results: Presence of trichome hair, the density of stomata, bicollatrol type of vascular bundle, testal layer, seed xylem were the distinguishing characteristics of the plant which focus on the Ebenaceae.
Conclusions: Presence of trichome and vascular bundle is importance for the phylogeny of the plant.

Keywords: Anatomy, Ebenaceae, Resin, Seed coat, Vascular bundle

INTRODUCTION

Disospyros kaki Thunb is belongs to Ebenaceae native in Asia. *Disospyros kaki* Thunb. is a multi-stemmed or sometimes single-stemmed deciduous Plant height usually (22-33) ft. sometimes crooked or willowy; seldom with a spread of more than 4.5-6 m. Branches somewhat brittle and can be damaged in high winds. Leaves alternate, entire, ovate-elliptic, oblong-ovate, or obviate, 7.5-25 cm long, 5-10 cm wide, leathery, glossy on the upper surface, brown-silky beneath; bluish-green, turning in the fall to rich yellow, orange or red; petioles 2 cm long, brown-hairy. Leaf anatomy different their probability evolutionary adaptation of the plant.[1] Differences in the tree growth, photosynthetic characteristics and leaf morphology among four Japanese persimmon [*Disospyros kaki*] cultivars grown in warm climate.[1] The mechanism vascular tissue pattern was described and seed coat structure and dormancy for comparative analyses of leaf anatomy of dicotyledonous species.[2-5]

The primary focus on this study is the morphology and anatomy of the species. Disospyros *kaki* Thunb. we also aimed to describe the detail histological which will benefit for the phylogeny of the species.

METHODS

The sample was collected from the Kangwon province, Chuncheon-si South Korea between the September to October, 2017. Fresh leaf was peeled out the epidermal layer after that stained with 0.1% toluidine blue for 60-90 sec for stomata and epidermal cell Olympus BX-50 light microscope (Olympus Co. Japan), photographs were taken with the digital camera system attached to the microscope. The Collected leaves and seeds were fixed with the FAA (formalin: glacial acetic acid: 50% ethanol, 5:5:90, by volume). Mature leaves and seeds were selected than passed alcohol series like 50%, 60%, and 70% 80%, 90%, 95%, 99% and 100% than alcohol: technovit 7100 resin. Serial section of 5-6 µm thickness were cut using disposable blade knives stuck into glass

slides, and dried on electrical slide hot plate for 24 hr. dried slide were stained with 0.1% toluidine blue for 60-90 sec. ringed with running water, and again dried on the electric hotplate for more than 6 hr to remove water. The stained slide were stained than mountain with Entellen (Merck Co. Germany Four permanent slides were observed under an Olympus BX-50 light microscope (Olympus Co. Japan), photographs were taken with the digital camera system attached to the microscope and multiple image alignment was done using Photoshop.

RESULTS

Simple leaf margin: entire; serrate Leaf shape: elliptic (oval); obviate pinnate leaf type and deciduous leaf blade length: 4 to 8 inches leaf color: green fruit color: orange; red; yellow fall characteristic: showy.

