WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 13, Issue 20, 280-304. Review Article ISSN 2277–7105

A REVIEW ON PHYTOCHEMICAL COMPOUNDS AND PHARMACOLOGICAL PROPERTIES OF CONTENTS OF TAMBUL BHASMA

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Article Received on
28 August 2024,

Revised on 18 Sept. 2024,
Accepted on 08 October 2024

DOI: 10.20959/wjpr202420-34232

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ABSTRACT

Ayurveda, an ancient and holistic system of medicine from India, has gained worldwide recognition for its deep wisdom and enduring principles. Rasashastra Evam Bhaishajyakalpana is a key branch of Ayurveda that focuses on the preparation, formulation, and use of herbs, metals, and minerals for medicinal purposes. Tambul Bhasma, an ancient Ayurvedic preparation made from betel leaf, holds an important role in traditional medicine. Tambul Bhasma is prepared using four key ingredients: Tambul Patra (betel leaf), Arka Kshir (milk of Calotropis), Saindhav Lavana (rock salt), and Dipya Churna (Ajmoda or celery seeds). In the current investigation, an effort has been made by reviewing 66 various references to state the phytochemical Compounds and pharmacological properties of the individual components of Tambul Bhasma.

KEYWORDS: Bhasma, Tambul Patra, Ark Kshir, Sindhava Lavana, Dipya Churna.

INTRODUCTION

Ayurveda, an ancient and holistic system of medicine from India, has gained worldwide recognition for its deep wisdom and enduring principles. Described as eternal, timeless, and infinite, it stands as one of the oldest documented healing traditions known to humanity.[1]

Rasashastra Evam Bhaishajyakalpana is a key branch of Ayurveda that focuses on the preparation, formulation, and use of herbs, metals, and minerals for medicinal purposes. Rasashastra, often referred to as Ayurvedic Iatrochemistry, emphasizes the processing and application of metals and minerals. These specialized combinations are called Rasayanas, known for their therapeutic benefits. Bhaishajyakalpana, also referred to as Ayurvedic Pharmaceutics, focuses on the preparation, processing, and use of herbal medicines. It involves techniques such as extraction, grinding, boiling, and fermentation, which produce various forms of medicine like Swaras (juice), Kashaya (decoction), Kalka (paste), Vati (tablets), Avaleha (herbal jam), Tail (oil), Ghrita (ghee), and Asava-Arishta (fermented liquids). Tambul Bhasma, an ancient Ayurvedic preparation made from betel leaf, holds an important role in traditional medicine. Its use dates back centuries, showcasing its therapeutic value in treating various health conditions. The preparation of Tambul Bhasma involves a careful process of purification, calcination, and grinding, transforming the betel nut into a powerful medicinal ash known as Bhasma. Tambul Bhasma is prepared using four key ingredients: Tambul Patra (betel leaf), Arka Kshir (milk of Calotropis), Saindhav Lavana (rock salt), and Dipya Churna (Ajmoda or celery seeds).[2] In the current investigation, an effort has been made to review the phytochemical Compounds and pharmacological properties of the individual components of Tambul Bhasma. Phytochemical Analysis is a scientific technique used to identify and assess the bioactive compounds in plants that contribute to their medicinal and therapeutic effects. Compounds such as alkaloids, flavonoids, tannins, glycosides, and saponins are crucial for the plant's defense and often provide significant health benefits. It allows researchers to explore the therapeutic potential of various plants and their applications in treating diseases. By uncovering the key bioactive compounds responsible for the plant's pharmacological actions, phytochemical analysis plays a vital role in drug discovery and the development of natural medicines.[3] Pharmacological properties encompass the effects and interactions of substances, such as drugs and medicinal compounds, on living organisms. Understanding these properties is vital for grasping how a substance influences bodily functions and offers therapeutic advantages. By investigating pharmacological properties, scientists can assess a compound's effectiveness, safety, and possible side effects. This involves examining how substances impact different physiological systems, including cardiovascular, nervous, and immune systems, and uncovering their mechanisms of action. These insights are crucial for the advancement and refinement of new drugs and therapeutic interventions.[4] This study provides a comprehensive review of the four components of Tambul Bhasma—Tambul Patra, Arka Kshir, Saindhav Lavana, and

Dipya Churna—focusing on relevant parameters associated with phytochemical compounds and pharmacological properties.

