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(REVIEW ARTICLE)

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Jalapippali (*Phyla nodiflora*): The hidden ayurvedic elixir for health and wellness

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Abstract

The increasing demand for safer, more sustainable alternatives to chemical-based medicines has prompted significant interest in plant-derived bioactive compounds, which are known to possess a wide range of therapeutic properties. Among these, *Phyla nodiflora* (L.) is the one, a medicinal plant commonly called Jalapippali used in Ayurveda, Siddha, and traditional Southeast Asian medicine. It belongs to the Verbenaceae family. It grows in tropical and subtropical regions worldwide and is valued for its abundant therapeutic properties, mainly to treat skin diseases, fever, cough, wounds, and inflammation, even diabetes.

Jalapippali is referenced in several Nighantus of Ayurveda. Although there are few mentions in Ayurveda Brihatrayee, most Nighantus have emphasized its medicinal value over time. Even the oldest Nighantu, Dhanvantari Nighantu, mentions it. Many experts suggest that the plant is rich in various important medicinal compounds such as nodiflorin, nodifloretin, lippiflorins, etc. While modern research has explored its properties, clinical studies remain scarce.

Given its diverse medicinal potential, *Phyla nodiflora* warrants greater attention from the scientific community. Future research focusing on its pharmacological properties, bioavailability, and therapeutic applications could pave the way for its integration into modern medicine. Enhancing public awareness and promoting its utilization through validated studies may contribute to unlocking its full medicinal potential.

Keywords: Jala pippali*; Lippia nodiflora*; *Phyla nodiflora*; Bakkun booti; Verbenaceae

1. Introduction

The riches of humanity lie in medicinal herbs. India offers a solid foundation for the use of several plants in both general healthcare and disease relief due to its mega-biodiversity and expertise in rich traditional medicine, or Ayurveda. Many Ayurvedic medications are really helpful, yet the main stakeholders are unaware of them. Jala Pippali is one of them, being readily available and pharmacologically important. The most important Bhavprakash nighantu of ayurveda has described jalapippali as Hridya, Chaksushya, Malasangrahi, Ruchikar, Agnivardhak, Daha, Vrana nashaka[7,14]. The modern research also highlighted jalapippali as antidiabetic, hypotensive, antioxidant, anticancerous, hepatoprotective, etc. [Table 6] The plant known as Jalapippali, or *Phyla nodiflora*, belongs to the Verbenaceae family and is found along riversides, lakes, and other freshwater bodies in the majority of Indian states [1]. Jalapippali is reviewed for its available references in this study, particularly in Ayurvedic texts, ethnobotanical usage, and associated studies. The present study aims to highlight its significance in the medicinal world, and which may prove fruitful for human society.

2. Materials and Methods

Jalapippali's literary review and therapeutic applications were examined through classical literature such as the Charaka Samhita, Sushruta Samhita, Ashtanga Sangraha & Ashtanga Hridaya as well as from nighantus like Raja

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Nighantu, Dhanvantari Nighantu, Bhavprakash Nighantu, Shodhal Nighantu, Madanpal Nighantu, Kaidev Nighantu, Shaligram Nighantu, and Bhaishajya Ratnavali, E-Nighantu, and essays published in a variety of periodicals. The botanical texts were also examined.

3. Result

As we know, Jalapippali has been mentioned in various Ayurvedic classical texts for its diverse pharmacological properties. Here is a compilation of all its references across different classical texts.

Table 1 Reference of Jalapippali in Brihattrayee

S.No.	Samhita	Reference	Context
1.	Sushruta Samhita [9] Nibhanda Sangrah Vyakya by Dalhana	S.S.Su.38/18	Dravya sangrahaneeya adyaya, Surasadigana
		S.S.Chi. 4/32	Vatavyadi chikista , Kalyanaka lavana
2.	Charaka Samhita [8] Ayurved Deepika by Chakrapanidatta	C. S.Su.27/171	Annapana vidhi adhyaya , Haritavarga
3.	Astanga Sangraha [10] Shashilekha Vyakya by Indu	A.S.Ut.10/22	Apasmara pratisheda adhyaya, Vrischikadi varti

