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CRINUM ASIATICUM- AN EMERGING ANTIMICROBIAL HERBAL CREAM

Samiksha Palkar[1]*, Kajal Khade[2], Aayesha Mujawar[3], Snehal Kakde[4], Vinod Pattankude[5] and Dhanraj Jadge[6]

[5]Assistant Professor, [6]Principle

[1,2,3,4]Department of Pharmacognosy Womens College of Pharmacy, Peth Vadgaon, 416112, Maharashtra, India.

***Corresponding Author: Samiksha Palkar**

Department of Pharmacognosy Womens College of Pharmacy, Peth Vadgaon, 416112, Maharashtra, India.

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ABSTRACT

Microbial infections continue to be one of the most urgent global health issues, impacting healthcare systems globally and affecting millions of people each year. Bacteria, viruses, fungi, and parasites are examples of harmful microorganisms that have a broad range of effects on human health, from minor skin infections to serious systemic disorders. Developing efficient surveillance, preventive, and treatment techniques requires an understanding of the global effects of microbial diseases. The current work performed by formulating and its evaluation of an antimicrobial herbal cream. Most currently available creams are made with synthetic drugs and can provide relief from skin infections; however, they often cause side effects like itching or allergic reactions. *Crinum asiaticum* is a medicinal plant recognized for its wide range of bioactive constituents and has shown strong antimicrobial activity in traditional healing practices. Phytochemical studies have identified the presence of alkaloids, flavonoids, and phenolic compounds, which are believed to play a key role in its biological effects. This study focuses on the formulation and evaluation of a topical herbal cream for its antimicrobial efficacy. Ethanollic extract of the plant's leaves were tested against common pathogenic microorganisms, including *Staphylococcus aureus* and *Salmonella typhimerium* using the agar well diffusion method. The formulated cream exhibited substantial antimicrobial activity. Stability testing indicated that the cream retained its effectiveness and physical properties under various storage conditions. These findings suggest that *Crinum asiaticum* based herbal cream holds promise as a natural, cost-effective and alternative treatment for microbial skin infections. Further studies are recommended to validate its safety and therapeutic potential.

KEYWORD:- Herbal cream, *Crinum asiaticum*, *Staphylococcus aureus*, *Salmonella typhimerium.*

INTRODUCTION

Scabies, impetigo, eczema, acne, pruritus, and molluscum contagiosum/warts are among the prevalent skin conditions that impact almost 900 million people globally.[1] Conditions like atopic dermatitis and acne vulgaris that are linked to opportunistic microorganisms require intensive therapy. Hormonal changes affect acne vulgaris, a common teenage skin disorder that often presents as irritation and pustule production. Skin issues significantly affect patients' quality of life because of the emotional and social stigma associated with them. The immune response and defence systems depend on the commensal bacteria that comprise the skin microbiota. Unbalances in the microbial community could be the cause. Allopathic antibiotics, retinoic acids, and corticosteroids make up the bulk of current treatments; nevertheless, these have drawbacks, such as side effects and antibiotic resistance.

By delivering therapeutic masters directly to or through the skin, transdermal calm transport systems (TDDS) present a highly attractive therapy option for skin conditions. By ensuring localised treatment, this process reduces systemic side effects and restores calm bioavailability at the site of action.[1] TDDS avoids the first-pass hepatic absorption system, which is crucial for medications that degrade in the gastrointestinal tract or have poor verbal bioavailability. Furthermore, transdermal methods provide regulated and sustained sedate release, resulting in significant improvements in patient compliance and treatment outcomes. Transdermal transfer is particularly effective in treating persistent dermatoses including psoriasis, skin irritation, and localised infections because the skin is both a barrier and a target for treatment.

The process for creating herbal creams or goods by starting with a variety of recognized pharmaceutical ingredients and then adding one or more herbal ingredients to deliver specific advantages solely is known as herbal formulation. Semi-solid formulations known as herbal creams are applied topically to treat irritated skin. Antimicrobial creams that shield the skin

from microbial infections are made with the formulation's active ingredient.