AIM AND OBJECTIVES

1. To review and analyze the phytochemical compounds present in the components of Tambul Bhasma.
2. To review and summarize the pharmacological properties associated with the ingredients of Tambul Bhasma.

MATERIALS AND METHODS

Information for this review has been systematically collected from a variety of sources, including classical Ayurvedic Samhitas and texts, as well as reputable academic databases such as Sage Journals, Scopus, Web of Science, Springer, and ScienceDirect. The study will commence with an in-depth Compounds of Tambul Patra, the principal component of Tambul Bhasma. Subsequent sections will explore Arka Kshir, Saindhav Lavana, and Dipya Churna in that sequence.

1. Tambul Patra

Ayurvedic Significance: Piper betel, known as Saptasira in Vedic texts and Tambool in Sanskrit, has been utilized in traditional medicine for over 2000 years. It is referenced in ancient texts such as Vatsyayana's Kamasutra, the Panchatantra, and Kalhan's Rajatarangni.[5]

Common Names[6]

Marathi: Nagabael
Hindi: Paan
Sanskrit: Tambool
Malayalam: Vettila
Kannada: Eleballi
Gujarati: Nagarbael
Tamil: Vetrilai
Bengali: Nagballi
Telugu: Betel-vine

Description[7]

Genus: Piper

Species: Piper betle L.

Division: Magnoliphyta

Kingdom: Plantae

Order: Piperales

Family: Piperaceae

Subfamily: Piperoideae

Plant Characteristics[8]

Type: Evergreen perennial dioecious creeper

Stems: Semi-woody, climbing with short adventitious roots

Leaves: 10-20 cm long, broadly ovate, slightly cordate, glabrous, bright green or yellowish, with stout petiole (2.0-2.5 cm)

Spikes: Male spikes cylindrical and dense; female spikes 2.5-5.0 cm long, pendulous

Fruits: Rarely produced, often forming nodule-like structures.

Picture 1: Creeper of Piper Betle (Tambul Patra)

Cultivation: Extensively grown in Bangladesh, India, Sri Lanka, Malaysia, Thailand, Taiwan, and other Southeast Asian countries.[9]

Qualities & Effect

In Ayurveda, betel leaf is recognized for its qualities and effects

Guna (Quality): Laghu (light), Ruksha (dry), Tikshan (sharp)

Rasa (Taste): Tikta (bitter)

Vipak (Metabolism): Katu (pungent)

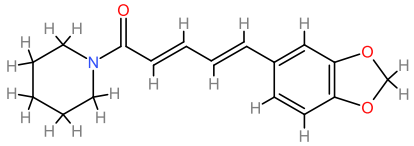
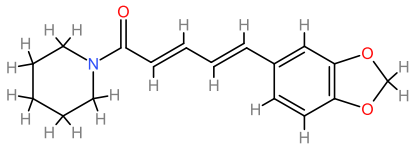
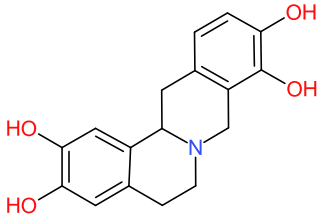
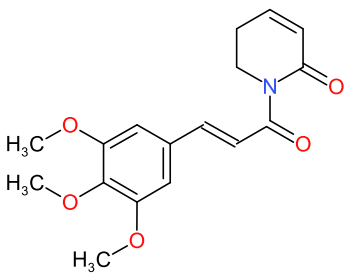
Virya (Potency): Ushana (hot)

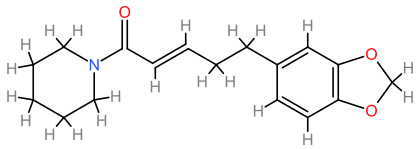
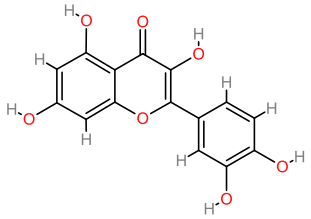
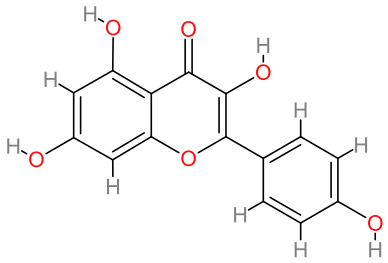
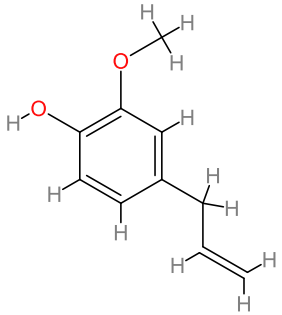
Prabhav (Impact): Hridya (beneficial for the heart)

