



ORIGINAL RESEARCH ARTICLE

PHARMACEUTICAL MODIFICATION OF *TANKANAMRITA MALAHARA* INTO GEL FORMS AND ITS INVITRO ANTIMICROBIAL ACTIVITY

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Abstract

Background and Aim: *Tankanamrita malahara* mentioned in *Rasatarangini* is indicated for external application in chronic non-healing ulcers (*dusta vrana*), which are prone to microbial contamination. With rising antibiotic resistance, establishing the antimicrobial activity of Ayurvedic formulations is essential. This study aimed to modify *tankanamrita malahara* into more patient-friendly gel forms without compromising efficacy.

Experimental procedure: Raw ingredients were analyzed for authenticity and made into a fine powder. *Tankanamrita malahara* was formulated by mixing active ingredients with *Siktha taila*. A hydrogel was initially prepared using Carbopol 940 and an emulgel was prepared by incorporating *Tila taila* into a xanthan gum gel base. Analytical parameters and FTIR were assessed for both *malahara* and gel formulations. The antimicrobial activity was assessed by measuring the zone of inhibition against *Candida albicans*, *Staphylococcus aureus*, and *Pseudomonas aeruginosa*.

Result and Conclusion: The modification of *tankanamrita malahara* into hydrogel was unstable due to *Kasisa* incompatibility, therefore a hydrogel without *Kasisa* and *Tankanamrita* emulgel containing 8.4% *Tila taila* was prepared. FTIR analysis confirmed incompatibility between Carbopol and *Shuddha Kasisa* and chemical compatibility of *Kasisa bhasma* in the emulgel system. The analytical parameters of emulgel and *malahara* were adequate. In vitro antimicrobial tests showed that 10% *tankanamrita malahara* had the highest activity against *Candida albicans*, followed by the 10% *tankanamrita* emulgel. *Tankanamrita malahara* and *tankanamrita* emulgel showed lower activity against *Staphylococcus aureus* and *Pseudomonas aeruginosa* at a concentration of 15%.

Introduction

In Ayurveda, treatment approaches are broadly categorized into *Antahparimarjana* (internal) and *Bahiparimarjana* (external) therapies. Internal treatments involve formulations like *Kashaya*, *Asava-Arishta*, *Avaleha*, and *Sneha Kalpana*, while external applications include *Lepa*, *Varthi*, *Upanaha*, and *Malahara*. Though *Malahara* is not explicitly mentioned in the *Brihatrayi*, similar preparations with unctuous bases are described, such as *Vipadikahara Lepa* in *Charaka Samhita*. The concept of *Malahara* appears more prominently in later texts like *Yogaratanakara* and *Rasa Tarangini*, where *Siktha taila*-a base made from beeswax and *Tila taila* is frequently used.

*Tankanamrita Malahara*¹, referenced in *Rasa Tarangini*, is traditionally indicated for *Dusta Vrana* (chronic wounds). Both the *Tankanamrita malahara* and its individual ingredients are proven to have antimicrobial activity. However, its greasy nature and strong odour may limit user compliance.

To enhance patient acceptability and stability, this study attempts to reformulate *tankanamrita Malahara* into gel-based systems specifically hydrogel and emulgel while preserving its therapeutic properties. Unlike organogels, which may promote rancidity due to high oil content, hydrogels and emulgels offer better stability and usability. The present study evaluates the antimicrobial efficacy of both the classical malahara and its modified gel forms.

Materials and Methods

2.1 Raw Material Collection and Identification

Tankana, *Kasisa*, and *Sarjika*, *Pippala vriksha twak* were sourced from suppliers in Trivandrum, Kerala. And the plant materials were identified and authenticated by the Department of Dravyaguna vijnana, Government Ayurveda College, Tripunithura, Kerala. Macroscopic and microscopic studies conducted at Govt. Ayurveda College, Tripunithura and XRD analysis for mineral identification done at CUSAT Kalamassery.

