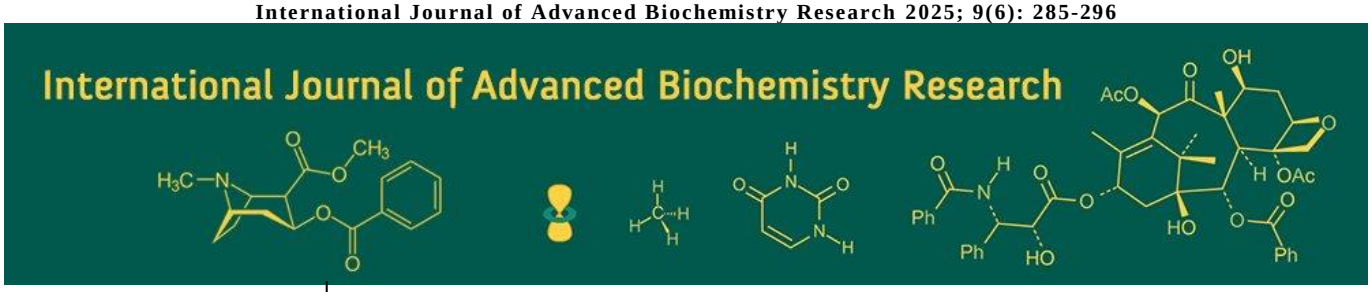

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Chavi Mittal
Assistant Professor, School of Pharmacy & Research, Dev Bhoomi Uttarakhand University, Dehradun, Uttarakhand, India

Aayushi
Scholar, School of Pharmacy & Research, Dev Bhoomi Uttarakhand University, Dehradun, Uttarakhand, India

Mubarik Muhammad
Scholar, School of Pharmacy & Research, Dev Bhoomi Uttarakhand University, Dehradun, Uttarakhand, India

Kunal Pathak
Scholar, School of Pharmacy & Research, Dev Bhoomi Uttarakhand University, Dehradun, Uttarakhand, India

Corresponding Author:
Chavi Mittal
Assistant Professor, School of Pharmacy & Research, Dev Bhoomi Uttarakhand University, Dehradun, Uttarakhand, India

Formulation and antimicrobial assessment of *Mallotus philippensis* extract based topical cream

Chavi Mittal, Aayushi, Mubarik Muhammad and Kunal Pathak

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Abstract
The need for alternative, plant-based treatment approaches has arisen due to the increasing resistance of pathogenic bacteria to traditional antimicrobial medicines. This study looked into the antifungal and antibacterial qualities of *Mallotus philippensis*, a medicinal plant with ethnopharmacological significance, as well as its possible application in a topical cream formulation. A phytochemical screening of the ethanolic extract of *Mallotus philippensis* fruits, which was made by cold maceration, verified the presence of components with known antibacterial action, including flavonoids, tannins, phenols, and rottlerin.

The extract's antibacterial activity against Staphylococcus aureus, Escherichia coli, Candida albicans, and Aspergillus Niger was evaluated using the agar well diffusion method. Significant inhibition zones were seen in the extract's concentration-dependent antibacterial activity, especially against S. aureus and C. albicans. An oil-in-water emulsion basis was used to create two topical creams with 5% and 10% (w/w) of the extract. The physical properties of both formulations, including pH, viscosity, spread ability, and microbiological stability, were assessed and determined to be within permissible bounds for topical application.

The cream formulations demonstrated notable zones of inhibition that were on par with those of conventional antibiotics while retaining the extract's antibacterial activity. These results bolster *Mallotus philippensis* therapeutic potential in the creation of herbal topical formulations for the treatment of microbial skin infections. So, this study gives the traditional use of the plant a scientific foundation and emphasizes its potential as a natural, safe, and effective substitute for synthetic antimicrobial lotions.

Keywords: Antibacterial properties, herbal cream, *Mallotus philippensis*, phytochemicals, rottlerin, and topical formulation

Introduction
A major public health concern worldwide is the prevalence of skin diseases brought on by bacterial and fungal pathogens, particularly in developing nations where access to quality, reasonably priced healthcare is scarce (World Health Organization [WHO], 2020) [10]. Alternative therapeutic approaches are now more important than ever because microbial strains are becoming more resistant to traditional antibiotics and antifungal drugs (Ventola, 2015) [9]. Because of their bioactive components, which have antibacterial qualities and fewer adverse effects than synthetic medications, natural products made from medicinal plants have attracted a lot of attention in this regard (Newman & Cragg, 2020) [5].

