

A Review on Anti-dandruff activity of *Phyla nodiflora* Linn

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Abstract: Dandruff, a most common dermatological disorder, is an unpleasant, chronic and pruritic scalp condition. This study is about to know the activity of polyherbal formulation against a dandruff causing organism *malassezia furfur* which was cultured from human dandruff sample. Dandruff, a common scalp condition, can be exacerbated by factors such as fungal infections, dry skin, and inflammation. This research investigates the phytochemical constituents of *Phyla nodiflora*, including flavonoids, terpenoids, and saponins, which may contribute to its antifungal and anti-inflammatory properties. In vitro assays demonstrated that extracts of *Phyla nodiflora* effectively inhibited the growth of *Malassezia furfur*, a fungus commonly associated with dandruff. Additionally, topical application of the extract on experimental models showed a significant reduction in scalp inflammation and flaking. These findings suggest that *Phyla nodiflora* possesses potential as a natural antidandruff agent, offering a viable alternative to conventional treatments.

Keywords: Antidandruff Activity, *Malassezia furfur*, Phytochemicals, *Phyla nodiflora*, Dandruff, Extraction, Antifungal.

INTRODUCTION

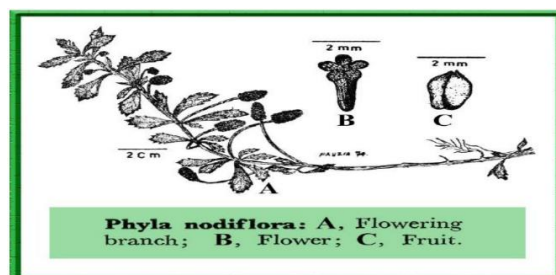
Dandruff is a prevalent scalp condition characterized by the shedding of dead skin cells, often accompanied by itching and inflammation. It can arise from various factors, including fungal infections, particularly by *Malassezia furfur*, as well as dry skin and seborrheic dermatitis. Conventional treatments often involve antifungal shampoos and topical corticosteroids, which may have side effects and vary in effectiveness among individuals.

Phyla nodiflora, commonly known as Lippia or fogfruit, is a perennial herbaceous plant native to tropical and subtropical regions. Traditionally, it has been used in folk medicine for its anti-inflammatory, antimicrobial, and soothing properties. Recent phytochemical studies have identified a range of bioactive compounds in *Phyla nodiflora*, including

flavonoids, saponins, and terpenoids, which are known for their therapeutic benefits.

Given the plant's historical use and the growing interest in natural remedies for skin conditions, this study aims to explore the antidandruff activity of *Phyla nodiflora*. By examining its effects on *Malassezia furfur* and evaluating its anti-inflammatory properties, this research seeks to establish a scientific basis for the potential use of *Phyla nodiflora* as a natural alternative for managing dandruff. Understanding its mechanisms and efficacy could pave the way for developing new, plant-based treatments that are both effective and safe for consumers.

Perennial, prostrate herb with somewhat woody rootstock, rooting at nodes, appressedly pubescent to glabrescent. Leaves oblanceolate, obovate to spatulate, somewhat fleshy, 5-40 mm long, 4-20 mm broad, serrate above, entire below, glabrous to appressedly pubescent, subsessile to sessile, obtuse, rarely subacute. Spikes 1-4.5 cm long, 6-8 mm broad, solitary, axillary, peduncled, appressedly pubescent to glabrous. Flowers very small, white, rarely pinkish, c. 3 mm long; bracts c. 2 mm long, mucronate or acuminate, imbricate. Calyx flattened, shorter than bracts, hyaline-membranous, deeply dissected with lanceolate lobes, pubescent. Corolla slightly exceeding the bracts, unequally 4-lobed with spreading lobes. Fruit ovate, c. 1.6 mm long, subcompressed, enclosed by the persistent calyx, into separating at maturity.



