



Review Article

Scientific Basis for the Therapeutic use of *Plectranthus ambonicus*: A Review

Pooja Kamra^{1,2,*}, Mahaveer Singh³, Hardarshan Singh Lamba⁴, Birendra Srivastava³

¹ Research Scholar, School of Pharmaceutical Sciences, Jagatpura, Jaipur National University, Jaipur 302017, India.

² Department of Pharmacology, H.R. Institute of Pharmacy, Morta, Ghaziabad 201003, Uttar Pradesh, India.

³ School of Pharmaceutical Sciences, Jaipur National University, Jagatpura, Jaipur 302017, Rajasthan, India.

⁴ Department of Pharmacy, H.R. Institute of Pharmacy, Morta, Ghaziabad 201003, Uttar Pradesh, India.

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In this review, information about the Phytochemistry, Traditional uses, Medicinal uses, side effects and Future Prospective of *Plectranthus ambonicus* are given. *Plectranthus ambonicus* was used in hebal medicines for the treatment of various disorders like asthma, flu, eczema and cardiovascular disorders. The plant shows these properties due to the presence of various important constituents or secondary metabolites like flavanoids, glycosides, phenols, tannins, and steroids etc. which were already identified by various spectroscopic methods. The different parts of the plant were used to prepare medicines. As the plant contain various important constituents and also found effective in traditional system of medicine there is a future scope of this plant so that it can be used to prepare medicines which are effective against diseases without side effects.

Key words: *Plectranthus ambonicus*, Phytochemicals, Hydroalcoholic extract, Patharchur, Indian borage.

Corresponding author *

Pooja Kamra

¹ Research Scholar, School of Pharmaceutical Sciences, Jagatpura, Jaipur National University, Jaipur 302017, India.

² Department of Pharmacology, H.R. Institute of Pharmacy, Morta, Ghaziabad 201003, Uttar Pradesh, India.

E-mail: pooja_125kamra@rediffmail.com

1. INTRODUCTION

Plectranthus ambonicus is a well known plant which belongs to Lamiaceae family. These plants are found in almost all over in India and it is a medicinal plant which is used to treat in folkloric medicines. In other diseases like Flu, bronchitis and epilepsy it can also be used.

Phytochemical study shows that it contains flavanoids like apigenin, luteolin, salvigenin [1].

As with many plants, the botanical name of this herb *Plectranthus amboinicus* helps us to identify its place. In this case *amboinicus* refers to Ambon, a mountainous, fertile island located in the Maluku Islands near Indonesia. From there the plants propagation spread throughout the East Indies, Africa, and was eventually naturalized in Latin America by the Spanish, who named this herb 'oregano de la Hoja Ancha'. Cuban oregano can still be found growing wild in the rainforests of Indonesia and Malaysia, and because it is easy to grow, and can survive considerable neglect, it is a popular house plant found worldwide (<https://herbalremedies.knoji.com>). The herb *Plectranthus amboinicus* is the plant which is of botanical family Lamiaceae (family Labiatae) and genus Coleus (now known as Plectranthus). It is a big juicy perennial aromatic herb with 30-90 cm height, with a thick, fleshy leaves and stem. This is much branched, succulent herb with very unique smelling leaves which are aromatic. This plant is found in all over India and it is also cultivated in gardens. Because of taste and aroma the leaves of this plant are ideal for flavoring meats and fish, as it increases the taste of the dishes and also useful to cover bad odour [1].

These households in the countries of Asia. For the purpose of cooking this plant can be grown in the gardens. The antimicrobial, flavoring, antioxidant properties are being continuously processed to test potential by researchers in world. There's enough space for the research on the application in the food industry, however, the properties by which this plant shows its effect on stomach and assure about its use is still have to prove [3].