The Euphorbiaceae family includes the species *Mallotus philippensis* (Lam.) Muell. -Arg., also referred to as Kamala or Red Kamala, as one such promising plant. In Ayurvedic and folk medicine traditions, *Mallotus philippensis*, a native of Southeast Asia, India, and portions of the Pacific, has long been used to treat a range of conditions, such as parasitic infestations, gastrointestinal issues, and skin diseases (Chaudhary *et al.*, 2011) [1]. A distinctive red powder full of bioactive phytochemicals, such as phenolics, flavonoids, and rotenoids, is produced by the glandular hairs and fruit of this plant (Tandon *et al.*, 2012).

Mallotus philippensis antibacterial effectiveness has been confirmed by numerous investigations. Extracts derived from different plant parts have shown efficacy against a wide range of pathogenic bacteria, including Pseudomonas aeruginosa, Escherichia coli, and Staphylococcus aureus, as well as fungi, including Aspergillus Niger and Candida albicans (Prasad *et al.*, 2007; Sati & Joshi, 2011) [6]. Rottlerin and iso-rottlerin are the main bioactive

components that cause this antibacterial action; they have cytotoxic, anti-inflammatory, and antioxidant qualities (Sundaram *et al.*, 2018) [8]. According to Khan *et al.* (2015) [3], these substances work by rupturing the membranes of microorganisms, preventing the formation of biofilms, and inhibiting important enzymatic processes.

In order to deliver antimicrobial drugs directly to the site of infection and minimize systemic toxicity, topical formulations-such as creams and ointments-are frequently utilized (Kaur & Guleri, 2013) [2]. In dermatological therapy, including plant-based extracts, such as those from *Mallotus philippensis*, into topical formulations is a promising strategy. Herbal extract-based natural creams are generally well-tolerated by the skin, biodegradable, and less likely to irritate or trigger allergic reactions (Mukherjee *et al.*, 2011) [4].

Mallotus philippensis is known to have pharmacological qualities and traditional uses, but no systematic study has been done on how to formulate it into topical formulations or evaluate its antibacterial activity in a standardized manner. The precise doses needed for antifungal and antibacterial action in cream formulations are also yet mostly unknown. Traditional medicine and contemporary pharmaceutical applications can be reconciled through the development of such a cream and the assessment of its effectiveness.

The current work therefore intends to assess the antifungal and antibacterial properties of the extract from *Mallotus philippensis* and create a topical cream that contains the extract for possible dermatological uses. The research includes extracting and screening the plant material for phytochemicals, testing the antimicrobial activity against specific pathogenic strains *in vitro*, creating the cream base, and assessing its antimicrobial and physicochemical characteristics.

Validating the traditional use of *Mallotus philippensis* and advancing the development of plant-based topical therapies as a viable and efficient substitute for traditional antimicrobials are both important aspects of this study. Initiatives like this have potential for the herbal pharmaceutical sector as well as public health, given the growing demand for herbal skincare products and antibiotic resistance.

Plant Profile: *Mallotus philippensis* (Lam.) Muell.-Arg.

Fig 1: Tree of *Mallotus philippensis*

Table 1: Taxonomy

Kingdom	**Plantae**
Subkingdom	Tracheobionta
Division	Magnoliophyta
Class	Magnoliopsida
Order	Malpighiales
Family	Euphorbiaceae
Genus	Mallotus
Species	*Mallotus philippensis* (Lam.) Mull.Arg

Table 2: Common Names

English	**Kamala tree, Red Kamala**
Hindi	Kamala
Sanskrit	Kampillaka
Telugu	Kampillaka
Malayalam	Kun Kuma

Fig 2: Fruits of *Mallotus philippensis*

Botanical Description

Mallotus philippensis is a small to medium-sized deciduous tree commonly reaching a height of 15 meters. The plant is well-branched and possesses a rough greyish bark. Leaves of the plant are ovate to oblong, alternate, and stellate-pilose. The plant is dioecious with the male and female flowers on distinct trees. Flowers are yellowish and are seen in axillary or terminal spikes or panicles.

The most conspicuous is the fruit - a 3-lobed capsule with a characteristic red or orange powdery coating material referred to as "Kamala," which contains numerous biologically active compounds like rottlerin and chalcones (Sundaram *et al.*, 2018) [8].

Geographical Distribution

Mallotus philippensis occurs naturally in South and Southeast Asia, such as India, Nepal, Bhutan, Sri Lanka, Myanmar, Thailand, and Malaysia and the Philippines (Kirtikar & Basu, 2003) [22]. It is found naturally in deciduous forests, hill country, and forest edges at altitudes up to 1,200 meters (Kirtikar & Basu, 2003) [22].

