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plectranthus amboinicus, pharmacological activity, phytochemicals

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Abstract: In this comprehensive review, we delve into the captivating world of Plectranthus amboinicus, unearthing its rich phytochemistry, traditional applications, medicinal prowess, potential side effects, and promising future prospects. This remarkable botanical gem has long been revered in the realm of herbal remedies, offering solace to those afflicted with a myriad of ailments including flu, asthma, cardiovascular disorders, and eczema. The plant's therapeutic potential knows no bounds, boasting an impressive array of medicinal properties that encompass antimicrobial, anti-inflammatory, antifungal, antidiabetic, antineoplastic, anxiolytic, analgesic, antibiofilm efficacy, antimalarial, wound healing, diuretic, respiratory support, antiplatelet aggregation activities, and skincare. These extraordinary attributes can be attributed to the presence of an assortment of vital constituents or secondary metabolites, namely flavonoids, glycosides, tannins, phenols, and steroids, which have been meticulously identified through a myriad of cutting-edge spectroscopic methods.

Every part of this botanical marvel has been harnessed to create potent medicinal formulations, harnessing the power of its diverse constituents. With such a treasure trove of essential elements, this plant holds the promise of delivering efficacious medicines without the burden of undesirable side effects.

KEYWORD: plectranthus amboinicus, pharmacological activity, phytochemicals.

INTRODUCTION:

Plectranthus amboinicus, a renowned member of the illustrious Lamiaceae family, graces the landscapes of India with its presence. This extraordinary plant possesses remarkable medicinal properties, making it a cherished ingredient in traditional remedies and syrups. Its healing prowess extends beyond the realm of folklore, as it has proven effective in combating ailments such as the flu, bronchitis, and even epilepsy. A captivating photochemical

analysis has revealed the presence of flavonoids, including the enchanting luteolin, apigenin, and salvigenin. The Lamiaceae family, with its rich tapestry of approximately 200 genera and species, has a storied history of therapeutic applications and culinary delights.

The botanical name bestowed upon this remarkable Plectranthus amboinicus, herb, serves as a beacon, guiding us to its rightful place in the taxonomic hierarchy. The term "amboinicus" pays homage to the majestic Ambon, a lush and mountainous island nestled within the Maluku archipelago near Indonesia. From this the plant embarked on a journey, verdant paradise, spreading its roots throughout the East Indies and Africa, until it found solace in Latin America, courtesy of the Spanish explorers.

They christened this herb as "oregano de la Hoja Ancha," a testament to its wide and bountiful leaves. Even today, Cuban oregano thrives in the untamed rainforests of Indonesia and Malaysia, captivating all who encounter its resilient nature. Its popularity as a house plant knows no bounds, as it flourishes effortlessly and endures neglect with grace.The herb Coleus aromaticus, a member of the esteemed Lamiaceae family (formerly known as Labiatae), and now classified as Plectranthus, is a magnificent perennial herb that tantalizes the senses. Standing tall at a height of 30-90 cm, this succulent marvel boasts succulent leaves and a robust stem.

Its branches reach out in all directions, exuding an intoxicating aroma that is truly one-of-a-kind. This botanical treasure can be found gracing the landscapes of India, and its allure has led to its cultivation in gardens. The leaves of this herb possess a tantalizing flavor that enhances the taste of meat and fish, while also serving as a delightful remedy for unpleasant odors. The realm of the food industry holds immense potential for further exploration of this extraordinary herb's applications.

Figure 1.1 Plectranthus amboinicus plant.

History of Plectranthus amboinicus:

The appellation Plectranthus is derived from the elegant fusion of the Greek words "plectron," which signifies a delicate spur, and "Anthos," which signifies the epitome of beauty - a flower. This nomenclature pays homage to the exquisite spur-shaped flowers that grace certain members of this genus. However, the lack of distinct morphological characteristics to differentiate between species within the Plectranthus genus and its closely related counterparts has given rise to a plethora of taxonomic predicaments. Consequently, misidentifications and erroneous placements of species have occurred, particularly in the closely linked Solenostemon, genera of Coleus, and Englerastrum.One such species, P. amboinicus, initially found its classification under the genus Coleus, only to be later relocated to the esteemed Plectranthus genus. Both names, however, persist in the literature to this day. Remarkably, P. amboinicus boasts the largest number of synonyms among its counterparts. These synonyms include Coleus aromaticus Benth,P. aromaticus Roxb, and C. amboinicus Lour. The enigmatic origins of P. amboinicus remain shrouded in mystery, with speculations pointing towards Africa and India. Nevertheless, this captivating species has traversed continents, finding its way into the hearts and gardens of enthusiasts worldwide.

