



Original Research Article

Development and analysis of a herbal bath bomb for its antifungal properties

Sonali D Labhade^{1*}, Harshad S Kapare¹, Juilee S Jagtap¹, Sohan S Chitlange¹,
Karishma M Rathi¹

¹Dr. D. Y. Patil Institute of Pharmaceutical Sciences and Research, Pimpri, Pune, Maharashtra, India



ARTICLE INFO

Article history:

Received 04-01-2024

Accepted 12-02-2024

Available online 12-03-2024

Keywords:

Aeglemarmelos Correa leaves

Sodium bicarbonate

Epsom salt

Citric acid

ABSTRACT

Introduction : Fungal skin infections are a prevalent health issue that requires investigation into safe and efficient alternative remedies. Herbal components are a good option for cosmetics formulations because they have historically shown antifungal capabilities. Building on this idea, the research seeks to create a novel antifungal herbal bath bomb by utilizing the medicinal properties of plants.

Aim & Objective: The aim of this project is to develop evaluate a herbal bath bomb, with an emphasis on its antifungal qualities. The main goal is to create a bath bomb with carefully chosen herbal elements that have been suggested to have antifungal properties.

Materials and Methods: The study employed a systematic approach to construct the herbal bath bomb, including a variety of herbal ingredients recognized for their antifungal properties. Precise measurement and blending were necessary during the material preparation process to ensure optimal efficacy. The effectiveness of the herbal bath bomb against common fungus strains was evaluated in the lab along with antifungal testing.

Results & Conclusion: The results reveal promising antifungal properties of the developed herbal bath bomb, as evidenced by its efficacy against common fungal strains. This study contributes valuable insights into the potential of herbal-based hygiene products for combating fungal skin conditions. The findings support the conclusion that the formulated bath bomb holds promise as a natural and effective solution, paving the way for further exploration and development in the realm of herbal skincare products.

This is an Open Access (OA) journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License](https://creativecommons.org/licenses/by-nc-sa/4.0/), which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprint@ipinnovative.com

1. Introduction

AegleMarmelos belongs to the citrus family Rutaceae.¹ Its known as a holy tree in Hindu scriptures which is grown near temples and is also an indicator of underground water sources. AegleMarmelos is known as Bael and originates in India (Figure 1). Its mentioned in Indian scriptures since 800 BC. The taxonomical classification of A. marmelos given in Table 1. In Hindu culture all parts of this plant were considered medicinal and were used to treat various conditions like asthma, fractures, anemia, swollen joints,

wound healing, diabetes, high BP, jaundice, diarrhea, stomachache, cancer, malaria and gastroduodenal disorders (Figure 2).² The bael plant contains furocoumarins such as xanthotoxol and the methyl ester of alloimperatorin, and also flavonoids such as rutin and marmesin, essential oils, and alkaloids such as á-fargarine (=alocryptopine), O-isopentenylhalfordinol, and O-methylhalfordinol.] N-[2-hydroxy-2(4-methoxyphenyl) ethyl]-3-phenyl-2-propenamide (N-[2-hydroxy-2(4-ethoxyphenyl) ethyl]-3-phenyl-2-propenamide) is a component that may be isolated from bael leaves. Aeglemarmelosine has been extracted as an orange viscous oil.¹⁻³ Bath bombs commonly contain bath salts, which help in muscle relaxation. It also acts as a

* Corresponding author.

E-mail address: sonalilabhade16@gmail.com (S. D. Labhade).

soft moisturizer and provides nourishment to the skin. The herbal ingredient used in bath bomb has various therapeutic properties such as antifungal, antimicrobial, antiviral, antidiabetic, analgesic, etc.³ The antioxidant activity of methanolic and ethanolic extracts of the fruit pulp of the A. marmelos plant was studied in a rat model using the DPPH radical scavenging method and the nitric oxide scavenging method.⁴ The antibacterial activity of petroleum ether, ethanol, and aqueous extract of A. marmelos plant leaves was investigated using the agar well diffusion technique. The extracts were reported to be efficient against E. coli, Streptococcus pneumoniae, Salmonella typhi, Proteus vulgaris, and Klebsiella pneumoniae bacteria.⁵ Antifungal activity was shown in an ethanolic preparation of the root towards A. fumigates and T. mentagrophytes.⁶ The antifungal activity of essential oils extracted from the ethanolic leaf extract of the Bael plant (Aegle marmelos), (Rutaceae Family), was studied against Candida albicans strains.⁷ All A. marmelos leaf extracts were tested for hypoglycemic action in a variety of animal models. At 500 mg/kg body weight, the aqueous and alcoholic extracts of the fruit portion demonstrated glycemic action against rabbits.⁸ In vitro proliferation of human tumour cell lines such as the leukemic K562, T-lymphoid jurkat, Blymphoid Raji, erythroleukemic HEL, melanoma Colo 38, and breast cancer MCF and MDA-MB-231 cell lines was inhibited by the extract.⁹ The analgesic effect of a methanolic extract of Bael plant leaves was investigated in a mouse model utilising a squirming and tail immersing test at a dose of 200 mg/kg. The plant's analgesic activity was found to be significant.^{10–12}