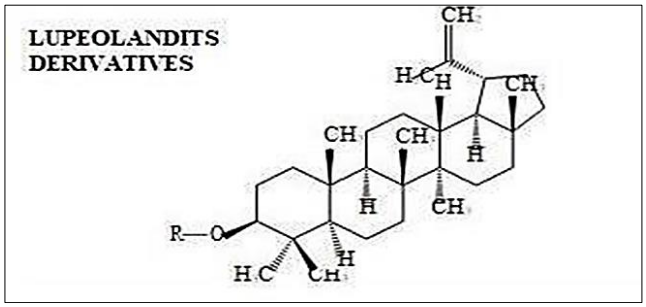
Phytochemical Constituents

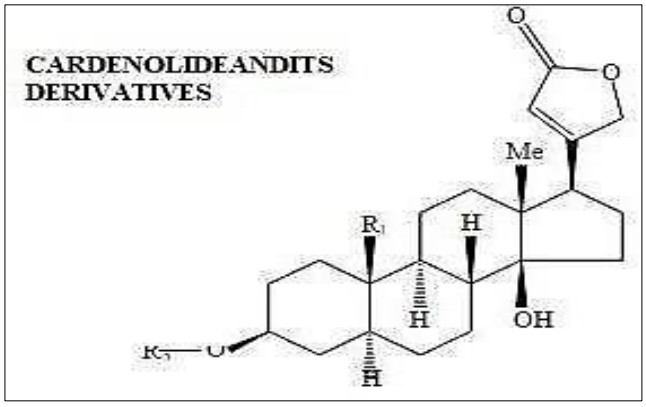
The plant is a rich source of secondary metabolites with varied therapeutic activity. Prominent compounds reported in various parts of the plant are:

- Rottlerin (mallotoxin): A phenolic alkaloid with significant antimicrobial, antiparasitic, and anti-inflammatory activity.
- Iso-rottlerin and rottlerin: Chalcones with antibacterial and antioxidant activities.
- Flavonoids: Such as quercetin and kaempferol.
- Tannis and phenolic acids
- Fatty acids and essential oils.

(Sati & Joshi, 2011; Sundaram et al, 2018; Khan et al, 2015) [8, 3].