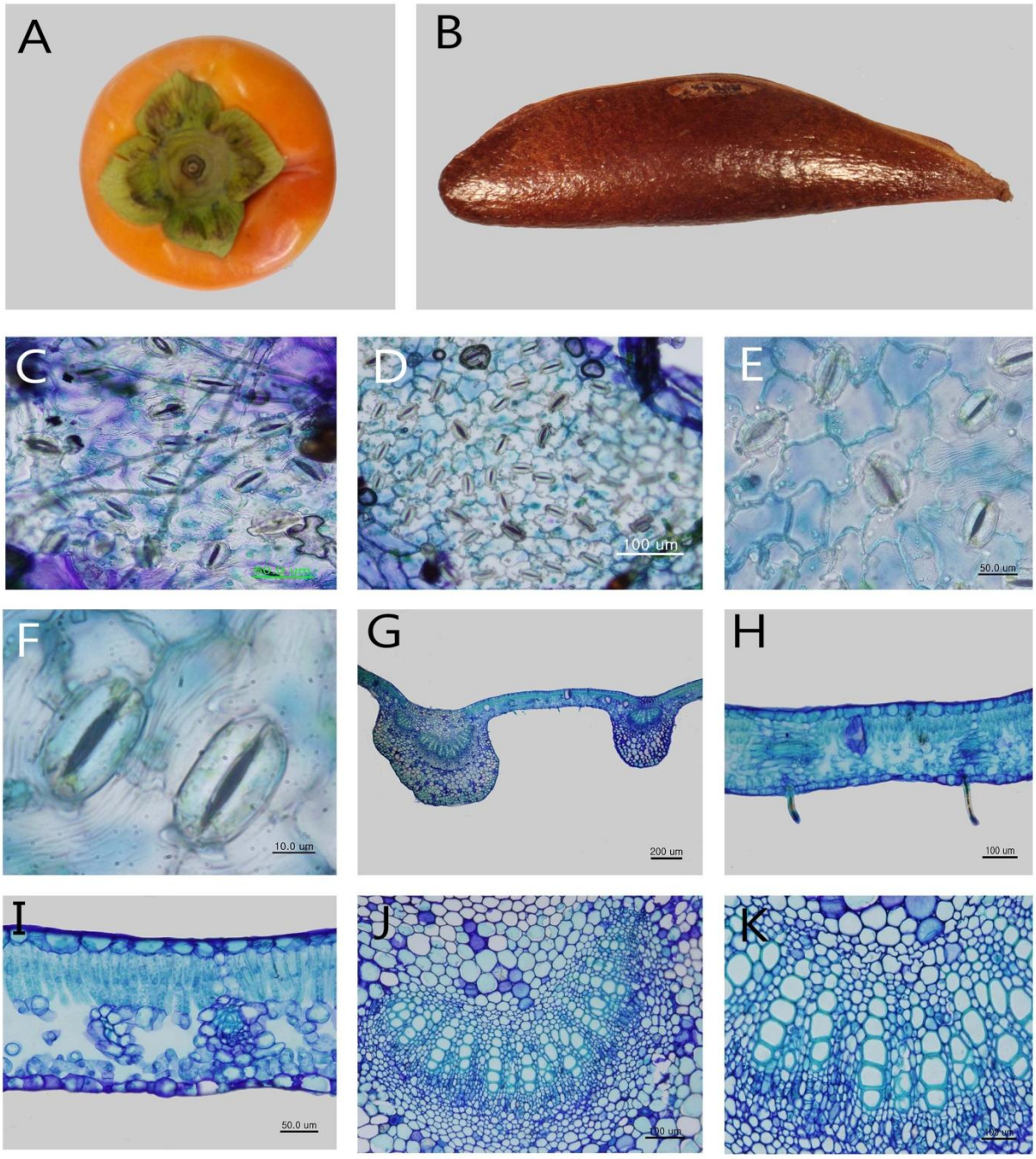

Figure 1: A=matured fruit; B=matured seed; C=net like structure and stomata; D=density of stomata; E=irregular shape of epidermal cell and stomata; F=magnifying stomata with 100 X; G=cross section of leaf with main vein and branched vein; H=cross section of leaf showing unicellular trichome hair; I=detail structure of leaf showing mesophyll cell, spongy cell; J and K=cross section of vein structure of vascular bundle.

Presence of dense stomata in the lower surface of leaf (Figure 1D), irregular epidermal cell was found (Figure 1E). Stomata were covered by five irregular epidermal cell. Unicellular, glandular trichome (Figure 1H) two layer of palisade parenchyma which have present in photosynthetic pigment. Protein cristae layer was in the leaf, highly interspace air cavity was formed due to the spongy parenchymatous tissue (Figure 1I). Conjoint and collateral vascular bundle was noted (Figure 1J). Metaxylem was highly thicker two layered walled connected with each other (Figure 1K).

