IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

DEVELOPMENT AND EVALUATION OF HERBAL ACNE PATCHES CONTAINING NEOLMACKIA CADAMBA EXTRACT.

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Abstract:

Acne vulgaris is a multifactorial inflammatory skin disorder that commonly affects adolescents and young adults. The limitations and side effects of conventional therapies such as antibiotics and retinoids have encouraged the search for safer, plant-based alternatives. The present study focuses on the development and evolution of a herbal transdermal acne patch incorporating Neolamarckia cadamba leaf extract, known for its antimicrobial, antioxidant, and anti-inflammatory properties. The work aimed to formulate, optimize, and evaluate a hydrocolloid-based herbal patch capable of providing controlled release and localized treatment of acne lesions.

Fresh leaves of N. cadamba were collected, authenticated, and subjected to hydroalcoholic extraction. Phytochemical screening confirmed the presence of alkaloids, flavonoids, tannins, and triterpenoids. Various patch prototypes were developed using combinations of polymers such as hydroxypropyl methylcellulose (HPMC), polyvinyl alcohol (PVA), and sodium carboxymethylcellulose (CMC), along with plasticizers including glycerol and propylene glycol. Formulations were optimized based on physical properties, extract compatibility, adhesion, and drug release behavior. The optimized patch demonstrated satisfactory mechanical strength, flexibility, and sustained release of active compounds for up to 24 hours. In vitro antimicrobial studies against Cutibacterium acnes and Staphylococcus epidermidis revealed significant inhibition zones, confirming the antibacterial potential of the extract. Stability testing under accelerated conditions showed no significant changes in appearance or activity, indicating good formulation stability. A preliminary pilot study on human volunteers demonstrated reduced inflammatory lesion count and improved skin appearance with no major adverse effects.

The study concludes that Neolamarckia cadamba-based herbal acne patches offer a promising natural, effective, and patient-friendly alternative for acne management. Future work will focus on standardization of active phytoconstituents, large-scale clinical trials, and commercialization strategies for this innovative herbal transdermal delivery system.

Key Words:

Herbal acne patch,neolmarckia cadamba,anti-acne activity,herbal formulation,phytochemical screening,antimicrobial study,natural extract.

Introduction:

Acne vulgaris is one of the most common chronic inflammatory skin disorders that affects the pilosebaceous units, primarily on the face, chest, and back. It is estimated that nearly 80–90% of adolescents worldwide experience acne at some point in their lives, and in many individuals, it may persist well into adulthood. Although acne is not a life-threatening disease, it has profound psychological, emotional, and social effects, including low self-esteem, anxiety, and depression. The pathophysiology of acne is complex and multifactorial, involving increased sebum production, hyperkeratinization of the hair follicle, colonization by Cutibacterium acnes (formerly Propionibacterium acnes), and subsequent inflammatory responses. The management of acne thus requires a multifaceted approach that targets both the microbial and inflammatory components of the disease.

Conventional anti-acne treatments primarily include topical retinoids, benzoyl peroxide, antibiotics such as clindamycin or erythromycin, and systemic agents like isotretinoin or hormonal therapy. While these drugs are effective to some extent, they are often associated with several adverse effects, such as dryness, irritation, erythema, photosensitivity, and microbial resistance. The rising concern over antibiotic resistance and the demand for safer, more sustainable alternatives have shifted research focus toward herbal and plant-based therapies. Medicinal plants possess a wide range of bioactive compounds, including alkaloids, flavonoids, tannins, terpenoids, and phenolic acids, which exhibit antimicrobial, anti-inflammatory, antioxidant, and wound-healing properties that can help manage acne naturally. Hence, the development of herbal formulations for acne treatment has gained significant importance in the field of dermatological research.