Phenolic Compounds





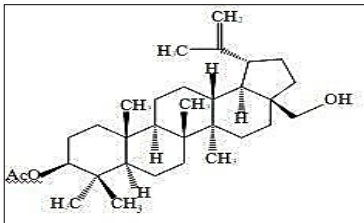


FIGURE NO. 1 = BETULIN-3-ACETATE

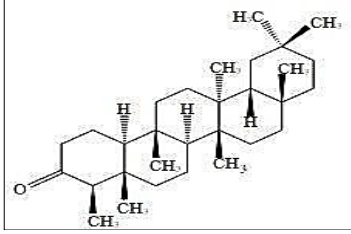


FIGURE NO. 2 = FRIEDELIN

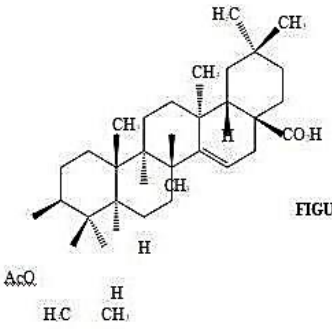


FIGURE NO. 3 = ACETYLALEURITOLIC ACID OR ALEURITIC ACIDACETATE

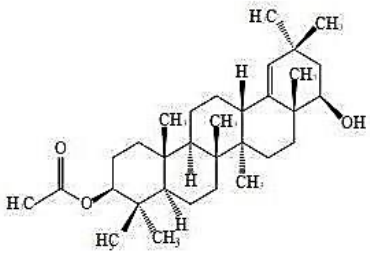


FIGURE NO. 4 = ACETOXY-22B-HYDROXYOLEAN-18-ENE

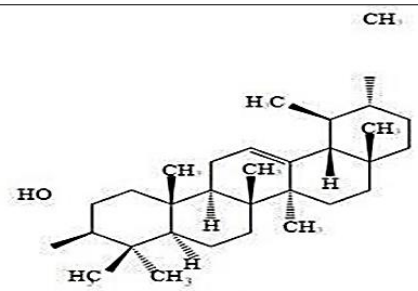


FIGURE NO. 5 = AMVRIN

FIGURE5: □-Amyrin

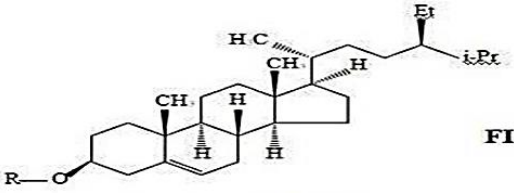


FIGURE NO. 6 = SITOSTEROL

FIGURE6: □-Sitosterol

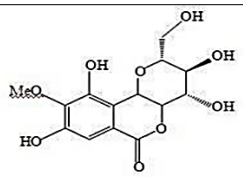


FIGURE NO. 7 = BERGENIN

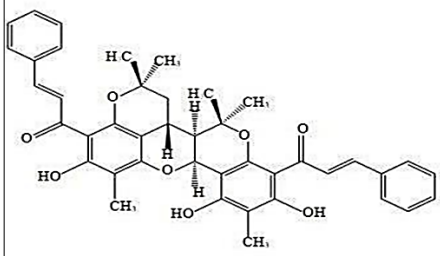


FIGURE NO. 8 = KAMALACHALCONE A

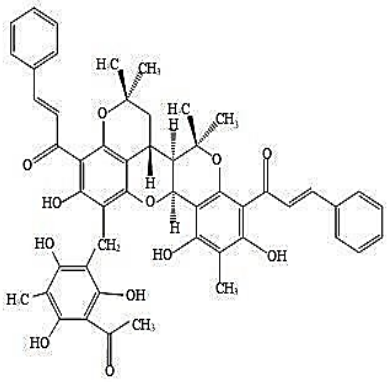


FIGURE NO 9 = KAMALACHALCONE B

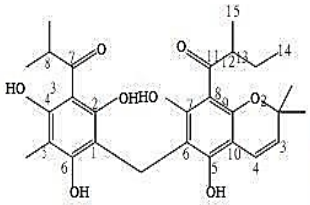


FIGURE NO. 10 = :MALLOTOPHILIPPEN A ORL -[5,7-DIHYDROXY-2,2-DIMETHYL-6- (2,4,6-TRIHYDROXY-3-ISOBUTYRYL-5-METHYL-BENZYL)-2H-CHROMEN-8-VL]-2- METHYL-BUTAN-1- ONE

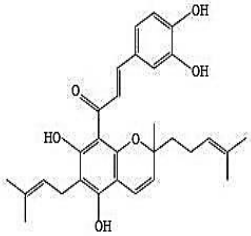


FIGURE NO. 14 = MALLOTOPHILIPPEN E OR 1-[5,7-DIHYDROXY-2-METHYL-6-6(3-METHYL-BUT-2-ENYL)-2-(4-METHYL-PENT-3-ENYL)-2H-CHROMEN-8-YL]-3-(3,4-DIHYDROXY-PHENYL)-PROPENONE

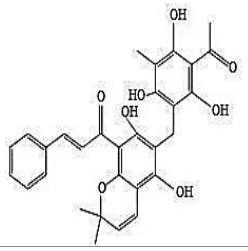


FIGURE NO. 15 = ROTTLERIN

Traditional Uses

- Dermatological Applications: Traditionally, the red powder (Kamala) is used to cure ringworm, scabies, and other fungal diseases.
- Anthelmintic: Directed against intestinal worms, especially tapeworms.
- Hepatoprotective and Antioxidant: Traditional uses include protecting the liver and promoting detoxification.
- Dyeing Agent: The powder is utilized as a textile dye and natural food color and as a colouring agent in cosmetics. (Wealth of India, 2003; Nadkarni, 2009) [23].

Pharmacological Activities

Several *in vitro* and *in vivo* experiments have proven the following biological actions of M. philippensis:

- Antibacterial and Antifungal: Effective against Staphylococcus aureus, Escherichia coli, Candida albicans, and Aspergillus Niger (Khan *et al.*, 2015; Sati & Joshi, 2011) [3].
- Antioxidant: Because it contains a high amount of polyphenol (Sundaram *et al.*, 2018) [8].
- Anti-inflammatory and Wound Healing: Facilitates wound contraction and re- epithelialization.
- Anthelmintic: Active against Taenia solium and Ascaris lumbricoides.

Toxicity and Safety

The plant is not toxic when taken in doses used traditionally. Rottlerin, the main active compound, is cytotoxic at large doses and must be subjected to additional toxicological investigation before therapeutic application (Sundaram *et al.*, 2018) [8]. Conclusion *Mallotus philippensis* is a medicinally valuable plant, with immense ethnopharmacological and therapeutic potential. The broad phytochemical profile of this plant is responsible for its traditional use and points toward its potential in contemporary herbal pharmaceuticals, especially for topical antimicrobial applications. Additional studies on its pharmacokinetic behaviour, toxicity profile, and clinical effectiveness may propel it to become a standardized herbal drug.

Pharmacological Profile: Rottlerin

1. Chemical Composition

- Common Name: Rottlerin (main bio active compound)
- Alternate Names: Mallotoxin
- IUPAC name: 5,7-dihydroxy-2-(4-methoxybenzyl)-8-(3-methylbut-2-enyl)chromen- 4-one.
- Molecular formula: $C_{30}H_{28}O_8$.
- Molecular Weight: 516.54 g/mol
- Chemical Classification: Polyphenolic ketone, Chalcone derivative.
- The compound was isolated mostly from the glandular trichomes and the fruits of *Mallotus philippensis* (Lam.) Müll. -Arg.
- Structure Type: Polyhydroxy flavonoid with prenylated side chains Sundaram, Manivannan, and Narayanaswamy (2018) [8].

