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Pogostemon cablin (Blanco) Benth's antioxidant and antimicrobial properties

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Abstract

Pogostemon cablin (Blanco) Benth, commonly known as Patchouli, has long been recognized in traditional medicine for its unique fragrance and therapeutic properties. This paper aims to analyze the antioxidant and antimicrobial properties of *Pogostemon cablin*, shedding light on its potential applications in modern pharmacology and therapeutics. Through the examination of various extracts and their bioactive compounds, we highlight the plant's efficacy against a range of microbial pathogens and its potent antioxidant capabilities.

Keywords: Traditional medicine, Fragrance, Therapeutic properties

Introduction

Pogostemon cablin, belonging to the family Lamiaceae, is a tropical herb indigenous to Southeast Asia. Traditionally, it has been utilized for treating common ailments, including colds, headaches, and gastrointestinal disturbances. Moreover, Patchouli oil, derived from its leaves, is extensively used in aromatherapy, cosmetics, and perfumery. Recent studies have focused on validating its traditional uses by exploring its chemical constituents and their biological activities.

Objective

The main objective of this study is to comprehensively explore and analyze the antioxidant and antimicrobial properties of *Pogostemon cablin* (Blanco) Benth. By delving into the scientific literature and empirical evidence, this research aims to elucidate the mechanisms underlying these properties, identify the bioactive compounds responsible, and evaluate the potential applications of *Pogostemon cablin* in pharmaceuticals, cosmetics, and food industries. Through a detailed examination of its antioxidant and antimicrobial capabilities, this study seeks to contribute to a deeper understanding of the therapeutic potential of *Pogostemon cablin* and pave the way for further research and development in utilizing this natural resource for human health and well-being.

Overview of Patchouli

Pogostemon cablin belongs to the *Lamiaceae* family and is characterized by its sturdy stems, aromatic leaves, and small, pale pink flowers. It thrives in warm, humid climates and is cultivated primarily for its essential oil, which is extracted from the leaves through steam distillation. Patchouli oil is renowned for its earthy, musky scent and has been used extensively in perfumery, incense, and aromatherapy.

Antioxidant Activities

Pogostemon cablin (Blanco) Benth, commonly known as patchouli, is a species of plant from the family Lamiaceae. Widely recognized for its distinctive scent and extensive use in perfumery, patchouli also possesses notable biological activities. Among these, the antioxidant properties of *Pogostemon cablin* are of significant interest due to their potential health benefits and applications in food preservation, cosmetics, and therapeutic agents.

The antioxidant capacity of *Pogostemon cablin* can be attributed to various bioactive compounds present within the plant.

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Fig 1: *Pogostemon cablin* (Patchouli)

Primary among these compounds are essential oils, polysaccharides, flavonoids, and phenolic acids. For example, a study conducted by Zhao *et al.* (2022) identified two polysaccharide fractions, PCB-1 and PCB2-1, isolated by water extraction and purified by Sepharose chromatography, demonstrating significant *in vitro* antioxidant activities based on scavenging activity against hydroxyl radicals, metal ion-chelating, and ferric-reducing abilities. Furthermore, these polysaccharides were shown to increase the levels of antioxidant enzymes in an oxidatively damaged mouse model, including superoxide dismutase, catalase, and glutathione peroxidase, thereby inhibiting malondialdehyde formation in the serum and liver.

Mechanisms of Antioxidant Action

The antioxidant activity of *Pogostemon cablin* primarily involves the scavenging of free radicals, inhibition of lipid peroxidation, and chelation of metal ions. These mechanisms help to prevent oxidative stress, a condition associated with various chronic diseases such as cancer, cardiovascular diseases, and neurodegenerative disorders. The efficacy of patchouli's antioxidant properties is closely linked to its chemical composition, particularly the presence of compounds like patchouli alcohol (patchoulol) and pogostone, which have been studied for their role in modulating oxidative stress pathways.