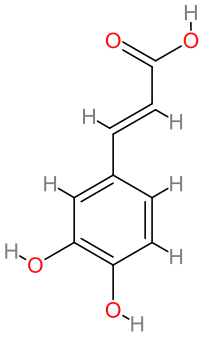
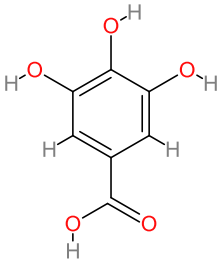
Betel leaf extract is commonly used both as an adjunct in various formulations and independently for its therapeutic benefits. According to the Sushruta Samhita, it is aromatic, sharp, hot, acrid, and aids in voice enhancement, digestion, and balancing Vata while aggravating Pitta.

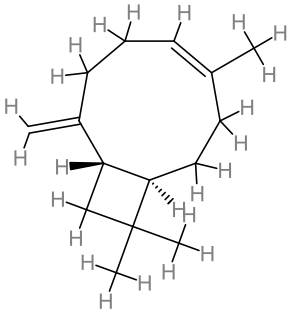
Phytochemical Compounds and Pharmacological Properties

Below is a tabular review of phytochemical compounds and pharmacological properties found in Tambul Patra –

Sr No.	Phytochemical Compound	Phytochemical Compounds	Pharmacological properties	Structure
1.	Alkaloids	Piperine Chavicine Piperbetin Piperlongumine Piperanine	Includes compounds like piperine and chavicine. These have been noted for their analgesic, anti-inflammatory, and antimicrobial properties.[10] Alkaloid Piperbetin has been noted for its potential anti-cancer properties and is involved in various biochemical processes within the plant.[11] Piperlongumine is Known for its potential to inhibit tumor growth and enhance apoptosis in cancer cells. It also exhibits anti-inflammatory and antimicrobial properties.[12] Piperanine an alkaloid with demonstrated potential for neuroprotective and anti-oxidative effects, contributing to the overall therapeutic value of the betel leaf.[13]	Piperine - $C_{17}H_{19}NO_3$  Chavicine - $C_{17}H_{19}NO_3$  Piperbetin – $C_{17}H_{17}NO_4$  Piperlongumine – $C_{17}H_{19}NO_5$  Piperanine – $C_{17}H_{21}NO_3$

				
2.	Flavonoids	Quercetin Kaempferol Luteolin Apigenin Myricetin	Contains flavonoids such as quercetin and kaempferol which exhibit antioxidant, anti-cancer, and anti-inflammatory activities.[14] Luteolin is a flavone with neuroprotective and anti-allergic effects is present in tambul patra.[15-16] Apigenin is a flavone with potential anti-anxiety and anti-cancer effects present in tambul patra.[17-18] Myricetin is a flavonol with strong antioxidant and anti-inflammatory properties.[19-20]	Quercetin – $C_{15}H_{10}O_7$  Kaempferol – $C_{15}H_{10}O_6$ 
3.	Essential Oils	Eugenol Cineole (Eucalyptol) Carvacrol Methyl Eugenol	Rich in essential oils including eugenol, which is known for its analgesic and antiseptic properties[21] Cineole (Eucalyptol) is a monoterpene with a fresh, minty scent giving Antimicrobial, anti-inflammatory, expectorant effect.[22-23] Carvacrol is a monoterpenoid with a pungent, oregano-like odor. It has Antimicrobial, anti-inflammatory, antioxidant properties.[24-25]	Eugenol – $C_{10}H_{12}O_2$ 

			Methyl Eugenol is an derivative of eugenol with a sweet-spicy aroma. It has Antimicrobial, anesthetic, potential carcinogenic effect.[26-27]	
4.	Tannins		Presence of tannins contributes to its astringent properties, which can be beneficial for wound healing[28] and gastrointestinal health[12]	
5.	Saponins		Exhibits immune-modulating, anti-inflammatory, and hypocholesterolemic effects[13]	
6.	Phenolic Compounds	Caffeic Acid Chlorogenic Acid Gallic Acid	Includes compounds like catechins and phenolic acids that offer antioxidant and anti-cancer properties[11] Caffeic Acid is a hydroxycinnamic acid with strong antioxidant activity. It has Antioxidant, anti-inflammatory, hepatoprotective, anti-cancer properties[29-30] Chlorogenic Acid which is an ester of caffeic acid and quinic acid. It has Antioxidant, anti-inflammatory, anti-diabetic, antihypertensive Properties.[31-32] Gallic Acid is trihydroxybenzoic acid with notable antioxidant effects. Properties are	Caffeic Acid – $C_9H_8O_4$  Gallic Acid – $C_7H_6O_5$ 