There are many antifungal drugs available to treat dandruff. The synthetic active substances include ketoconazole, zinc pyrithione, selenium sulfide and salicylic acid, where many of them are used to control the abundance of fungi in scalp. But problems like development of fungal resistance to antibiotics, reduced efficiency and increased toxicity of synthetic drugs, are now creating the need for an alternative way of treatment. By the way, ethnobotanical research gained more interest and phytoactive constituents of plants are now some effective approach to deal antimicrobial resistance. Herbal drugs are actually known for formulations. A Polyherbal Formulation (PHF)-blend of herbs is more effective than individual herbal extract highlights “Sarangdhar Samhita”, an Ayurvedic text. PHFs are regarded with comparable efficiency and fewer side effects. To promote the use of medicinal plants as potential sources of antimicrobial compounds, it is necessary to thoroughly investigate their composition and activity. The present study was taken up to assess the antidandruff potential of a Polyherbal Formulation (PHF) made of leaves of *Phyla nodiflora* (Frog fruit or Turkey tangle), *Azadirachta indica* (Neem) and ripen fruit seeds of *Piper nigrum* (White pepper) against the isolated fungi *Malassezia furfur*. This study also tries to find the phytochemical constituents of this herbal mixture when extracted with water (by preliminary phytochemical analysis) and with methanol.

PHARMACOGNOSTIC ACCOUNT

CLASSIFICATION:-



Kingdom. – Plantae
Division. – Magnoliophyta
Class. – Magnoliopsida
Order. – Lamiales
Family. – Verbenaceae
Genus. – *Phyla*
Species. – *Nodiflora*

Vernacular Names

English : Lippia, Frog fruit
Philippines : Busbusi, Chachahan
Thailand : Yaa Riet Pla
Hindi : Bukkan, Jalpapli
Sanskrit : Vasir Vasuka
Marathi : Ratolia Vakkan
Tamil : Poduthalai

Synonyms: *Lippia incisa*, *Lippia nodiflora*, *Lippia reptans* Kunth, *Phyla incisa* Small

Habitat and Distribution

- Native to tropical and subtropical regions of Central and South America
- Naturalized in many parts of the world, including North America, Africa, and Asia
- Grows in wetlands, grasslands, and along roadsides

Macroscopical Characters

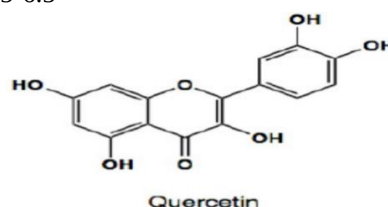
- Stem: Erect or spreading, up to 1 meter tall, hairy, and branched
- Leaves: Opposite, ovate-lanceolate, 2-5 cm long, hairy, and serrated
- Flowers: Small, white or purple, in clusters
- Fruits: Small, dry, and splitting into two mericarps

Microscopical Characters

- Leaf: Epidermal cells with wavy walls, trichomes present
- Stem: Cortical cells with sclerenchymatous fibers
- Root: Cortical cells with starch grains

Physicochemical Constants

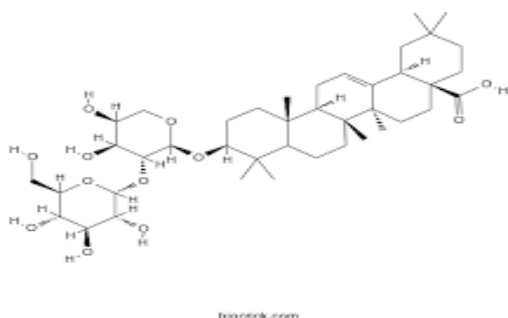
- Ash value: 10-15%
- Moisture content: 5-10%
- Total solids: 90-95%
- pH: 5.5-6.5



Phytochemical Constituent

- Flavonoids (luteolin, apigenin, quercetin)
- Phenolic acids (caffeic, ferulic)
- Terpenoids (ursolic acid, oleanolic acid)

- Alkaloids (present but not characterized)



Oleanolic Acid

Pharmacological Activities

- Anti-inflammatory
- Antimicrobial
- Antioxidant
- Antifungal

Traditional Uses

- Wound healing
- Fever reduction
- Digestive issues
- Respiratory problems
- Skin conditions

Distribution

It is distributed in India, Sri Lanka, Ceylon, Baluchistan, South and Central America and Tropical Africa. It is native of California. In India, it is found in the warmer parts including A.P., Karnataka, Kerala, and Maharashtra, some parts Rajasthan, Tamil Nadu, U.P. and W.B. It is common in wet places along bunds or irrigation canal edges and sliver banks.

