

Macroscopic and Microscopic Studies of *Polyscias guilfoylei* L. H. Bailey Leaves (Araliaceae)

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ABSTRACT

Introduction: The leaves of *Polyscias guilfoylei* L. (Araliaceae) were reported to have medicinal value. Therefore, authentication of the leaves of *Polyscias guilfoylei* L. is important to ensure the reproducible quality of herbal raw materials. **Objective:** This study aims to evaluate macroscopic and microscopic parameters of the leaves of *Polyscias guilfoylei* L. **Methods:** Organoleptic, macroscopy, and microscopy of fresh leaves and microscopy parameters of leaves powder were observed. **Results:** Organoleptic and macroscopic studies found that the leaves had a smooth surface with green color, pinnate venation, elongated to lanceolate shape, cuspidate apex, serrated margin, broad base stem, a bit of distinctive smell, and characteristic taste. The leaves microscopy indicated the presence of anisocytic and paracytic stomata, druses type of calcium oxalate crystals, spiral type xylem, and essential oil were found. **Conclusion:** The results obtained can be used as quality control parameters, especially diagnostic features for the herbal raw material of *Polyscias guilfoylei* L.

Key words: *Polyscias guilfoylei*, Puding leaves, Araliaceae, Morphological studies, Plant anatomy.

INTRODUCTION

Polyscias guilfoylei L. (Puding leaves) belongs to Araliaceae family which commonly grows in Indonesia, especially in Sumatra, Java, Sulawesi, and Ambon.¹ This plant is cultivated as ornamental plant.² The leaves of this plant are used in traditional medicine for cold and head ulcers treatment.³ The current article describes some phytochemical analysis, antioxidant, and antimicrobial activities.⁴⁻⁷ Although the plant is widely studied, no studies characterizing the anatomy of *Polyscias guilfoylei* L. leaves have been conducted in detail when in fact the identification of correct species is important for quality control of herbal raw materials. The main objective of this article is macro- and microscopic features of the leaves of *Polyscias guilfoylei* L.

MATERIALS AND METHODS

The leaves of *Polyscias guilfoylei* L. (Araliaceae) were collected in August 2018 from Bogor, West Java, Indonesia and identified by Indonesian Institute of Sciences, Cibinong, West Java, Indonesia.

The leaves of *Polyscias guilfoylei* L. were separated from other parts, washed, and dried. The observed organoleptic parameters of *Polyscias guilfoylei* L. leaves, that were noted, consist of color, size (length and width), odor and taste. The macroscopic parameters of the fresh leaves including the type of leaf, shape, surfaces, venation, presence or absence of petiole, the apex, margin, base, lamina, and texture were noted.⁸ The macroscopic pictures were obtained using a digital camera (Canon G11).

The microscopic parameters of the fresh leaf and leaves powder were the identified fragment. Fresh

leaf was transversely sectioned with a sharp blade and the resulted thin slides were stained with chloral hydrate solution. Fragments were photographed with Nikon Coolpix 4500. Leaves powder on a glass object was stained with chloral hydrate solution and examined under a microscope. Parameter fragments were observed and photographed with a Nikon Coolpix 4500 microscope unit. Microscopic analysis was performed using a Nikon Eclipse E200 model microscope (objective: 10X and 40X).^{9,10}

RESULTS

Organoleptically, fresh leaves of *Polyscias guilfoylei* L. had a dark green color on the outer surface and light green color on the inner surface. Lengths of the leaves were between 5.4 – 12.9 cm and their widths ranged from 4.6 – 8.8 cm. The leaves had a bit of distinctive odor and characteristic taste. Macroscopically, the fresh leaf had a smooth surface, pinnate venation, elongated to lanceolate shape, cuspidate apex, serrated margin with 0.9- 3.6 cm long petiole, leaves with 3-4 pairs of leaflets on petiolules and broad base stem. The pictures of the leaves can be seen in Figure 1.

Microscopy of *Polyscias guilfoylei* L. fresh leaf showed in Figure 2. The transverse sections passing through the bone leaves of *Polyscias guilfoylei* L. (Figure 2A), both surfaces were lined with elongated epidermis cells (ep) with cuticle (Figures 2D and 2E), a vascular bundle like phloem and xylem arranged in the form of a ring around parenchyma (pa), collenchyma cells (co) below the epidermis (Figure 2B). The numerous calcium oxalate druse crystals (coc) were scattered throughout lamina (Figure 2C). The upper epidermis had trichome (tr) with a bulbous base and pointed apex (Figure 2F).