			Antioxidant, anti-inflammatory, anti-cancer, antimicrobial[33-34]	
7.	Terpenoids	β-Caryophyllene α-Pinene	β-Caryophyllene is sesquiterpene with a peppery, woody aroma. It is Anti-inflammatory, analgesic with potential anticancer effect.[35,36] α-Pinene is a monoterpene with a pine-like aroma.It has Anti-inflammatory, bronchodilator, memory-enhancing properties[37-38]	β-Caryophyllene -$C_{15}H_{24}$ 

2. Ark Kshir

Ark Kshir, an Ayurvedic preparation derived from the distillation of medicinal herbs, holds significant therapeutic value. It is primarily used for its detoxifying, digestive, and anti-inflammatory properties, often recommended for ailments like indigestion and respiratory issues. Its application in Ayurvedic treatments is supported by classical texts such as the Charaka Samhita and Sushruta Samhita, which highlight the importance of such formulations in balancing the body's doshas and promoting overall health.[39,40] The preparation method enhances the potency of the herbs, making Ark Kshir an essential component in traditional Ayurvedic medicine.

Common Names[41]

Marathi: Rui

Hindi: Akavana;Aak;Madar

Sanskrit: Arka;Tulphala;Kshirparna;Arkaparna;Vikirana;Aasphota

Malayalam: Erikku

Kannada: Ekkagida

Gujarati: Aakado

Tamil: Vellerukku

Bengali: Aakanda

Telugu: Jilledu

Description[42]

Genus: Calotropis

Species: Calotropis procera (Ait) R.Br.

Division: Magnoliophyta

Kingdom: Plantae

Order: Gentianales

Family: Asclepiadaceae

Subfamily: Asterideae

Plant Characteristics[43]

Type: Habit is described as large shrub with much branched.

Stems: The stem is herbaceous and the lower portion is woody. Upper portion is covered with wolly hairs. It contains milky juice.

Leaves: Leaves are mainly cauline and ramal, unicostate reticulate, hermaphrodit, pentamerous.

Flowers: Flowewrs are mainly medium sized with purplish color. Calyx made of five sepals, polysepalous, quincuncial. Corolla made of five petals, gamopetalous. Stamens are mainly united with stigma to form gynostegium. Coronary outgrowth is present at the rear of every stamen. Flowers do not have any fragrance.

Fruits: The fruits of this plant are an aggregate follicle type of fruits which is called as etaerio of follicles.

Cultivation- Calotropis procera have been distributed throughout the world from ancient time. It is surrounded throughout India and in other warm and dry places like Waziristan, Afganistan, Egypt and tropical Africa.[44]

Picture-2: Calotropis Procera with flowers, fruits and leaves.

Qualities & Effect

In Ayurveda, Arka khsir is recognized for its qualities and effects

Guna (Quality): Laghu (light), Ruksha (dry), Tikshna (sharp)

Rasa (Taste): Katu (pungent), Tikta (bitter)

Vipak (Metabolism): Katu (pungent)

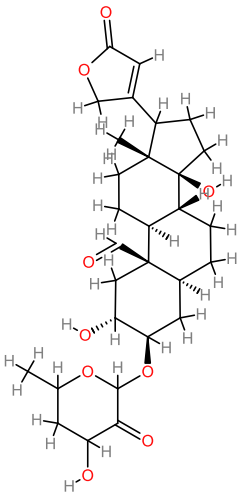
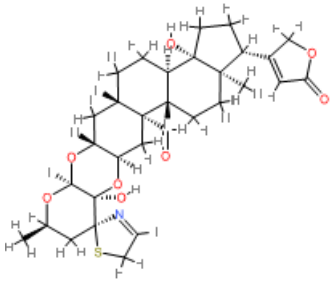
Virya (Potency): Ushana (hot)