MATERIALS AND METHODS

Collection of Plant Materials:

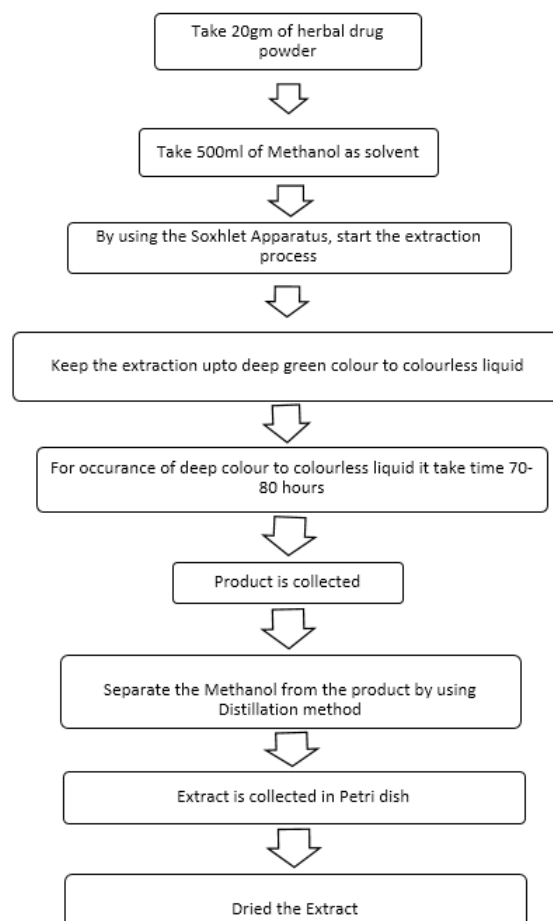
The plant specimen for the proposed study *Phyla nodiflora* was collected from the wetland fields and other irrigated fields in and around shrigonda district, India.

Preparation of plant extracts:

The fresh whole plant of *phylanodiflora* was washed with distilled water to removed unwanted foreign

materials like soil and dusts. After, washed plant material was dried under shade at room temperature without direct exposure of sunrays. It was then coarsely grounded by using mechanical device. The powdered plant material was passed through sieve no 40 and stored in an airtight container for further use.

Extraction Process:



Determination of anti-dandruff activity:

1. Preparation of Test Solutions

Concentration Preparation: Prepare various concentrations of the plant extract, such as 10, 25, 50, and 100 mg/mL. Use a suitable solvent for dilution: DMSO for non-polar extracts. Water for polar extracts.

2. Antifungal Assay Against Dandruff-Causing Fungi
Culture Preparation: Obtain *Malassezia furfur* from a microbiology culture collection or clinical sample.
Media: Use Sabouraud Dextrose Agar (SDA) or Potato Dextrose Agar (PDA), supplemented with olive oil to promote the growth of *Malassezia* species.
Inoculation:

Plate the fungal culture onto the media.

Apply the plant extracts using:

Agar Well Diffusion: Create wells in the agar, add the plant extract, and measure inhibition zones.

3. Incubation

Incubate the plates at 32–35°C (optimal for *Malassezia*) for 48–72 hours.

4. Positive and Negative Controls

Use a known antifungal agent like ketoconazole as a positive control.

Use the solvent (e.g., DMSO or water) without the extract as a negative control.

5. Measurement of Antifungal Activity

Measure the diameter of the inhibition zones (in mm) around the wells or disks.

Calculate the percentage inhibition and compare it to the positive control.

6. Analysis of Results

Record inhibition zones for each concentration.

Use statistical analysis (e.g., ANOVA) to determine the significance of differences in antifungal activity among concentrations.

7. Optional: Minimum Inhibitory Concentration (MIC) Determination

If needed, perform a broth dilution assay to determine the MIC, where the lowest concentration that inhibits visible fungal growth is considered the MIC.

