

Research Article



Formulation and Evaluation of Polyherbal Ointment

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ABSTRACT

Objective: To prepare a polyherbal ointment using suitable herbal extracts and ointment base; to evaluate physicochemical properties such as colour, odour, consistency, pH, spreadability, and stability; to assess anti-inflammatory activity using denaturation and membrane stabilization methods; to evaluate antioxidant activity using DPPH and hydrogen peroxide scavenging assays; and to study the compatibility and excipients.

Methods: Selected medicinal plants were collected, authenticated, dried, and powdered. The plant materials were extracted using suitable solvents such as ethanol and methanol by maceration or Soxhlet extraction. The obtained extracts were concentrated and incorporated into an ointment base using the fusion method to prepare the polyherbal ointment. The formulation was subjected to physicochemical evaluation including colour, odour, pH, consistency, spreadability, and stability studies. The methodology described in this study was adapted a standard journal source. The procedures, including collection, authentication, extraction of plant materials, formulation of ointment using the fusion method, and evaluation techniques such as physiochemical analysis, anti-inflammatory and antioxidant assays, and FTIR compatibility studies, were referred from a published journal and PDF and modified suitably for the present research work.

Results: The results were abstracted from a published journal PDF with slight modifications. The polyherbal ointment showed acceptable physicochemical properties and good stability with exhibited significant anti-inflammatory activity through protein denaturation inhibition and membrane stabilization, along with strong antioxidant activity. No incompatibility between ingredients was observed.

Conclusion: The conclusion was derived from a journal PDF and adapted for the study. Formulation was found to be safe and effective for treating inflammation and oxidative stress related conditions, and it can be considered a promising herbal alternative.

Keywords: Polyherbal ointment, Anti-inflammatory activity, DPPH assay, Herbal formulation, Topical drug delivery.

INTRODUCTION

Phytochemicals are bioactive compounds produced by plants, playing a crucial role in a defense mechanism and exhibiting a range of beneficial properties for human health, including antioxidant and anti-microbial activities. These compounds are diverse and can be specific to certain plant families, making them useful markers for chemotaxonomy. The classification of plants based on their biochemical characteristics. Comparative studies of phytochemical constituents across different plant families can provide insights into their evolutionary relationships, ecological significance and potential therapeutic applications.

Anti-inflammatory:

Anti-inflammatory activity refers to the ability of a substance to reduce or eliminate inflammation. It involves inhibiting or modulating the bodies inflammation response. Anti-inflammatory agents can be used various conditions, including; arthritis pain, inflammatory bowel disease, skin conditions, respiratory disease.

These agents can be synthetic, natural or biological in origin. They work by targeting specific pathways involved in inflammation. Effective anti-inflammatory therapy can

improve quality of life and reduce disease progression. It's essential to understand the underlying mechanisms of inflammation to develop effective treatments. Anti-inflammatory activity is a crucial aspect of maintaining overall health and wellbeing. Reducing chronic inflammation or prevent or manage various diseases. Anti-inflammatory agents can be used combination with other therapies. Research is ongoing to develop new and effective anti-inflammatory treatments natural products lifestyle changes are also being explored for their anti-inflammatory activity can help individuals make informed decisions about their health.

It is a complex process that requires a comprehensive approach. Anti-inflammatory activity is vital for maintaining homeostasis and preventing disease. Anti-inflammatory refers to any drug, substance or mechanism that reduces inflammation by lessening the redness, swelling, fever or pain and less of function which are part of bodies inflammation response. Anti-inflammatory drugs are agents that inhibit action or production of inflammatory mediators such as cytokines, histamines and prostaglandins. These drugs reduce pain by inhibiting mechanisms of inflammation, as oppose to opioids, which affect the central nervous system to block pain.



Antioxidant:

Antioxidants are the molecules that neutralize free radicals, which are unstable molecules that can damage cells, proteins, and DNA. Free radicals are produced naturally by the body during metabolism but also arise from external factors like pollution, radiation, smoking and chemical exposure. Oxidative stress is linked to various chronic diseases including cancer, cardiovascular disease and neurodegenerative disorders. Antioxidants play a crucial role in maintaining cellular homeostasis and protecting against oxidative damage.

