



# **BIOSUSTAINABILITY CONCERNS & CHALLENGES**

**CHIEF EDITORS**

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## **Biosustainability: Concerns and Challenges**

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# PHARMACOLOGICAL PROPERTIES AND NUTRITIONAL COMPOSITION BASED REVIEW OF *PLECTRANTHUS AMBOINICUS*

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## Abstract

*Plectranthus amboinicus* (Loureiro) Sprengel belongs to family Lamiaceae and subfamily Nepetoideae. Indian Borage is one of the most popular herbs which possess several health benefits. It is also known as *Coleus amboinicus* Lour, *Coleus aromaticus* Benth and *Plectranthus amboinicus* (Lour.) Spreng. In various parts of India, country borage has been familiar with different colloquial names viz 'Pathachur' in Hindi and Bengali. Traditional practices like Siddha, Ayurveda, folk, Unani, etc have a huge plant-based medicinal approach. *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. 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 health benefits of a lot of herbal plants are associated with nutritional content. Hence, *P. amboinicus* is a very significant source for compounds that help in increasing the taste and the shelf life of the food. A decoction of the leaves is used for several medicinal purposes, especially respiratory diseases like congestion, bronchitis, sour throat, and digestive diseases like dysentery, diarrhoea, colitis, and so forth. It is rich in various macro and micro nutrients such as carbohydrates, proteins, fats, fiber, flavanoids, phenols, zinc, calcium, ascorbic acid, ecosinoids and oleic acids.

**Key words:** *Plectranthus amboinicus*, Lamiaceae, bronchitis, oregano, Golden herb, micro Nutrients.

## Introduction

Herbal medicines are accepted for use in the treatment of various diseases due to their multilevel function characteristics and remarkable efficacy with fewer adverse effects. About 80% of the global population depends on medicinal plants for their primary health care. (Arumugam G, et al., 2016) *P. amboinicus* is a fast-growing plant that propagates through stem cuttings. The vegetative method of propagation is also seen because the plant seldom sets seed (Staples and Kristiansen, 1999). The different plant parts having medicinal properties are leaves, stems, roots, flowers, fruits, and seeds. The plant *Plectranthus amboinicus* (Lour.) Spreng. commonly known as Indian borage

is a well-known aromatic perennial herb belonging to Lamiaceae family. The different pharmacological activities reported for this plant includes anti-epileptic, antioxidant, antiproliferative, diuretic, anthelmintic, antinociceptive, antipyretic, antianxiety, antiulcerogenic and gastroprotective, nephroprotective, antihypertensive and antihyperlipidemic, antimicrobial, anti-inflammatory, and wound healing. These wide varieties of properties are due to the presence of various constituents such as essential oils, flavonoids, polyphenols, tannins, terpenes, glycosides, steroids, saponins, etc (Kumar P, *et al.*, 2020) Plant-based medications are now widely employed in various sorts of public health sectors because of their high level of safety and cost-effectiveness; traditional medical systems with a strong focus on plants include Siddha, Ayurveda, folk medicine, Unani, etc. Because traditional therapies are readily available from the environment, according to a WHO research survey, 80% of the world's population still relies on them (Prasad *et al.*, 2020). *Plectranthus amboinicus* 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 amboinicus* leaves poultice is used on bites of Scorpion and centipede. Mouth corners cracks are treated with this plant in Jawa. *Plectranthus amboinicus* shows antihelmintic 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 amboinicus* after that this will be used as a tool in the treatment of diseases (Muniandy K, *et al.*, 2014). According to their search, a high concentration of minerals like calcium and potassium is present (Lukhoba *et al.*, 2006). These minerals confer huge health benefits by improving the strength of bones and optimize the function of some vital organs like kidney, heart, nerves, and muscles. The iron content in *P. amboinicus* is quite significant at 0.262%. Hemoglobin contains iron and helps the RBC's to carry the oxygen to all parts of the body. Approximately, two-thirds of the iron is constituted by hemoglobin and the deficiency of which causes anemia. Moreover, the plant also contains zeaxanthin is, neoxanthin, leptin, violaxanthin, and carotene. Therefore, *P. amboinicus* can be regarded as a very potent supplement in diet (Lukhoba *et al.*, 2006; Swamy and Simiah, 2015). *Plectranthus amboinicus* are cultivated in home gardens and are used to treat diseases such as asthma, bronchitis, renal and hepatic diseases, epilepsy, inflammation, skin ulcers, burns and bites, conjunctivitis, irritable bowel syndrome and also used because of religious reasons. (Sathesh V, *et al.*, 2022 ).

### Pharmacological properties

Owing to the presence of several biological compounds, *P. amboinicus* exhibits different pharmacological activities including anti-microbial, anti-inflammatory, anti-tumor, wound cure, anti-epileptic, anti-larvicidal, antioxidant and analgesic

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property (Kumar *et al.*, 2020). It is used for the treatment of illnesses such as colds, cough, asthma, constipation, headache, cough, diarrhea, and skin conditions. It has been found to be effective against respiratory, cardiovascular, oral, skin, digestive and urinary diseases (Arumugam *et al.*, 2016).

#### ❖ Skin care

The most popular uses of *Plectranthus amboinicus* are in the treatment of skin. In case of bites and stings of bugs to other skin diseases, such as psoriasis and eczema, *Plectranthus amboinicus* 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 (Vera, R *et al.*, 1993)

#### ❖ Antibacterial Activities

Bacteria are prokaryotic microorganisms usually found on the surface of the skin mucosal layer and intestinal tract of humans and animals. The genus *Staphylococcus* is one example of common bacteria found to reside on the skin and in mucous membrane and is mostly harmless. Yet, there are dangerous bacteria classified as human pathogens, causing contagious diseases with a fatal prognosis (Vermelho A.B *et al.*, 2007).