REFERENCES

- [1] Ranganathan S, Mukhopadhyay T. Indian journal of dermatology, 2010; 55(2):130-139.
- [2] Schwartz JR, DeAngelis YM, Dawson TL. Practical modern hair science, 2012; 1:389-413.
- [3] Krishnamoorthy JR, Ranganathan S, Shankar SG, Ranjith MS. African Journal of Biotechnology, 2006; 5(10):123-132.
- [4] Mehdi N, Roya AB, Mohsen T, Rezvan T, Mohaddese M. Iranian Journal of Dermatology, 2015; 18(1):10-15.
- [5] Nazzaro F, Fratianni F, Coppola R, Feo VD. J of Pharmaceuticals, 2017; 10(4):86-92.
- [6] Pragadheesh VS, Saroj A, Yadav A, Chanotiya CS, Alam M, Samad A. Industrial crops and products, 2013;49:628-633.
- [7] Mokbel AA, Alharbi AA. Australian Journal of Crop Science, 2015; 9(6):532-544.
- [8] DeAngelis YM, Gemmer CM, Kaczvinsky JR, Kenneally DC, Schwartz JR, Dawson TL Jr. Three etiologic facets of dandruff and seborrheic dermatitis: *Malassezia* fungi, sebaceous lipids, and individual sensitivity. The Journal Investigative Dermatology Symposium Proceedings. 2005 Dec;10(3):295-7. doi:10.1111/j.1087-0024.2005.10119.x
- [9] Ro BI, Dawson TL. The role of sebaceous gland activity and scalp microfloral metabolism in the etiology of seborrheic dermatitis and dandruff. The Journal of Investigative dermatology. Symposium Proceedings. 2005 Dec;10(3):194-7. DOI: 10.1111/j.1087-0024.2005.10104.x. PMID: 16382662.
- [10] Abirami A, Mohamad SH, Jayprakash S, Karthikeyini C, Kulathuran KP, Firthouse MP. Effect of *Ocimum sanctum* and *Azadiractaindica* on the formulation of antidandruff herbal shampoo powder. Der Pharmacia Lettre. 2009 Mar; 1(2), 2009, 68-76.
- [11] HarshaliWadekar ,RizwanThara. Preparation and Evaluation of Herbal Hair Oil. International Journal of Science and Research. 2020 Nov;9(11):991-5
- [12] Mithal BM, Shah RN. A Hand Book of Cosmetics. VallabhPrakashan Publishers. New Delhi ;2000:1sted: pp141-2
- [13] Acid value and other parameters. Indian Pharmacopoeia, Government of India, Ministry of Health and Family Welfare. The Controller of Publication; 1996: 2 ed: 2:45-
- [14] Lazarides M, Cowley KJ &Hohen P. CSIRO handbook of Australian weeds, CSIRO,Australia, Collingwood, Victoria, 1997
- [15] Akhtar M F Chemical and biological investigations of medicinal herbs *Phyla nodiflora*, *Ruellia patula* and *Ruellia brittoniana* Ph.D. Thesis. 1993 ,Pakistan: Univ. of Karachi
- [16] McCosker, RO. *Lippia* (*Phyla nodiflora*): an invasive plant of floodplain systems in theMurray–Darling Basin, a report on the distribution and ecology of lippia in the lower Gwydir Valley and the Murray–Darling Basin prepared for the Gingham WatercourseLandcare Group, Department of Ecosystem Management, University of New England,Armidale, NSW. 1994

