

"A COMPREHENSIVE REVIEW ON *Plectranthus amboinicus*: BOTANICAL, PHYTOCHEMICAL, AND PHARMACOLOGICAL INSIGHTS"

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Abstract: The traditional systems of medicine, including Ayurveda, Sidda and Unani, have conventionally employed herbal drugs and about 80% of the world's population continues to use plant medicines due to their availability and fewer side effects. The majority of the modern allopathic medicines derive their active principles from plants, which indicates the contribution of natural products to drug discovery. This is a review of *Plectranthus amboinicus*, which is a highly documented medicinal member of the family *Lamiaceae* and the review provides information on its botanical description, phytochemicals, pharmacognostic details, and potential medicinal value. The plant is world-renowned for medicinally, gastronomically and aromatically serving various societies. Morphology based on microscopy and scanning electron microscopy validates some structural features needed to identify taxonomically and pursue pharmacognostic study. Besides, phytochemical screening also confirms the presence of alkaloids, glycosides, flavonoids, tannins, and other bioactive molecules, which gives credence to its pharmacological significance. It is the goal of this current review to see more light on *P. amboinicus* as a potential medicinal plant of multiple uses.

Keywords: *Plectranthus amboinicus*, Medicinal plants, Phytochemicals, Pharmacognosy, Herbal medicine, Natural drug discovery.

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Introduction:^[1,2,3,4,5,6]

Folk medicine, Ayurveda, Sidda, Unani and other traditional medical traditions all make extensive use of herbal remedies. Approximately 80% of people worldwide continue to depend on traditional herb-based remedies, according to the World Health Organization, because they are inexpensive, easily accessible and probably have less adverse effects than allopathic pharmaceuticals. Allopathic medicine's current utilization of many of the most potent active pharmacological molecules from plants and their derivatives is undoubtedly largely a result of knowledge of traditional medicinal techniques for the treatment of illnesses. Absolutely, the knowledge of traditional medical procedures for curing diseases is largely responsible for the use of many of the most potent active medication molecules of plants and their derivatives in allopathic medicine today. Natural plant-based molecules and their byproducts dominate modern drug discovery research, with synthetic chemicals coming in second. Nowadays, the pharmaceutical industry makes great use of natural goods since they are regarded as a significant source of medications. Due to the rising demand for medicinal plants worldwide in the current natural medicine grow older, new plant sources are being explored and exploited for their therapeutic qualities. There are about 300 species of *Plectranthus* that are found in the warm, tropical parts of the past world, such as Asia, Africa, and Australia. More than 85% of the literature on *Plectranthus* focuses on the genus's medicinal

benefits, which are followed by its horticultural and nutritional qualities, which are ascribed to its fragrant quality and capacity to produce essential oils. (Loureiro) *Plectranthus amboinicus* One of the *Lamiaceae* family's best-documented species is Springer. Information on *P. amboinicus*'s botanical description, phytochemistry, pharmacognostical, pharmacological, and Culinary uses compiled in this review.

Botanical Description:

Taxonomical:^[7]

Division: Magnoliophyta

Kingdom: Plantae

Clade: Angiosperms

Class: Magnoliopsida

Order: Lamiales

Family: Lamiaceae

Genus: *Plectranthus*

Species: *Coleus aromaticus*

Synonyms: *Coleus amboinicus* Lour

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Vernacular Names and Traditional Uses¹⁸

TABLE: 1. Vernacular names and traditional uses

| Country | Vernacular Names | Traditional Uses |
|-----------|--|--------------------------------------|
| Barbados | Poor man's pork, Broad leaf thyme | Folk medicine, Culinary |
| Cambodia | Sak dam ray | Folk medicine, Culinary |
| China | Da shou xiang | Folk medicine, Home garden |
| Cuba | orégano; orégano de Cartagena | Folk medicine, Culinary |
| Fiji | Rhaivoki, Sage | Folk medicine, Culinary |
| Germany | Jamaika thymian | Folk medicine, Culinary |
| Guyana | Thick leaf thyme, broad leaf thyme | Folk medicine, Culinary |
| India | Indian Borage, Pashan Bhedi, Karpooravalli, Patharchur | Folk medicine, Culinary, Home garden |
| Indonesia | Torbangun, Daun Kutjing | Folk medicine, Culinary, Home garden |

Morphological Features: [9,10,11]