Plant profile***Ocimum sanctum*:****Figure 1:** *Ocimum sanctum*

Family: Lamiaceae

Parts used: Leaves

Chemical constituents: Eugenol

Activity: Anti-inflammatory, Antioxidant

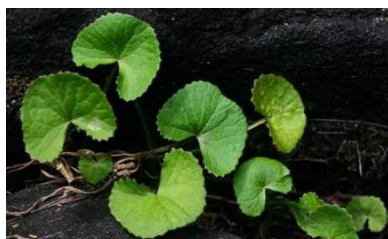
***Plectranthus amboinicus*:****Figure 2:** *Plectranthus amboinicus*

Family: Lamiaceae

Parts used: Leaves

Chemical constituents: Thymol, Carvacol

Activity: Anti-inflammatory

***Centella asiatica*:****Figure 3:** *Centella asiatica*

Family: Apiaceae

Parts used: Whole plant/ leaves

Chemical constituents: Asiaticoside

Activity: Wound healing, Antioxidant

***Coriandrum sativum*:****Figure 4:** *Coriandrum sativum*

Family: Apiaceae

Parts used: Leaves

Chemical constituents: Flavonoids

Activity: Antioxidant

MATERIALS AND METHODS**Data collection:**

The plant leaves of *Ocimum sanctum*, *Plectranthus amboinicus*, *Centella asiatica* and *Coriandrum sativum* were collected from the local areas of Kanyakumari.

Apparatus required:

Beakers, measuring cylinders, funnels, water bath, simple distillation, Soxhlet apparatus, mortar and pestle, glass rod, analytical balance, China dish, petri dish.

Materials requirement:

- **Active ingredients:** Aqueous or ethanolic extracts of *Ocimum sanctum*, *Plectranthus amboinicus*, *Centella asiatica*, *Coriandrum sativum* leaves.
- **Ointment base:** White soft paraffin, wool fat.

Extraction process:

The extraction of herbal constituents for the polyherbal product was carried out using a Soxhlet apparatus. The selected plant materials were first cleaned to remove dust and impurities and then shade-dried to eliminate moisture. The dried plant materials were coarsely powdered using a mechanical grinder. A measured quantity of the powdered drug was placed in a filter paper thimble and inserted into the extraction chamber of the Soxhlet apparatus. A suitable solvent such as ethanol or methanol was added to a round bottom flask attached to the apparatus. The assembly was connected to a condenser and heated using a heating mantle or water bath. As the solvent boiled, it evaporated and moved upward into the condenser where it cooled and condensed into liquid form. The condensed solvent then passed through the plant material, dissolving the active phytochemical constituents. When the extractor

chamber filled to a certain level, the solvent containing the dissolved compounds siphoned back into the round bottom flask. This cycle of evaporation, condensation, and siphoning was repeated several times until complete extraction of the plant constituents occurred. Finally, the solvent was evaporated to obtain a same concentrated extract, which was collected and stored in an air tight container for further use in the formulation of the polyherbal ointment.



Figure 5: Extraction using Soxhlet apparatus

Preparation of Ointment:

The herbal extracts were dried and powdered. 25gm of hydrous wool fat and 25gm of white soft paraffin was taken in a China dish as ointment base. The ointment base was melted gently using a water bath. Extract was incorporated into the base under continuous stirring to ensure uniform distribution. The mixture was allowed to cool and stored in sterilized containers.



Figure 6: Labelled polyherbal ointment (own source)

Justification for selection of Plant:

The selection of plants for the study was primarily based on evidence obtained from extensive literature review. Previous studies have consistently reported that the plant possesses significant anti-inflammatory and antioxidant properties, which are essential for managing various pathological conditions related to oxidative stress and inflammation. This documented pharmacological activity provided a strong scientific basis and rationale choosing this plant for the present project. Therefore, the study was designed with the assumption that the inherent bioactive compounds present in the plant could contribute effectively to the intended therapeutic outcomes, thereby justifying its selection for further formulation and evaluation.