Table 2 Classification of Jalapippali in Nighantus

S.No	*Nighantu*	*Varga*
1.	Dhanwantari Nighantu[4,5]	Karaveeradi varga
2.	Shodal Nighantu[11]	Karaveeradi varga
3.	Madanapal Nighantu[13]	Abhayadi varga
4.	Raja Nighantu[6,14]	Shatahwadi varga
5.	Kaiyadeva Nighantu[15]	Aushadhi varga
6.	Bhavaprakasha Nighantu[7,16]	Guduchyadi varga
7.	Shaliigram Nighantu[17]	Guduchyadi varga
8.	Madhava Dravyaguna[18]	Vividhoushadi varga
9.	Siddamantra Nighantu[19]	Tridoshagna varga
10.	Nighantu Shesh [12]	Gulma kanda
11.	Adarsha Nighantu[20]	Nirgundyadi varga
12.	Parayaya Ratnamala[2]	Jalapippali
13.	Nighantu Ratnakar[3]	Jalapippali

Table 3 Synonyms in Different Classsical Texts

S.No.	Nighantus	Synonyms
1.	Dhanwantari Nighantu[4,5]	Matsaydani, Matsaygandha, Langali, Toyapippali, Shaaradi, Shakuladani
2.	Madanapal Nighantu[13]	Toyapippali, Kanchat, Ambuvalli, Paloor
3.	Raja Nighantu[6,14]	Maharashtri, Shaaradi, Toyapippali, Shakuladani, Langali, Machadani, Machagandha, Agnijwala, Chitrapatri, Praanada, Trinshita, Bahushikha
4.	Kaiyadeva Nighantu[15]	Toyapippali, Shaaradi, Shakuladani, Laangali, Matsaydani, Matsaygandha, Kanchat, Gandupadi, Toyavalli
5.	Bhavaprakasha Nighantu[7,16]	Shaaradi, Shakuladani, Laangali
6.	Shaliigram Nighantu[17]	Shaaradi , Shakuladani, Matsaygandha
7.	Siddamantra Nighantu[19]	Shaaradi , Shakuladani, Langali, Toyapippali, Matsaydani, Matsaygandha
8.	Nighantu Shesh[12]	Shaaradi , Shakuladani, Matsaydani, Matsaygandha, Langali, Toyapippali
9.	Parayaya Ratnamala[2]	Shaaradi , Shakuladani, Langali, Toyapippali

Table 4 Pharmacological actions mentioned in different Nighanus

S.No.	Nighantu	Pharmacological Action
1.	Kaiyadeva Nighantu[15]	Hridya, Chaksushya, Vatavardhak, Ruchikar, Agnivardhak, Daha, Vrana, Rakta-vikarnashaka
2.	Bhavaprakasha Nighantu[7,16]	Hridya, Chaksushya, Malasangrahi, Ruchikar, Agnivardhak, Daha, Vrana nashaka
3.	Shaligram Nighantu[17]	Hridya, Chaksushya, Malarodhak, Ruchikar, Agnivardhak, Sukra janak, Daha, Vrana nashaka
4.	Dhanwantari Nighantu[4,5]	Swasa, Rakta-vikar, Visahara, Daha, Bhram, Murcha, Trishna nashaka Kriminashaka
5.	Madanapala Nighantu[13]	Hridya, Chaksushya, Sukral, Sangrahi, Daha, Vrana nashaka
6.	Raja Nighantu[6,14]	Mukha sodhaka, Vrana, Visa hara
7.	Adarsha Nighantu[20]	Premeha nashaka, Mutra-vikar nashaka
8.	Kalpadruma Nighantu[21]	Hridya, Chaksushya, Sukra-janak, Daha, Rakta-vikar nashaka
9.	Madhava Dravyaguna[18]	Kaphavatahara
10.	Shodala Nighantu[11]	Hridya, Rochana, Deepana, Grahi , Hikka, Kasa, Visha, Swasa, Parshwa ruk, Kriminashana
11.	Nighantu Ratnakar[3]	Akshi hita, Ruchya, Pittatisaar nashni, Swas-trid-visha-daha-arti-bhram-murcha-jwar apaha, Ras dosha har, Mukhshudhikar, Hridya, Rakta dosha apaha