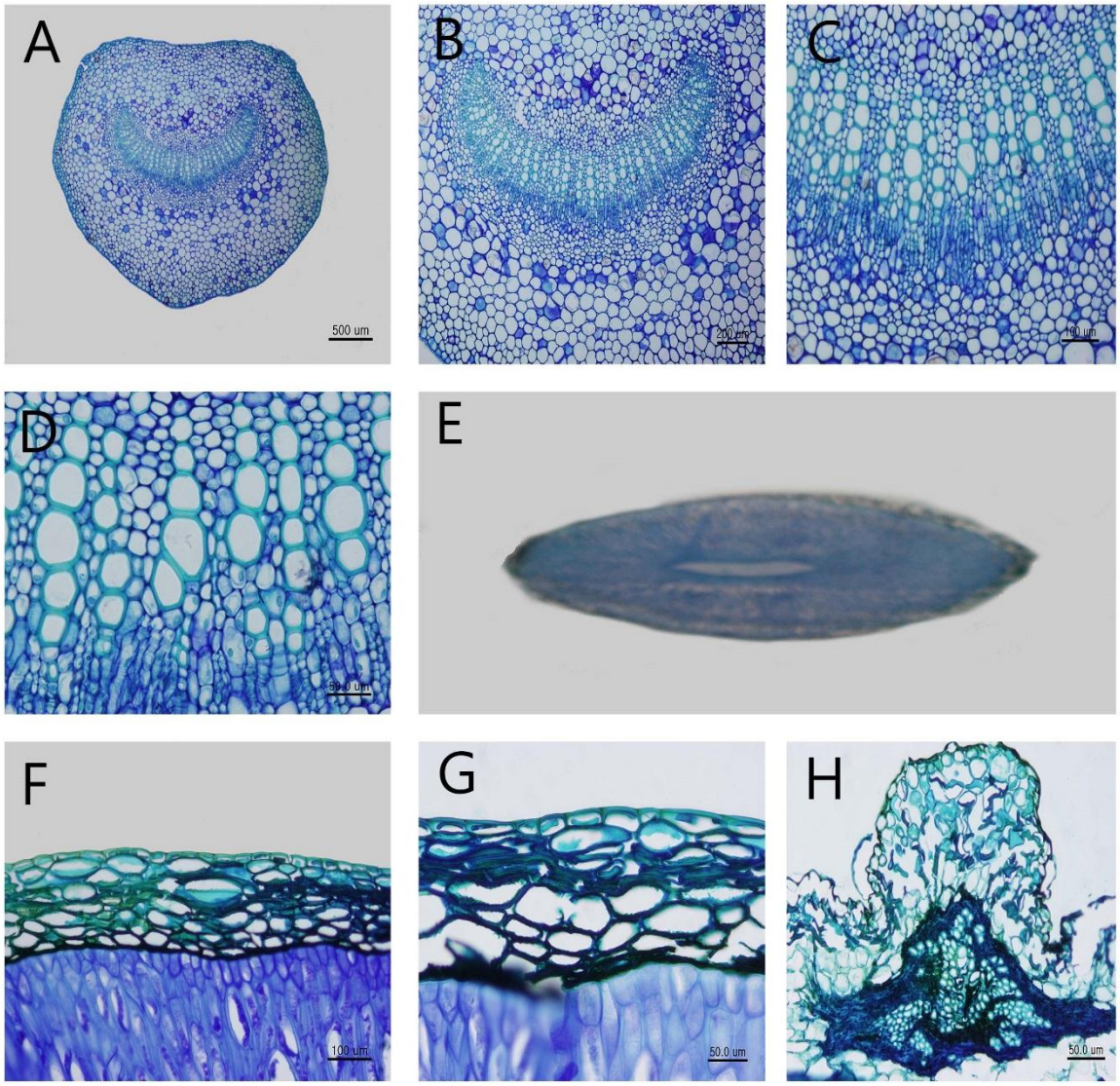

Figure 2: Cross section: A=petiole; B=petiole showing the vascular bundle; C=petiole magnification: xylem and phloem; D=regularly arranged xylem vessel showing in petiole; E=cross section of seed (without scale); F and G=cross section of seed coat; H=vascular bundle in seed.

Highly developed bicollatereal type of vascular bundle was found xylem was covered by the upper and lower Phloem tissue. Metaxylem was also noted two layered cell wall (Figure 2C and 2D). Rounded colancymatous cell was below the cuticle layer.

Ovule, round fruit length was 4-6 inches length, fleshy, orange color. Measurement of seed was 2.2-2.4 × 0.7-0.9 mm, ovule shaped, divided as embryo, cotyledons and seed coat (Figure 2E), the seed coat was single layer of exotesta layer 7-8 layer of testal cell (Figure 2F and 2G). At the end of seed there was vascular bundle was developed (Figure 2H).

DISCUSSION

Plant describe in Japanese, *Disospyros kaki*: Japanese Persimmon.[6] Here is a vast body of literature that

describes the anatomy of vascular tissue development the vascular system of seed plants is composed of a coherent network of strands called vascular bundle.[7] The xylem is the main conduit for water and mineral nutrients that travel from the root to the sites of vapor-transpiration in the shoot system. From the character studied, the anatomy and cuticle morphology of leaf, petiole and seed shows that the *Disospyros kaki* as their phylogeny affinity. Anatomical character which support the same clade of plant.[8] We found here, presence of bicollatrol vascular bundle in both leaf and petiole, the unicellular trichome hair was also the characteristic feature of Ebenaceae. Exotestal layer is highly mechanical and, vascular bundle was end of the seed tip.

CONCLUSION

We conclude that the structure of vascular bundle, presence of unicellular trichome, helps for the phylogeny of the plant *Disospyros kaki* in Ebenaceae.

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Ethical approval: The study was approved by the institutional ethics committee

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