The succulent shrub *P. amboinicus* has a propensity to creep or climb. In the wild, it can grow to a height of more than 1 m and a width of even greater. This large, sprawling succulent herb has a strong aroma and is meaty. The fleshy stems, which range in length from 30 to 90 cm are either (densely covered with soft, short, or erect hairs, pubescent) or have long, rigid hairs (his idly villous). The leaves are pubescent (thickly studded with hairs), broadly ovate to sub orbicular with a tapering tip (ovate), undivided

(simple) and extremely thick, with the lower surface having the greatest number of glandular hairs, giving the appearance of frosted. This leaf has a pleasant, aromatic flavor and a cool, pleasant scent. In a long, thin raceme, the flowers are pale purplish and arranged in dense whorls at distant intervals on a short, short-pedicel stem. A bell-shaped calyx and a smooth, two-lipped throat are features of flowers. The lower lip has four narrow teeth, while the upper lip is ovate and thin. Fruit nut lets measure 0.7 mm in length and 0.5 mm in width. They are smooth and pale brown in color. Rarely, *P. amboinicus* flowers and seeds are hard to gather.

Phytochemical Screening

TABLE: 2. phytochemical screening

| PHYTOCHEMICAL | TEST | OBSERVATION |
|-------------------------------|---------------------|--------------------------|
| Alkaloids | Mayer's test | Cream colour ppt |
| Glycoside | Keller kilians test | Brown ring |
| Tannins and phenolic compound | Lead test | Green colour |
| saponins | Foam test | Foam persists for 10 min |
| Terpenoids and phytosterols | Salkowaski's test | Reddish –brown ring |
| Flavonoids | Lead acetate test | Yellow ppt |
| | FeCl ₃ | Greenish –black colour |
| Protenins | Biurets test | Violet colour |
| | | |

Pharmacognostical Study:^[12]

To warranty the quality of plant medications used in traditional medicine, scientific methods must be applied. This study examines the medicinally relevant medication of *P. amboinicus* from a micro morphological perspective. Scanning electron microscopy helps solve taxonomic problems by obtaining structural details, avoiding oversimplified descriptions, and identifying phytoconstituents not visible



Figures.1.plectranthus amboinicus

Macroscopic Characters

The plant has a his idly villous or tomatoes fleshy stem of 30-90 cm. The leaves are simple, large, oval and thick. They are densely haired, with glandular hairs on the lower surface creating a frosted look. The leaf has a pleasant aromatic taste and refreshing odor. Flowers are pedicel led and pale purple, arranged in dense whorls along a long, slender raceme.

Histological Characters

Preparation of specimen

The leaves had been attached from the plant and fixed in FAA (5 ml Formalin + 5 ml Acetic Acid + 90 ml 70% Ethanol). After 24 hours of fixing, the specimens were dehydrated using a graded series of tertiary butyl alcohol. Infiltration of the specimens was carried out gradually. Melt paraffin wax (58-60°C) until the tertiary butyl alcohol solution reaches saturation. The specimens were cased into paraffin blocks.

Sectioning

The paraffin coated sample was sectioned with a rotary microtome. The thickness of the slice was 10-12 μ M. Following dew axing, the

slices were dyed with toluidine blue. Toluidine blue, a polychromatic stain, provided excellent staining results and induced photochemical reactions. The dye was used to color cellulose walls pink, lignified cells blue, suborn dark green, mucilage violet and protein bodies blue. Sections were further stained with safranin, fast green and iodine for starch analysis. To evaluate stomata morphology, flesh pattern and trachoma distribution, par dermal sections, leaf cleaning with 5% sodium hydroxide and epidermal peeling using Jeffery's maceration method were used. Temporary glycerin-based treatments were used for macerated materials.

Photomicrographs

Micrographs are used to enhance microscopic descriptions of tissues as needed. Photographs were shot at various magnifications using Nikon Labphot-2 microscope devices. For normal observations a bright field was used. Polarized light was used to analyze crystals, starch grains and lignified cell structures. These structures have a birefringent feature, making them look bright against a dark background when exposed to polarized light.

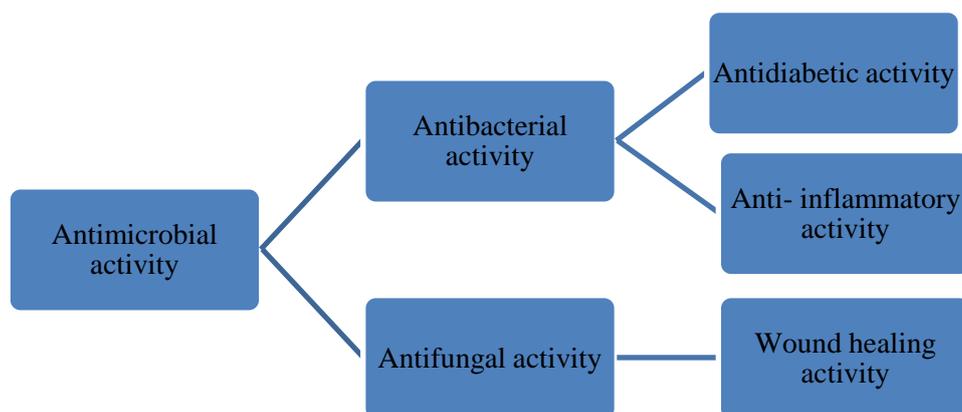
Scanning Electron Microscopy (SEM)

