

## **PRELIMINARY PHYTOCHEMICAL INVESTIGATIONS OF LEAVES AND PSEUDOBULBS OF *DENDROBIUM APHYLLUM* (ROXB).C.FICHER**

Kyawt Kyawt Khing<sup>1</sup>, Khin Myo Thant<sup>2</sup>

### **Abstract**

In this research, the studied plants were Myanmar medicinal orchids *Dendrobium aphyllum* belong to the family orchidaceae and locally known as Phayaungpanthit-khwa. This paper conducted morphological character, histological character and phytochemical constituents of the leaves and pseudobulbs of *Dendrobium aphyllum* (Roxb).C.Ficher were studied. The present studied plants were collected from South Dagon Township, Yangon Division during flowering period from December, 2017 to February, 2018. Fresh plants were grown in home garden. In morphological study, the collected plants were classified and identified with the help of available literatures. The plants were epiphytic herbs, evergreen stem, inflorescence raceme; flowers lavender. In histological studied free hand section of the leaves and pseudobulbs of fresh specimens were prepared by using the blade and examined by the help of microscope. Anomocytic type of stomata was abundant in lower surface and absent on upper surface. Vascular bundles of leaf and pseudobulbs were collateral and closed type. In phytochemical test, the powdered samples were examined by the method of (Trease and Evens, 1989; British pharmacopoeia 1968). Leaves and pseudobulbs were dried and powdered using the homogenizer. The preliminary phytochemical investigation revealed the presence of,  $\alpha$ -amino acid, carbohydrates, reducing sugar, glycoside, terpenoids and steroids but tannins, alkaloid, saponin, phenolic compound, flavonoid, starch were not detected in the plant.

**Keywords:** *Dendrobium aphyllum* phytochemicals.

---

<sup>1</sup> Associate Professor, Department of Botany, Ye Nan Chaung Degree College

<sup>2</sup> Associate Professor, Department of Botany, Myeik University

## Introduction

*Dendrobium* is one of the largest genera in orchidaceae family. The genus is comprised of about 1,100 species, and 150 species have been identified in Thailand. The stems of several *Dendrobium* species, locally known as 'Shi-hu', have been used in Traditional Chinese Medicine for reducing fever, nourishing the stomach and promoting the saliva production. In Thailand, the dried stems of *D. draconis* have been used in blood tonic effect in the form of the tea. Recent pharmacological investigation have shown that *Dendrobium* plants possess a wide variety of biological activities including cytotoxic, antioxidative, antimalarial, antifibrotic, hypoglycemic activities. (www.acgpubs.org).

*Dendrobium aphyllum* (Roxb.) C. Fischer is an orchid found in most collection. It is also known as the 'hooded-orchid' because of the cone shaped leaf of the flower. It is attractive and easily cultivated and has long, pendulous stems that become leafless in the resting period and, for a few weeks during the spring. It carries numerous, pinkish violet, fragrant flowers with a pale yellow or whitish lip. (www.phyhojournal.com.)

*Dendrobium* species of orchidaceae family has been credited as traditional medicine of the centuries in Asia, Europe and Australia countries with more than 1,100 species (Rosa, 2010). There are records of some species of *Dendrobium* used for medicinal purposes during ancient China during 2800 B.C (Hedge & Ingalhalli, 1988). Currently total of 74 species of *Dendrobium* plants found in China and about 30 species of them are used in tradition or folk medicine as antipyretic, eyes remedy, immunoregulator and as anti aging agent. (www.pakbs.org.PJ).