2.2 Processing of Raw Materials

2.2.1. *Tankana Nirmalineekarana*:

Tankana was dissolved in 24 parts of water, filtered, and then heated to remove the water. The purified *Tankana* was dried under the sun.²

2.2.2 *Kasisa Shodhana and Marana*:

Kasisa was processed by soaking in *Bhringaraja* (*Eclipta alba* L.) swarasa (juice), followed by *bhavana* with *Nimbu swarasa* and incineration at a temperature of 700°C for multiple times since *Bhasma lakshana* are obtained.^{3,4}

2.2.3. *Sarjika Kshara Nirmana*:

Ashes of *Tragia involucrata* L. were soaked in water, filtered, and evaporated to yield *Kshara*.^{5,6}

2.2.4. *Pippala Vriksha Twak Kshara Preparation*:

Ashes of the bark of *Ficus religiosa* L. were similarly processed to extract the *Kshara*.⁷

2.3 Preparation of Malahara

Siktha taila was prepared by combining *Madhuchista* and *Tila taila* in a ratio 1: 5⁸, suitable for hot season. Active ingredients *Nirmalineekrita tankana*, *Shuddha Kasisa*, *Sarjika kshara*, and *Pippala vriksha twak kshara* were incorporated into molten *Siktha taila* and mixed thoroughly until homogeneity is achieved (Table 1).

2.4 Preparation of Hydrogel:

The hydrogel base was prepared using Carbopol 940 (1.5 g) triethanolamine (5-6 drops) as neutralizing agent and distilled water (100 mL) as the vehicle. At 1.5% concentration, 1.08g of Carbopol 940 was mixed with 72 mL of distilled water and 5 drops of tri ethanol amine, blended at 1200 rpm in a

homogenizer. Active ingredients were incorporated into the gel base to form a brown translucent gel. The hydrogel with all active ingredients became unstable within 4-5 days. Trials were conducted with different concentrations (1-4%), but the consistency was not stable.

Table 2 Ingredients of hydrogel

Ingredient	F1	F2
Hydrogel base	72 g	72 g
<i>Tankana</i>	12 g	12 g
<i>Kasisa</i>	3 g	-----
<i>Sarjika kshara</i>	3 g	3 g
<i>Pippala vriksha twak kshara</i>	1 g	1 g
Stability	Unstable	Stable

Hydrogel with *Kasisa* lost its consistency slowly, whereas hydrogels without *Kasisa* remained stable, with a semisolid consistency.

2.4.1 Compatibility testing

Based on the instability observed, the compatibility of active ingredients with gel base was tested individually. The active ingredients were individually added into the gel base. And stability of gel was tested. Carbopol 940 was found to be compatible with *Tankana*, *Sarjika Kshara* and *Pippala Vriksha Twak Kshara*, but showed incompatibility with *Kasisa*. In contrast, xanthan gum was compatible with all the tested ingredients, including *Tankana*, *Kasisa*, *Sarjika Kshara*, and *Pippala Vriksha Twak Kshara*.

2.4.2 Fourier Transform Infrared (FTIR) Spectroscopy

FTIR spectroscopy was carried out to evaluate functional group integrity and compatibility between Carbopol 940, xanthan gum, and *Kasisa*. FTIR spectra of individual ingredients, physical mixtures, hydrated gel bases, and final formulations were recorded using the Universal Attenuated Total Reflectance Accessory (UATR) method in the range of 4000-400 cm⁻¹. The spectra were analysed for peak shifts, appearance or disappearance of characteristic bands to assess possible interactions.

2.5 Preparation of emulgel with Xanthan Gum:

The emulgel base was formulated with xanthan gum (3 g). glycerin (6 mL), distilled water and *Tila taila* (10 g). Xanthan gum was mixed with glycerine to prevent agglomeration, followed by the addition of water and *Tila taila* in specific quantities. The mixture was emulsified using a homogenizer and allowed to swell for six hours before incorporating active ingredients. Gels prepared with *shuddha Kasisa* (purified *Kasisa*, sulphate form of iron) oxidized during storage, causing color changes. Replacing *shuddha Kasisa* with *Kasisa bhasma* (Calcined *Kasisa*, oxide form of iron) yielded a stable emulgel (Table 3).

Table 1 Ingredients of *Tankanamrita malahara*

Sl no	Ingredient	Botanical/ Chemical name	Family name/ Chemical formula	English name
1	<i>Tankana</i>	Sodium pyroborate	Na ₂ B ₄ O ₇ 10H ₂ O	Borax
2	<i>Siktha taila</i>	Sesame oil + bee wax	----	----
3	<i>Sarjika kshara</i>	Ash of <i>Tragiainvolucrata</i> L.	<i>Euphorbiaceae</i>	Indian stinging nettle
4	<i>Kasisa</i>	Ferrous sulphate	FeSO ₄ . 7H ₂ O	Green vitriol
5	<i>Kshara of pippala</i>	<i>Ficus religiosa</i> L.	<i>Moraceae</i>	Sacred fig

Table 3 Ingredients of emulgel

Ingredients	Quantity
Emulgel base	72g
Tankana	12g
Kasisa bhasma	3g
Sarjika kshara	3g
Pippala vriksha twak kshara	1g

2.6 Challenges in Gel Preparation

During the development of gel formulations, several formulation-related challenges were encountered, mainly due to incompatibility between certain ingredients and the gelling agents. When Carbopol 940 was used as the gelling polymer, the incorporation of *Kasisa* resulted in gradual dissociation of the gel structure, leading to loss of consistency and conversion of the semisolid gel into a liquid form. This instability indicated a chemical interaction between the iron-containing compound and the polymer network.