Example: Application in Food Preservation

The antioxidant properties of *Pogostemon cablin* have practical applications in food preservation. The ability of patchouli extracts to inhibit lipid oxidation can extend the shelf life of food products by preventing rancidity. Zhu Meijuan (2009) explored the antimicrobial activities of ethanol, ether, and aqueous extracts from *Pogostemon cablin*, demonstrating their effectiveness in sustaining the content of water, vitamin C, and soluble solid substance in tested food, with antimicrobial rates almost over 80%. While the study primarily focused on antimicrobial effects, the underlying antioxidant mechanisms contribute to the preservation quality by protecting against oxidative deterioration (Zhu, M.-J., 2009).

Antimicrobial Activities

1. Antibacterial Activity: Several studies have demonstrated the antibacterial activity of *Pogostemon cablin* extracts against a wide range of pathogenic bacteria. For example, research published in the

International Journal of Molecular Sciences (2019) showed that the essential oil of *Pogostemon cablin* exhibited significant antibacterial effects against *Staphylococcus aureus*, *Escherichia coli*, and *Pseudomonas aeruginosa*.

- 2. Antifungal Activity:** *Pogostemon cablin* extracts have also been found to possess potent antifungal properties. In a study published in the Journal of Ethnopharmacology (2003), it was reported that the essential oil of *Pogostemon cablin* displayed strong antifungal activity against *Candida albicans*, a common fungal pathogen responsible for various infections in humans.
- 3. Antiviral Activity:** While research on the antiviral properties of *Pogostemon cablin* is relatively limited compared to antibacterial and antifungal studies, some preliminary findings suggest its potential in combating certain viral infections. Further research is required to elucidate its effectiveness against specific viruses.
- 4. Mechanism of Action:** The antimicrobial activity of *Pogostemon cablin* is attributed to its rich chemical composition, particularly the presence of bioactive compounds such as patchouli alcohol, pogostone, and patchoulene. These compounds exhibit various mechanisms of action, including disruption of bacterial cell membranes, inhibition of enzyme activity, and interference with microbial cell metabolism.

Detailed Analysis

- 1. Extraction Methods:** Different extraction methods, such as steam distillation, solvent extraction, and supercritical fluid extraction, have been employed to isolate bioactive compounds from *Pogostemon cablin*. Each method may yield extracts with varying chemical compositions and antimicrobial potencies.
- 2. Chemical Composition Analysis:** Gas chromatography-mass spectrometry (GC-MS) and high-performance liquid chromatography (HPLC) are commonly used techniques to analyze the chemical composition of *Pogostemon cablin* extracts. These analyses help identify the major bioactive compounds responsible for its antimicrobial activity.
- 3. Minimum Inhibitory Concentration (MIC):** MIC assays are conducted to determine the lowest concentration of an antimicrobial agent that inhibits the growth of a specific microorganism. MIC values for *Pogostemon cablin* extracts against different bacterial and fungal strains provide insights into their potency as antimicrobial agents.
- 4. Synergistic Effects:** Studies have explored the potential synergistic effects of *Pogostemon cablin* extracts in combination with conventional antimicrobial agents. Synergy testing helps assess whether the combined use of these agents enhances antimicrobial efficacy, reduces drug resistance, or minimizes adverse effects.

Conclusion

Pogostemon cablin (Blanco) Benth, commonly known as patchouli, possesses remarkable antioxidant and antimicrobial properties, making it a valuable resource in various fields including pharmaceuticals, cosmetics, and food industries. Through numerous scientific studies and analyses, it has been demonstrated that *Pogostemon cablin* extracts exhibit potent antioxidant activity, scavenging free

radicals and protecting cells from oxidative damage. This antioxidant activity is attributed to the presence of bioactive compounds such as patchouli alcohol, pogostone, and patchoulene.

Moreover, *Pogostemon cablin* also demonstrates significant antimicrobial activity against a wide range of pathogenic bacteria, fungi, and potentially viruses. Studies have shown its effectiveness in inhibiting the growth of bacteria like *Staphylococcus aureus*, *Escherichia coli*, and fungal pathogens like *Candida albicans*. The mechanisms underlying its antimicrobial activity involve disruption of microbial cell membranes, inhibition of enzyme activity, and interference with microbial cell metabolism.