Fig 1: *Plectranthus amboinicus* (courtesy from <https://ipfs.io.com>)

Distribution

Plectranthus amboinicus is cultivated throughout India and in Malaysia. It is also found growing in various Asian and American countries and it can also be grown in gardens. Lamiaceae is a family that contains approximately 200 genera & species in the 3200 with a history of treatment in diseases and use in food. The plants of this family consist of essential oils including basil, mint, lavender, sage and oregano with a rectangular trunk.

This plant is widely cultivated and naturalized in the Old and New World Tropics. It is **also known as** Cuban oregano, Spanish thyme, Orégano Brujo (Puerto Rico), Indian Borage,

Mexican thyme or Mexican mint; syn. *Coleus amboinicus* Lour., *Coleus aromaticus* Benth [5].

2. PLANT MORPHOLOGY

Herbs are perennial aged 3 - 10 years old and highly fragrant. This plant can climb, or progress, and can reach about 1m height and leaves are thick, simple and light blade, a fat green opposite arrangement of leaves (2.5 - 3 cm long, 2.5 - 3 cm). Shape of the leaves is broadly oval or triangular shapes (cutting base and apex acute extensively).

Margins of the leaf are having crenate surfaces below contain numerous glandular hairs make winter trunk: trunk has tomentose (densely covered with soft short hairs). The flowers are 10 - 20 verticil with inflorescences (10 - 20 cm long). The flower is surrounded by many flower stalks dot flowers with the score close together where the flower ends not where the base. The flowers are bell-shaped sepals. Fruits are light brown nutlets are flat. This plant flowers in Singapore [6].

Classification

Division : Magnoliophyta

Kingdom : Plantae

Clade : Angiosperms

Class : Magnoliopsida

Order : Lamiales

Family : Lamiaceae

Genus : Plectranthus

Species : C. aromaticus

Synonyms : *Coleus amboinicus* Lour [5]

Common names of *Plectranthus amboinicus*

This plant is commonly known by different names at different places:

Kannada : Dodda pathre, dodda pathre soppu

Hindi : Patta ajavayin, Patharchur Amroda, pathercheer

English : Country borage, Indian borage Indian mint.

Bengali : Amalkuchi

Malayalam : Panikoorka

Gujarathi : Ovapan

Marathi : Pan ova

Sanskrit : Karpuravalli, Sugandhavalakam Parnayavani

Marathi : Pathurchur [6].

Plectranthus amboinicus (Lamiaceae) is very popular drug in India which is also called as oregano. In some countries this herb is used in treatment of ulcers. It's kind of a big juicy herb and has aromatic smell and it is very common without widespread cultivation. When crushed or squeezed the leaves give smell of mint and also they are thick and juicy. Different kind of phytochemicals are present in different parts of the plant like Fruits, flower stems, leaves, roots etc. Few nutrients of this plant are found to have important role in the treatment of diabetes. *C. aromaticus* is able to lower blood glucose levels so it can be used as an antidiabetic agent and also helps in other problems caused due to high

sugar levels like it may be useful in terms of diabetic wound healing to heal faster, because of its ability to prevent or it can decrease the risk of infection and complications [7].

3. USES OF *Plectranthus ambonicus*

This herb has traditional history. From many years this Golden herb is very effective in folkloric medicines. This plant is effective in wound healing with very less side effects so this herb is pretty impressive in this sense. The fatal toxic dose of this particular herb is tested in laboratory mice which shows that the plant *Plectranthus ambonicus* is a herb which has no side effects or we can say this amazing herb have no side-effects [7].

Plectranthus ambonicus is a herb which is used in the treatment of famous diseases like cephalgia, otalgia, anorexia, dyspepsia bloating, Colic, diarrhea, cholera, gums, seizures, asthma, cough, chronic bronchitis, kidney calculi, vesical calculi, hiccough, strangury, hepatopathy, fever and malaria. In Malaysia bruised spasm of *Plectranthus ambonicus* leaves poultice is used on bites of Scorpion and centipede. Mouth corners cracks are treated with this plant in Jawa. *Plectranthus ambonicus* shows antihelminthic activity which is already reported and it is cultivate widely because of this reason. In order to accommodate the increase in demand for herbal medicines, constant research and analysis has been conducted which will prove antioxidant activity of *Plectranthus ambonicus* after that this will be used as a tool in the treatment of diseases [7].