- [17] Nair AGR, Ramesh P, Nagarjan S and Subraimanam S. A new flavones glycosides from Lippianodiflora. Indian journal chem., 2, 1973. 1316-1317.
- [18] Durairaj, A, Vaiyapuri TS, Mazumder UK and Gupta M.,Protective activity and antioxidant potential of Lippianodiflora extract in paracetamol induced hepatotoxicity in rats. Iranian Journal of Pharmacology & Therapeutics, 2008, 7(1), 83-89.
- [19] RangachariBalamurupan, VeeramutherDuraipandiya, Savarimuthu IG, Macimuthu. Anti diabetic activity of YSitosterol isolated from LippiaNodiflora L. in streptozotocin induced diabetic rats." European journal of pharmacology. 667 (1-3) Sept., 2011, 410-418.
- [20] Barnabas C, Gunasingh G, and Nagarajan S, Flavonoids from the flowers of Phyla nodiflora Linn. Indian Journal of Chemistry, Section B: Organic Chemistry including Medicinal Chemistry, 19B(9), 1980, 822.
- [21] Verma, S., & Singh, S. P. (2008). Current and future status of herbal medicines. Veterinary world, 1(11), 347.
- [22] Nasri, H. (2013). Toxicity and safety of medicinal plants. Journal of HerbMed Pharmacology, 2.
- [23] Prakash, J., Srivastava, S., Ray, R. S., Singh, N., Rajpali, R., & Singh, G. N. (2017). Current status of herbal drug standards in the Indian pharmacopoeia. Phytotherapy Research, 31(12), 1817-1823.
- [24] Abbasi, A. M., Khan, M. A., Ahmad, M., Zafar, M., Jahan, S., & Sultana, S. (2010). Ethnopharmacological application of medicinal plants to cure skin diseases and in folk cosmetics among the tribal communities of North-West Frontier Province, Pakistan. Journal of ethnopharmacology, 128(2), 322-335.
- [25] Shanmughanandhan, D., Ragupathy, S., Newmaster, S. G., Mohanasundaram, S., &Sathishkumar, R. (2016). Estimating herbal product authentication and adulteration in India using a vouchered, DNA-based biological reference material library. Drug safety, 39(12), 1211-1227.
- [26] Malik HMA. Treatment through Herbs in: Medicinal Plants of Pakistan, (Eds.): R. Anwar, N. Haq, And S. Masood. 2001 pp. 21-23
- [27] Durairaj AK. VaiyapuriTS ,Mazumder UK, Gupta M. Antimicrobial and lipid peroxide scavenging activity of lippianodiflora (verbenaceae) Pharmacology online 3, 2007,177-189.
- [28] Balamurugan R, Duraipandiyan V and Ignacimuthu S. Antidiabetic activity of γ sitosterol isolated from Lippianodiflora L in streptozotocin induced diabetic rats. Eur J Pharmacol 2011;667(1-3):410-418.
- [29] Sudershan C. Shoot brid regeneration from leaf explants of a medicinal plant. EnicosternmaOxillare. Current science 74, 1998, 1099-1100.
- [30] Joshi BC. Chemical examination of Lippianodiflora. VijnanaParishadAnusandhanPatrika 1970; 11(4):219-214.
- [31] Teklemichaltesfay, kamalakara Rao konuku, Krishna chaithanya karri (2020) Phytochemical screening and in-vitro antidandruff activity.
- [32] Prajakta Ashok Halnor*, MilkaAnandJadhav, PratikshaMachhindraHalnor, Anjali BabasahebChaudhari(Volume 9, Issue 2024) Preparation and Formulation of Herbal Antidandruff Shampoo
- [33] Regupathi T and Chitra K, (2015) Int. J. Res. Pharm. Sci., 6(2), 185-188[10:41 AM, 10/11/2024]: Antidandruff activity of Eclipta alba (L.) Hassk. andLippianodifloralinn
- [34] Susan G. Suganya*, Adhithya Subramanian Suganya et al., J AdvSci Res, 2021; 12 (2) Suppl 1: ANTIDANDRUFF ACTIVITY OF A POLYHERBAL FORMULATION AGAINST MALASSEZIA ISOLATES FROM HUMAN SCALP IN VITRO
- [35] Sakthivel Srinivasan, WankuparWankhar, SheeladeviRathinasamy, RavindranRajan*. Larvicidal Potential of IndigoferaTinctoria (Fabaceae) On Dengue Vector (AedesAegypti) And Its Antimicrobial Activity Against Clinical Isolates. Asian Journal of Pharmaceutical and Clinical Research.2015;8(3):316-319
- [36] Visweswari G, Christopher R and Rajendra W: Phytochemical screening of active secondary metabolites present in Withaniasomnifera root: Role in traditional medicine. International Journal of Pharmaceutical Scinces and Research.2013;4(7):2770-2776