EVALUATION PARAMETERS:

Parameters	Formulation (2gm)	Formulation (6gm)	Formulation (6gm)
Odour	Mild characteristic	Mild characteristic	Mild characteristic
Colour	Light green	Green	Dark green
Homogeneity	Good	Good	Good
pH	6.8 ± 0.3	6.5 ± 0.4	6.9 ± 0.2
Diffusibility (60 sec)	0.6 cm	0.5 cm	0.7 cm
Sensitivity	No irritation	No irritation	No irritation
Washability	6 min	5 min	6 min
Loss of drying	11.5% w/v	11.10% w/v	10.8% w/v
Spreadability	10 cm/sec	11 cm/sec	12 cm/sec
Solubility	Soluble in chloroform, ether. Insoluble in H ₂ O	Soluble in chloroform, ether. Insoluble in H ₂ O	Soluble in chloroform, ether. Insoluble in H ₂ O
Storage ability	Stable	Stable	Stable

Spreadability:

Polyherbal ointment spreadability is determined by measuring the time (sec) required for an upper glass slide to separate from a fixed bottom slide containing the ointment, under a specified weight. A shorter time indicates better spreadability. The methodology involves compressing a fixed amount of ointment between slides, applying a load (e.g., 30gm), and measuring the spreading diameter or time taken to slide off.

pH:

The pH of formulations (F1, F2, and F3) was determined using a pH meter. A small amount of ointment was dispersed in distilled water. The electrode was immersed in the sample and the pH was noted. The pH should be within the acceptable skin range.

Washability:

A washability test was carried out by applying a small amount of ointment to the hand and then washing it with tap water. All three formulations were easily washable.

Homogeneity:

The homogeneity of formulation (F1, F2 and F3) was evaluated by visual inspection. A small amount of ointment was pressed between fingers or on a glass slide. The formulations were observed for uniformity and absence of lumps. Smooth and uniform appearance indicates good homogeneity.

Loss on drying:

The loss on drying of formulations (F1, F2 and F3) was determined by weighing a sample. The sample was dried in a hot air oven at a specified temperature until constant weight. After drying, the sample was cooled and reweighed. The difference in weight indicates the moisture content of the formulation.

Sensitivity:

The sensitivity of formulations was evaluated by applying a small amount on the skin. The area was observed for any irritation, redness or itching. The response was monitored for a specific period of time. Absence of irritation indicates good sensitivity of the formulation.

Diffusibility:

The Diffusibility of formulations were determined by applying a small amount on an agar plate. A well was made in the agar and the ointment was placed in it. The plates were incubated for a specific period of time. The extent of diffusion from the well indicates the Diffusibility of the formulation.

Stability:

The stability of formulations was evaluated by storing them at different conditions. The samples were observed over a period of time for any changes. Parameters like colour, odour, and consistency were checked. No significant

change indicates good stability of the formulation.

Storage Ability:

The storage ability of formulations was evaluated by storing them in suitable containers. The samples were kept under normal room temperature conditions. They were observed periodically for any physical or chemical changes. No change in properties indicates good storage ability of the formulation.

RESULTS**Physical properties:**

The ointment was smooth, uniform, and free from grittiness. color was greenish-brown due to the combination of plant extracts, with a characteristic herbal odor. Homogeneity tests indicated uniform distribution of active compounds throughout the base.

pH measurement:

PH ranges from 6.8 to 7.1, confirming suitability for topical application and minimal risk of skin irritation.

Spreadability:

The ointment spread easily with a mean diameter of 11 cm, indicating good patient compliance and ease of application.

Stability:

During the 30-day storage period, no significant colour change, phase separation, or odour development was observed. The ointment maintains its physical properties, indicating good.