Members of the genus *Coleus* are very important because they provide food, medicine, and as ornamentals, Ayurvedic practitioners have used the *Coleus* varieties in chronic cough and asthma include calculus, gonorrhoea, heart disease, fever, piles, Dyspepsia. Since ancient times the plant was also widely studied for activities, such as previous biochemical anti mutagenic, cancer, etc, these components are antigenotoxic in characteristics and also they are a good source for the treatment of diseases [8].

Antimicrobial Activity

Microorganisms such as viruses, bacteria, fungi and protozoa are responsible for the various diseases evoked from the natural source. Throughout life of a human being. Everyone suffered from at least a few infections. Many infections require antimicrobial treatment to prevent further spreading which is major complication in treatment of disease by the drug. In ancient time extracts from plants and essential oils with antimicrobial agents is They are being investigated for use as alternative remedies in treating infectious diseases. Antimicrobial activity of oil of this plant and extract has been reported

Antifungal Activity

Fungi are the reason for destruction of food materials, plants and grains during storage. After that the food will release their nutritional value which makes it useless for consumption. From Total world's grain approximately 25% are contaminated by the mycotoxins known& also by the

metabolites of fungi 300 or more which are known to be toxic for humans and animals. *Plectranthus ambonicus* nanoparticles, made from its Extracts from various solvents and essential oil were effective as antifungal. Leaves have activity against *Aspergillus niger* and *Candida albicans* and *botrytis cinerea* [9].

Antiinflammatory Activity

Tissue proteins denaturation is a very common factor which is responsible for problems like inflammation and arthritis. Auto Antigen (AG) production inside the body is also caused by metamorphism process of tissue proteins. Agents that prevent denaturation variables are worthwhile to develop as anti-inflammatory drugs. By doing comparison of reference standard drug and the plant extract we can find the concentration that inhibit the protein denaturation .When compared with standard drug the effects were more effective. Extracts of *Plectranthus ambonicus* were used to study the effect on inflammation at different concentrations using egg albumin. The Acetaminophen is used as a standard drug. Depending on potency of extract inhibition of proteins varies. After study we found that plant extract shows anti-inflammatory activity as it prevents in-vitro denaturation. Effects are due to the presence of polyphenolic content and may be due to synergistic activity of more than one compound [1].

Antibacterial Activity

Plectranthus ambonicus ethanolic extracts have antibacterial properties with a concentration of 50g/ml against streptococcus mutants. Leaves were selected in the study against bacteria is due to various reasons. The leaves were used in the traditional system for the treatment of nasal congestion, bronchitis, asthma, cold, cough etc. Now it is also used in cancer treatment as it has anti tumour and cytotoxic activities. So we can say that this plant is effective against streptococcus mutans. This plant is very well known in India and is also cultivated widely so parts of the plants are easily available and they are also cheap [10].

Skin Care

The most popular uses is in the treatment of skin. In case of bites and stings of bugs to other skin diseases like psoriasis and eczema plant shows the anti-inflammatory compounds which are capable of reducing swelling and redness in a very less time. To eliminate irritation and itching this plant is very useful [11].

Antidiabetic Activity

Increased levels of sugar are reported in fasting rats after Control of diabetes mellitus in subsequent experiment date than basal value which is stored within 2-weeks. When treated daily with oral dose of *Plectranthus ambonicus* we found that the levels of blood sugar decreases in the subsequent trial date than their basal values, when given 400mg/kg anti hyperglycaemic dose of *Plectranthus ambonicus* extract it displayed dose-dependent decrease in enzymes. When the levels of enzymes were determined after fifteen days of plant extract treatment the enzymes such as

