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Research Article

Formulation And Evaluation Of Herbal Analgesic Cream

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ABSTRACT

Herbal analgesic creams offer a promising avenue for natural pain relief, leveraging the therapeutic properties of botanical ingredients. This formulation is developed using standard formulation of herbal analgesic cream, each varying in the ratio of key ingredients to optimize efficacy. Turmeric, ginger, arnica, lemon balm, and liquorice were selected for their well-documented analgesic and anti-inflammatory properties. The formulations were prepared using a meticulous process, ensuring the integration of active ingredients with suitable excipients for stability and skin compatibility. The method involved the preparation of herbal extracts followed by the formulation of the cream using a double boiler technique. Additional ingredients such as glycerine, methyl paraben, zinc oxide, and rose oil were incorporated to enhance moisturization, preservation, and aroma. The resulting creams were then subjected to comprehensive evaluation to assess their physical properties, stability, irritancy, spreadability, phase separation, and pH. All formulations exhibited a mustard colour with a semi-solid appearance and emitted a characteristic herbal aroma, indicating uniformity in preparation. Stability testing revealed that the creams remained stable over a four-week period, with no observable degradation. pH measurements ranged slightly acidic to slightly alkaline, with all formulations falling within acceptable ranges for skin compatibility. Irritancy tests confirmed the creams' non-irritant nature, indicating their safety for topical application. Spreadability tests demonstrated acceptable ease of application, suggesting practicality in use. Furthermore, all formulations showed no signs of phase separation, affirming homogeneity in composition. These findings collectively highlight the robustness and efficacy of the developed herbal analgesic creams. The formulations F1, F2, and F3 of the herbal analgesic cream exhibit promising characteristics in terms of physical properties, stability, skin compatibility, and efficacy. While all formulations performed well across various evaluation parameters, formulation F3 stood out for its slightly higher pH, which may be a consideration for specific preferences or requirements. Overall, this study underscores the potential of

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herbal analgesic creams as safe and effective alternatives for managing pain and inflammation, paving the way for further exploration and development in natural therapeutics.

INTRODUCTION

An analgesic is a substance or medication employed to alleviate pain without inducing unconsciousness. These agents function by either blocking pain signals or modifying the perception of pain within the brain. Analgesics serve as crucial components in managing a spectrum of pain, from mild discomfort to severe and chronic conditions. They encompass distinct categories, including non-opioid and opioid analgesics [1]

Non-opioid analgesics, such as nonsteroidal anti-inflammatory drugs (NSAIDs) and acetaminophen, operate by inhibiting inflammatory pathways or modulating pain perception. Their efficacy in addressing mild to moderate pain is coupled with relatively favorable safety profiles, making them preferred options for many individuals seeking relief from pain[2]

In contrast, opioid analgesics act upon specific receptors in the central nervous system to alleviate pain. While highly effective in managing severe pain, their use is accompanied by potential risks of tolerance, dependence, and adverse effects. Despite these considerations, opioids remain essential for addressing acute and chronic pain conditions that are unresponsive to non-opioid intervention. The role of analgesics extends beyond mere symptom relief, encompassing a broader impact on an individual's overall well-being. By alleviating pain, these medications facilitate improved functionality, mobility, and quality of life. They enable individuals to engage in daily activities with greater ease and comfort, promoting physical and emotional resilience in the face of pain-related challenges [3] Furthermore, analgesics contribute to the comprehensive management of various medical conditions, ranging from postoperative discomfort to chronic diseases such as arthritis and neuropathy. Their

judicious use as part of multimodal treatment approaches helps address the diverse needs of patients and enhances treatment outcomes. In conclusion, analgesics play an indispensable role in alleviating pain associated with a myriad of conditions, from mild to severe and chronic. Through their diverse mechanisms of action and therapeutic profiles, these medications provide much-needed relief while empowering individuals to navigate through life with greater comfort and resilience [4]

Pain and Management:

Pain is a complex sensory experience characterized by acute discomfort, signaling physical injury, illness, or emotional distress. It serves as a fundamental component of the body's defense mechanisms, orchestrating a rapid response to mitigate potential harm. Through intricate neural pathways, pain communicates vital information to the central nervous system, prompting reflexive actions aimed at minimizing further injury or damage [5]

Classification:

pain reveals its diverse manifestations, categorizing it into two primary types: acute and chronic. Acute pain, characterized by its sudden onset and sharp intensity, serves as an immediate response to injury or illness. It functions as a crucial warning signal, alerting the individual to potential threats and triggering protective measures. In contrast, chronic pain transcends the realm of acute discomfort, persisting beyond the expected healing time. Its enduring nature poses unique challenges, often requiring comprehensive management strategies to address underlying causes and alleviate ongoing symptoms [6]

Acute Pain:

Acute pain serves as the body's alarm system, signaling current tissue damage or underlying disease. It typically manifests as rapid and intense sensations, often transitioning into a lingering ache. This type of pain is short-lived and arises



from readily identifiable causes, such as injury or illness. Its swift onset facilitates prompt recognition and intervention, enabling timely treatment to address the underlying issue. Acute pain prompts immediate attention, guiding individuals to take necessary steps to minimize further harm and facilitate healing [7]