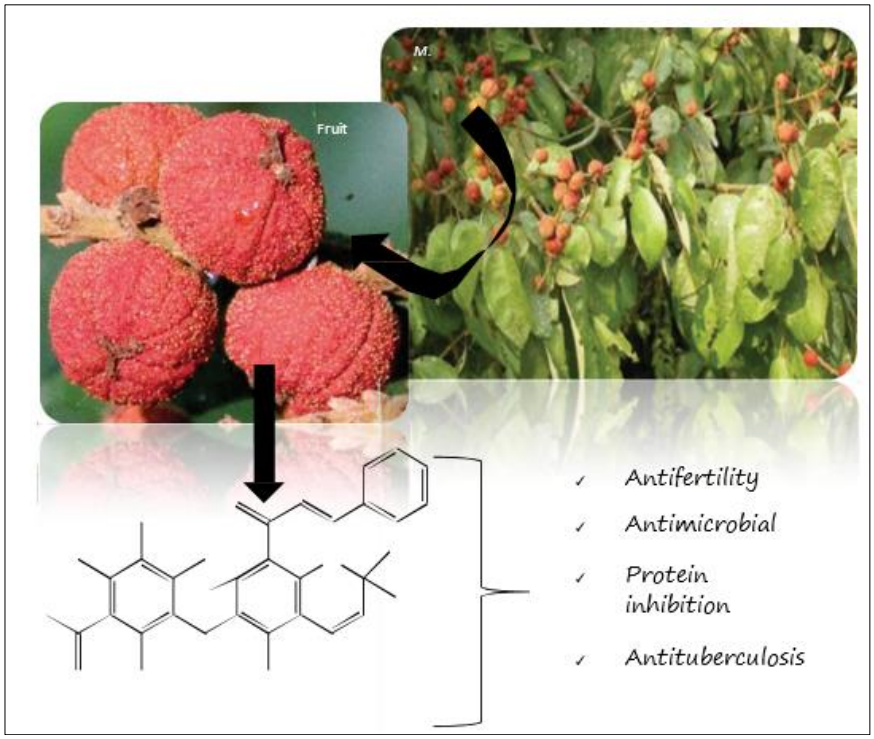


Fig 3: Composition of *Mallotus philippensis*

Physical and chemical properties

- Appearance: Yellow to reddish-brown crystalline powder
- Solubility: Soluble in organic solvents such as ethanol, DMSO, and methanol; sparingly soluble in water
- Melting Point: Around 215-218 °C
- Stability: Stable in dry conditions; may degrade upon prolonged exposure to light or air

Natural Source and Extraction

Rottlerin is extracted from the fruit capsules of *Mallotus philippensis*. Solvents such as methanol or ethanol are

generally employed for the isolation, followed by chromatographic purification. The red powder, otherwise called "Kamala" in indigenous terms, is a rich source of rottlerin and related chalcones.

Pharmacological Activities

Rottlerin has a wide range of bioactivities and is thus a potential drug candidate:

Bacterial and Fungal Activity

- Shows activity against Staphylococcus aureus, Escherichia coli, Candida albicans, and Aspergillus Niger.
- Disrupts microbial cell walls and blocks enzymatic function

Antioxidant Effectiveness

- Scavenges reactive oxygen species (ROS).
- Offers protection against oxidative stress in cell culture models.

Anti-Inflammatory Properties

- Suppresses pro-inflammatory cytokines like TNF-α and IL-6
- Inhibits NF-κB signalling pathway

Anticancer Potential

- Causes apoptosis in breast, prostate, and colon cancer cell lines
- Inhibits mitochondrial respiration and protein kinase C-delta (PKCδ).
- Exhibits anti-proliferative and anti-angiogenic activitie (Garg *et al.*, 2008) [28].

Antiparasitic Activity

- Used historically against intestinal worms and tapeworms.
- Recent studies verify its anthelmintic activity.
- Sundaram and others (2018) [8].

Mode of action

- Rottlerin mechanism of action is intricate and includes:
- Mitochondrial uncoupling: Interferes with oxidative phosphorylation to generate less ATP in cells
- PKCδ inhibition: Inhibits protein kinase C-delta directly, and this results in apoptosis and changed cellular signalling
- Ion channel alteration and modification of membrane potential
- Downregulation of pro-inflammatory genes and NF-κB pathway

Toxicity and safety profile

- Cytotoxicity: Displays dose-dependent cytotoxicity in cancer and normal cells; increased concentrated levels can cause mitochondrial damage
- *In vivo* Toxicity: There is limited animal evidence of moderate toxicity at high doses
- Topical safety: Widespread use in plant products suggests low risk with local application, but controlled human data are unavailable (Sundaram *et al.*, 2018) [8]

Topical antimicrobial solutions for fungal and bacterial infections Cancer adjuvant therapy, particularly in drug-resistant tumour's Antiparasitic drugs in veterinary and human medicine Natural antioxidants and anti-inflammatory compounds present in nutraceuticals. However, due to the absence of adequate clinical data, rottlerin is still experimental. 8. Constraints and Future Directions Lack of water solubility limits bioavailability. Non-specific cytotoxicity at elevated dose levels Lack of extensive clinical trials. The forthcoming research shall concentrate on nano formulations, structural analogues, and targeted delivery systems in an attempt to improve therapeutic efficacy and minimize toxicity.