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The leaves powder had a light green color, characteristic taste, and distinctive odor. Leaves powder was examined by a microscope and the fragments of their elements were described. Photos of the diagnostic fragments were taken and given in Figure 3 which shows the presence of anisocytic and paracytic stomata embedded in lower epidermis cells (Figures 3A), spiral xylem vessels (Figure 3B), and druse crystals of calcium oxalate (Figure 3C).

DISCUSSION

Macroscopic and microscopic studies play an important role in the quality control parameters of the herbal raw materials.¹¹ The macroscopic parameters of the leaf can be used as its diagnostic parameters.

The microscopic parameters such as the presence of anisocytic and paracytic stomata with a single guard cell on the abaxial epidermis can be found in the characteristic features of the *Polyscias guilfoylei*.¹² The type of stomata is abnormal stomata. This study also verified the presence of the calcium oxalate crystals as the druses in the mesophyll. It can be distinguished by a group of *Polyscias-Pseudopanax*.¹³ The druse is a spherical aggregate of individual crystals.¹⁴ Spiral type of xylem vessels was found in leaves powder. This type of xylem vessel is typical for a vascular bundle of plants in Angiosperms.¹⁵ Concerning other distinctive parameters that were observed in *Polyscias guilfoylei* L., are the presence of trichome in the upper epidermal region. This study corresponded with other literature which stated that *Polyscias guilfoylei* L. contained essential oil.¹

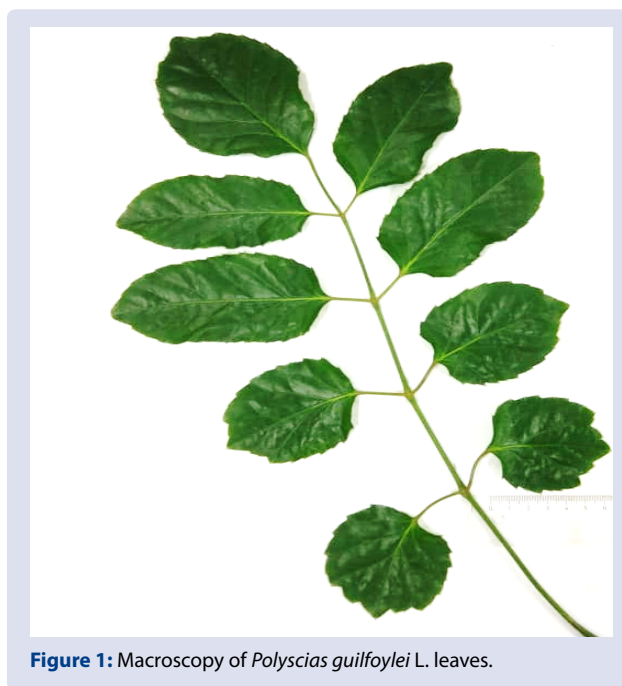


Figure 1: Macroscopy of *Polyscias guilfoylei* L. leaves.