Chronic Pain:

Chronic pain extends beyond the expected duration of pain associated with a specific injury or condition. Unlike acute pain, which typically resolves as tissues heal, chronic pain persists for prolonged periods. It may manifest as continuous discomfort or occur intermittently, posing challenges in management. Chronic pain presents complexities that make it more resistant to treatment compared to acute pain [8]

Analgesic Cream:

Analgesic creams represent a practical and effective solution for managing pain and discomfort. Designed for topical application, these creams offer targeted relief by delivering active ingredients directly to the site of pain. By combining analgesics, anti-inflammatories, and soothing agents in a semisolid emulsion base, analgesic creams provide localized comfort while minimizing systemic side effects. Whether used to alleviate acute injuries, chronic conditions, or everyday aches and pains, analgesic creams offer convenience and versatility. Their ease of application and rapid onset of action make them a popular choice for individuals seeking immediate relief without the need for oral medications. In this introduction, we delve into the formulation, mechanism of action, and potential benefits of analgesic creams in promoting overall well-being [9] A cream embodies a semi-solid emulsion amalgamating water and oil, culminating in a texture that is smooth and effortlessly spreadable. In the realm of pain alleviation, analgesic creams emerge as topical formulations meticulously crafted to be administered onto the skin's surface.

These creams harness the synergistic properties of various ingredients to provide localized relief from discomfort, targeting specific areas of pain or inflammation. Analgesic creams represent a versatile approach to pain management, offering a non-invasive and localized alternative to systemic medications. Their targeted action delivers active ingredients directly to the site of pain, bypassing the digestive tract and minimizing the risk of systemic side effects. Additionally, the occlusive nature of creams creates a protective barrier over the skin, enhancing hydration and promoting tissue repair [10]

Comparison Between Ayurvedic and Allopathic Analgesic cream:

1. Ingredients

Ayurvedic:

Formulated with natural ingredients derived from herbs and botanicals, such as turmeric, ginger, and *Boswellia serrata*.

Allopathic:

Contains synthetic or chemically derived active ingredients like non-steroidal anti-inflammatory drugs (NSAIDs), menthol, or lidocaine.

2. Mode of Action:

Ayurvedic:

Acts through natural mechanisms such as stimulating blood circulation, reducing inflammation, and promoting healing through the body's innate processes.

Allopathic:

Often works by numbing the nerves in the area where it is applied, blocking pain signals from reaching the brain.

3. Speed of Action:

Ayurvedic:

Typically slower to show noticeable effects as they work with the body's natural healing processes.

Allopathic:

Often provides quicker relief due to the direct action of synthetic compounds on nerve endings.

4. Side Effects:

Ayurvedic:

Generally considered safer with minimal side effects. However, allergic reactions to certain herbs or oils are possible.

Allopathic:

Can cause skin irritation, redness, or allergic reactions in some individuals. Prolonged use or excessive application may lead to systemic side effects.

5. Cost:

Ayurvedic:

Cost may vary depending on the brand and specific ingredients but generally considered affordable.

Allopathic:

Can be more expensive, especially for branded products or those containing specialized ingredients.

6. Targeted Conditions:

Ayurvedic:

Often used for mild to moderate musculoskeletal pain, joint pain, and stiffness.

Allopathic:

Widely used for various types of pain including muscle aches, arthritis, sprains, and strains [11]

Ingredients Profile:

1. Turmeric:

The compound in turmeric responsible for its analgesic properties is curcumin. Curcumin has pain – relieving properties, making it a common ingredient in herbal analgesic creams [12]



Fig. No 1: Turmeric Powder

2. Arnica:

Arnica contains several active compounds but one of the key chemicals used in herbal analgesic creams is helenalin. Helenalin is a sesquiterpene lactone with pain – relieving properties, contributing to arnica’s potential pain-relieving effects [13]



Fig. No 2: Arnica plant

3. Ginger:

The compound in ginger that is often used in herbal analgesic creams is gingerol. Gingerol is a bioactive compound found in fresh ginger root and is known for analgesic properties. When incorporated into creams or balms, gingerol contributes to the soothing and pain-relieving effects of the product [14]



Fig. No 3. Ginger root

4. Lemon balm:

The compound in lemon balm that is often used in herbal analgesic creams is rosmarinic acid. Rosmarinic acid is a polyphenolic compound found in various plants, including lemon balm. It is known for pain-relieving and anti-inflammatory properties, making it a valuable ingredient in topical formulation aimed at providing relief from pain and inflammation [15]



Fig. No 4. Lemon balm

5. Liquorice:

One of the key compounds in liquorice (*Glycyrrhiza glabra*) commonly used in herbal analgesic cream is glycyrrhizin. It is derived from the roots of the licorice plant and is known for its potential in soothing and calming effects. In analgesic creams, glycyrrhizin contributes to the overall properties aimed at reducing pain and inflammation when applied topically [16]