Figure 1 Whole jalapippali plant

3.1. Plant Description [1]

- **Latin name**: *Phyla nodiflora* (L.) Green
- **Family**: Verbenaceae
- **Synonyms**: Lippia nodiflora (L.) A. Rich
- **Vernacular names**
  - **English :** Purple Lippia
  - **Hindi :** Jalpipali, Panisigaa, Bhuiokaraa
  - **Gujrati :** Rataveliyo
  - **Bengali :** Bukkana, Kaanchadaa
  - **Kannada :** Nelahippali
  - **Malayalam :** Nirtippali, Podutalai (Siddha)
  - **Marathi :** Jalpippali, Ratavel
  - **Tamil :** Potuttali
  - **Telugu :** Bokkena
- **Habitat** - A small creeping perennial herb found commonly in sandy, wet, grassy places along bunds of irrigation channels, canal edges, and riverbanks almost throughout the greater part of India and up to 900 m on the hills.
- **Macroscopic features**
  - **Root** - Fibrous, branched, brown in colour 2 to 10 cm in length and 1.0 to 1.5 mm in diameter; nodal roots are smaller, 0.5 to 1.0 cm in length, and unbranched. (figure 1)
  - **Stem** - Much branched, subquadrangular, 1 to 2 mm in diameter, rooting at nodes, more or less clothed with appressed, two-armed, white hairs when seen under 10x, brownish-green,length of internode 5.0 to 9.0 cm.
  - **Leaf** - Opposite, sub-sessile, 1.5 to 3.7 cm long and 1 to 2 cm broad, spathulate, cuneate at the base, deeply and sharply serrate in the upper part, appressed by two armed, minute white hairs on both sides. (figure 3)
  - **Flower** - Sessile, densely packed in long pedunculate axillary spikes, mature ones 1.0 to 2.0 cm long and 0.4 to 0.5 cm broad, flowering densely, becoming oblong during fruiting; peduncles 2.5 to 7.5 cm long, bracts about 2.5 mm long, broadly elliptic or obovate, cuneate at base , white or light pink, bilipped; stamens 4, didynamous, anthers 2-celled; ovary superior, bicarpellary; style short, stigma oblique, subcapitate. (figure 2)

- **Fruit** - Small, 1.5 to 2.0 mm long, globose, oblong, splitting into two 1-seeded planoconvex pyrenes; seeds exalbuminous, about 1 mm in size.

- **Part Use** – Whole plant
- **Important Formulations** - Akika Pisti , Akika Bhasma
- **Dose** - 2 to 3 g powder,
  - 1/2 to 2 ml juice
- **Constituents** - Flavonoids namely nodiflorin A and nodiflorin B, nodifloretin, & lippiflorins A and B.

PROPERTIES[16]	
Rasa	Katu , Tikta , Kashaya
Guna	Ruksha , Tikshna
Virya	Shita
Vipaka	Katu

Figure 2 Flower of jalapippali

Figure 3 Leaves of jalapippali

Table 5 Ethnomedicinal uses of Jalapippali (*Phyla nodiflora*)

S.No.	Plant Part Used	Form	Mode of administration	Ethnomedicinal Uses and Therapeutics
1.	Leaf [23]	juice	Externally	Dandruff, leaf juice mixed and boiled with an equal volume of gingelly oil, is applied twice a week on the head.
2.	Flowers, Leaves, or Roots [45]	Crude	Internally	Oral thrush (chewed and spit out)
3.	Whole Plant [46	Crude	Internally	Nervous disorders, constipation, eczema, heatstroke, rheumatoid arthritis, gonorrhea, pain, spasms.
4.	Leaf and stem [46]	Crude	Internally	Dizziness, headache, fever, & back pain due to a fall or rheumatic pain.
5.	Whole Plant [47]	Crude	Internally	Common cold
6.	Whole Plant [48]	Crude	Internally	Jaundice
7.	Whole plant [49]	Paste and juice	Externally	Paste for boils, swollen cervical glands, and chronic indolent ulcers. The juice is for bleeding gums.
8.	Stem and Leaf [50]	Paste	Externally	Headache (Forehead)
9.	Young Stem [50]	Paste	Externally	Broken bones
10.	Whole Plant [51]	Decoction	Externally	Skin rashes
11.	Leaves and Roots [52]	Extract	Internally	Antibacterial
12.	Whole Plant [53]	Paste	Internally	Cure ulcers, burning micturition, and asthma.
13.	Whole Plant [54]	Poultice	Externally	Boils
14.	Tender stalks and Leaves [54]	Infusion	Internally	Useful in indigestion in children and after parturition in women
15.	Leaves and Fruits [54]	Paste	Internally	Internal Piles