The use of herbal extracts alone, however, poses challenges in terms of stability, bioavailability, and targeted delivery. topical applications such as creams or gels often suffer from poor adherence, limited penetration, and frequent re-application requirements. to overcome these drawbacks, innovative delivery *systems* like transdermal or topical patches have gained popularity. a transdermal or topical patch is a medicated adhesive system designed to deliver active ingredients to the skin in a controlled and sustained manner. patches provide numerous advantages, including ease of use, precise dosing, prolonged contact time, and minimal systemic side effects. for acne treatment, an herbal patch can act as a localized therapeutic system that maintains close contact with the lesion, absorbs excess sebum, and continuously releases active compounds directly into the affected area.

Herbal acne patches offer a modern and convenient solution combining traditional plant-based remedies with advanced drug delivery technology. The incorporation of herbal extracts into polymeric patch matrices allows for better stability, controlled release, and enhanced patient compliance. Moreover, patches serve a dual purpose: they protect acne lesions from external contamination and mechanical irritation while simultaneously delivering bioactive agents for therapeutic action. Polymers such as hydroxypropyl methylcellulose (HPMC), polyvinyl alcohol (PVA), and sodium alginate are commonly used for patch preparation due to their biocompatibility, flexibility, and non-toxic nature. The combination of these polymers can be optimized to achieve desirable physical properties like tensile strength, folding endurance, and moisture absorption, as well as favorable drug release profiles.

The process of developing such herbal patches involves several stages, including extraction and characterization of the plant material, formulation design, optimization of polymer composition, and evaluation of the final product through various physicochemical and biological tests. The extract of Neolamarckia cadamba can be prepared using solvents like ethanol or methanol through maceration or Soxhlet extraction methods. The obtained extract is then subjected to phytochemical screening to confirm the presence of active constituents. The prepared herbal extract is incorporated into a polymeric matrix to form a uniform film or patch using the solvent casting technique. The developed patches are evaluated for parameters such as thickness, weight uniformity, folding endurance, tensile strength, surface pH, moisture content, and drug content uniformity to ensure their quality and consistency.

The growing consumer preference for natural and sustainable skincare products further emphasizes the importance of developing herbal-based acne treatments. Unlike synthetic formulations, herbal acne

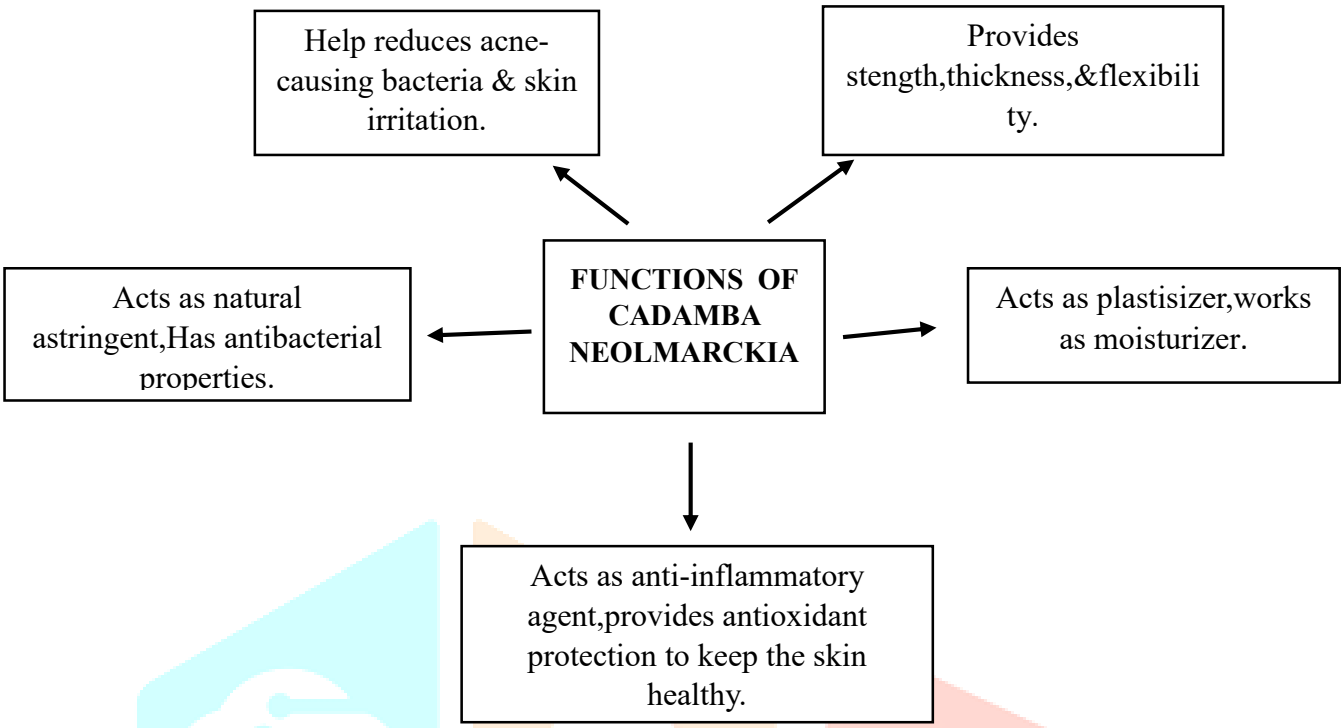
patches minimize side effects, reduce the risk of allergic reactions, and align with environmentally friendly production practices. By utilizing Neolamarckia cadamba, a plant known for its rich ethnomedicinal heritage and potent bioactive profile, this study contributes to the development of a novel herbal acne patch that could serve as an effective, safe, and eco-conscious alternative to conventional anti-acne products.