*Dendrobium pierardii* (or) *aphyllum* or *cucullatum* is an orchid found in most collection. It is also known as the 'hooded orchid' because of the core shaped lip of the flower. Racemes almost inflorescences, 1-3 flowered bundled from old leaves with fallen leaves for leaves, flowers spreading, pendulous. Sepals white purplish red above or sometimes entire lilac, petals; 2-3 cm long, 9-10 mm wide. beautiful pale pink flowers, with strong violet

fragrance, on long hanging canes. Also known as *Dendrobium aphyllum* or *pieradii*. Warm growing winter blooming. Blooms in the month of March/April. The plant *Dendrobium aphyllum*(Roxb).C.Ficher , petals much broader than the sepals, lip involute almost throughout the length; stem rather thin, pendulous; leaves ovate-oblong-lanceolate, acute, rather thin, native to South East Asia; in Java cultivated as an ornamental (Backer,1968). In this research, morphological characters, microscopical features of fresh and dried powder of leaves and pseudobulbs of *Dendrobium aphyllum*(Roxb).C.Ficher were have been undertaken. The aim of the present study was to identify the plant *Dendrobium aphyllum*(Roxb).C.Ficher by using vegetative and floral parts to investigate the histological characters of leaves and pseudobulbs and to investigate and revealed the phytochemical analysis of leaves and pseudobulbs.

### Materials and Methods

The plants *Dendrobium aphyllum*(Roxb).C.Ficher were collected from South Dagon Township, Yangon Division during the flowering period from December 2017 to February 2018. The classification and identification of species was made by using the Backer, 1963. The leaves and pseudobulbs of *Dendrobium aphyllum*(Roxb).C.Ficher were used to study the histological characters. The fresh specimens were prepared by using the blade . Free hand sections of specimens were studied under the microscope. The collected leaves and pseudobulbs of *Dendrobium aphyllum*(Roxb).C.Ficher were repeatedly washed with tap water and finally with pure water. The sliced samples were dried under shades for three weeks. Dried samples were powdered by the grinding machine and were stored in air tight containers for the phytochemical investigation. Phytochemical analysis concerned with the presence or absence of alkaloids,  $\alpha$ -amino acid, carbohydrates, reducing sugar, glycoside, phenolic compound, starch, saponins, tannins, steroids, terpenoids and flavonoids were investigated by the methods of British Pharmacopoeia, 1965 and Trease and Evans, 1989. Preliminary

phytochemical examination was carried out in the Department of Botany, Yenanchaung Degree College. These results were shown in Table 1.

## Result

### 1. Morphological characters of *Dendrobium aphyllum*(Roxb). C. Fischer.

Sympodial epiphyte, ever green stem long, clubs-shaped 20-30cm long 2.00cm wide, large upwards and tapering, pear-shaped. Leave oblong lanceolate, acute about 6.00cm to 8cm long and 2.00cm to 3.00cm wide, margin entire and the tip acute both surface glabrous. Inflorescence, raceme, ovate 2.5 cm long 1.5cm wide, slightly lavender with faintly purple tip. Labellum lateral upper portion of the pseudobubs, 2 to 3 flower per node, peduncle very short cylindrical, green, lavender, resupinate, slightly fragrant, pedicel cylindrical, pale purple. Flower bracteate acute, dull white, glabrous, sepals 3 lavender, oblong lanceolate acute, fused of the base, forming mentum lavender, obtuse. Petals 3, 2 lateral petals oblong with deeply yellow in centre and purple at pointed end, finely pubescent on the upper surface, column short with stripe. Anther white, terminal, and celled, pollinia 4 in pairs. The stigmatic surface concaves, ovary inferior. Fig. 1-2.



**A.** Habit



**B.** Leaves

**Figure 1.** Habit and leaves of *Dendrobium aphyllum* (Roxb). C. Fischer.



C. Inflorescence



D. Flower

**Figure 2.** Inflorescences and flower of *Dendrobium aphyllum* (Roxb). C. Ficher.

## **2. Histological characters of *Dendrobium aphyllum*(Roxb).C.Ficher**

### **2 (a) Microscopically characters of leaves and pseudobulbs of *Dendrobium aphyllum*(Roxb).C.Ficher**

#### **Lamina**

In surface view, the epidermal cells of both surfaces were parenchymatous and thin walled. The cell walls of the upper surfaces and lower surfaces were polygonal to barrel in shape. Stomata were present on the lower surfaces and absent on the upper surface. They were anomocytic type.