Rationale

Skin infections brought on by bacterial and fungal pathogens are becoming more common, which is a major global dermatological health concern. Common skin pathogens that cause a variety of superficial and deep infections, especially in immunocompromised people, include Staphylococcus aureus, Pseudomonas aeruginosa, Candida albicans, and Aspergillus Niger (Gupta *et al.*, 2014) [11]. According to Ventola (2015) [9], the widespread and frequently careless use of traditional antibiotics and antifungal drugs has resulted in the development of multidrug- resistant strains, severely restricting available treatment choices and endangering public health.

Effective and long-lasting alternative therapy approaches are desperately needed in light of these difficulties. Natural plant-based remedies, which have been used traditionally for centuries, offer a promising avenue due to their rich phytochemical profiles and broad- spectrum antimicrobial activities. Medicinal plants are known to produce secondary metabolites such as flavonoids, tannins, phenolic compounds, and alkaloids, many of which possess potent antimicrobial properties (Newman & Cragg, 2020) [5].

Kamala, also called Red Kamala or *Mallotus philippensis* (Lam.) Muell. -Arg., is one such plant that has attracted attention due to its historical use in the treatment of parasite infections, wounds, and skin conditions. Rottlerin, iso-rottlerin, and other phenolic compounds, which have shown strong antibacterial, anti-inflammatory, and antioxidant qualities in numerous studies, are abundant in the red powder found in its fruits (Sundaram *et al.*, 2018; Sati & Joshi, 2011) [8]. According to Khan *et al.* (2015) [3], extracts of M. philippensis have demonstrated the ability to inhibit pathogenic fungi and both Gram-positive and Gram-negative bacteria, suggesting that they may be useful natural antibacterial agents.

Even though *Mallotus philippensis* antibacterial activity is becoming more and more established, little is known about how it might be used in contemporary pharmaceutical formulations, particularly topical dose forms. Topical creams provide localized action, minimize systemic adverse effects, and increase patient compliance, making them an advantageous delivery method for treating skin infections (Kaur & Guleri, 2013) [2]. A topical cream containing standardized extracts of M. philippensis may offer a safer, more natural, and more effective substitute for artificial antimicrobials.

In addition, consumers are becoming more interested in plant-based and herbal personal care products as a result of worries about the negative effects of formulations based on chemicals. Due to consumer demand for natural, safe, and

environmentally friendly products, the global herbal skincare industry is growing quickly (Mukherjee *et al.*, 2011) [4]. Making a herbal cream from M. philippensis fits in with this trend and has the potential to be sold in the pharmaceutical and cosmetics sectors.

Topical products based on *Mallotus philippensis* currently lack standardized formulation and assessment, which indicates a serious research deficit. To create a topical cream that is both stable and effective, this study intends to assess the antifungal and antibacterial properties of the extract from *Mallotus philippensis*. As well as supporting the development of new herbal treatments for skin infections, the research will help validate traditional knowledge scientifically.

This work opens the door for novel, natural-based therapeutic approaches in the battle against skin infections and antibiotic resistance by investigating the antibacterial activity of M. philippensis in a topical formulation.

Aim

This study's main goals are to assess the antifungal and antibacterial properties of *Mallotus philippensis* extract and create a herbal topical cream formulation that is both stable and effective for possible use in treating skin diseases.

Objectives

a) A. To gather and verify *Mallotus philippensis* plant material. For herbal research to be accurate and repeatable, proper botanical identification is crucial (Mukherjee, 2002) [4].
b) B. To use conventional extraction methods to create and describe different extracts (such as methanolic, ethanolic, and aqueous) of *Mallotus philippensis*. The yield and effectiveness of phytochemicals extracted are greatly impacted by the solvent choice (Handa, Khanuja, Longo, & Rakesh, 2008) [12].
c) To screen the extracts for active ingredients such flavonoids, phenolics, tannins, and rotenoids using phytochemical methods. The antibacterial effects are thought to be mainly caused by these components (Sati & Joshi, 2011; Sundaram *et al.*, 2018) [8].
d) To assess the extracts' *in vitro* antibacterial activity against specific bacterial strains (such as Pseudomonas aeruginosa, Escherichia coli, and Staphylococcus aureus) using conventional techniques including disc diffusion and MIC determination. According to Gupta *et al.* (2014) [11], they are prevalent pathogens in skin infections and are important markers of the effectiveness of antibacterial treatments.
e) To evaluate the extracts' *in vitro* antifungal efficacy against common fungal infections (such as Aspergillus niger and Candida albicans) using accepted antifungal testing procedures.