Table 6 Researches on Pharmacological Properties

S.No.	Properties	Researches
1.	Antimicrobial Activity	*Bacillus subtilis, Staphylococcus epidermidis, and Staphylococcus aureus* were all effectively inhibited by *Phyla nodiflora* ethyl acetate and chloroform fractions. [28] Comparing the ethanol extract to petroleum ether and aqueous extract, the presence of bioactive chemicals resulted in substantial antibacterial activity. [36] The essential oils of this plant exhibited antimicrobial properties. [37]
2.	Anti-inflammatory Activity	At 100 and 200 mg/kg bw, Lippia nodiflora aqueous extract demonstrated anti-inflammatory action in mice with paw edema produced by carrageenan ($p<0.01$). Nevertheless, neither dose of the ethanolic extracts produced any anti-inflammatory benefits. [27] Anti-inflammatory and anti-neoceptive activities of methanolic extract of *Lippia nodiflora Linn* were also seen. [41]

3.	Antioxidant Activity	Shukla et al. assessed the methanol extract of *L. nodiflora* for total phenolic content, antioxidant, and free radical scavenging activity. The study related the antioxidant activity of the extract to the presence of flavonoid. [29]
4.	Antiurolithiatic Activity	The *Phyla nodiflora* Linn ethanolic extract was tested against a diet that produced calculi. The study clearly shows that P. nodiflora has an antiurolithiatic effect against the most prevalent type of renal stones, which are calcium oxalate-type stones. [24]
5.	Hepatoprotective Activity	The activity of methanol extract of Lippia nodiflora (MELN) was compared with standard drug silymarin (25 mg/kg), which is a well-known natural anti-hepatotoxic drug, and the potency of MELN is more or less the same as that of silymarin. It is concluded that MELN possesses good hepatoprotective activity, probably by its antioxidative potential on hepatocytes. [42] In this study, it showed that Lippia nodiflora reduced reactive oxygen species (ROS) production against lipopolysaccharides induced toxicity on HepG2 cells and thereby decreased the apoptotic gene expression and protected the liver cells against toxicity. [43]
6.	Hypotensive Activity	The methanol extract of Lippia nodiflora at doses of 200 and 400 mg/kg shows a significant increase in the volume of urine in rats. This study suggests that the active component(s) in MELN had a similar diuretic effect to that of frusemide.[44]
7.	Antidiabetic Activity	Streptozotocin (STZ)-induced diabetic rats were used in the current work to test the antidiabetic potential of γ-sitosterol, which was extracted from Lippia nodiflora. In isolated rat islets, the response of insulin production to glucose was assessed. In rats with STZ-induced diabetes, oral γ-sitosterol (20 mg/kg body weight) given once daily for 21 days significantly increased plasma insulin levels, body weight, and food intake while significantly lowering blood glucose and glycosylated hemoglobin. [25] Oral administration of γ-sitosterol (20 mg/kg body weight) once daily for 21 days in STZ-induced diabetic rats resulted in a significant decrease in blood glucose and glycosylated hemoglobin with a significant increase in plasma insulin level, body weight, and food intake. [22]
8.	Anticancer Activity	With an IC50 value of 47.5 µg/ml, the aqueous leaf extract of P. nodiflora demonstrated strong antiproliferative activity against the HepG2 cancer cell line. The Acridine Orange/Ethidium Bromide assay was used to measure the increased apoptotic potential of HepG2 cells in a concentration-dependent manner. The aqueous leaf extract of *Phyla nodiflora* has been found to have the potential for anticancer, antibacterial, and antioxidant properties. [38] By dysregulating the expression of cell cycle regulators such as CDKs and cyclins, all extracts disrupted the cell cycle at the S phase. According to our research, P. nodiflora suppresses MCF-7 cells by causing apoptosis and altering the cell cycle.[39] According to MTT results, all of the extracts inhibited MCF7 cells, with IC50 values ranging from 90 to 120 µg/ml. DNA laddering was observed in treated cells' extracted DNA, indicating the presence of apoptosis.[40]
9.	Anti-hyperlipidemic Activity	In streptozotocin (STZ)-induced diabetic rats, γ-sitosterol had antihyperlipidemic activity as demonstrated by a significant decrease in blood total cholesterol, triglycerides, and very low density lipoprotein-cholesterol levels, as well as an increase in high density lipoprotein-cholesterol levels. When compared to diabetic control rats, γ-sitosterol treatment significantly reduced the activity of alanine aminotransferase, aspartate aminotransferase, alkaline phosphatase, and acid phosphatase, suggesting that it protects against liver damage.[34]
10.	Neuropharmacological Activity	According to the findings, mice exhibited notable central inhibitory (sedative), anticonvulsant, and anxiolytic effects from Lippia nodiflora's ethanolic extract at oral dosages of 250 and 500 mg/kg as well as its chloroform extract at a higher dose of 500 mg/kg. At both dosage levels (250 and 500 mg/kg orally), the plant's petroleum ether extract did not result in any central effects. [30]