The findings of the present study were interpreted with reference to previously published reports available in standard journal literature. The observed anti-inflammatory activity, indicated by inhibition of protein denaturation, showed a concentration- dependent increase, which is consistent with earlier documented studies. Similarly, the antioxidant potential evaluated through the DPPH assay demonstrated significant free radical scavenging activity, comparable to results reported in scientific journals. These observations suggest that the formulation contains bioactive constituents responsible for its pharmacological effects.

DISCUSSION

The present study focused on the formulation and evaluation of polyherbal ointment containing extracts of *Ocimum sanctum*, *Plectranthus amboinicus*, *Centella asiatica*, *Coriandrum sativum*. Phytochemical screening confirmed the presence of important bioactive compounds such as flavonoids, tannins, saponins, alkaloids, steroids, glycosides, and terpenoids, which are responsible for antioxidant, antimicrobial, and anti-inflammatory activities.

These phytoconstituents contribute significantly to wound healing, tissue regeneration, and protection against oxidative stress. The prepared ointment was evaluated for physicochemical parameters including colour, odour,



texture, pH, spreadability, and homogeneity. All formulations showed acceptable characteristics suitable for topical application. Among the different formulations, F3 exhibited superior properties such as smooth texture, good consistency, excellent spreadability, and indicating better patient compliance and drug absorption. The pH of the formulations was within the acceptable skin range, confirming their non-irritant nature and safety for skin application. No phase separation for instability was observed during the study period. The antioxidant studies revealed strong free radical scavenging activity comparable to standard antioxidants, which may help reduce oxidative stress and promote faster wound healing. Anti-inflammatory activity studies showed effective reduction of inflammation, swelling, and redness, possibly through inhibition of inflammatory mediators such as prostaglandins via the cyclooxygenase (COX) pathway. Stability study confirmed that the formulation remains stable under different storage conditions without significant changes in physical appearance, pH, or efficacy. Skin irritation tests also indicated that the ointment was safe for topical use with no signs of irritation or adverse effects. Overall, the study concluded that the formulated polyherbal ointment possesses excellent physicochemical properties along with significant antioxidant anti-inflammatory activities. Among all formulations, F3 was found to be the most effective due to its balanced compositions and synergistic therapeutic effects.

CONCLUSION

The present study successfully focused on the formulation and evaluation of a polyherbal ointment using medicinal plants such as *Plectranthus amboinicus*, *Coriander sativum*, *Ocimum sanctum*, and *Centella asiatica*. The formulated ointment exhibited satisfactory physicochemical properties including appropriate pH, good spreadability, homogeneity, and stability, indicating its suitability for topical application. Based on the results obtained and by comparing them with established journal reports, the formulated polyherbal ointment exhibits appreciable anti-inflammatory and antioxidant activities. The outcomes agree with findings from previously published research articles, confirming the therapeutic potential of the formulation. Therefore, it can be concluded that the formulation may serve as an effective natural remedy for managing inflammation and oxidative activity. The selected herbal ingredients are well known for their anti-inflammatory and wound healing properties, which contributed to the overall therapeutic effectiveness of the formulation. The evaluation results suggest that the polyherbal ointment has the potential to promote wound healing, prevent microbial infection, and provide a soothing effect on the skin. Furthermore, the formulation demonstrated safety and compatibility with the skin, with minimal chances of irritation or adverse effects due to its natural origin. This supports its use as a safer alternative to synthetic formulations. In conclusion, the developed polyherbal ointment can be considered an effective,

economical, and natural topical preparation. However, further advanced studies, including clinical trials, are recommended to confirm its efficacy and to explore its potential for large-scale production and commercial application.

AUTHORS CONTRIBUTION:

Abisha. R: Contributed to the formulation design, preparation of the polyherbal ointment, and data collection. Mekha. C P: Participated in experimental work, evaluation studies, and literature review. Nandana. R: Contributed manuscript preparation, data analysis, and documentation of results. Shiji. R S: Assisted in formulation development, stability studies, proof reading of the manuscript. Veena. R V: Supervised the project work, guided the research process, and reviewed the final manuscript.

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