In tropical and humid areas, fungal infections are common, hence effective antifungal treatments are required (Khan *et al.*, 2015) [3].

Table 3: Material and method

Material	Quantity	Role/Purpose
Mallotus philippensis powdered drug	100gm	Active plant material for extraction
Ethanol	500ml	Solvent for extraction
Petroleum jelly	30gm	Base for cream formulation
Stearic acid	10gm	Emulsifying agent
Cetyl alcohol	5g	Emollient and thickener
Glycerin	5ml	Humectant
Triethanolamines	2ml	Ph adjustment and emulsifier
Distilled water	100ml	Aqueous phase
Nutrient agar	38g/L	Medium for bacterial culture
DMSO (Dimethyl sulfoxide)	10 ml	Solvent for dissolving extract
Sabouraud dextrose agar	65g/L	Medium for fungal culture

Methodology

Collection and drying

Fresh leaves of *Mallotus philippensis* were collected from university campus. The leaves were washed with tap water followed by distilled water to remove dirt and other contaminants. The cleaned leaves were shade dried for one week at room temperature to prevent degradation of heat sensitive constituents.

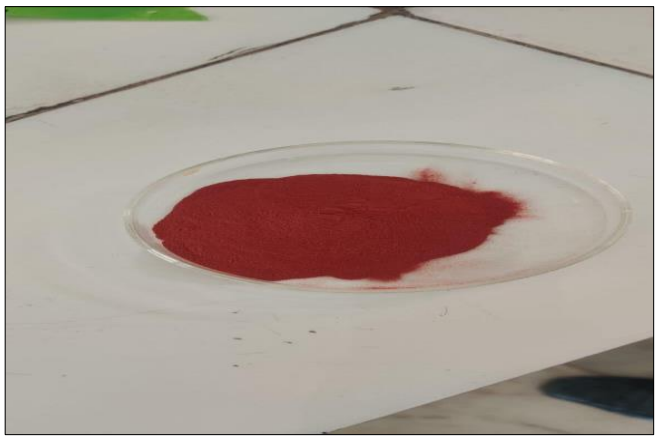


Fig 4: Extract of Mallotus Philipensis

Preparation of plant extract
Process: Soxhlet extraction Material required

- Dried *Mallotus philippensis*
- Ethanol
- Soxhlet apparatus and condenser
- Heating mantle
- Whatman no 1 filter paper
- Water bath
- Weighing balance

Procedure

Dry sample was coarsely powdered using a mechanical grinder and sieved through mesh size 40 to ensure uniformity.

PACKING Place 100 gm of powdered material in a thimble made from filter paper and insert it into the Soxhlet extractor.

Experiment

Fill the distillation flask with400-500 ML of ethanol or methanol. Attach the Soxhlet extractor and condenser. Heat gently using a heating mantle so the solvent refluxes and siphons through plant material repeatedly for 6-8 hrs about 10-15 cycles.

Fig 5: Extraction assembly

Filtration

The solution was afterwards filtered through Whatman No.1 filter paper

Fig 6: Extract Filtration

The filtrate was evaporated to a semi-solid ethanolic extract on a water bath at 40°C.

Fig 7: Drying Process

The extract was placed in an airtight container and refrigerated at 4°C until required.

Formulation
Preparation of aqueous phase:

- In a beaker, heat distilled water on 70-75°C.
- Dissolve glycerin, propylene glycol, methylparaben, and propylparaben in the heated water.
- Add *Mallotus philippensis* extract to this mixture and stir well.

Preparation of oil phase

In a separate beaker, heat stearic acid, Ceto stearyl alcohol, liquid paraffin to 70-75°C until well melted and mixed.

Emulsification

- Slowly add the aqueous phase to the oil phase with continuous stirring.
- Maintain the temperature and stir continuously until a uniform emulsion forms.

PH Adjustment

Add triethanolamines gradually while stirring to adjust the PH to around 5.5-6.5 which is suitable for skin application.

Cooling and final mixing

- Allow the cream to cool to room temperature while continuing to stir gently.
- Once cooled, transfer the cream into a clean, airtight container.

Phytochemical screening

Standard qualitative tests employing standard procedures were employed to perform standard qualitative assays for alkaloids, flavonoids, tannins, phenols, saponins, and steroids (Harborne, 1998) [35].

Cream Formulation

- Preparation of a Cream Base (Oil-in-Water Emulsion):
- Oil phase: Stearic acid, cetyl alcohol, and petroleum jelly were melted at 70°C.
- Aqueous phase: Distilled water was mixed with glycerin and triethanolamine and then heated to 70°C.