Another difficulty observed during formulation was the oxidation of *Shuddha Kasisa* on exposure to air. The gel prepared using *Shuddha Kasisa* showed gradual colour change on the surface during storage, suggesting oxidation of ferrous ions present in the sulphate form of iron. This change affected the appearance and stability of the formulation.

To overcome these issues, compatibility trials were performed using different gelling agents and different forms of *Kasisa*. Replacement of Carbopol with xanthan gum improved the stability of the formulation, and the use of *Kasisa Bhasma* (calcined form of iron) instead of *Shuddha Kasisa* prevented oxidation and maintained uniform consistency of the gel. Based on these observations, a stable formulation was selected for further standardization and evaluation (Figure 1).

These findings guided the selection of the final composition and ratio of ingredients used in the optimized formulations described in the following section.



Figure 1: Tankanamrita malahara and gel forms

Figure 1A: Tankanamrita malahara with *Shuddha Kasisa* and with *Kasisa bhasma*



Figure 1. B: F1, F1 after 4 days, F2 (F1- Hydrogel with *Kasisa*, F2 Hydrogel without *Kasisa*)

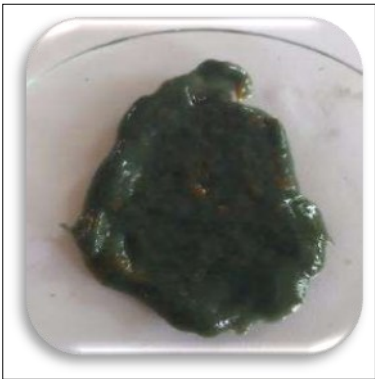


Figure 1.C: Emulgel with *Shuddha Kasisa*, Colour change after 4 days, emulgel with *Kasisa bhasma*

2.7 Final Formulation and Ratios:

Active ingredient ratios were standardized across the formulations:

In the *Malahara*, hydrogel without *Kasisa*, and emulgel quantity of base was fixed as 72 g as per the original reference and active ingredients were added in specified ratios. The finalized formulations were prepared in three batches and analyses were performed in triplicate.

2.8 Physicochemical Analysis of *Tankanamritha Malahara*

The physicochemical properties of the formulation were analyzed to assess its stability and quality (Table 4).

2.8.1 Moisture content by kalfisher method

Standardization:

The Karl Fischer reagent is being standardized using Sodium tartrate. Fill the burette with Karl Fischer reagent. Add sufficient methanol to the titration vessel so that the electrode is immersed, taking care not to splash the sides of the vessel, and start the stirrer. Adjust the titration rate, end point adjustment and polarizing voltage according to the instrument manufacturer's instructions. Start the titration and continue blank in the solvent⁹.

640mg of sodium tartrate (equivalent to 100mg of water) is taken in a beaker. Remove the stopper and carefully transfer it to the titration vessel and replace the stopper. Once the titration is finished, note and record the titre value. For the subsequent titration, refill the burette. To ensure stability repeat the previous standardization process until repeatable results (99–101% water recovery) are obtained. Determine the Karl Fischer reagent's water equivalent as

Water Equivalent (WE) of Karl Fischer Reagent (mg H₂O/mL KFR)

$$= \text{Weight of sodium tartrate (mg)} / \text{Titre value (mL)}$$

Moisture analysis of *Tankanamritha Malahara*:

The sample *Malahara* is taken in a beaker and note the weight. Ensure that the solvent is free from moisture and a definite amount of the sample is carefully added to the titration vessel, avoid sticking of sample to the sides of the titration vessel. Again, weigh the beaker immediately to find the quantity of sample that was added to the titration vessel. Allow the sample to fully dissolve in the solvent after switching on the mixer. Once the titration is finished, note and record the titre value. The preceding procedure is repeated for concordant values.⁹ Percentage of moisture present in the sample is calculated by,

Sample Moisture, % = $\frac{\text{Sample Titre (mL)} \times \text{WE} \times 100}{\text{Sample Wt. (mg)}}$