Table 1: Taxonomical classification of aeglemarmelos

Kingdom	Plantae
Order	Sapindales
Family	Rutaceae
Subfamily	Aurantioideae
Genus	Aegle Correa
Species	A.Marmelos
Clade	Angiosperms
Division	Magnoliophyta
Common name	Baelpatra, Bael



Figure 1: Image of aegle marmelos leaves

2. Materials and Methods

2.1. Experimental

Aegle Marmelos leaves were taken from the local area of Pimpri, Pune. All the chemical were of AR grade.

All of the leaves of Bael were cleaned and dried with distilled water. Using a mortar and pestle or mixer grinder, fine powder was extracted from the dried leaves. The cold extraction/maceration method was used to extract fine leaf powder using solvents such as ethanol. 50g of powdered sample was soaked in 100ml of each solvent for 4-5 days to allow diverse chemical contents from the leaf to permeate into the solvents, and the filtrate was collected after the filtration procedure. By evaporating extra solvent with the help of rota evaporator equipment, final pure form of extract is obtained.^{13–16} The rotovap works by increasing the rate of evaporation of the solvent by reducing the pressure to lower the solvent boiling point, rotating the sample to increase the effective surface area and heating the solution.

2.2. Preparation of bath bomb

All the dry ingredient in dist were combined and mixed until uniform. Food Colourant was added in the last step. After the dry ingredient mixed Bael leaves extract (Figure 2) was added and combined well. At the same time, wet ingredients were mixed in separate bowl without adding food colourant. Dry ingredients were then added to wet ingredients and stirred it properly. During mixing the mixture appeared like dry sand. Bath bomb mould was used to give it beautiful shape. Mould was allowed to stand for 20 minutes in refrigerator before removing the opposite side of the mould. After letting the second side to dry, leave the bath bomb to harden up overnight. Prepared formulations were evaluated for various parameters like Effervescent time, pH test, Antifungal test.



Figure 2: Extract obtained from leaves of Aeglesmarmelos

Table 2: Formulation table for bath bomb

S.No.	Ingredients	Quantity				Role
		F1	F2	F3	F4	
1	Sodium bicarbonate	2.55 g	2.50 g	3.20 g	2.85 g	Weak base
2	Citric acid	1.04 g	2.14 g	2.74 g	1.14 g	Weak acid
3	Corn starch	1.14 g	1.14 g	1.98 g	2.14 g	Binder
4	Magnesium sulphate	1.02 g	1.32 g	1.22 g	1.42 g	Muscle relaxant ⁵
5	Bael leaves extract	1.00 g	0.99 g	1.00 g	1.00 g	Antifungal & Antimicrobial ^{17–20}
6	Turmeric	Q.S	Q.S	Q.S	Q.S	Coloring agent & Antiseptic ¹³
7	Honey	Q.S	Q.S	Q.S	Q.S	Moisturizer & Antibacterial ²¹
8	Rose water	Q.S	Q.S	Q.S	Q.S	Fragrance & Anti-inflammatory ²²

2.3. Determination of zone of inhibition

The cup-plate diffusion method is used to compare the zone of inhibition of ethanolic extract of Bael leaves (Aeglemarmelos) to Fluconazole solution in potato dextrose agar media.^{15,23}

2.4. Determination of zone of inhibition

Firstly *Candida albicans* grown on agar media. Plates were allowed to dry before 5 mm wells were made using a sterile cork borer. Plant leaves extract was added using a micropipette into the wells of incubated plates, which were then allowed to stand for 10-15 minutes for extract diffusion before incubation freeze it for 3 to 4 hrs then being incubated at 37° C for 48 hours. Following the incubation period, the plates were evaluated for the presence of a clear zone surrounding the extract-containing wells. Then compare the zone of inhibition of ethanolic extract of Bael leaves to Fluconazole solution in potato dextrose agar media.^{22–24}

3. Result and Discussion

3.1. Effervescent time and pH

The effervescent time and pH of a bath bomb formulation F1 to F4 were tested both in cold and hot water mentioned as below:

