

Comparative Study on the Morphological and Anatomical Characters of *Peperomia pellucida* L. (Kunth.) and *Piper longum* L. in Myitkyina Area

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Abstract

The present study was carried out the morphological and anatomical characteristics of *Peperomia pellucida* and *Piper longum* belonging to the family Piperaceae. The plants were collected from Myitkyina area. Morphological and anatomical studies were carried out Department of Botany, University of Myitkyina from June to November 2019. Anatomical characters of stem and leaves in *Peperomia pellucida* and *Piper longum* were studied, described and their photomicrograph were presented. The anisocytic type of stomata was present on both surfaces of *Peperomia pellucida* and cyclocytic type was found in *Piper longum*. Vascular bundle were collateral types. Trichomes were present in *Peperomia pellucida* and *Piper longum*.

Key Words: Epidermis, Trichomes, Vascular Bundles.

Introduction

Medicinal plants are essential plants for man, providing health care. Medicinal plants of *Peperomia pellucida* (L.) Kunth. *Piper longum* L., belonging to family piperaceae were focused on the morphological and anatomical characters grown in Myitkyina area, Kachin state. Myitkyina lies between North Latitude 25° 22' and East Longitude 97° 26'. The elevation is 159m above sea level.

The leaves and stems of *Peperomia pellucida* are uses in the treatment of arthritis and gout, analgesic, anticancer, antifungal, anti-inflammatory, cholagogue, diuretic and refrigerant. They are used in the treatment of bronchitis and asthma, headache and kidney problems etc. (Agarez *et al.* 1994).

Piper longum is commonly used to treat chronic bronchitis, asthma, constipation, gonorrhoea, paralysis of the tongue, diarrhoea, cholera, chronic malaria, viral hepatitis, respiratory infection, stomachache, bronchitis, diseases of the spleen, cough and tumors (Kim *et al.* 2006).

The aim and objectives of this research were to compare the differences of their morphological and anatomical structures of the vegetative parts of *Peperomia pellucida* and *Piper longum* and to examine the anatomical characters used for medicinal value.

Materials and Methods

Plants samples were collected from Myitkyina area, Kachin State. The collected specimens were studied, described and identified at Department of Botany, University of Myitkyina. The family of the collected specie was designated by flowering plants of the world (Hutchison, 1967), genus and species was identified by flora of Ceylon, Vol VI (Dassanayake 1997). The anatomical characters were carried out and identified by referring to literature of Anatomy of Dicotyledons, Vol II

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(Metcalf and Chalk 1972). Anatomical characters of selected species are described by dermal tissue system, ground tissue system and vascular tissue system.

Results

The morphological and anatomical characters of *Peperomia pellucida* and *Piper longum* in family Piperaceae were described.

Table 1. Comparative morphological characters of study species

| | Morphological characters | <i>Peperomia pellucida</i> | <i>Piper longum</i> |
|---------------|--------------------------|--|----------------------------|
| Habit | | Annual, delicate and succulent erect herbs | Perennial climber |
| Leaves | stipules | absent | present |
| | petioles | short, about 0.5 cm long | long, about 5 cm long |
| | shape | triangular ovate | ovate |
| | base | cordate | deeply cordate |
| | margin | entire | entire |
| | apex | short acuminate | acute |
| | surface | glabrous | minutely puberulous midrib |
| Inflorescence | position | terminal or leaf opposed | axillary |
| | type | spike | spike, erect |
| Flower | | bisexual | unisexual(dioecious) |
| | size&colour | small, pale green | small, pale yellow |
| | perianth | absent | absent |
| Androecium | stamens | 2, small | 2, small |
| | filaments | subulate | subulate |
| Gynoecium | ovary | superior | superior |
| | shape | globose or ovoid | ovoid |
| Fruit | type | berry, not fleshy | berry |