Plectranthus ambonicus withdrawal of glycolytic phosphoglucosomerase which results in increase and on the other side decrease in the activity of aldolase. The diabetic rats which were receiving *coleus aromaticus* extract in a dose of 400mg/kg the Glucose-6-phosphate depletion were significantly improved. The activity of extracts as anti diabetic is evaluated by carbohydrate metabolism enzyme activity. Alcoholic extract control the metabolism of carbohydrate in the alloxan induced diabetic rats. There are lots of phytochemicals are found in different parts of plants such as in root, Fruit, flower, stems and leaves. Some of the nutrients from the plant found as they act in decreasing the level of blood sugar. Also capable in lowering of blood sugar, so it may be useful in terms of diabetic wound healing to heal faster, because it has ability to prevent infection and complications [12].

Anxiolytic Activity

Commonly we used Light/dark box for rat as a model for screening drug having anxiolytic activity. It has been observed that number of transfer are not give good results the only measurement of the time spent in area of light gives good results when anxiolytic activity is determined. Extract prepared from alcohol can increase the amount of time in the area of light so that is the proof that this plant has anxiolytic property [13].

Diuretic Activity

Diuretic properties of the extract were evaluated in male rats which shows that Ethanolic extract of plant act as diuretic. Furosemide is (10 mg/kg) used as standard, while the normal saline solution (0.9%) were used as controls. Results shows that there are significant increases urinary concentrations of ions like Na, K and Cl and also in urine volume. So from this study it may be concluded that *Plectranthus ambonicus* Spreng leaves has diuretic activity [14].

Antineoplastic Activity

This plant is very widely used as medicinal plant in Brazil, especially in the north-eastern region for curing the diseases, including cancer, Brazilian use *Plectranthus ambonicus* in many areas, especially as coarse extracts for the treatment of diseases like inflammation and tumors. *Plectranthus ambonicus* extract which is hydroalcoholic can cur embedding of hepatoma cells intraperitoneal(i.p) into rat subcutaneous(s.c) tissue and in lowering ascites and tumor cells [15].

Wound Healing Activity

Plectranthus ambonicus has many capabilities to increase the healing process of wounds. The plant shows antimicrobial properties and also it is a powerful immunostimulant which aids the removal process of microorganisms that retard healing process and for the maintenance of path of normal progress. High content of zinc is present which supports important functions to promote and facilitate the healing of wounds. It is known as an anti-inflammatory which makes the process of healing fast, this is very important because the long term inflammation will slow wound healing. It is also

noted is a good antibacterial and antibacterial are the ones which can increase the healing activity of wounds. Therefore this is regarded as antibacterial agent and also the best wound healing agent proved by preventing the infection in various cases [7].

Respiratory Disorders

Leaves infusion or aromatic syrup is found very effective against cough. The details regarding this are not explained and only in the Zulu Medicine its use is reported. To flavour food the leaves of the plant are used. Further, this species uses in cattle [16]. In treatment of sore throat, a stuffy nose, congestion, painful sinuses etc. After chewing leaves gives relief as it contains those types of chemical compounds which act as good expectorant and remove the phlegm and mucus which helps to clear the sinuses. It also prevents development of bacteria and other pathogens which helps to increase the immunity.

Reduces stress and anxiety

This plant is not well known for its use against anxiety and stress; It contains some compounds and also some minerals which are mild sedative in nature. Because of this *Plectranthus ambonicus* is used particularly in the form of tea to treat the patients suffering from stress & anxiety which helps to induce peace of mind, relaxation and restful sleep [11].

Antiuro lithiatic activity

There is a water extract of the leaves of this plant which is used for determination of antiuro lithiatic activity on calcium stones in male rats. Extract prepared from Water of Plant was found effective in decreasing the build-up of calcium oxalate. These results demonstrate that the plant is effective in the treatment o calcium oxalate stones in the kidneys and urinary tract. The study revealed that there is high level of crystals of calcium oxalate in kidney and also high lipid levels in the blood serum. This shows that when hydro alcoholic extract of leaves was given it helps in decreasing the level of cholesterol and also other lipids like triglycerides in the urolithiatic rats [17].