11.	Antimelanogenic Activity	The anti-melanogenesis properties of the *Phyla nodiflora* aerial part's methanolic extract were investigated. The findings demonstrated that the extract was not cytotoxic and that it considerably decreased tyrosinase activity and cellular melanin concentration in a dose-dependent manner ($p < 0.05$).[32]
12.	Effect on hair growth	When compared to a negative control, the topical application of gel containing extracts of E. alba and L. nodiflora alone and in combination dramatically accelerated the rate of hair growth.[31]
13.	Antidandruff activity	The disc diffusion assay was used to investigate the antidandruff properties of the ethanolic extract and isolated substance of Lippia nodiflora and Eclipta alba. Using a sterile cotton swab, a suspension containing 5× 106 CFU/ml of the dandruff-causing organism (Malassezia furfur) was applied to the surface of the sterile SDA plates. The seeded SDA plates were aseptically covered with sterile filter paper discs impregnated with the separated chemical dosages (25 µg/ml and 50 µg/ml) and ethanolic extract (250 µg/ml and 500 µg/ml) per disc. The findings demonstrated that the isolated Lippia nodiflora component and all ethanolic extract concentrations had an effect on the Malassezia furfur.[33]
14.	Effect on blood clotting	Blood coagulation is greatly accelerated by Lippia nodiflora ethanol extract at doses of 100 mg/kg ($p<0.05$) and 200 mg/kg ($p<0.01$). The ethanolic extract's effect seemed to be dose-dependant. But at both dosages, the aqueous extract had no discernible impact on blood clotting time.[35]

4. Discussion

As we may see, there are abundant uses of jala pippali mentioned in classical texts like the oldest Dhanwantari nighantu , the famous Bhavprakash nighantu, and also many researches that supported them. Even the pharmacological activities that haven't even been mentioned are also proven by research, but there are many that have been mentioned but still not proven by studies. Such activities of the drug need to be explored wisely.

- Nighantus**:** Almost all the Nighantus have mentioned the plant Jalapippali, even the oldest Nighantu, Dhaanwantari Nighantu. Nighantus has highlighted its therapeutic values as uses in blood disorders, wounds, burning sensations, diarrhea, indigestion, asthma, bronchitis, cough, antipyretic, antidiabetic, antihelmintic, spermetogenic, antidelusional, cardioprotective, urine disorders, antidotes, etc., and is practiced by most of the traditional systems of medicine for the same.

The plant shows many pharmacological activities. It shows antioxidant and free radical scavenging activity. The plant is having significant antimicrobial, anti-inflammatory, anti-diuretic, anti-urolithiatic, antimelanogenic, antihyperlipidemic, anticancer, antidiabetic, hypotensive, hepatoprotective, etc. activities. Its significance is also found in Unani medicine and the Chinese system of medicine.

Although almost all properties of jalapippali mentioned in classical texts have been proven through research. However, spermatogenic activity needs to be paid attention to, as it may prove very fruitful to human society .

5. Conclusion

Due to its global distribution, the plant L. nodiflora is readily available and has been utilized widely for a variety of medical conditions. The majority of the Nighantus have emphasized the plant's medicinal qualities, despite the fact that Jalapippali is barely mentioned in the Brihatrayees. Numerous studies indicate its pharmacological significance, but there aren't many corroborating clinical investigations. As a result, Jalapippali is a significant plant, and more clinical research on its potential therapeutic benefits should be done.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare that there are no financial or personal relationships that could have appeared to influence the work reported in this paper.

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