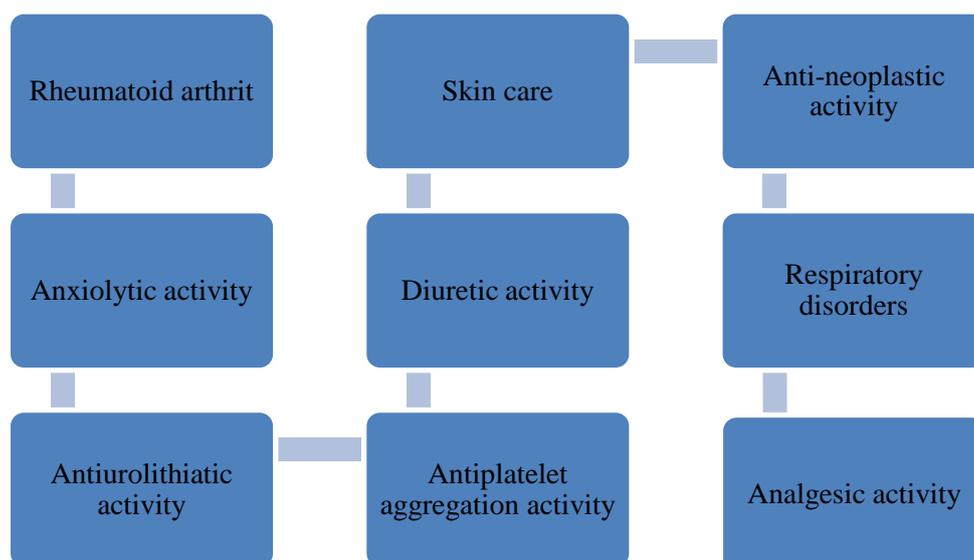
SEM creates a three-dimensional image on a cathode ray tube by focusing a stream of electrons on an object and reading the scattered and secondary electrons. This microscope uses electromagnetic lenses and focuses by varying the current. The image is projected on a photographic plate on screen, providing a clear three-dimensional representation of the object under examination. This allows for a better understanding of the ultra structure of plant cells. Additionally, it shows geographical relationships, unexpected subtleties, and previously unknown characteristics. SEM micrographs provide detailed structural information about the specimens.

SEM Sample preparation

SEM samples were mounted on specimen stubs using finical adhesive. Small samples were placed on Scotch double adhesive tape. The samples were coated with gold to a thickness of 100 AO using a Hitachi vacuum evaporator. Coated samples were evaluated using a Hitachi Scanning Electron Microscope model S-450 at 15 kV and photographed.

Quantitative microscopy was used to measure stomata number, index, and trachoma length in fresh plant leaves. Researchers studied total ash, water soluble ash, acid insoluble ash, extractive values for different solvents, and drying loss. The dried powdered leaves were tested to Identify Pharmacological activity:[20]





Culinary uses

Plectranthus amboinicus is referred to as Indian borage in India due to its strong flavor. It tastes much like oregano, thyme and Iowan caraway spices and would be particularly good for seasoning curry, fish, and lamb dishes. It also goes well with these herbs. This herb is used by the West Indies most frequently with jerk seasonings, in Cuba with black beans and salsa, and in Japan as spinach.

Conclusion

Plectranthus amboinicus is a valuable medicinal plant with extensive applications in traditional medicine, culinary use and modern pharmacology. Its richness in phytochemical content, including alkaloids, flavonoids, glycosides, tannins, and terpenoids, is the basis for its therapeutic effect in various ailments. The morphological and pharmacognostical characteristics of the plant provide a strong basis for the identification and quality control of the plant in herbal medicine. As the demand for natural medicine grows, there will be more scientific research and clinical trials on *P. amboinicus* that will further cement its medicinal value and open up its horizon for drug development. This review emphasizes the preservation and research of this plant for its possible contribution to conventional as well as alternative medicine.

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