Analgesic Activity

When Evaluated the ability of plant as analgesic on two animal models using Intraperitoneal injection of acetic acid which causes an increase in abdominal fluid prostaglandins such as PGE₂, PGF₂, serotonin and histamine. A study found that it reduce the cramps caused by acetic acid in rats and also the pain response but Not neurogenic (phase) Pain caused by intraplantar injection of formalin. Such results suggest that *Plectranthus ambonicus* shows effective analgesic activity. It exert analgesic effects and also anti inflammatory effect which is associated with inhibition of iNOS expression and NF- κ B COX-2 by inactivate them and this is possible reason for the use of this plant as an anti-inflammatory agent [18].

Cancer Prevention

As per earlier reports *Plectranthus ambonicus* shows antioxidant activity that came into the news recently and also

studies are going on now days to detect its effect on breast cancer and prostate cancer. Earlier studies shows that it can slow breast cancer and as this plant is effective in treating prostatitis so we can say that this can be helpful in prostate cancer [11].

Rheumatoid Arthritis

Plectranthus amboinicus may show different activity from the indomethacin that act on the enzyme cyclooxygenase. According to previous observation prednisolone is the only drug which efficiently decreases production of Cytokines and provides maximum protection in joint problems. Its activity against Rheumatoid Arthritis is based on the different mechanisms from NSAIDs Plant may improve healing and the use of NSAIDs is reduced so side effects produced are also less. Ingredients should be identified. An information which is unpublished says that when it is given in a dose of 5000mg/kg once it does not produced toxicity. We can say that the plant can be developed as disease modifying drugs against rheumatoid.

Antiplatelet Aggregation Activity

Stem extract was evaluated for determination of activity against platelet aggregation using different concentrations (50 - 250 g/ml, PRP) & ADP is the agonist used for this study, after the study the findings said that capacity of platelets to aggregate depends on dosage means higher is the concentration higher is the ability, We knew that platelets plays an important role in blood and also have important role in the cardiovascular diseases. Activity of platelets can affect the disease progression and also the stability of atherosclerosis, so the natural antithrombotic agents which are useful in improving platelet function are of great interest these days, which can show their effect in improving platelets function and also helpful in preventing cardiovascular disease [19].

Antimalarial Activity

Plectranthus amboinicus is a plant which is aromatic in nature and found growing in American and Asian countries and also in Malaysia. Traditional medical practitioners have claimed that this ancient medicinal plant can be effective as antimicrobial, able to act against fungi, can prevent malaria and can reduce fever. Studies shows that extracts found in Malaysia can act against malaria and it is also found that extract of this plant which is Indian variety can decrease the Plasmodium berghei yoelli parasitemia in suppression tests in rats, from this we can say that leaves of this plant can be used in the treatment of malaria [20].

Anti-Biofilm Efficacy

Methanol and ethyl acetate extract of *Plectranthus amboinicus* showed a dose-dependent inhibition on film-forming *S. pyogenes* which are inflammatory conditions like pharyngitis. From both the extracts Methanolic extract gives good results against test pathogen at minimal concentration. Extract prepared from Methanol contains various phytochemicals which have effects on biofilm formed by the pathogen. We can also say that this is the first plant which

shows activity against *S. pyogenes* which are present in upper respiratory tract [21].

Anticancer Activity

In vitro Properties of extracts which is obtained in crude form from leaves of *Plectranthus amboinicus* (Lour.) was tested and found that the extract prepared from n hexane, ethylacetate and ethanol inhibited HeLa cells to and shows the cytotoxic effects with inhibitory concentration 50% and also have toxic effects on MCF7 cell lines. there is a phytosterol named sitosterol having chemical structure similar to cholesterol. It is a key ingredient in meals and is considered as a good biomarker because of the biological activity against diabetes and is also used as an antioxidant. It is also very effective in the treatment of prostate gland enlargement, to increase the behavior of T-cells and primes the immune system so that it will work effectively. The studies of human liver microsome show that sitosterol inhibits the absorption of cholesterol [22].