The term "antibacterial activity" describes compounds (drugs) that kill or inhibit the growth of bacteria. Numerous antibiotics have been developed to treat different kinds of illnesses. Microorganisms are becoming more and more resistant to the current antibiotics. Infectious diseases continue to rank as the second greatest cause of death worldwide due to the problem of antibiotic resistance. Antibacterial drugs made from plant metabolites have steadily gained popularity in recent years. The growth in infectious diseases and the advent of microorganisms resistant to drugs could be the cause of this. Utilizing plant secondary metabolites as agents that modulate resistance is an alternate strategy for dealing with this issue.

Common herbs used for Herbal antimicrobial cream

1. The tea tree, *Melaleuca alternifolia*, Terpinen-4-ol, is the active components,[2] is effective against bacteria and fungi, including *Staphylococcus aureus*.
2. Neem, or *Azadirachta indica*, has two active ingredients: nimbidin and azadirachtin. It exhibits effectiveness against a range of microorganisms, including both Gram-positive and Gram-negative bacteria, as well as various fungal species.[3]
3. *Curcuma longa*, or turmeric Curcumin is the active ingredient. It works well against *Candida albicans*, E. coli,[4] and MRSA.
4. Aloe vera's active ingredients include acemannan, anthraquinones, It works well against germs and fungi and aids in the healing of wounds.[5]

In the treatment of skin infections and associated conditions, herbal antimicrobial creams have drawn more attention as safer and more effective substitutes for synthetic formulations. Herbal compounds, which come from plants, usually have broad-spectrum antibacterial activity and are less likely to cause resistance, which is a developing issue with synthetic antibiotics. Additionally, herbal creams are frequently linked to less negative side effects, including toxicity, allergic reactions, and skin irritation, which makes them better suited for long-term use for people with sensitive skin. Because of the synergistic effects of several phytochemicals, these formulations also offer several advantages, including anti-inflammatory, antioxidant, and properties that support wound healing. Herbal creams offer a potential path in dermatological therapy and antimicrobial management, given the growing consumer preference for natural goods and the demand for sustainable, environmentally friendly healthcare solutions.

Advantages of herbal antimicrobial cream

1. **Natural origin:** Herbal creams are derived from plants, making them a more natural alternative to synthetic antimicrobials, which may be preferable to users seeking holistic or organic options.
2. **Fewer side effects:** Many herbal agents are associated with fewer adverse effects, such as skin irritation or allergic reactions, compared to chemical-based products.
3. **Broad-spectrum activity:** Certain herbal extracts (e.g., neem, tea tree oil, turmeric) exhibit broad-spectrum antimicrobial activity against bacteria, fungi, and viruses.
4. **Lower risk of resistance:** Herbal antimicrobials often contain multiple active compounds, which may reduce the likelihood of pathogens developing resistance, unlike single-compound synthetic drugs.
5. **Biodegradability and Environmental safety:** Herbal ingredients are generally biodegradable and eco-friendly, posing less risk to the environment.
6. **Synergistic effects:** Many plant-based compounds can work synergistically, enhancing the overall antimicrobial effect and potentially reducing the required concentration of each.
7. **Cultural acceptance:** In many regions, herbal remedies are culturally accepted and have historical backing, which can increase compliance and acceptance among patients.
8. **Cost-effectiveness:** In some cases, especially in regions where medicinal plants are locally available, herbal creams may be cheaper to produce and more accessible.

MATERIALS AND METHOD

1. Materials

- ***Crinum asiaticum* plant**

The perennial bulbous plant *Crinum asiaticum L*., sometimes known as big crinum lily or poison bulb, belongs to the Amaryllidaceae family. It can be found all throughout Asia, Africa, and the Pacific Islands in tropical and subtropical areas, especially in coastal and marshy settings.[6] Folk medicine has long utilised many plant parts for their analgesic, anti-inflammatory, antibacterial, and wound-healing qualities.[7,8] Numerous bioactive substances, including alkaloids, flavonoids, and saponins,[9] have been found by phytochemical investigations and are thought to be involved in their pharmacological effects.[10] *Crinum asiaticum* continues to be a major subject of phytopharmacological research because of its ethnomedicinal significance.

Taxonomy

Crinum belongs to the plant kingdom (Plantae) and is classified under the class Equisetopsida, order Asparagales, and family Amaryllidaceae.

Fig. 1: *Crinum asiaticum* plant.

➢ **Other ingredient for formulation of cream**

Almond oil, methylparaben, stearic acid, cetyl alcohol, Triethanolamine and glycerol.