Fig 1. Habit of *Peperomia pellucida*



Fig 2. Habit of *Piper longum*

Table 2. Comparative anatomical characters of the leaf of study species

| Parts | Tissue system | Anatomical characters | <i>Peperomia pellucida</i> | <i>Piper longum</i> | |
|------------------------|---|---|---|---|------------------------|
| Petiole | Dermal tissue system | outline (shape) | creseent | creseent | |
| | | cuticle | Thick about 4um | Thinabout 2 um | |
| | | trichome shape | scgt, mut | sugt, mut | |
| | | epidermal cell (shape) | berral or polygonal | rounded or polygonal | |
| | Ground tissue system | collenchyma below the adaxial epidermis | 1- layered | collenchyma on the same radius with vascular bundle | |
| | | collenchyma above the abaxial epidermis | 1-layered | 4-7 layered | |
| | | parenchyma below the vascular bundle | 3-4 layered | 4-6 layered | |
| | | parenchyma above the vascular bundle | 3-4 layered | 3-5 layered | |
| | | secretory cells | (drue) | crystal sand | |
| | | xylem | 2-4, endarch | 2-4, endarch | |
| | | phloem | 3-4, collateral | 5-12, collateral | |
| | | pith | solid | hollow | |
| | Lamina | Dermal tissue system | Trichome type | scgt, mt | scgt, mt |
| Epidermal cell | | | 1-layered | 1-layered | |
| shape | | | barrel | barrel | |
| Stomata type | | | anisocytic | cyclocytic | |
| Ground tissue system | | Palisade mesophyll Shape | 1-2 layered, retangular | 1-2 layered, columnner | |
| | | Spongy mesophyll shape | 2-4 layered, polygonal | 1-2 layered, rounded or polygonal | |
| Vascular tissue system | | Vascular bundle shape | Collateral, oval | Collateral, oval | |
| | | | Epidermal cell | 1-layered | 1-layered |
| | | | shape | berral | berral |
| | | Ground tissue system | collenchyma below the adaxial epidermis | 2-4 layered | 1-2 layered, polygonal |
| | collenchyma above the abaxial epidermis | | 2-3 layered | 2-4 layered, polygonal | |
| | parenchyma below the vascular bundle | | 3-5 layered | 2-4 layered, polygonal | |
| | parenchyma above the vascular bundle | | 4-5 layered | 2-3 layered | |
| | Secretory cell | | druse | Slightly crystal sand in parenchyma cell | |
| | Vascular tissue system | Vascular bundle shape | Oval | Oval | |
| | | Xylem | 2-4 layered endarch | 2-4 layered, endarch | |
| | | Phloem | 5-8 layered | 7-10 layered | |
| | | Vessels | spiral | Spiral, pitted, scalariform | |
| | | Tracheids | spiral | spiral | |

scgt = stalked capitate glandular trichome, mut = multicellular uniseriate trichome

Table 3. Comparative anatomical characters of the stem of *Peperomia pellucida* and *Piper longum*

| Parts | Tissue system | Anatomical characters | <i>Peperomia pellucida</i> | <i>Piper longum</i> |
|-------|------------------------|-------------------------|--|--|
| Stem | Dermal tissue system | outline | cresent shaped | nerarly circular |
| | | cuticle | thick, about 4µm | thin, about 2 um |
| | | trichome shape | absent | scgt, mt |
| | | epidermal cell | berral-shaped or slightly polygonal | rounded or polygonal |
| | | chloroplast | present | absent |
| | Ground tissue system | collenchyma shaped | oval or polygonal | arranged on the same radius with vascular bundle |
| | | inner cortex parenchyma | 2-3 layered polygonal with intercellular space | 5-7 layered, polygonal with intercellular space |
| | | secretory cells | druse | sand stone |
| | | oil gland | absent | absent |
| | Vascular tissue system | vascular bundle | scattered, 1- row, collateral | scattered, 2-rows arranged in the ring, collateral |
| | | xylem | 1-2 layered, endarch | 2-4 layered, endarch |
| | | phloem | 3-5 layered | 4-8 layered |
| | | vessels | spiral | scalariform, spiral |
| | | tracheids | spiral | scalariform |