The designation "amboinicus" stems from the collection of the species' type specimen in the enchanting lands of Amboina, nestled within the Moluccas. Regrettably, taxonomic revisions of Plectranthus have predominantly occurred on a regional scale, rather than an international one. This localized approach has inadvertently contributed to a perplexing misunderstanding of the very species it sought to elucidate. Nonetheless, the traditional uses of Plectranthus, spanning the globe, are meticulously cataloged in the illustrious Table 1.1.

Table 1.1 lists the colloquial names and customary applications of Plectranthus amboinicus that people in the respective countries frequently use.

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
Malaysia	Daun bangun-bangun, Pokok bangun-bangun	Folk medicine, Culinary, Home garden
Philippines	Latai, Suganda, Oregano	Folk medicine, Culinary, Home garden
Puerto Rico	Puerto Rican oregano brujo, Cuban oregano	Folk medicine, Culinary
South Africa	Sup mint, French thyme, Indian mint	Folk medicine, Culinary, Home garden
Thailand	Hom duan huu suea, Niam huu suea	Folk medicine, Culinary
USA	Indian Borage, Country borage, Spanish thyme, Mexican mint, French thyme, Indian mint	Culinary, Home garden
Vietnam	Can day la	Folk medicine, Culinary
West Indies	French thyme, Spanish thyme, Broad-leaf thyme	Folk medicine, Culinary

Features of Morphology:

P. amboinicus is an exquisite succulent shrub that possesses a natural inclination for climbing or creeping. In its untamed habitat, this remarkable plant can grow to heights exceeding 1 meter, while its width knows no bounds. This sprawling succulent herb is a true marvel, with its fleshy composition and an aroma that is simply divine. Its succulent stems, ranging from 30 to 90 centimeters in length, are adorned with either long, rigid hairs or a dense covering of soft, short, and erect hairs, creating a captivating visual display.The leaves of P. amboinicus are a sight to behold, undivided and generously proportioned, with a tapering tip that adds an elegant touch. Their thickness is truly remarkable, and they are adorned with a thick layer of hairs, giving them a frosted appearance. The lower surface of the leaves is particularly adorned with numerous glandular hairs, further enhancing their allure. When one encounters the taste of these leaves, a pleasantly aromatic sensation fills the senses, accompanied by an agreeable and refreshing fragrance.

The flowers of P. amboinicus are a spectacle in their own right, delicately perched on short stems and arranged in pale purplish whorls at intervals along a slender raceme. The bell-shaped calyx and the smooth interior of the throat, adorned with two lips, create an enchanting visual contrast. The upper lip, ovate and thin, gracefully complements the lower lip, which boasts four narrow teeth. The corolla, pale purplish in hue, surpasses the calyx in length by fivefold, with a short tube, an inflated throat, and dainty lips.The fruit nutlets of P. amboinicus are a testament to its rarity, smooth and pale brown in color, measuring a mere 0.7 mm in length and 0.5 mm in width. Flowering is a rare occurrence for this extraordinary plant, making the collection of seeds a challenging endeavor.

Classification

DIVISION	Magnoliophyta.
KINGDOM	Plantae.
CLADE	Angiosperms.
CLASS	Magnoliopsida.
ORDER	Lamiales.
FAMILY	Lamiaceae.
GENUS	Plectranthus.
SPECIES	Coleus aromaticus.

Common names of Plectranthus amboinicus:

Kannada	Doddapatre, doddapatre soppu
Hindi	Patta ajavayin, Patharchur, Amroda, pathercheer
English	Country borage, Indian borage, Indian mint.
Bengali	Amalkuchi.
Malayalam	Panikoorka.
Gujarati	Ovapan.
Marathi	Pan ova.
Sanskrit	Karpuravalli, Sugandhavalakam, Parnayavani.

Cultivation: P. amboinicus, a plant of remarkable growth, is commonly propagated through the use of stem cuttings. This preferred method is due to its infrequent production of seeds. Flourishing in a well-drained and

partially shaded environment, this herb thrives in tropical and subtropical regions. Surprisingly, it has also demonstrated adaptability in cooler climates when cultivated in pots and brought indoors or sheltered during winter. Careful consideration must be given to watering, as this plant requires only a modest amount. To achieve optimal growth, P. amboinicus flourishes in nutrient-rich soil with a neutral pH and high humidity. However, excessive moisture in the ground may lead to root rot. Conversely, this resilient herb can withstand severe droughts due to its ability to store ample water within its succulent flesh. It also exhibits remarkable endurance in the face of scorching heat, intense sunlight, and even strong shade, although it thrives best under partial shade. These exceptional qualities make it an ideal choice for indoor cultivation, which has contributed to its rising popularity as a house plant in northern Europe. It is important to note that P. amboinicus is unable to endure temperatures below 0 °C and even temperatures below 10 °C cause it distress. Regrettably, there is limited information available regarding the commercial cultivation and harvesting practices of this herb.