➢ **Test microorganisms**

1. *Styphylococus aureus* (ATCC 25923)
2. *Salmonella typhimerium* (ATCC 14028)

3. Methods

Collection and Authentication of plant

To guarantee precise identification, fresh specimens of *Crinum asiaticum L*. were gathered throughout the flowering season from [Radhanagari, Kolhapur, Maharashtra]. The plant was get authenticated from Yashwantrao Chavan Warana Mahavidyalaya, Warananagar, Kolhapur, Maharashtra state, India.

Extraction procedure

1. Fresh *Crinum asiaticum* leaves were thoroughly washed with water and left to drain.
2. The cleaned leaves were then chopped into approximately 1-inch segments and dried in a hot air oven at 40°C for 12 hours.
3. Once dried, the leaves were finely ground into powder. A 500 mg portion of this powder was soaked in 600 ml of 70% ethanol for three days, with intermittent stirring.[11]
4. The resulting mixture was filtered using No. 1 filter paper with an 11 mm pore size. The filtrate was transferred to a china dish and allowed to evaporate.

Preparations of cream

To fit the unique circumstances of this investigation, the experimental technique was somewhat modified from the one described by [Ram Kumar Sahu et al., 2012][12]

1. In Part A, the emulsifier (stearic acid) was dissolved, and the remaining oil-soluble components were heated.
2. In Part B, the water-soluble ingredients—including methyl paraben, glycerol, triethanolamine, and Crinum asiaticum extract—were dissolved, and the aqueous phase was heated to 75°C.
3. Once both phases were heated, the aqueous solution was slowly added to the oil phase with continuous stirring until the mixture cooled and the emulsion formed.
4. Table 1 presents the formulations prepared in batches F1, F2, F3, and a control (C), each containing varying concentrations of the active ingredient.

Table 1: Quantity of ingredients for anti microbial cream.

Sr. No.	Ingredients	C (w/w)	F1 (w/w)	F2 (w/w)	F3 (w/w)	Role
1.	*C. asiaticum* extract	-	0.06%	0.12%	0.25%	Antimicrobial
2.	Stearic acid	6%	6%	6%	6%	Cream base
3.	Cetyl alcohol	2%	2%	2%	2%	Emulsifier
4.	Almond oil	2%	2%	2%	2%	Flavoring agent
5.	Glycerol	1.5%	1.5%	1.5%	1.5%	Moisturizer
6.	Methylparaben	0.01%	0.01%	0.01%	0.01%	Preservative
7.	Triethanolamine	q.s.	q.s.	q.s.	q.s.	pH Balancer
8.	Water (50 gm)	q.s.	q.s.	q.s.	q.s.	Vehicle

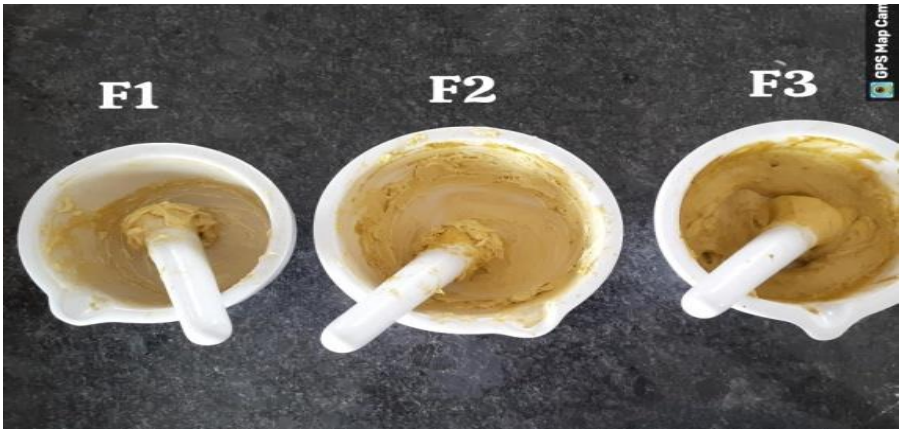


Fig. 2: Formulation of Anti-microbial cream.

Evaluation procedures for antimicrobial cream formulations

1. Physical assessment

Visual inspection was conducted to examine physical characteristics, including color and overall appearance.

Table 2: Physical assessment.