In transverse sections of leaves, the cuticle layer of the upper surface and lower surface were thin. The upper epidermal cells were polygonal to barrel shape. The lower epidermal cells were similar in shape and size. The mesophyll cells were not differentiated into palisade and spongy parenchyma. The mesophyll cell consists of 8-10 layers of cells, which were oval to circular in shape and loosely arranged. They contained numerous chloroplasts. Small vascular bundles were present. The phloem cap and xylem cap were made up of three layer of sclerenchymatous cell. Each bundle was surrounded by a compact layer of thick-walled sclerenchymatous sheath, distinct from the

neighboring cells. *Dendroium aphyllum*(Roxb).C.Ficher was composed of annular and spirally thickened vessels, tracheids, fibres and xylem parenchyma. Phloem was composed of sieve-tubes, companion cells and phloem parenchyma cell Figure.(A and B ).

### **Midrib**

In surface view, the epidermal cells of both surfaces were parenchymatous and elongated along the length of the midrib. In transverse section, the epidermal cells of both surfaces were polygonal to rectangular in shape. The parenchyma cells were 4-5 layers in thickness above the vascular bundle and 2-3 layers in thickness below the vascular bundle. They were thin-walled and rounded to oval in shape.

The vascular bundle was more or less rounded in outline. Each vascular bundle was surrounded by a compact layer of sclerenchymatous cells known as the bundle sheath in layers. The cells were thick-walled, and lignified.

Vascular bundles of midrib were collateral and close type, the xylem cells are hexagonal, thick-walled, and lignified, composed of vessels, tracheids, fibers, and xylem parenchyma. The phloem cells were thin-walled and composed of sieve-tube, companion cells and phloem parenchyma cells Figure (C).

### **Pseudobulb**

In surface view of the epidermal cells were rectangular and compactly arranged, stomata were absent.

In transverse section, the pseudobulbs were circular in shaped. Epidermal cell were round to oval in shaped and uniseriate. Ground tissue consists of large and small parenchymatous cells. Air cavities were conspicuous.

All vascular bundles were associated with sclerotic sheath. Sclerotic sheath at phloem was 2-3 layered where as xylem was single layered. Large and small

vascular bundles were distributed in ground tissue. Vascular bundles were collateral and close type. The vessels of xylem were spiral, annular, sieve-tube, scleriform and pitted vessel Figure. ( Dand E).

### **Diagnostic features of powdered leaves and Pseudobulbs of *Dendroium aphyllum*(Roxb).C.Ficher**

#### **Sensory characters**

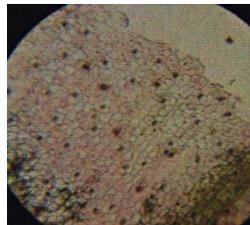
Light yellow green , characteristic odour .

#### **Macroscopical characters**

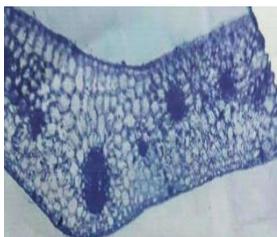
The leaves were oblong and Lanceolate acute, margin entire and the tip acute both surface glabrous .

#### **Microscopical characters**

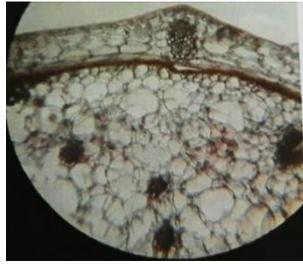
Fragments of epidermal cells ,fibres , unicellular trichome , trachied , spiral vessel , pitted vessel and sclereiform vessel were observed in powdered leaves and pseudobulbs .