fig 01:geographical structure of cadamba neolmarckia.

Classification Of Cadamba Neolmarckia:

- **Kingdom:** Plantae
- **Class:** Magnoliopsida
- **Subclass**: Gamopetalae
- **Order:** Gentianales
- **Family:** Rubiaceae
- **Genus**: Anthocephalus
- **Species:** Neolmarckia Cadamba
- **Chemical Constitution:**The dried of the bark contains alkaloids,steroids,reducing sugars,cinchona acid and tannins(about 46%).The ether soluble alkaloids of the bark show anti-bacterial activity.
- **Biological Source:** The biological source of Cadamba consists of the leaves, bark, and flowers of Neolamarckia cadamba.

Functions:



Objectives of Cadamba Neolmarckia:

1. collect and prepare the extract of Neolamarckia cadamba.
2. To identify and confirm the presence of active phytochemicals.
3. To formulate herbal acne patches using suitable polymers.
4. To evaluate the physical and chemical properties of the patches.
5. To study the drug release profile of the herbal patches.
6. To test the antimicrobial activity against acne-causing bacteria.
7. To check the stability and effectiveness of the formulated patches.

Advantages Of Cadamba Neolmarckia:

1. Cadamba is a natural and safe herbal plant with minimal side effects.
2. It has strong antibacterial properties that help kill acne-causing bacteria.
3. Its anti-inflammatory action reduces redness, swelling, and irritation on the skin.
4. The plant contains antioxidants that protect skin cells from free radical damage.
5. It promotes faster wound and pimple healing by supporting new tissue growth.
6. Cadamba helps control excess oil and keeps the skin clean and fresh.
7. It also supports liver function and helps regulate blood sugar levels.
8. The extract shows anti-ulcer and fever-reducing activity.

Disadvantages Of Cadamba Neolmarckia:

1.Limited scientific evidence to fully validate medicinal effects

2.Risk of toxicity when used in higher concentration

3.May cause allergic or skin irritation in some individuals

4.Bitter taste limits use in oral formulations

5.Seasonal and regional dependence reduces consistent availability

6.Variation in phytochemical content affects quality control

7.Extraction of active compounds is difficult and costly

8.Slow onset of therapeutic action

Benefits Of Cadamba Neolmarckia:

- **Antioxidant Activity :-** Cadamba contains natural phytochemicals that help neutralize free radicals. This antioxidant property protects cells from oxidative stress and supports overall health.
- **Anti-inflammatory Effect :-**The plant shows significant anti-inflammatory action. Its extracts help reduce swelling, pain, and tissue inflammation, making it useful in traditional medicine.
- **Antimicrobial Properties :-**Cadamba exhibits antibacterial and antifungal activity. Its leaves and bark can inhibit the growth of harmful microorganisms and support infection control.