Sr. No.	Batch	Color	Odor	Texture
1.	C	White	Odorless	Smooth
2.	F1	Slightly yellowish	Pungent	Smooth
3.	F2	Slightly yellowish	Pungent	Smooth
4.	F3	Slightly yellowish	Pungent	Smooth

2. pH Measurement

The pH of the cream formulation was determined using a pH meter. Prior to measurement, the electrode was rinsed with double-distilled water and dried with tissue paper. It was then immersed in 20 grams of the cream sample. The average pH of the formulation (n=3) was recorded at room temperature.

Table 3: pH of Cream.

Sr. No.	Batch	pH Readings			
		1	2	3	Mean±SD
1.	C	6.10	6.12	6.15	6.12±0.02
2.	F1	6.58	6.60	6.57	6.58±0.01
3.	F2	6.55	6.67	6.51	6.57±0.08
4.	F3	6.60	6.59	6.62	6.60±0.01

3. Homogeneity

The uniformity of the formulations was evaluated through tactile assessment and visual inspection.

4. Viscosity

Using spindle number 64 at 25 RPM and a Brookfield viscometer set to 26°C, the viscosity of the formulation was measured. The findings are displayed in Table 4. It was discovered that all herbal creams had viscosities between 15,000 and 19,000 cps.

Table 4: Viscosity of formulation.

Sr. No.	Batch	Viscosity Readings (cPs)			Mean±SD
		1	2	3	
1.	C	15389	15385	15386	15386±1.70
2.	F1	18836	18838	18841	18837±0.80
3	F2	16852	16854	16853	16853±0.82
4.	F3	18254	18251	18250	18251±1.70

5. Spredability

Spreadability refers to how easily and uniformly a formulation can be applied over the skin or the targeted area. This property is crucial as it influences the therapeutic effectiveness of the product. A higher spreadability value indicates better ease of application and enhanced coverage. To evaluate spreadability, the time taken for two glass slides—placed with a layer of cream in between and subjected to a specific weight—to slide apart was measured. A shorter separation time suggests improved spreadability. For the test, two identical glass slides were used. A measured quantity of the cream was applied to one slide, and another slide was carefully placed on top. A standard weight was then placed on the upper slide to press and distribute the cream into a thin, even layer. After removing the weight, any excess cream adhering to the edges was cleaned off.[13] The time it took for the upper slide to move away under the influence of the attached weight was recorded.

Spreadability was calculated using the formula:
$S = (m \times L) / T$

Where:
m = standard weight applied (50 g)
L = length of the glass slide (5 cm)
T = time in seconds for the upper slide to separate

Table 5: Spredability.

Sr. No.	Batch	Spredability
1.	C	20g.cm/s±0.2SD
2.	F1	17.5g.cm/s±0.15SD
3.	F2	20.52g.cm/s±0.21SD
4.	F4	13.63g.cm/s±0.11SD

6. Washability

The cream formulation was applied to a 3 cm area of skin, left for 5 minutes, and then washed off. The ease of removal of the cream was assessed to determine its washability.

7. Emolliency

A fingertip unit of the formulated creams was applied on the 3 cm area of skin and checked for emolliencyand greasiness.

8. Anti-microbial Activity Assessment

To confirm the viability and purity of bacterial cultures, authenticated strains of *Salmonella typhimurium* and *Staphylococcus aureus* were obtained from a recognized microbial culture collection center (Balwantrao Yadav College, Peth Vadgaon, Maharashtra). The bacterial isolates were revived and subcultured using appropriate selective media—Xylose Lysine Deoxycholate (XLD) Agar for *S. typhimurium* and Mannitol Salt Agar for *S. aureus*.

The antibacterial activity of the cream formulations was tested using the agar well diffusion method. Agar media were prepared and sterilized by autoclaving at 121°C under 15 psi pressure for 20 minutes. Once cooled to an appropriate temperature, the sterilized molten agar was inoculated separately with *S. aureus* (Gram-positive) and *S. typhimurium* (Gram-negative) under aseptic conditions in a laminar flow cabinet. The inoculated media were poured into sterile Petri dishes and allowed to solidify.[14]

Sterile cork borers (6 mm in diameter) were used to punch wells in the solidified agar. Cream formulations were diluted to create 1%, 2%, and 3% concentrations by mixing 1 g, 2 g, and 3 g of cream with 1 ml of distilled water, respectively. These samples were carefully introduced into the wells. The plates were then left undisturbed for diffusion of the formulations into the agar and subsequently incubated at 37°C for 24 hours.