- [37] Jayaramu M et al. Studies on Qualitative and Quantitative Phytochemical Analysis of *Cissusquadrangularis*. *Advances in Applied Science Research*.2016;7(4):11-17
- [38] Gul, Rahman & Jan, Syed & Faridullah, Syed & Sherani, & Jahan, Nusrat; Preliminary Phytochemical Screening, Quantitative Analysis Of Alkaloids, And Antioxidant Activity Of Crude Plant Extracts From *Ephedra Intermedia* Indigenous To Balochistan; *The Scientific World Journal*.2017;24(4):24-30
- [39] Pinal Patel, Nivedita Patel, Dhara Patel, Sharav Desai, Dhananjay Meshram. Phytochemical Analysis and Antifungal Activity of *Moringa oleifera*. *International Journal of Pharmacy and Pharmaceutical Sciences*.2014;6(5):144-147
- [40] Saranya K, Thirumarimurugan M and Manivasagan V. Biosorption of hexavalent chromium from paint industrial effluent by *Saracaindica* leaves using with and without gel entrapment method, *International journal of environment and sustainable development*.2016;15(3):219-226
- [41] Azwaida NN. A Review on the Extraction Methods Use in Medicinal Plants, Principle, Strength and Limitation. *Med Aromat Plants*.2015; 4(3)
- [42] Basant Kumar Sinha. Studies on the Inhibitory Effect of some Plant Extracts on *Mycoflora* and Aflatoxin Production. *Acta Scientific Microbiology*.2018;1(6):23-25
- [43] Melville Matheson; Gram Stain; Community Eye Health.1999; 12(30)
- [44] Mistry Zoya, Gaurav Shah. Anti-Dandruff activity of synthetic and herbal shampoos on dandruff causing isolate: *Malassezia*. *International journal of Applied Research*.2016;2(7):80-85
- [45] Shu'aibu Isa et al. Isolation and Identification of *Malassezia globosa*, Associated with Dandruff among Female Students of Gombe State University. *Greener Journal of Microbiology and Antimicrobials*.2013;1(1):1-6
- [46] Mohanapriya S, Mercy Bastine C, Caroline Jeba R. Comparative study of anti-dandruff activity of *Syzygium aromaticum* and *Zingiber officinale*. *Indo American Journal of Pharmaceutical Research*.2013;3(6):2231-6876
- [47] Naga Padma P., Anuradha K., Divya K. Comparison of potency of antifungal action of dandruff shampoos and different plant extracts. *International journal of medical research & health sciences*. 2015;4(2):327-331
- [48] DeAngelis YM, Gemmer CM, Kaczvinsky JR, Kenneally DC, Schwartz JR, Dawson TL Jr. Three etiologic facets of dandruff and seborrheic dermatitis: *Malassezia* fungi, sebaceous lipids, and individual sensitivity. *The Journal Investigative Dermatology Symposium Proceedings*. 2005 Dec ;10(3):295-7. doi:10.1111/j.1087-0024.2005.10119
- [49] Abirami A, Mohamad SH, Jayprakash S, Karthikeyini C, Kulathuran KP, Firthouse MP. Effect of *Ocimum sanctum* and *Azadiractaindica* on the formulation of antidandruff herbal shampoo powder. *Der Pharmacia Lettre*. 2009 Mar; 1(2), 2009, 68-76.
- [50] Harshali Wadekar, Rizwan Thara. Preparation and Evaluation of Herbal Hair Oil. *International Journal of Science and Research*. 2020 Nov;9(11):91.
- [51] Kumar et al. (2018) - "Phytochemical and pharmacological profile of *Phyla nodiflora*" (*Journal of Pharmacy and Pharmacology*, Vol. 70, No. 8, pp. 1038-1046)
- [52] Singh et al. (2020) - "*Phyla nodiflora*: A review of its botany, phytochemistry, and pharmacology" (*Journal of Ethnopharmacology*, Vol. 253, pp. 112324)91-5