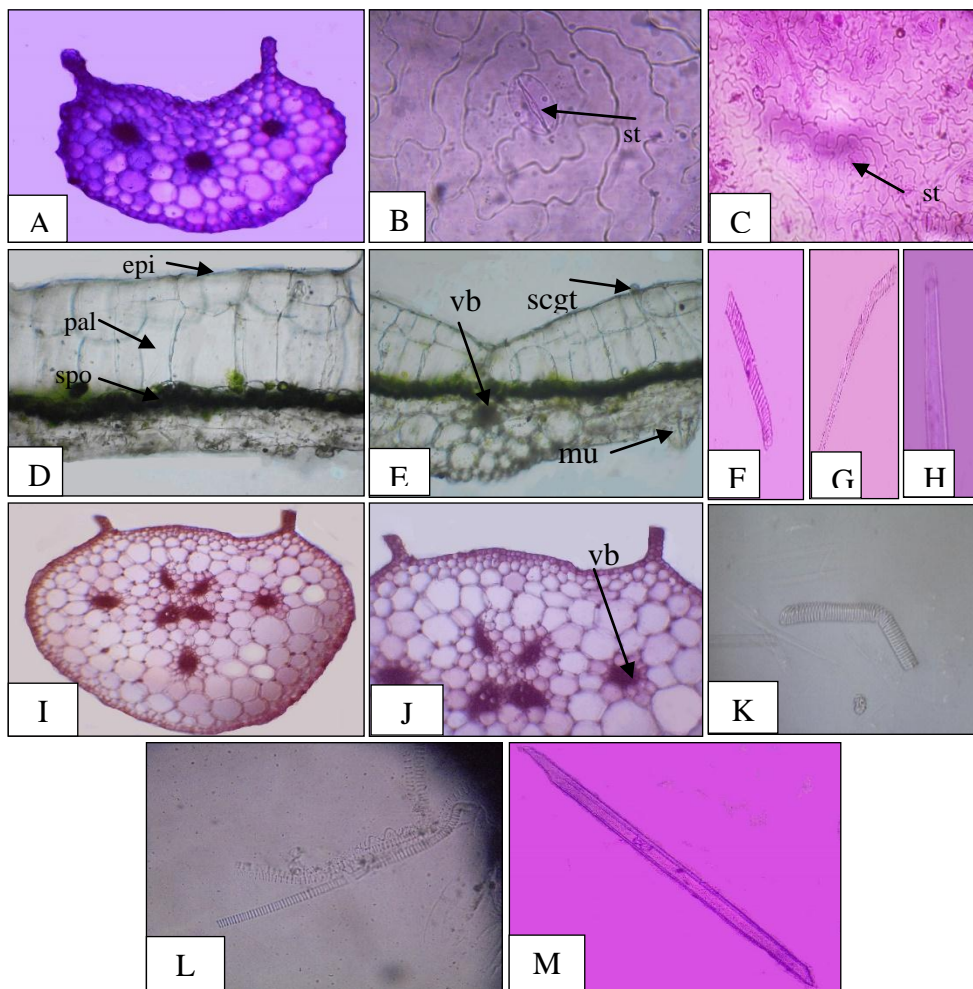


Fig 3. **A.** Internal structure of the leaf of *Peperomia pellucida* (L.) Kunth, T.S of petiole, **B.** Adaxial side of stomata, **C.** Abaxial side of stomata (st) **D.** T.S of lamina (epi=epidermis, pal=palisade, spo= spongy) **E.** T.S of midrib (vb=vascular bundle, scgt= stalked capitate glandular trichome, mu=multicellular uniseriate trichome **F.** Vessel, **G.** Tracheid, **H.** Fiber, **I.** Internal structure of the stem of *Peperomia pellucida* , T.S of stem in outline, **J.** T.S of stem showing vascular bundle (vb), **K.** Vessel, **L.** Tracheid, **M.** Fiber