Post-incubation, zones of inhibition around the wells were measured in millimeters using a vernier caliper to assess the antibacterial effect of each formulation.

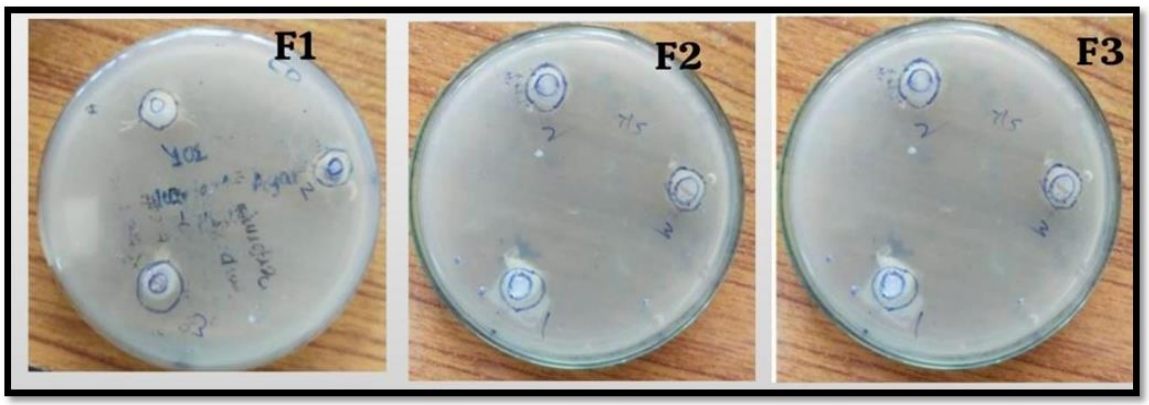


Fig. 2: Diameter of growth inhibition for *staphylococcus aureus.*

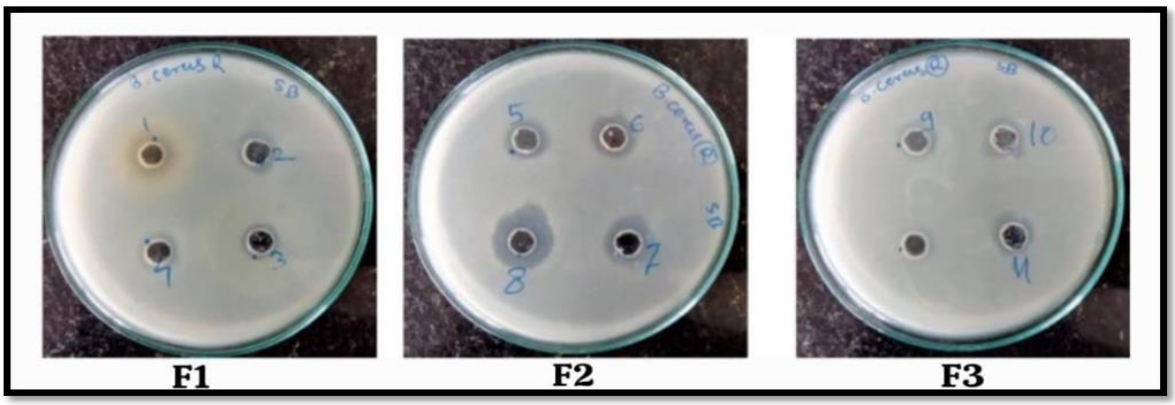
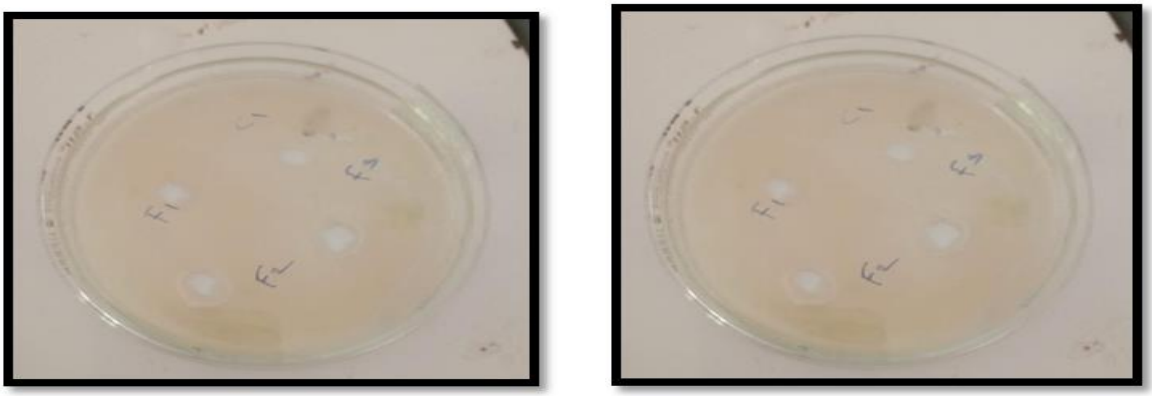