Table 3: Effervescent time and pH

Formulations	Hot water	Cold Water	pH
F1	1.21	1.30	6.6
F2	1.25	1.37	6.8
F3	1.18	1.40	6.5
F4	1.29	1.49	6.7

3.2. Antifungal activity

The cup-plate diffusion method is used to compare the zone of inhibition of ethanolic extract of Bael

leaves (Aeglemarmelos) to Fluconazole solution in potato dextrose agar media. Based on the results, it was determined that betel leaves had antifungal action. The zone of inhibition of ethanolic Bael (Aeglemarmelos) against *Candida albicans* was nearly identical to the normal (standard) Fluconazole formulation. A bath bomb comprising an ethanolic extract of Bael leaves was effectively made and tested (Figure 3).

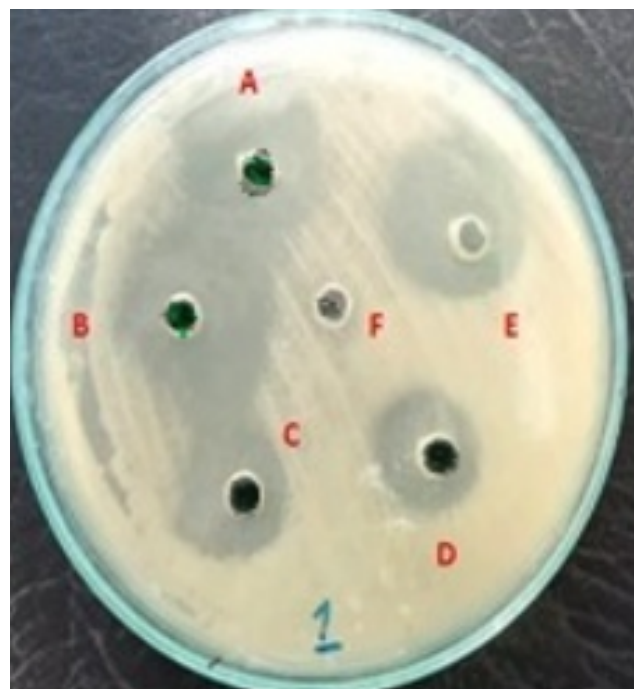


Figure 3: Antifungal activity of aeglesmarmelos

4. Discussion

Fungal species are becoming resistant to many antifungal medications as a result of their widespread usage, necessitating the creation of new drugs. If a drug is generated from natural resources, it must be extremely successful in treating a fungal condition. A novel

formulation makes it possible to target specific fungi. Effective fungus killing is made possible by topical medication administration. It's interesting to think about how to prepare a soothing bath with therapeutic activity. Further research on this subject could aid in the development of a new anti-dermatophytosis medicine.

5. Source of Funding

None.


6. Conflict of Interest


None.