2.8.2 Homogeneity

Homogeneity is tested by visual inspection after the gels have been set in the container. The *malahara* was examined for their appearance and presence of any aggregates.¹⁰

2.8.3. Total fat matter

After weighing five grams of the sample, dissolve it in 100 mL of hot water. To make the solution acidic, add around 40 mL of 0.5N nitric acid (HNO₃). The mixture should be heated until a layer of fatty acids forms above the solution. To solidify the fatty acids, cool the mixture in ice water. After separating the solidified fatty acids, add 50 mL of chloroform to the aqueous

solution to eliminate any leftover fatty acids. Mix the fatty matter that has been separated, let the solvent evaporate, and note the yield. The total amount of fatty matter can be calculated using the formula below.

Weight of the empty dish = x

Weight of the dish + sample after drying = y

Weight of sample = y - x

% of fatty mater = $\frac{(y - x) \times 100}{\text{Weight of sample}}$

2.8.4 Spreadability - Arvouet-Grand Method

The spreadability of *malahara* was assessed by placing 1 gram of the sample between two horizontal plates measuring 20 x 20 cm, with the upper plate weighing 125 grams. After one minute spread diameter was measured. This experimental setting indicates that semifluid gels should have a spread diameter greater than 50 mm but less than 70 mm, while semistiff gels should have a spread diameter of less than or equal to 50 mm. The average result was calculated after the spreadability measurements were carried out in triplicate.¹¹

2.8.5 Rancidity

Weigh 5 g of the material accurately and pour it into a 250 mL conical flask with a glass stopper. After adding 30 mL of a solution consisting of two parts chloroform and three parts glacial acetic acid, agitate the mixture until it dissolves. After adding 0.5 mL of the saturated potassium iodide solution, let it stand for precisely one minute, shaking from time to time. Next, add 30 mL of water and gradually titrate with 0.01M sodium thiosulphate until the yellow hue almost completely vanishes. After adding 0.5 mL of the starch solution, titrate the mixture while shaking vigorously until the blue hue completely fades (mark this volume as 'a' mL). Without the material, repeat the process (note this volume as 'b' mL). Ensure that the blank determination's 0.01M sodium thiosulphate volume does not exceed over 0.1 mL. Apply the following expression to determine the peroxide value:

$$\text{Peroxide Value} = 10(a - b) / w$$

Where, W is the weight of substance in grams.

Table 4 Physico chemical analysis of *Tankanamritha malahara*

Parameter	Outcome
Moisture content	80%
Homogeneity	Homogeneous
Total fat matter	79.455%
Spreadability	30 mm
Rancidity	Nil

2.9 Evaluation of Gel Formulations

Various gel formulations were evaluated for their appearance, spreadability, homogeneity, pH, and viscosity. Arvouet-Grand method was used to check the spreadability (Table 5,6).

2.9.1 Viscosity

The sample was placed in a Brookfield Lv viscometer with 100 rpm and spindle number 64 at a temperature of (28±1)⁰C to measure the viscosity of the produced gels.

2.9.2 PH

The pH of the obtained gel compositions was measured using a digital pH meter. For this, 1g of gel was dissolved in 100 mL of distilled water and allowed to sit for two hours. The pH value

was noted from the digital pH meter by immersing the rod in to solution of the solution. The pH measurement of each formulation was triplicated and the average value was calculated.

2.9.3 Spreadability - Arvouet-Grand Method

The spreadability of gels was assessed by placing 1 gram of the sample between two horizontal plates measuring 20 x 20 cm, with the upper plate weighing 125 grams. After one minute spread diameter was measured. This experimental setting indicates that semifluid gels should have a spread diameter greater than 50 mm but less than 70 mm, while semistiff gels should have a spread diameter of less than or equal to 50 mm. The average result was calculated after the spreadability measurements were carried out in triplicate.^{11,12}

2.9.4 Extrudability

The gel formulation was filled into collapsible aluminium tubes, which were then sealed by crimping. The weight required to extrude a 0.5 cm ribbon of gel within 10 seconds is considered as extrudability.¹³

2.9.5 Homogeneity

All developed gels were packed into transparent containers and inspected to assess homogeneity. The gels are examined for their appearance and presence of any aggregates.