Fig. 3: Diameter of growth inhibition *salmonella typhimerium.*



Staphylococcus aureus Salmonella typhimerium

Fig. 4: Inoculated Plate with *Styphyllococus aureus* and *Salmonella typhimerium* as control.

Table 6: Diameter of growth Inhibition of Micro-organism.

Sr. No.	Microorganisms	F1 (mm)	F2 (mm)	F3 (mm)
1.	*Staphyllococcus aureus*	15.07±0.03SD	15.60±0.05SD	15.06±0.06SD
2.	*Salmonella typhimerium*	12.47±0.01SD	13.01±0.02SD	12.89±0.04SD

RESULT AND DISCUSSION

As indicated in Table 7, the outcomes of the formulations (F1 through F3) were assessed according to a number of qualities, offering insights into their features.

Table 7: Result of formulation.

Sr. No.	Parameter	C	F1	F2	F3
	Colour	White	Yellowish	Yellowish	Yellowish
2.	Odor	Odorless	Pungent	Pungent	Pungent
3.	pH (Avg)	6.12	6.57	6.58	6.60
4.	Homogeinity	Homogenous	Homogenous	Homogenous	Homogenous
5.	Viscosity (Avg)	15386 cPs	18837 cPs	16853 cPs	18251 cPs
6.	Spreadability	Readily Spreadable	Readily Spreadable	Readily Spreadable	Readily Spreadable
7.	Washability	Readily Washable	Readily Washable	Readily Washable	Readily Washable
8.	Emolliency	Emollient	Emollient	Emollient	Emollient

The F2 batch showed larger zones of inhibition in comparison to the F1 and F3 batches, indicating significantly stronger antibacterial activity against the microbiological strains of *Salmonella tyohimerium* and *Staphylococcus aureus* that were investigated. This indicates that the microbial inhibition may have been more affected by the formulation variables or component concentrations of F2. The enhanced efficacy may be due to improved release profiles from the F2 matrix, improved bioavailability or solubility of the antibacterial agents, or ideal synergistic interactions amongst the active ingredients. These findings demonstrate how important formulation optimisation is for increasing antibiotic efficacy.

CONCLUSION

The development of the anti-microbial herbal cream demonstrates promising potential in combating skin infections caused by various pathogenic microorganisms. The use of natural plant-based ingredients, known for their anti-bacterial, anti-fungal, and anti-inflammatory properties, not only provides effective microbial inhibition but also ensures minimal side effects compared to synthetic alternatives. The formulation offers a safe, eco-friendly, and cost-effective option for topical applications, aligning with the growing demand for natural skincare products.

Different concentrations of *Crinum asiaticum* extracts were used to make the various herbal creams, which were then evaluated based on a number of criteria, including pH, appearance, viscosity, spreadability, and antibacterial activity. All these formulations prepared were exhibited strong antimicrobial properties. Based on results and discussion, the formulations F1and F2 were stable at room temperature and can be safely used on the skin. Out of all of them, the F2 formulation produced superior outcomes. The herbal cream with *Crinum asiaticum* extract showed a potential formulation with prominent antimicrobial activity.

Further research should focus on optimizing the formulation to enhance its stability, shelf-life, and efficacy. Moreover, exploring additional herbal extracts and synergistic combinations could improve the antimicrobial spectrum and potency.

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