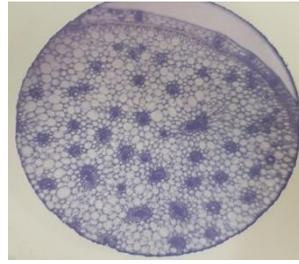
**A.** Upper surface of lamina      **B.** Lower surface of lamina



**C.** T.S of midrib



D. Pseudobulbs

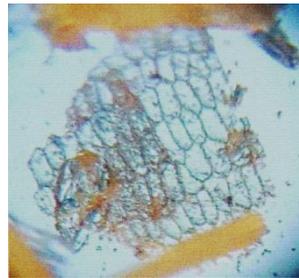


E. Pseudobulbs

**Figure 3.** Internal structural of leaves and pseudobulbs of *Dendrobium aphyllum* (Roxb). C. Ficher



A. Powdered leaves



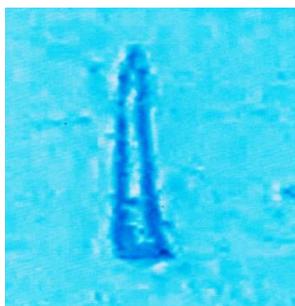
B. A fragment of epidermal cell



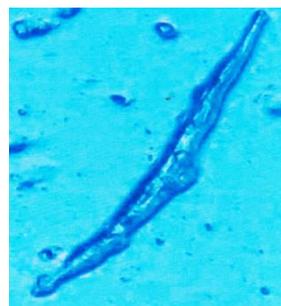
C. Fibers



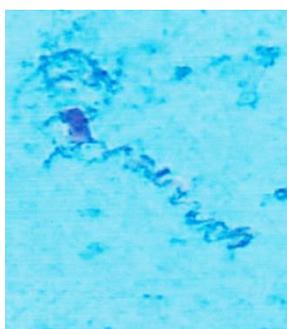
D. Fibers



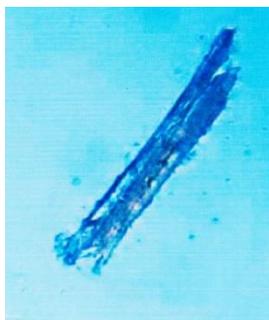
**E.** Unicellular uniseriatetrichome



**F.** Tracheid



**G.** Spiral vessel



**H.** Pitted vessel



**I.** Sclereiform vessel

**Figure 4.** Microscopical structures of powdered leaves and pseudobulbs of *Dendrobium aphyllum* (Roxb). C. Ficher

### 3. Preliminary phytochemical investigation of leaves and pseudobulbs of *Dendroium aphyllum*(Roxb).C.Ficher

The preliminary phytochemical examination of the leaves and pseudobulbs of *Dendroium aphyllum* (Roxb).C.Ficher indicated the presence of carbohydrate, glycoside,  $\alpha$ -amino acid, steroid, terpendoids , starch and reducing sugar. The results were shown in Table 1.

**Table 1.** Phytochemical constituent of leaves and pseudobulbs of *Dendroium aphyllum*(Roxb).C.Ficher

No.	Type of compound	Results	
		Leaves	Pseudobulbs
1.	Alkaloid	-	-
2.	Carbohydrates	+	+
3.	Glycoside	+	+
4.	Phenolic compound	-	-
5.	$\alpha$ -amino acid	+	+
6.	Saponin	-	-
7.	Tannin	-	-
8.	Flavonoid	-	-
9.	Steroid	+	+
10.	Terpenoid	+	+
11.	Reducing sugar	+	+
12.	Starch	+	+

(+) = presence

(-) = absence

### Discussion and Conclusion

In this research, the morphological characters , anatomical character and phytochemical study from leaves and pseudobulbs of *Dendroium aphyllum* (Roxb).C.Ficher have been carried.

*Dendroium aphyllum*(Roxb).C.Ficher belongs to the family orchidaceae. It is commonly known as Phayaungpan-thit-khwa in Myanmar . Sympodial epiphyte, ever green stem long, the, leaves oblong acute, margin entire and both surface glabrous; inflorescence, raceme, lateral upper portion

of the pseudobulbs; flowers, peduncle very short cylindrical, green, lavender, resupinate, slightly fragrant, pedicel cylindrical, pale purple, glabrous, sepals lavender, oblong lanceolate acute, fused at the base, forming a tube, petals 3, 2 lateral petals oblong ovate, lavender with faintly purple tip. Labellum is deeply yellow in centre and purple at the tip and finely pubescent on the upper surface, column short, with a stripe. Anther green yellow, terminal and two celled; pollinia 4 in pairs. The stigmatic surface is concave, ovary inferior. These characters were in agreement with those mentioned by Hooker, 1961; Backer, 1965; Moe Sandar Shein, 2008 and Mya Mya Than, 2008.