2.10 Fourier Transform Infrared (FTIR) Spectroscopy

FTIR spectra of Carbopol hydrogel containing *Shuddha Kasisa* showed the appearance of metal-oxygen vibrational bands in the low-frequency region along with attenuation of carboxylate peaks, whereas such changes were not observed in xanthan gum-based emulgel containing *Kasisa bhasma*. The characteristic functional groups of xanthan gum and lipid phase were retained in the emulgel formulation (Table 7).

2.11 Antimicrobial activity

Tankanamrita malahara was modified into emulgel form. Modification into hydrogel was not possible due to incompatibility of *Kasisa* with carbopol. A hydrogel could be prepared only after removing *Kasisa* from the formulation; however, this altered the original composition of *Tankanamrita malahara*. Since *Kasisa* is one of the active ingredients contributing to the therapeutic effect, antimicrobial evaluation was carried out only for formulations that retained the complete composition. Therefore, the antimicrobial activity of

Table 6 Extrudability of gel formulation

Formulation	Grade
Hydrogel without <i>Kasisa</i>	+++
Emulgel	++

classical *Tankanamrita malahara* was compared with the modified *Tankanamrita emulgel* to evaluate whether the stable modified formulation retained the efficacy of the original preparation.

The agar well diffusion method was employed to identify the zone of inhibition (ZOI) against *Staphylococcus aureus* (Gram-positive), *Pseudomonas aeruginosa* (Gram-negative), and *Candida albicans* (fungus). Standard antibiotics Ampicillin and Ketoconazole were used as controls for comparison. Tests to determine the zone of inhibition produced by *tankanamrita malahara*, *tankanamrita* Emulgel, against these microorganisms were conducted at various concentrations (5%, 10%, and 15%). Ampicillin (0.1%) was used as the standard for bacterial strains, and Ketoconazole (0.15%) served as the standard for *Candida albicans*. All tests were conducted in triplicate, and the average values were determined.

Wells were prepared in agar plates inoculated with the test microorganisms, and the formulations were applied into the wells. Ampicillin was used as standard drug for bacterial strains. And ketoconazole for fungal strain. The zones of inhibition were measured after 24 hours.¹³

Sample 1: *Tankanamrita malahara*

Sample 2: *Tankanamrita emulgel*

Table 8 Zone of inhibition (ZOI)

Sample	Initial ZOI	Z1	Z2	Z3	Mean ZOI	Mean ZOI
shown dilution of sample of standard drug						
Sample 1	15%	13	13	12	12.55	50.33
Sample 2	15%	12	12	12	12	50.66
Mean value of Zone of inhibition against <i>Pseudomonas aeruginosa</i>						
Sample 1	15 g in 100 mL	11	12	11	11.3	17
Sample 2	15 g in 100 mL	12	12	11	11.6	16.33
Mean value of Zone of inhibition against <i>Candida albicans</i>						
Sample 1	10 g in 100 mL	20	22	23	21.6	39.6
Sample 2	10 g in 100 mL	14	14	15	14.33	30.33

Table 5 Physical evaluation of various gel formulation

	Appearance	Spread ability	Homogeneity	pH (1%)	Viscosity
Hydrogel (F1) day 1	Brown semisolid	80 mm	Homogenous	7.5	2711cP
Hydrogel (F1) day 4	Brown liquid	130 mm	Homogenous	7.5	789cP
Hydrogel without <i>Kasisa</i> (F2) day 1	Clear transparent semisolid	70 mm	Homogenous	8.9	5303cP
Hydrogel without <i>Kasisa</i> (F2) day 4	Clear transparent semisolid	70 mm	Homogenous	8.9	5303cP
Emulgel day 1	Coffee coloured	60 mm	Homogenous	8.4	1198cP
Emulgel day 4	Coffee coloured	60 mm	Homogenous	8.4	1198cP

Table 7 FTIR peak assignment of individual components and gel formulations.

Sample	Major peaks (cm ⁻¹)	Functional group assignment	Interpretation
<i>Shuddha Kasisa</i>	~3360, 1629, 1084, 993, 665–469	O–H stretching, sulphate vibrations, Fe–O	Hydrated, ionic iron salt
Carbopol 940 (powder)	~1703, 1452–1415	C=O and COO ⁻ stretching	Gel-forming polymer
Hydrated Carbopol gel base	~3336, 1638, 1407	O–H and COO ⁻ vibrations	Proper polymer swelling
Carbopol gel + <i>Shuddha Kasisa</i>	~458, reduced 1638/1407	Fe–O interaction, COO ⁻ attenuation	Polymer–metal incompatibility
Xanthan emulgel + <i>Kasisa bhasma</i>	~3340, 2928, 2855, 1094–1043	O–H, C–H, C–O vibrations	Chemical compatibility

2.12 Statistical analysis

2.12.1 *Candida albicans*:

At 5 g/100 mL, no inhibition was observed. Increasing the concentration to 10 g and 15 g/100 mL produced mean inhibition zones of 11.7 mm and 15.3 mm, respectively, compared to the standard drug (ketoconazole) at 36.7 mm. ANOVA revealed significant differences ($F = 8.05$, $p = 0.008$), with Tukey's test showing significant differences between 5 g and ketoconazole ($p = 0.006$) and 10 g and ketoconazole ($p = 0.045$).