- **Hepatoprotective (Liver-Protective) Action :-**Extracts of Cadamba help protect liver cells from toxins and improve liver function, making it beneficial in liver-related disorders.

- **Wound-Healing Potential :-**Cadamba helps in faster tissue regeneration and supports wound healing due to its antimicrobial and anti-inflammatory effects.

- **Analgesic (Pain-Relieving) Effect :-**Its bioactive compounds help reduce pain naturally, providing mild analgesic benefits.

- **Antidiabetic Activity :-**Some studies suggest that Cadamba extracts help regulate blood glucose levels and improve insulin sensitivity.

Material and Method:

Cadamba Neolmarckia extract,Manjishta extract,Lemon juice,Distilled water,Ethanol,HPMC.

Method of Preparation:

Take a HPMC in a beaker,add a H2O and mix well.

↓

The Beaker was kept on a magnetic stirrer for 1 hour.

↓

The gel was formed add a Cadamba Neolmarckia extract,Manjishta extract,lemon juice,ethanol,Glycerin.

↓

Mixture was poured into petri dish and spread evenly.

↓

The petri dish was kept in incubator for drying.

↓

The film was cut into small patches ,stored in air tight colet appratus.

fig 01:(drug extraction process with the help of soxhlet appratus)

fig 02:(filteration process)

↓

fig 03: (mixing process using magnetic stirrer)

↓

fig 04. (to prepared acne patches containing neolmarckia cadamba extract.)

Formulation Table Of Cadamba Neolmackia:

Table no-1. formulation of cadamba neolmackia

Sr.No	Name of ingredients	Quantity To Be Taken		
		F1	F2	F3
01.	HPMC	2 gm	2.5 gm	3 gm
02.	Manjishta Extract	1 ml	1 ml	1 ml
03.	Cadamba Extract	1 ml	1 ml	1 ml
04.	Lemon juice	0.4 ml	0.5 ml	0.6 ml
05.	Glycerin	0.4 ml	0.5 ml	0.6 ml
06.	Ehanol	0.3 ml	0.4 ml	0.3 ml
07.	Water	20 ml	25 ml	25 ml

Evaluation Of Prepared Acne Patches:

- Prepared tablets were evaluated on the basis of following parameters:

1) Physical Appearance:

Color, texture, flexibility, and uniformity of the patches were visually inspected to ensure smooth surface and defect-free films.

2) Thickness:

The thickness of the patches was measured at three different points using a Vernier caliper. Uniform thickness indicates proper film formation.

3) Weight Uniformity:

Individual patches were weighed, and the average weight was calculated to confirm uniform distribution of ingredients across all patches.

4) Folding Endurance:

Patches were repeatedly folded at the same point until they broke. The number of folds required to break the patch indicates its flexibility and mechanical strength.

5) pH Measurement:

The pH of the patch was determined by dissolving a small piece in distilled water. A skin-friendly pH (5–6.5) ensures suitability for topical application.

6) Moisture

Patches were weighed and then dried in a desiccator. The difference in weight indicates the moisture content, which affects stability and shelf life.

7) Moisture Uptake:

Patches were placed In a controlled humidity chamber. Increase in weight was recorded to determine the moisture absorption capacity.

8) Stability Study:

The optimized herbal acne patch was stored at two different conditions — room temperature and 40°C ± 2°C/75% relative humidity — for 30 days. The patches were examined at regular intervals for any changes in color, flexibility, and drug content to check their stability.

Conclusion:

The study successfully developed herbal acne patches containing extract of Neolamarckia cadamba. The formulated patches showed good physical properties, stability, and antibacterial activity against acne-causing bacteria like Propionibacterium acnes. Hence, the herbal acne patch can be considered a safe and effective natural treatment for acne.

Result:

The prepared acne patches showed uniform thickness, good flexibility, and proper drug content. The formulation also demonstrated antimicrobial activity against acne-causing microorganisms, indicating its potential effectiveness in acne treatment.

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