In these microscopical studies, the epidermal cells of both surfaces of leaves are polygonal in shape. Anomocytic type of stomata was present on the lower surface and absent on the upper surface. This finding agreed with those mentioned by Metcalf 1960; Pandey, 2001.

Mesophyll cell is homogeneous, not differentiated into palisade and spongy parenchyma. It consists of barrel and circular to oval shaped cells with intercellular space. Assimilatory cells are rich with chloroplast. This finding agreed with those mentioned by Metcalf, 1960; Pandey, 2001.

Vascular bundles are arranged in a single series with a layer, in the midrib a large vascular bundle at the center. Small and large vascular bundles on either side of it. This finding agreed with those mentioned by Metcalf, 1960, Pandey, 2001. The phloem cap is present. Xylem comprises tracheids and fibers. Phloem consists of sieve tube elements, companion cells, fibers and parenchymatous cells. This finding agreed with those mentioned by Metcalf, 1960; Pandey, 2001.

The preliminary phytochemical examination of the leaves and pseudobulbs of *Dendrobium aphyllum* (Roxb.) C. Fischer showed that the presence of carbohydrate, glycoside,  $\alpha$ -amino acid, steroid, terpenoids, starch and reducing sugar. These findings in this research agreed with those mentioned in the literature of (British Pharmacopeia, 1965).

For this reason, plants containing secondary metabolites are very important to us as potential ingredient of herbal and many modern medicines.

In conclusion, the study focused on the morphological characters and phytochemical characters. The morphological characters were useful information in identification of the plant. Phytochemical finding in this research could also be useful in medicinal plant research and production of drugs from plants.

For further research programme, pharmacological activities should be carried out concerning *Dendrobium aphyllum* (Roxb).C.Ficher , possess many medicinal values and other bioactive compounds should be isolated from plants parts.

### **Acknowledgement**

I would like to express my sincere gratitude to Professor Dr. Tint Khine Aye , Head of Department of Botany Yenanchaung Degree collage for her kind help with very effective suggestion , advice and encouragement throughout the research work . My warm thanks are also extend to Dr. Khin Myo Thant , Associate Professor , Department of Botany , Myike University , for her kind help in this work .

### **References**

- Backer C.A. (1963).Flora of Java Vol.III, NoordhoofGroninen Co., NetherlaBechtel
- Easu, K, (1965). Plant Anatomy, 2<sup>nd</sup> edition, John Wiley & Sons, Inc., New York.
- Harbone, J. B, (1989). Phytochemical Methods.Champman and Hall, London.Huda,
- Metcalfe CR (1960) Anatomy of the monocotyledons.Vol 1.Gramineae.Clarendon, Oxford.731 pp.
- Moe Sandar Shein (2008).Floristic study orchids in Kalaw Area of Sounthern Shan State (PhD disserlation).Department of Botang, Yangon University.
- Mya Mya Than (2008) Floristic study on orchids of Northern Chin State, (PhD dissertation).Department of Botang, Yangon University.

Pandey, S N., Achandha, (2001), Plant Anatomy and Embryology, Vikas Publishing House PVT LTD. New Delhi.

Saw Lwin (2006) Montane Orchid of the Kachin Hiss and Chin Nat Ma Taung (PhD dissertation). Department of Botany, Yangon University.

Trease, G.E. and Evans, W.C. (1989). **Pharmacognosy**. 11th edn. Brailliar Tiridel Can. Macmillian publishers.

#### Websites

1. [www.qcgpublishers.org](http://www.qcgpublishers.org).
2. [www.pakbs.org.PJ](http://www.pakbs.org.PJ)
3. <https://w.w.wpokbsorg.Pj.bol.PDP>.