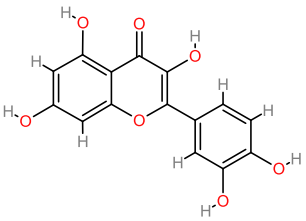
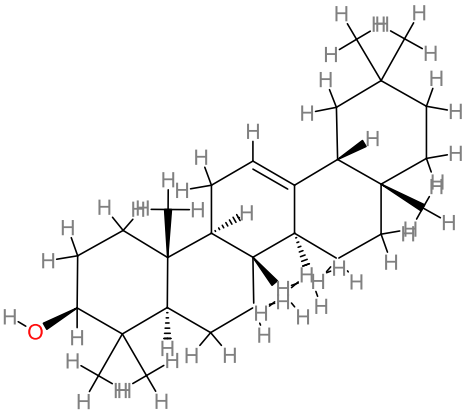
Prabhav (Impact): Tikshna virechak (strong purgative)

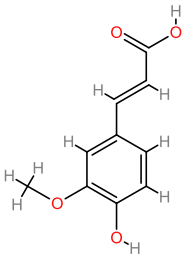
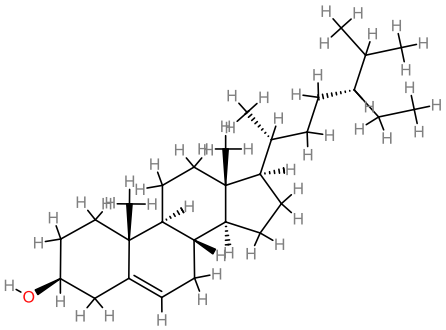
Arka kshir is used mainly for purgation while its also cures respiratory,skin,gastrointestinal and cardiovascular disorders. According to Ayurveda the Dosakarma of Arka kshir is Kapha-vata samak.[45]

Phytochemical Compounds and Pharmacological Properties

Below is a tabular review of phytochemical compounds and pharmacological properties found in Arka kshir.

Sr No.	Phytochemical Compound	Phytochemical Compounds	Pharmacological properties	Structure
1)	Cardiac Glycosides	Calotropin, Calotoxin	Cardiotonic, Antibacterial, Antiviral Cardiotonic: Enhances heart muscle contraction, improving cardiac output. Antibacterial: Inhibits bacterial cell growth and reproduction, especially Gram-positive bacteria. Antiviral: Exhibits significant activity against a variety of viruses, including herpes simplex and influenza[46]	Calotropin : $C_{29}H_{40}O_9$ 
2)	Alkaloids	Calotropagenin, Uscharin	Analgesic, Antipyretic, Anti-inflammatory[47] Analgesic: Effective in reducing pain by interacting with the nervous system. Antipyretic: Lowers fever by affecting the body's temperature-regulating mechanisms. Anti-inflammatory: Suppresses inflammatory	Uscharin: $C_{31}H_{41}SO_8N$ 

			responses by inhibiting the production of pro-inflammatory cytokines.	
3)	Flavonoids	Quercetin, Isorhamnetin	Antioxidant, Anti-inflammatory[48] Antioxidant: Scavenges harmful free radicals, protecting cells from oxidative damage. Anti-inflammatory: Reduces inflammation by inhibiting the release of pro-inflammatory mediators like nitric oxide, prostaglandins, and leukotrienes.	Quercetin – $C_{15}H_{10}O_7$ 
4)	Triterpenoids	β-Amyrin, Lupeol	Hepatoprotective, Anticancer, Antiviral[49] Hepatoprotective: Protects liver cells from damage caused by toxins like alcohol and paracetamol. Anticancer: Inhibits the growth of various cancer cells, including lung, breast, and colon cancer cells, by inducing apoptosis and cell cycle arrest. Antiviral: Effective against several viral strains, including Hepatitis B.	β-Amyrin: $C_{30}H_{50}O$ 
5)	Saponins	Calotropis saponins	Antifungal, Anti-inflammatory, Antimicrobial.[50] Antifungal: Exhibits significant activity against various fungi, including Candida and Aspergillus species. Anti-inflammatory: Reduces inflammation by inhibiting the activity of enzymes like cyclooxygenase (COX) and lipoxygenase (LOX) that promote inflammation. Antimicrobial: Broad-	

			spectrum activity against bacteria and fungi, potentially by damaging microbial cell membranes.	
6)	Phenolic Compounds	Caffeic acid, Ferulic acid	Antioxidant, Immunomodulatory[51] Antioxidant: Neutralizes reactive oxygen species (ROS), reducing oxidative stress in cells. Immunomodulatory: Modulates the immune system by either enhancing or suppressing the activity of certain immune cells, which helps in fighting infections and auto-immune diseases.	Ferulic Acid: $C_{10}H_{10}O_4$ 
7)	Steroids	β-Sitosterol, Calotropsterol	Anti-inflammatory, Immunomodulatory[52] Anti-inflammatory: Potent anti-inflammatory agent that reduces edema and inflammation by suppressing the expression of inflammatory cytokines such as TNF-α and IL-6. Immunomodulatory: Balances immune responses by regulating immune cell activity, which is useful in both autoimmune conditions and immunosuppression.	β-Sitosterol : $C_{29}H_{50}O$ 