2.12.2 *Staphylococcus aureus*:

Samples 2, and 3 had mean inhibition zones of 13.3 mm, 12.7 mm, and 12.0 mm, respectively, while the standard drug exhibited 50.6 mm. ANOVA showed highly significant differences ($F = 2530$, $p < 0.001$). Tukey's test indicated significant differences between all samples and the standard, with no significant differences among the samples.

2.12.3 *Pseudomonas aeruginosa*:

Samples 2, and 3 showed inhibition zones of 13.3 mm, 11.3 mm, and 11.7 mm, respectively, against the standard drug's 16.8 mm. ANOVA revealed significant differences ($F = 34.65$, $p < 0.001$), with Tukey's test identifying differences between Sample 1 and Sample 2 ($p = 0.041$) and all samples compared to the standard.

Discussion

The present study involved the reformulation of *Tankanamrita Malahara* a classical Ayurvedic preparation into hydrogel and emulgel forms to improve stability, patient acceptability, and application convenience without compromising its therapeutic value. The ingredients were selected and processed as per classical references and validated using modern analytical tools. Pharmacognostic and physicochemical evaluations confirmed the authenticity and quality of *Tragia involucrata* and *Ficus religiosa*, used in the preparation of *Sarjika kshara* and *Pippala twak kshara*, respectively. All parameters complied with standards prescribed in the Ayurvedic Pharmacopoeia of India.

Initial hydrogel formulations using Carbopol 940 were found unstable due to its incompatibility with iron-containing *Kasisa*. The incompatibility between Carbopol 940 and *Shuddha Kasisa* was further confirmed by FTIR analysis. The appearance of Fe–O stretching vibrations in the FTIR spectrum of hydrated Carbopol containing *Shuddha Kasisa* indicates ionic interaction between ferrous ions and carboxylate groups of the polymer. Such interactions neutralize electrostatic repulsion between polymer chains, resulting in collapse of the gel network and loss of consistency. Removing *Kasisa* from the formulation improved gel stability. Xanthan gum-based emulgel was stable only when *Kasisa bhasma* replaced *Shuddha Kasisa*, highlighting the importance of using oxide forms in certain gelling systems. The FTIR spectra of xanthan gum-based emulgel containing *Kasisa bhasma* did not exhibit Fe–O stretching vibrations or distortion of polysaccharide functional groups. The absence of colour change and sustained gel consistency further support the superior stability of *Kasisa bhasma* in emulgel systems.

Analytical testing of the final formulations revealed good spreadability, pH stability, and viscosity within acceptable limits. These findings support the feasibility of modifying traditional malahara into more acceptable dosage forms while preserving therapeutic integrity.

Malahara and emulgel formulations exhibited comparable antibacterial activity, with a clear concentration-dependent increase in efficacy. The emulgel showed slightly improved spread and ease of application, which may contribute to better diffusion of active ingredients and potentially enhanced antibacterial effect. Antifungal activity was more pronounced in the malahara, possibly due to the synergistic effects of *Kasisa* and lipid-based base (*Siktha taila*), which enhances penetrate on and retention on fungal cell walls. The emulgel showed moderate antifungal activity.

Conclusion

The study aimed to modify *Tankanamrita Malahara* by developing hydrogel and emulgel formulations. Due to incompatibility between *Kasisa* and the gelling agent, a hydrogel excluding *Kasisa* was prepared, while the emulgel incorporated 8.4% *Tila taila*. All formulations met analytical quality standards. In vitro antimicrobial testing revealed that the classical malahara showed the highest activity against *Candida albicans*. However, none of the samples matched the efficacy of standard drugs, indicating the need for repeated application. Among the three, malahara demonstrated broad activity, while the hydrogel offered better application properties. Further studies including in vivo wound healing models and long-term stability studies are required to confirm the therapeutic potential of the modified formulation.

Declarations

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Conflict of Interest

The authors declare no conflict of interest.

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