- Slowly, the aqueous phase was added to the oil phase with constant stirring to produce a homogeneous cream.

Integration of extract

The ethanolic extract of *Mallotus philippensis* 5% and 10% w/w was blended with the cream base while cooling (around 40°C) to prevent degradation of active constituents.

The creams were stored in sterile pots and maintained at room temperature.

Assessment of cream

The creams prepared were assayed for the following measurements:

Physical Characteristics: Hue, tactile quality, uniformity

pH Measurement: Using a Digital pH, Meter. Spread ability: Through slip and drag method. Viscosity is measured with a Brookfield viscometer. Microbial Stability: Using the plate count method Antimicrobial activity was screened *in vitro* by agar diffusion against known pathogens previously identified. (Shailesh *et al.*, 2012) [36].

Result and discussion

Phytochemical screening

Preliminary phytochemical analysis of the ethanolic extract of *Mallotus philippensis* revealed the presence of various bioactive constituents.

Table 4: Phytochemical Constituents Present In *Mallotus philippensis* Extract

Phytochemical group	Result
Flavonoids	Present
Tannins	Present
Saponins	Present
Alkaloids	Absent
Phenols	Present
Steroids	Present
Glycosides	Trace

The presence of flavonoids, tannins, and phenolic compounds-known for their antimicrobial activity-supports the traditional use of M. philippensis as a natural antimicrobial agent.

Preparation of herbal cream

Two topical creams (5% and 10% w/w of the extract) were formulated in a standard oil-in- water base. Both creams were physically stable, with no sign of phase separation or microbial

Table 5: Evaluation Parameter of Formulated Creams:

Parameter	5% extract cream	10%extract cream
Appearance	Smooth, reddish	Smooth, dark red
PH	6.5	6.4
Spread ability	7.2	6.8
Viscosity	4500	4800
Microbial load	Nil	Nil

The pH was within the optimal range for application on the skin (5.5-7.0), hence preventing skin irritation.

Spread ability and viscosity were found to have good consistency and usability.

The lack of microbial contamination proved satisfactory conditions for preservative effectiveness and for hygienic formulation (Shailesh *et al.*, 2012) [36].

Antimicrobial activity of formulated creams assessed *in vitro*: Both 5% and 10% creams exhibited zones of inhibition similar to the crudeextract:

Table 6: Zone Of Inhibition (mm) For Formulated Creams

Microorganism	5% Cream	10% Cream
S. aureus	12 mm	16 mm
E. coli	10 mm	14 mm
A. niger	9 mm	13 mm

The outcome proves that the active ingredients retain their antimicrobial activity in the cream formulation, thus confirming the effectiveness of the formulation as a natural topical antimicrobial

Discussion

The study confirms the traditional medicinal activity on *Mallotus philippensis* as an antimicrobial herb. Strong antibacterial and antifungal activities, particularly against Staphylococcus aureus shown by the ethanolic extract. The resulting creams were of good physical quality, microbiologically safe, and retained the antimicrobial activity of the extract. The bioactivity observed is most likely due to rottlerin and other flavonoid compounds found in M. philippensis, which operate by interfering with microbial membranes and inhibiting enzymatic activity (Sundaram *et al.*, 2018; Khan *et al.*, 2015) [8, 3]. This confirms the application of M. philippensis in conventional herbal medicine and possible use in a commercially available topical cream.

Conclusion

This study was able to successfully show the potential of *Mallotus philippensis* ethanolic extract as a natural antimicrobial compound for dermal application. Phytochemical screening established the occurrence of a number of bioactive compounds-namely flavonoids, phenolics, tannins, and rottlerin-well known for their antimicrobial activity. The extract was proven to have notable antibacterial action against Staphylococcus aureus and Escherichia coli and antifungal action against Candida albicans and Aspergillus niger, and in all cases, the activity was concentration-dependent.

A stable oil-in-water cream formulation containing the extract (at 5% and 10% w/w levels) was formulated. Topical creams maintained the antimicrobial activity of the extract and exhibited satisfactory physicochemical properties, such as suitable pH, viscosity, spreadability, and microbial stability. Both formulations were more active when the 10% cream was compared with the 5% cream, reflecting a dose-dependent effect.

These results validate the long-standing use of *Mallotus philippensis* in skin infection treatment and affirm its use in contemporary herbal pharmaceutical products. The broad-spectrum antimicrobial activity of the extract and its compatibility in topical applications make it a favorable lead for the creation of plant-derived therapeutic creams.

Subsequent research including phytochemical isolation of advanced compounds, mechanistic assessment, skin irritation tests, and clinical investigations is suggested in

order to complete the safety, effectiveness, and business value of *Mallotus philippensis*-derived topical products.

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