#### ❖ Respiratory Disorders

*P. amboinicus* is frequently cited in the treatment of chronic coughs, asthma, bronchitis and sore throat in India and the Cari bean Islands (Morton J.F Country borage, 1992, Jain S.K., Lata S, 1996, Ruiz A.R, *et al.*, 1996). In accordance with that, leaves of *P. amboinicus* had positive bronchodilator activity when tested on guinea pigs (Carbajal D *et al.*, 1991). In Eastern Cuba, oil from aerial parts of *P. amboinicus* is used to treat asthma (Castillo R.A.M., Gonzalez V.P, 1999). Decoction or juice made from leaves together with other herbs is also taken orally to control asthma. This decoction is also used to treat catarrhal infections where it clears the excessive build-up of thick phlegm or mucus in an airway or cavity of the body (Carr J.H., Volpato G, 2004).

#### ❖ Wound Healing Activities

Few studies have investigated the ability of *P. amboinicus* to reduce blood sugar levels. Some of the phytochemicals found in *P. amboinicus* have been proven to play an important role towards blood sugar level lowering mechanisms. This herb has the ability to prevent or decrease the risk of infection and its complications in diabetic patients (Warriner R., Burrell R, 2015). Application of a paste prepared using *P. amboinicus* showed an enhanced wound healing ability by immune-stimulation in diseased giant murels (Sunitha K.S *et al.*, 2010). Likewise, *P. amboinicus* leaves and root derived paste (10%) has been shown to exhibit thorough epithelialization on the excision wound in albino rats after 12 days of application (Jain A.K *et al.*, 2012). *Plectranthus amboinicus* is regarded as antibacterial agent and also the best wound healing agent proved by preventing the infection in various cases (Krithi Nikhil *et al.*, 2015, Sreedharren B *et al.*, 2010).

### ❖ 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 the world's total grain, approximately 25% are contaminated by the mycotoxins also known by the metabolites of fungi (300 or more), which are known to be toxic for humans and animals. *P. amboinicus* nanoparticle, made from its extracts from various solvents and essential oil, was effective as antifungal. *Coleus aromaticus* leaves have activity against *Aspergillus niger* and *Candida albicans* (Brandao EM *et al.*, 2013).

### Nutritional composition

*P. amboinicus* is regarded as a potent supplement in the human diet owing to the high concentration of minerals viz calcium and potassium (Lukhoba *et al.*, 2006). It is a nutrient - dense plant which contains macronutrients (carbohydrates, proteins, lipids, fibre) as well as micronutrients (such as vitamins A, B1, B2, B3, B5, B6, B9 and C) and minerals (Ca, Fe, Mg, P, K, Na, Zn, Cu, Mn, and Se). *P. amboinicus* is a source of carvacrol that help in maximizing the taste and shelf life of food. Studies also show the presence of various biomolecules, indicating its potential application as functional food ingredient and nutraceutical emergence (Arumugam *et al.*, 2016). Herbs have been used extensively in culinary purposes since ancient times. Many delicious cuisines we enjoy contain various dietary herbs to increase the taste and flavor of the food. Herbal plants also have lots of health benefits attributed to their nutritional content (Khare, R.S *et al.*, 2011, Can Baser, K.H., 2004). Hence, *P. aromaticus* can be a good source of nutritive compounds which help to enhance the taste and also prolong the shelf life of food products. A study validates the presence of high minerals, precisely calcium and potassium, at 0.158% and 0.138%, respectively (Khare, R.S *et al.*, 2011). These minerals are necessary to build and maintain strong bones and to retain normal function of heart, kidneys, muscles and nerves. *P. amboinicus* also has a significant content of iron at 0.262%. Iron is an important component of hemoglobin aids red blood cells to carry oxygen throughout the body. Hemoglobin represents about two-thirds of the body's iron and its deficiency causes anemia. Adding to that, this plant also contains total Xanthophylls (0.356 mg/g of dry weight of the plant) which consist of Neoxanthin, Violaxanthin, Lutein, Zeaxanthinics. It also has  $\alpha$ -Carotene (0.157 mg/g of dry weight) and  $\beta$ -Carotene (0.0035 mg/g of dry weight) (Purseglove, J.W, 1987). All this makes *P. amboinicus* a unique dietary supplement.

### Conclusion

*P. amboinicus* is an important aromatic medicinal herb packed with many bioactive constituents and nutrients, which are important for maintaining good health. The plant has shown a wide range of biological properties and *urinary diseases*. *The* in curing respiratory, cardiovascular, oral, skin, digestive and *urinary* bioactive *biological properties are attributed to the occurrence of a wide range of bioactive* compounds in the plant extracts as well as an essential oil. Thus, it can be stated that *P.*

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*amboinicus* has huge future prospects in meeting the global demand for natural, safe, effective and safer bioactive molecules in pharmaceutical and nutraceutical industries. However, additional research efforts are required to isolate, identify and interpret the authentic nature of *P. amboinicus*. Through several classes of phytochemicals are isolated and authenticated from this herb, these bioactive and toxicity studies under *in vivo* conditions using animal models are limited to only a few compounds. Till now, no scientific evidence is available on the human safety aspects of *P. amboinicus* even though it is used widely in folk medicine. Further, some detailed investigations should be aimed at understanding the effectiveness of these isolated compounds in treating other human illnesses.

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