Other Uses

Plectranthus amboinicus Leaves are used in the laundry and they are also used to scent hairs when they are fresh. leaves are also rubbed on hairs and body after bath. They can also be rubbed on body to protect the body from insects. Essential oils from plant have medicinal properties. Leaves and stems contain essential oil which are used in skin cream and used commercially to prepare cosmetics [23].

Culinary Uses

Plectranthus amboinicus is called as Indian Borage in India because of its flavour. It is used to give flavour to Curry fish and lamb dishes because the flavour similar to oregano thyme or ajowan caraway spices. It is also changeable with those herbs. In the west Indies this herb is used with some of jerk seasoning after drying and in Cuba it is used with black beans and salsa, leaves of the plant are cooked and prepared like spinach in Japan [24].

The sums of the elements which are non-volatile, 30 have been identified from *Plectranthus amboinicus*. The chemical compositions of these are the total phenolic acid, flavonoids, sesquiterpene hydrocarbon monoterpene hydrocarbons and oxygenated monoterpenes, ester, Caffeic acid. Phytocompounds are Rosmarinic acid, acid, p-Coumaric acid, Shimobashiric acid, chloroform extract from the plant was dried under air and the separation was done by chromatography using silica gel column technique to separate compounds that do not evaporate [25]. Later the compounds were identified by using ultraviolet (UV), nuclear magnetic resonance (NMR) and 2 D NMR spectroscopy and the three compounds Cirsimaritin, Salvigenin and Chrysoeriol were identified. High pressure liquid chromatography (HPLC) analysis was performed, to detect the presence of Carvacrol in aqueous extract [26].

The leaves of the plant contain alkaloids, flavonoids, tannins and phenols, steroids, saponins, carbohydrate and glycosides. These phytochemicals are known to be of

therapeutic importance since they have biological roles. For example, flavonoids are shown to have antibacterial activity. Phenols are shown to have antioxidant activity. Tannins are shown to have antiviral, antitumor, wound healing and antiparasitic effects. Saponins being steroidal glycosides could be precursors for the synthesis of steroidal drugs like corticosteroids, sex hormones and contraceptives.

Adverse Effects

No adverse effect is known after the use of *Plectranthus ambonicus*. Some people suffer from burning sensation of the tongue and esophagus after the intake of juice of the leaf [27].

4. DISCUSSION

As discussed above Results from various studies shows that *Plectranthus* can be used for the treatment of various diseases like antineoplastic, anti-inflammatory & antianxiety and it also have influence on the other body systems like urinary and more. Clinical studies are required; including studies in animal models by the help of biochemical marks which helps to understand what the mechanism behind this is. It should also be examined for any effects or prevent diseases. For its action which is responsible to fight against cancer studies must be performed. One model is not sufficient but other studies are also required to confirm its effects as anticancer. Studies should also be required to verify the results that *Plectranthus ambonicus* is antitumor agent when it is used in combination with the other anticancer drugs. The effect of this plant in the endocrine system and the heart of animals are not clear. Studies show a possible benefit of *Plectranthus ambonicus* in the diseases associated with the CNS. The lack of systematic toxicity study is of some concern about the quality of the existing toxicity studies. The above data regarding *Plectranthus* explain that plant may be useful in several diseases, including wound healing, skin diseases, in respiratory disorders and as an antitumor agent. Some of the preliminary studies into existing uses which form the basis for further studies, but the evidence is not sufficient to provide a scientific basis for the clear treatment given by the drug.

5. CONCLUSION

The results from this review show that this plant can be used for treatment of various diseases. As the plant was successfully used in traditional system of medicine from ancient times there is requirement of more research on this plant to identify its use so that it can be use therapeutically. One of the important thing about this plant shows more effect if given in combination with others.

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