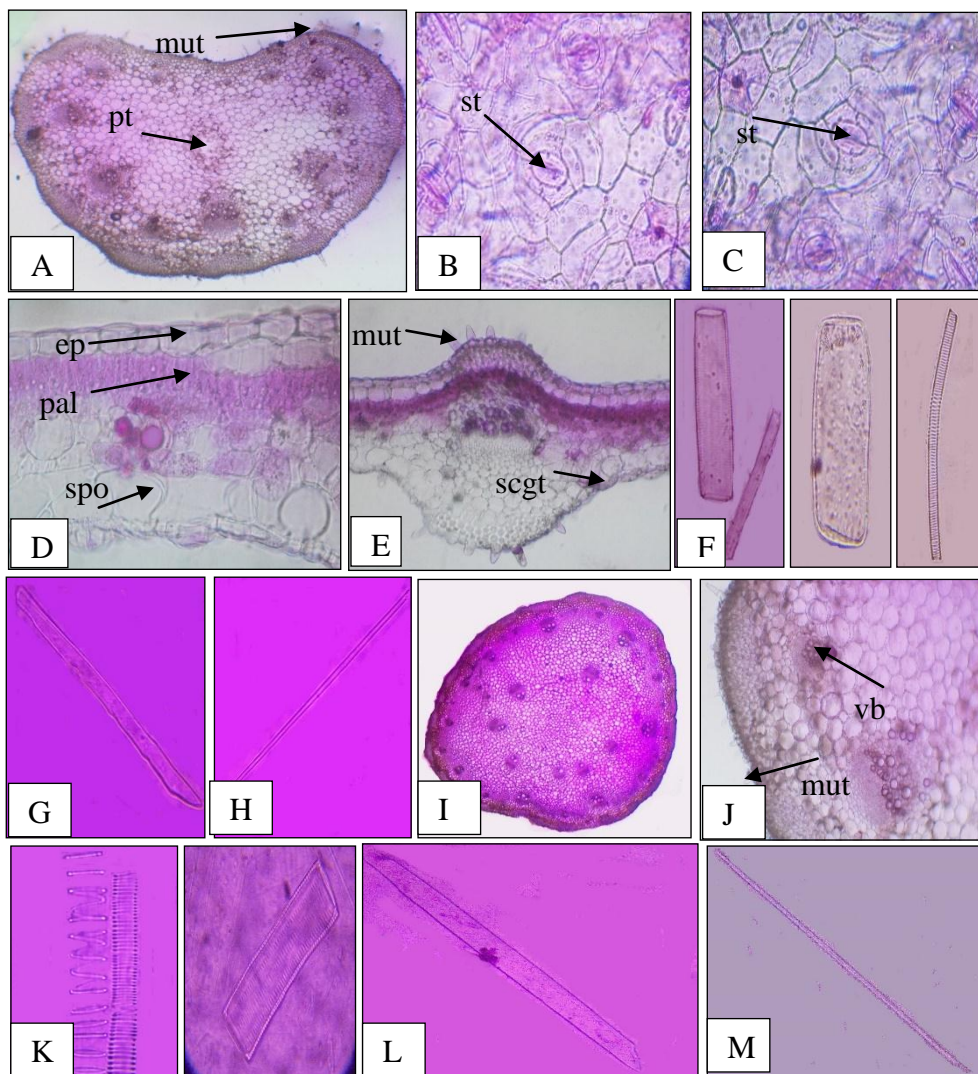


Fig 4. **A.** Internal structure of leaf of *Piper longum* L, T.S of petiole showing multicellular uniseriate trichome (mut), pith (pt), **B.** Adaxial side of stomata (st), **C.** Abaxial side of stomata, **D.** Transverse section of lamina (ep=epidermis, pal=palisade, spo=spongy), **E.** Transverse section of midrib (mut=multicellular uniseriate trichome, scgt=stalked capitate glandular trichome), **F.** Vessels, **G.** Tracheid, **H.** Fiber, **I.** Internal structure of stem of *Piper longum* L, T.S of Outline, **J.** Close up view of stem showing vascular bundle (vb) and multicellular uniseriate trichome (mut), **K.** Vessels, **L.** tracheid, **M.** fiber

Discussion and Conclusion

In this research, the morphological and anatomical characters of two species *Peperomia pellucida* and *Piper longum* belonging in family Piperaceae were studied.

In morphological characters, habit of *Peperomia pellucida* was delicate annual herb and *Piper longum* was perennial climber. The leaves of these species are simple alternate and deeply cordate leaf base in *Piper longum*. The inflorescences are spike and hypogynous with apetalous flowers. *Peperomia pellucida* was bisexual and *Piper longum* is dioecious. These species have 2 stamens and filaments subulate and fruit baccate. These characters are in agreement with (Dassanayake 1997).

In surface view of lamina, the stomata type of *Peperomia pellucida* was anisocytic type and cyclocytic type in *Piper longum*. These characters were in agreement with those mention by (Matcafte & Chalk, 1950).

In transverse section of lamina stalked capitate glandular trichomes and multicellular uniseriate trichomes were occurred in both species. Drues were found in *Peperomia pellucida* and crystal sands were found in *Piper longum*. The petiole of *Peperomia pellucida* was solid and *Piper longum* was solid. These characters are also in agreement with (Matcafte & Chalk, 1950).

According to (Matcafte & Chalk, 1950), vessels in *Peperomia pellucida* was spiral and *Piper longum* were occurred spiral, scalariform and pitted. Two species of study area were also found spiral vessels and spiral, scalariform and pitted vessels. Tracheids in *Peperomia pellucida* and *Piper longum* were spiral.

In transverse section of midrib the vascular bundles were collateral types and endarch in both species stalked capitate glandular trichomes and multicellular uniseriate trichomes were observed in both species. Drues were present in *Peperomia pellucida* and crystals sands were found in *Piper longum*. These characters are also in agreement with ((Matcafte & Chalk, 1950).

In transverse section of stems, was crescent shaped in *Peperomia pellucida* and solid pith. *Piper longum* was nearly circular shaped and hollow pith in outline. In ground tissue, cortex was composed of collenchymatous and parenchymatous cells in both species. Cortex including a well developed system of small intercellular spaces. Secretory cells present in *Peperomia pellucida*, cortical collenchyma including a continuous ring from no definite endodermal layer by (Yuncker & Gray, 1934). These characters were found in two species of study area.

Clusters of crystals present in the ground parenchyma of *Peperomia pellucida* examined by (Skottsberg, 1947). In transverse section, the vascular bundles were scattered, these characters recalling that of monocotyledons, which was agreement with (Matcafte & Chalk, 1950).

Peperomia pellucida and *Piper longum* were grown wild and abundantly found in study area. Decoration of *Peperomia pellucida* can be used for reduced uric acids.

In conclusion, the present research can provide the information of similarities and differences of morphological and anatomical characters of two species. It is hope that the results of the anatomical characters have useful information of medicinal value and references for other researchers.

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