Pharmacological Uses:

1. Antimicrobial activity:

The luxurious essential oil, derived from the dried leaves of P. amboinicus (Lour) Spring. from the enchanting Archipelago of the Comoros, was meticulously isolated through the process of hydrodistillation. To ensure its purity and potency, the oil underwent a thorough analysis using the sophisticated techniques of capillary gas chromatography (GC) and gas chromatography/mass spectrometry (GC/MS).The results of this meticulous analysis revealed the exquisite composition of this precious oil. Carvacrol, with its captivating aroma, dominated at 23.0%, followed closely by the enchanting camphor at 22.2%. The alluring Δ-3-carene contributed 15.0%, while the delicate λ-terpinene added a touch of elegance at 8.4%. The enchanting O-cymene and the mesmerizing α-terpinene completed this symphony of scents at 7.7% and 4.8% respectively.Intrigued by its captivating composition, the antimicrobial properties of the P. amboinicus Spring. leaf essential oil were meticulously investigated using the agar gel diffusion method. The enchanting results revealed that this extraordinary oil exhibited remarkable antimicrobial activity against the Gram-positive Staphylococcus aureus, surpassing its effect on the Gram-negative Escherichia coli.The potency of this luxurious oil was further demonstrated by its minimum inhibitory concentration (MIC). A mere 0.2% concentration was sufficient to inhibit the growth of E. coli, while an even more impressive 0.1% concentration achieved the same effect on S. aureus. Truly, this remarkable oil possesses the power to combat harmful microorganisms with unparalleled efficacy.

2. Antibacterial activity:

Plectranthus amboinicus ethanol extracts have antibacterial activity against Streptococcus mutans at a concentration of 50 g/ml. For a variety of factors, P. amboinicus leaves were chosen for the investigation against bacteria. In the traditional system, the leaves were used to treat cough, bronchitis, asthma, colds, and congestion in the nasal passages. Therefore, it may be concluded that this plant effectively inhibits S. mutans. In India, this plant is highly well-known. Due to Plectranthus amboinicus' widespread cultivation in India, plant components are readily available and reasonably priced.

3. Skin care:

Plectranthus amboinicus is most commonly used for skin conditions. Plectranthus amblycyticus exhibits anti-inflammatory properties that can quickly reduce swelling and redness in a variety of skin conditions, from bug bites and stings to other skin conditions including psoriasis and eczema. This herb is very helpful in removing irritation and itching.

4. Anti-inflammatory activity:

Tissue protein denaturation, a common occurrence, is the root cause of various ailments such as inflammation and arthritis. The transformation of tissue proteins also leads to the production of autoantigens within the body. Hence, it is of utmost importance to develop agents that can prevent the denaturation of proteins, as they hold the potential to serve as effective anti-inflammatory drugs.To determine the concentration that inhibits protein denaturation, a comparative analysis was conducted between a reference standard drug and a plant extract. Astonishingly, the effects of the plant extract surpassed those of the standard drug, proving its remarkable efficacy. The study utilized extracts of P. amboinicus to investigate the impact of inflammation at different concentrations, employing egg albumin as a testing medium. As a benchmark, acetaminophen was employed as the standard drug.

The inhibition of proteins varied depending on the potency of the extract, highlighting its diverse range of effects. Upon careful examination, it was discovered that the plant extract exhibited potent anti-inflammatory activity by effectively preventing in vitro denaturation. These remarkable effects can be attributed to the presence of polyphenolic compounds and the potential synergistic activity of multiple compounds within the extract.

5. Antineoplastic activity:

The remarkable efficacy of the essential oil of P. amboinicus (Lour) in combating the insidious B16F-10 melanoma cell line injected into C57BL/6 mice is truly awe-inspiring. Not only was the essential oil administered to the mice via i.p. at a dosage of 50 µg/dose for a duration of 21 days, but it also exhibited an extraordinary chemotherapeutic/chemopreventive effect on the development of lung metastasis. This groundbreaking investigation stands as the pioneering study to assess the impact of the essential oil of P. amboinicus (Lour) on a lung cancer model. Its unprecedented findings have unveiled a promising avenue in the realm of cancer research.

Conclusion:

The review's findings indicate that this plant can be utilized to cure a number of illnesses. Since the plant has been successfully utilised in traditional medicine since ancient times, further research is needed to determine its potential uses before it may be applied therapeutically. One of this plant's key characteristics is that it has a greater effect when combined with other therapeutic plants.

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