References


- Bhattacharya E, Dutta R, Chakraborty S, Biswas SM. Phytochemical profiling of *Artocarpus lakoocha* Roxb. leaf methanol extract and its antioxidant, antimicrobial and antioxidative activities. *Asian Pacific J Trop Biomed.* 2019;9(11):484–92.
- Chatham-Stephens K, Taylor E, Chang A, Peterson A, Daniel J, Martin C, et al. Hepatotoxicity Associated with Weight Loss or Sports Dietary Supplements, Including OxyELITE Pro™-United States. *Drug Test Anal.* 2017;9(1):68–74.
- Avula B, Chittiboyina AG, Wang YH, Sagi S, Raman V, Wang M, et al. Simultaneous Determination of Aegeline and Six Coumarins from Different Parts of the Plant *Aegle marmelos* Using UHPLC-PDA-MS and Chiral Separation of Aegeline Enantiomers Using HPLC-ToF-MS. *Planta Med.* 2016;82(06):580–8.
- Kaur C, Kapoor HC. Antioxidant Activity of Some Fruits in Indian Diet. In VII International Symposium on Temperate Zone Fruits in the Tropics and Subtropics-Part Two. *Acta Horticulturae.* 2003;696:563–5.
- Jain NK. Antifungal Activity of Essential Oil of *Aegle marmelos* Correa (Rutaceae). *Indian J Microbiol.* 1977;17(1):51–6.
- Hema CG, Lalithakumari K. Screening of Pharmacological Actions of *Aegle marmelos*. *Indian J Pharmacol.* 1988;20(2):80.
- Lampronti I, Martello D, Bianchi N, Borgatti M, Lambertini E, Piva R, et al. In Vitro Anti-Proliferative Effects on Human Tumor Cell Lines of Extracts from the Bangladeshi Medicinal Plant *Aegle marmelos* Correa. *Phytomedicine.* 2003;10(4):300–8.
- Costa-Lotufo LV, Khan MT, Ather A, Wilke DV, Jimenez PC, Pessoa C, et al. Studies of the anticancer potential of plants used in Bangladeshi folk medicine. *J Ethnopharmacol.* 2005;99(1):21–30.
- Shankarananth V, Balakrishnan N, Suresh D, Sureshpandian G, Edwin E, Sheeja E, et al. Analgesic Activity of Methanol Extract of *Aegle marmelos* Leaves. *Fitoterapia.* 2007;78(3):258–9.
- Gupta D, John PP, Pankaj K, Kaushik R, Yadav R. Pharmacological Review of *Aegle marmelos* Corr. Fruits. *Int J Pharm Sci Res.* 2011;2(8):2031–6.
- Shanthi A, Radha R, Jaysree N. Anti-Ulcer Activity of Newly Formulated Herbal Capsule. *Asian J Pharm Clin Res.* 2011;4(3):86–9.
- Van Der Plas A, Schilder JC, Marinus J, Van Hilten J. An explanatory study evaluating the muscle relaxant effects of intramuscular magnesium sulphate for dystonia in complex regional pain syndrome. *J Pain.* 2013;14(11):1341–8.
- Singh AR, Kalirajan K. Anti-Microbial Activity of Turmeric Natural Dye Against Different Bacterial Strains. *J Appl Pharm Sci.* 2012;2(6):210–2.
- Mali SS, Dhumal RL, Havaladar VD, Shinde SS, Jadhav NY, Gaikwad BS, et al. A Systematic Review on *Aegle marmelos* (Bael). *Res J Pharmacognosy Phytochem.* 2021;12(1):31–6.
- Mali SS, Dhumal RL, Havaladar VD, Shinde SS, Jadhav NY, Gaikwad BS. A Systematic Review on *Aegle marmelos* (Bael) *Res J Pharmacognosy Phytochem;*2020(01):12–12.
- Walker B, Harris ME. Bath Bubbles. *J Chem Educ.* 2003;80(12):1416A. doi:10.1021/ed080p1416A.
- Meena RK, Pareek A, Meena RR. Antimicrobial Activity of *Aegle marmelos* (Rutaceae) Plant Extracts. *Int J MediPharm Res.* 2016;2(1):1–5.
- Balakumar S, Rajan S, Thirunalasundari T, Jeeva S. Antifungal activity of *Aegle marmelos* (L.) Correa (Rutaceae) leaf extract on dermatophytes. *Asian Pac J Trop Biomed.* 2011;1(4):309–12.
- Rana BK, Singh UP, Taneja V. Antifungal activity and kinetics of inhibition by essential oil isolated from leaves of *Aegle marmelos*. *J Ethnopharmacol.* 1997;57(1):29–34.
- Sharma GN, Dubey SK, Sharma P, Sati N. Medicinal Values of *Bael* (*Aegle marmelos*) (L.): A Review. *Int J Curr Pharm Rev Res.* 2011;1(3):12–22.
- Mandal MD, Mandal S. Honey: its medicinal property and antibacterial activity. *Asian Pac J Trop Biomed.* 2011;1(2):154–60.
- Drew WL, Barry AL, Toole RO, Sherris JC. Reliability of the Kirby-Bauer Disc Diffusion Method for Detecting Methicillin-Resistant Strains of *Staphylococcus aureus*. *Appl Microbiol.* 1972;24(2):240–7.
- Miller RE, Rose SB. Studies with the Agar Cup-Plate Method: IV. A Correlation of Agar Cup-Plate Data with Antiseptic Dilution Data. *Am J Clin Pathol.* 1941;11(5):414–24.
- Patel S, Siddaiah M. Formulation and Evaluation of Effervescent Tablets: A Review. *J Drug Delivery Ther.* 2018;8(6):296–303.


Author biography

Sonali D Labhade, Assistant Professor  <https://orcid.org/0000-0002-6706-4848>

Harshad S Kapare, Associate Professor  <https://orcid.org/0000-0003-2991-7413>

Juilee S Jagtap, Assistant Professor  <https://orcid.org/0000-0003-2685-1869>

Sohan S Chitlange, Principal  <https://orcid.org/0000-0002-9355-3303>

Karishma M Rathi, Assistant Professor  <https://orcid.org/0000-0002-6407-6739>

Cite this article: Labhade SD, Kapare HS, Jagtap JS, Chitlange SS, Rathi KM. Development and analysis of a herbal bath bomb for its antifungal properties. *IP Indian J Clin Exp Dermatol* 2024;10(1):28–31.