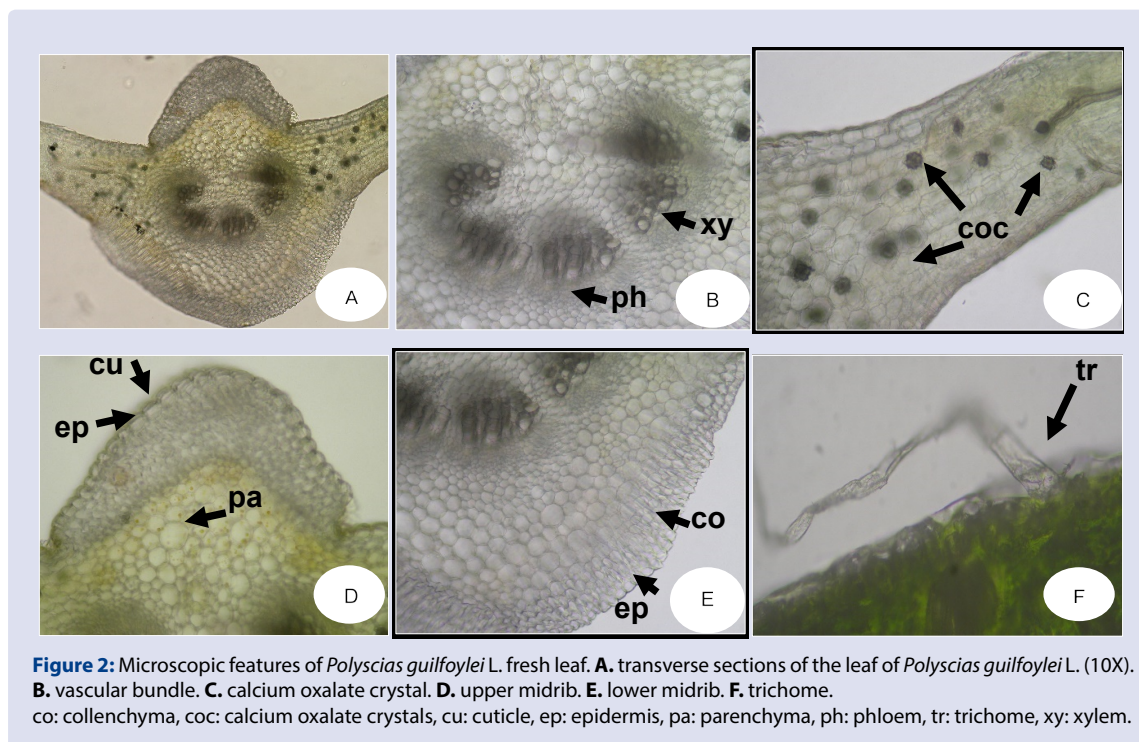


Figure 2: Microscopic features of *Polyscias guilfoylei* L. fresh leaf. **A.** transverse sections of the leaf of *Polyscias guilfoylei* L. (10X). **B.** vascular bundle. **C.** calcium oxalate crystal. **D.** upper midrib. **E.** lower midrib. **F.** trichome.
co: collenchyma, coc: calcium oxalate crystals, cu: cuticle, ep: epidermis, pa: parenchyma, ph: phloem, tr: trichome, xy: xylem.

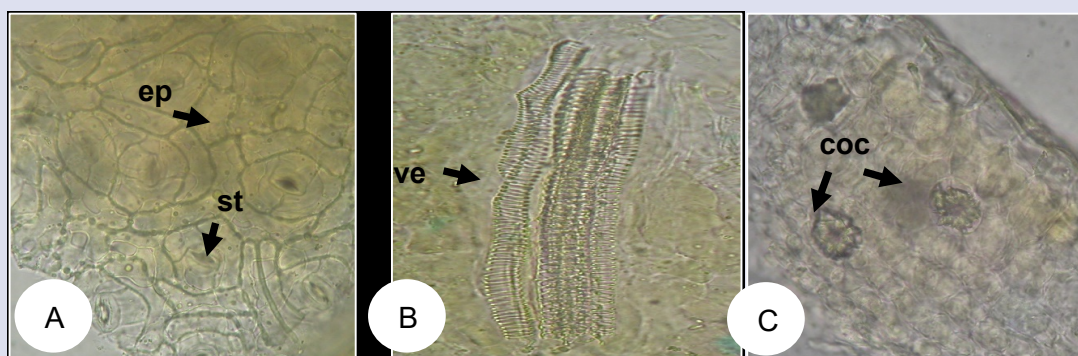


Figure 3: Powder fragments of *Polyscias guilfoylei* L. leaves. **A.** lower epidermis cells with stomata. **B.** group of vessels on a leaf. **C.** lamina with calcium oxalate druse crystals. coc: calcium oxalate crystals, ep: epidermis, st: stomata, ve: vessel elements. Bars: **A,B,C.** 40X.

CONCLUSION

The macroscopic and microscopic data in this study of *Polyscias guilfoylei* L. leaves can be used as to botanical authentication and quality control parameters of herbal raw materials.

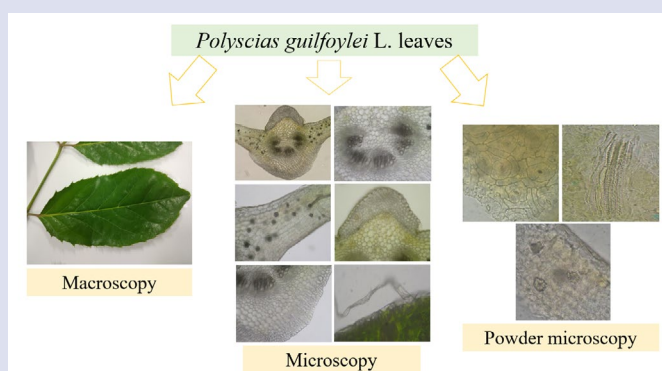
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GRAPHICAL ABSTRACT



SUMMARY

- Organoleptic and macroscopic studies found that the leaves had a smooth surface with green color, pinnate venation, elongated to lanceolate shape, cuspidate apex, serrated margin, broad base stem, a bit of distinctive smell, and characteristic taste.
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