The combined antioxidant and antimicrobial properties of *Pogostemon cablin* make it a promising candidate for various applications. In the pharmaceutical industry, it could be utilized in the development of natural remedies for oxidative stress-related disorders and infectious diseases. In cosmetics, *Pogostemon cablin* extracts may find applications in skincare products due to their ability to neutralize free radicals and combat microbial pathogens. Additionally, in the food industry, they could serve as natural preservatives, extending the shelf life of perishable products while providing health benefits.

In conclusion, *Pogostemon cablin* (Blanco) Benth stands out as a versatile botanical with potent antioxidant and antimicrobial properties. Further research and development are warranted to explore its full potential, optimize extraction methods, identify key bioactive compounds, and unlock its diverse applications across various industries.

References

1. Dechayont B, Ruamdee P, Poonnaimuang S, Mokmued K, Chunthong-Orn J. Antioxidant and Antimicrobial Activities of *Pogostemon cablin* (Blanco) Benth. *Journal of Botany*. 2017 Mar 29.
2. Dechayont, Bhanuz, *et al.* "Research Article Antioxidant and Antimicrobial Activities of *Pogostemon cablin* (Blanco) Benth." (2017).
3. DP, Pradeep, and K. Murugan. "Comparative Study on Antioxidant Activity of Essential Oils from *Pogostemon benghalensis* (Burm. F.) Kuntze. And *P. cablin* (Blanco) Benth." (2018).
4. Lima Santos L, Barreto Brandão L, Lopes Martins R, de Menezes Rabelo E, Lobato Rodrigues AB, da Conceição Vieira Araújo CM, Fernandes Sobral T, Ribeiro Galardo AK, Moreira da Silva de Almeida SS. Evaluation of the larvicidal potential of the essential oil *Pogostemon cablin* (Blanco) Benth in the control of *Aedes aegypti*. *Pharmaceuticals*. 2019 Apr 8;12(2):53.
5. Liu F, Cao W, Deng C, Wu Z, Zeng G, Zhou Y. Polyphenolic glycosides isolated from *Pogostemon cablin* (Blanco) Benth. As novel influenza neuraminidase inhibitors. *Chemistry Central Journal*. 2016 Dec;10:1-1.
6. Manoj G, Manohar SH, Murthy HN. Chemical constituents, antioxidant and antimicrobial activity of essential oil of *Pogostemon paniculatus* (Willd.). *Natural product research*. 2012 Nov 1;26(22):2152-4.
7. Kumar V, Shriram V, Bhagat R, Khare T, Kapse S, Kadoo N. Phytochemical profile, anti-oxidant, anti-inflammatory, and anti-proliferative activities of *Pogostemon deccanensis* essential oils. *3 Biotech*. 2019 Jan;9:1-2.
8. Verma RS, Padalia RC, Chauhan A, Singh VR. Chemical composition of leaves, inflorescence, whole aerial-parts and root essential oils of patchouli {*Pogostemon cablin* (Blanco) Benth.}. *Journal of essential oil research*. 2019 Jul 4;31(4):319-25.
9. Swamy MK, Sinniah UR. Patchouli (*Pogostemon cablin* Benth.): botany, agrotechnology and biotechnological aspects. *Industrial Crops and products*. 2016 Sep 1;87:161-76.
10. Das K. Patchouli (*Pogostemon cablin* benth) oils. In *Essential oils in food preservation, flavor and safety* 2016 Jan 1 (pp. 633-639). Academic Press.
11. Kim EK, Kim JH, Jeong S, Choi YW, Choi HJ, Kim CY, Kim YM. Pachypodol, a methoxyflavonoid isolated from *Pogostemon cablin* bentham exerts antioxidant and cytoprotective effects in HepG2 cells: possible role of ERK-dependent Nrf2 activation. *International journal of molecular sciences*. 2019 Aug 21;20(17):4082.