3. Saindhava Lavana

In Ayurvedic medicine, Saindhava Lavana (rock salt) holds a significant place due to its numerous health benefits. Its properties and uses are discussed extensively in classical Ayurvedic texts like the Charaka Samhita and Sushruta Samhita[53,54]

Amongst the five varieties of Lavana, Saindhava Lavana is the best Lavana[55]

Chemical name- Sodium chloride (NaCl)

Common Names[56]

Marathi: Sampurna mith

Hindi: Sendha namak

Sanskrit: Saindhav

Malayalam: Kalluppu

Kannada:Ganadauppu

Gujarati: Gadhu mithu

Tamil: Sendhaluppu

Bengali: Saindhav lavana

Telugu: Saidhava uppu

English: Rock salt

Description[57]

It is a mineral which is obtained from mines.There are three varieties viz. Red, white and Crystalline. Crystalline is preffered for medicinal use.

Place of Occurance[58]

Rock salt is found in Mandi district of Himachal Pradesh.

Qualities & Effect[58]

In Ayurveda, Saidhav lavana is recognized for its qualities and effects.

Guna (Quality): Laghu (light), Snigdha (unctous), Tikshna (sharp)

Rasa (Taste): Lavana (salt)

Vipak (Metabolism): Katu (pungent)

Virya (Potency): Shita (cold)

Prabhav (Impact): Hridya (beneficial for heart)

Saindhav lava acts agnideepak, Rochak,chakshushya and mitigates all doshas i.e. Tridoshshamak. In Viswachi adi roga it is said to hold in hand for relief.

Picture-3: Saindhav lavana.

Chemical Compounds and Pharmacological Properties

Below is a review of chemical compounds and pharmacological properties found in Saindhav lavana –

Chemical compounds - Sodium chloride-97.6%, Sodium bicarbonate-0.07%, Insoluble matter-0.031%, Magnesium chloride, Calcium chloride, Calcium sulphate, Trace elements like iodine.

Pharmacological properties

1. Anti-inflammatory Properties

Saindhava Lavana has been reported to exhibit anti-inflammatory effects. Research indicates that it can reduce inflammation in conditions such as arthritis and other inflammatory disorders. The presence of various minerals helps modulate inflammatory pathways, leading to a decrease in inflammatory markers.[59]

2. Antioxidant Activity

Studies show that Saindhava Lavana possesses antioxidant properties, which can help combat oxidative stress in the body. This is particularly beneficial in preventing chronic diseases such as cancer and cardiovascular disorders.[60]

3. Digestive Aid

Saindhava Lavana is traditionally used to enhance digestion. It stimulates the secretion of digestive enzymes and improves gut health, thereby aiding in nutrient absorption.[61]

4. Antimicrobial Effects

The antimicrobial properties of Saindhava Lavana have been explored in various studies, indicating its efficacy against a range of pathogens, including bacteria and fungi. This makes it a potential natural preservative in food applications.[62]

5. Electrolyte Balance

Due to its rich mineral content, Saindhava Lavana plays a crucial role in maintaining electrolyte balance in the body. This is essential for various physiological functions, including muscle contractions and nerve signaling.[63]

6. Blood Pressure Regulation

Some studies suggest that the mineral composition of Saindhava Lavana can aid in regulating blood pressure levels, potentially benefiting those with hypertension.[64]

4. Dipya Churna

Ajmoda, scientifically known as Apium leptophyllum, is a lesser-known herb that has garnered attention for its unique properties and potential health benefits. This herb is part of the Apiaceae family, which includes other well-known culinary and medicinal plants. Ajmoda is primarily found in the Indian subcontinent, where it is traditionally used in folk medicine for its various therapeutic properties. Known for its aromatic leaves and small, edible seeds, Ajmoda is utilized in various culinary dishes, particularly in regional cuisines that value its distinctive flavor. Beyond its culinary uses, the herb is reputed in traditional medicine for its role in treating digestive issues, respiratory ailments, and other health conditions. Its bioactive compounds are believed to contribute to its anti-inflammatory and antimicrobial properties, making it a valuable addition to natural health practices.

Common Names[65]

Marathi: Ajamoda, Ova

Hindi: Ajamod

Sanskrit: Ajamoda, Dipyaka, Kharashwa

Malayalam: Omam

Kannada: Ajamodvoma

Gujarati: Ajamod

Tamil: Ashamtavovam

Bengali: Radhuni

Telugu: Ajumodvayu

Description[66-67]

Genus: Carum

Species: Apium leptophyllum (Pers.) F. V. M. ex Benth.

Division: Magnoliophyta

Kingdom: Plantae

Order: Apiales

Family: Umbelliferae

Subfamily: Apioideae

Plant Characteristics[65]

Type: It is a biennial or perennial shrub and 1-3 ft in length.

Leaves: Leaves are pinnate to bi-pinnate.

Flowers: Flowers are small, creamy white occur in dense compound umbels.

Fruits: The fruits yellowish broad ovoid to globose.

Place of Occurance- Ajamoda plants are found in throughout India specially cultivated in Maharashtra, Punjab and Uttar Pradesh.[65]

Picture-4: Ajmoda plant and seeds.

Qualities & Effect[65]

In Ayurveda, Ajamoda is recognized for its qualities and effects:

Guna (Quality): Laghu (light), Ruksha (dry), Tikshna (sharp)

Rasa (Taste): Katu(Pungent), Tikta(Bitter)

Vipak (Metabolism): Katu (pungent)

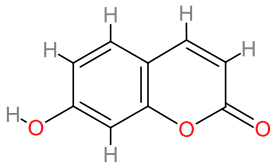
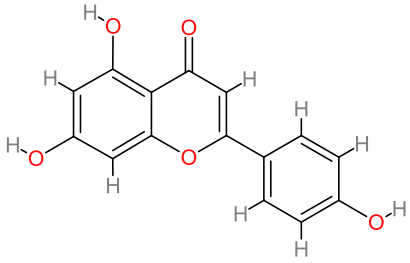
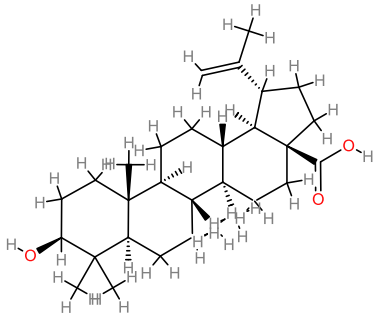
Virya (Potency): Ushna (hot)

Prabhav (Impact): Sulaprasamak (Analgesic)

Ajamoda acts agnideepak, vatanulomak, krimighna and mitigates kapha-vata doshas and aggrevates Pitta dosha.

Phytochemical Compounds and Pharmacological Properties

Below is a tabular review of phytochemical compounds and pharmacological properties found in Ajmoda

Sr No.	Phytochemical Compound	Phytochemical Compounds	Pharmacological properties	Structure
1)	Coumarins	Umbelliferone	Umbelliferone exhibits anti-inflammatory, analgesic, and antioxidant properties. Studies indicate that it can inhibit certain enzymes related to inflammation and exhibit cytotoxic effects against cancer cell lines[68]	Umbelliferone: $C_9H_6O_3$ 
2)	Alkaloids		Alkaloids derived from Apium leptophyllum demonstrate various biological activities, including antimicrobial and analgesic effects. Some alkaloids may also act as CNS stimulants[69]	
3)	Flavonoids	Apigenin, Luteolin	Flavonoids in Apium leptophyllum show significant antioxidant, anti-inflammatory, and antimicrobial activities. Apigenin has been shown to inhibit cancer cell proliferation and exert neuroprotective effects.[70]	Apigenin: $C_{15}H_{10}O_5$ 
4)	Triterpenoids	Betulinic acid	Betulinic acid exhibits antitumor, anti-inflammatory, and antiviral properties. Research indicates its potential in inducing apoptosis in cancer cells and modulating immune responses.[71]	Betulinic acid: $C_{30}H_{48}O_3$ 
5)	Saponins		Saponins have been associated with a range of	

			pharmacological effects, including cholesterol-lowering activity and immunomodulatory effects. They are known to exhibit cytotoxicity against certain cancer cell lines.[72]	
6)	Phenolic Compounds		Phenolics in Apium leptophyllum are known for their antioxidant properties, which help in neutralizing free radicals and protecting against oxidative stress. They may also have anti-inflammatory effects[73]	
7)	Essential Oils		The essential oils from Apium leptophyllum exhibit antimicrobial, antifungal, and insecticidal properties. They show efficacy against various pathogens and may be used in food preservation and medicine.[74]	

DISCUSSION

Tambul Bhasma, a time-honored Ayurvedic formulation, has been hardly explored in research for its therapeutic effects. This review sought to explore the individual components of Tambul Bhasma—Tambul Patra (betel leaf), Arka Kshir (Calotropis latex), Saindhav Lavana (rock salt), and Dipya Churna —and evaluate the pharmacological properties that contribute to its efficacy. Each of these components has been studied in traditional and modern contexts for their anti-inflammatory, analgesic, and antimicrobial effects. Tambul Patra, rich in phenolic compounds and essential oils, has been reported to exhibit potent anti-inflammatory and antimicrobial properties, making it a crucial component in addressing microbial infections. Additionally, its anti-inflammatory and antioxidant activities further contribute to its use in traditional formulations.

Arka Kshir, or the latex of Calotropis, is known for its wide range of therapeutic effects, including pain relief and inflammation reduction, which aligns well with the Ayurvedic principles that underscore its inclusion in formulations meant to treat pain-related disorders.

Saindhav Lavana, or rock salt, while typically recognized for its culinary use, has significant medicinal properties, especially in terms of digestive health and antimicrobial action. Its role

in facilitating digestion, coupled with its mild laxative and detoxifying properties, makes it an essential balancing element within the formulation of Tambul Bhasma.

Dipya Churna (Ajmoda or celery seeds), commonly used in Ayurvedic medicine for its digestive and anti-inflammatory effects, contributes both to the metabolic enhancement and the anti-inflammatory properties of Tambul Bhasma. Its presence supports the overall therapeutic goal of the formulation, especially in reducing inflammatory responses.

The synergistic action of these components likely enhances the efficacy of Tambul Bhasma in treating conditions associated with inflammation, pain, and microbial contamination. Modern pharmacological studies support the traditional claims, reinforcing the validity of Ayurvedic formulations in contemporary therapeutic practices. However, while individual studies on each component show promise, there remains a need for more rigorous, comprehensive studies on the formulation as a whole to substantiate these claims under standardized research conditions. Finally, further research should aim to explore the mechanisms of action at the molecular level, assessing how the interactions between these natural components produce therapeutic effects. Investigations should also focus on potential side effects, toxicity, and bioavailability, ensuring that Tambul Bhasma can be optimized for safe and effective use in modern healthcare. By establishing a stronger scientific foundation for its use, this ancient formulation could be seamlessly integrated into contemporary medicine, offering a holistic alternative for treating inflammation, pain, and infections.

CONCLUSION

In conclusion, the review of contents of Tambul Bhasma, an ancient Ayurvedic formulation composed of Tambul Patra, Arka Kshir, Saindhav Lavana, and Dipya Churna, highlights its significant role in traditional medicine. The extensive literature reviewed—33 references for Tambul Patra, 12 for Arka Kshir, 11 for Saindhav Lavana, and 10 for Dipya Churna—demonstrates a wealth of knowledge regarding the phytochemical compounds and pharmacological properties of each component. The collective evidence suggests that these ingredients possess noteworthy anti-inflammatory, analgesic, and antimicrobial properties. Therefore, it may be reasonably inferred that Tambul Bhasma has the potential to effectively address issues related to inflammation, pain, and microbial contamination, reinforcing its relevance in both historical and contemporary therapeutic practices. Further research could pave the way for deeper insights into its efficacy and mechanisms of action, ultimately promoting its integration into modern healthcare paradigms.

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to my Research guide, Dr. Smita Johar, for her invaluable guidance, encouragement, and constant support throughout the course of this research. Her insightful feedback and dedication have been instrumental in shaping this review article on "A Review on Phytochemical Analysis and Pharmacological Properties of Contents of Tambul Bhasma."

I am also deeply thankful to my colleague, Dr. Ramit Singha, for his assistance in framing the research and helping with the collection of relevant work.

Lastly, I extend my heartfelt thanks to all those who have supported me, directly or indirectly, in completing this work.

Conflicts of Interest

Nil.

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