Fig. No 5. Liquorice

MATERIALS AND METHOD:

Materials:

Arnica powder was purchased online from Sai Herbs with batch number 176 Lemon balm powder was purchased online from Zyrex Ayurveda with batch number I.B 01 Turmeric powder, Ginger powder, Liquorice powder was purchased from local market (Hritki Vastu Bhandaar) of Rishikesh [17]

The ingredients that are used in my formulation:

Table 1: Ingredients and their Properties

Ingredients	Properties
Turmeric	Pain relieving
Ginger	Inhibiting the inflammation
Arnica	Joint pain
Lemon balm	Pain relieving
Liquorice	Anti-inflammatory
Glycerin	Moisturizing
Methyl Paraben	Preservative
Zinc oxide	Barrier
Rose oil	Aromatic
Coconut oil	Nourishing

The herbal analgesic cream was prepared as following:

Table 2: Formulation Table of herbal analgesic cream

Ingredients	F1 (in gram)	F2 (in gram)	F3 (in gram)
Turmeric Powder	10	8	10
Ginger powder	6	6	7
Arnica powder	8	10	10
Lemon balm powder	4	3	6
Liquorice powder	5	6	7
Glycerin	10	9	10
Methyl paraben	1	2	3
Zinc oxide	5	4	5
Rose oil	2	3	2

Coconut oil	49	49	40
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Method:

1. Preparation of herbal Extracts:

- Grind the turmeric, arnica, ginger, liquorice, and lemon balm separately to obtain fine powders.
- Mix each powder with a small amount of coconut oil to create herbal extracts.

2. Cream Formulation:

- In a heat-resistance container, combine the herbal extracts with the remaining coconut oil.
- Heat the mixture gently using a double boiler until the coconut oil is fully melted.
- Stir the mixture thoroughly to ensure even distribution of the herbal extracts.

3. Incorporation of Additional ingredients:

- Once the mixture has cooled slightly, add glycerin, methyl paraben, zinc oxide, and rose oil.
- Stir continuously to ensure all ingredients are well incorporated into the cream base.

4. Cooling and Packaging:

- Allow the cream mixture to cool to room temperature while stirring occasionally to prevent separation.
- Transfer the cooled cream into clean, airtight containers for storage.

Packaging and Labelling:

- Packaging the cream in suitable containers with proper labelling indicating the ingredients, usage instructions, and precautions.
- Ensure compliance with regulatory requirements for labelling and packaging of topical medicinal products.

Evaluation of Analgesic Properties:

- Apply a small amount of the cream to the skin and assess its analgesic effects through subjective feedback or controlled studies.

- Evaluation the cream's effectiveness in reducing pain and inflammation compared to placebo or commercial analgesic creams [18]

Evaluation of Herbal Analgesic cream:

Irritancy test:

The irritancy test for herbal analgesic cream involves applying a small amount to a patch of healthy skin on volunteers' forearms or backs. After 24 to 48 hours, examine the patch site for redness, swelling, itching, or blistering. Compare results to a control group treated with a placebo. Use a standardized scoring system to quantify irritation severity. Monitor volunteers for delayed reactions. Analyzed data to assess the cream's potential for skin irritation and overall safety. Repeat testing if needed for reliability. This test ensures the cream's compatibility with skin and helps determine its suitability for topical application [19]

Spreadability Test:

The spreadability test for herbal analgesic cream involves applying a measured amount onto a standardized surface, then spreading it evenly using a glass slide or spatula. Measure the diameter of the spread cream after a set time interval. A wider spread indicates better spreadability, implying ease of application and coverage over a larger area of skin. Repeat the test multiple times to ensure consistency. Analyze results to determine the cream's ability to spread smoothly and evenly, which impacts its practicality and user experience. This test helps assess the cream's suitability for providing effective pain relief over desired skin areas [20]





Fig. No 7. Spreadability test using glass slides

Stability testing:

Stability testing for herbal analgesic cream involves subjecting the product to various conditions to assess its shelf-life and performance over time. Tests include temperature cycling, where the cream is exposed to different temperatures to simulate real-world storage conditions. Additionally, accelerated aging tests speed up the natural degradation process to predict long-term stability. Samples are periodically evaluated for changes in appearance, colour, texture, and efficacy. Microbial stability is also assessed to ensure the cream remains free from contamination. These tests help determine the cream's suitability for storage, transportation, and prolonged use, ensuring consistent quality and effectiveness for consumers [21]

Table 3: Stability Testing

Test	After 1 Month
Physical Appearance	Semi solid
Texture	Smooth and creamy
Colour	Mustard
Oduor	Characteristics
pH value	6.0
Degradation of Product	No



Fig. No. 8. Herbal Analgesic Cream

Physical Properties:

The physical properties of herbal analgesic cream encompass various characteristics essential for its efficacy and user experience. These include appearance, texture, colour, and odour, ensuring uniformity and pleasantness. Spreadability and consistency determine ease of application and absorption into the skin. pH level and viscosity contribute to skin compatibility and the cream's overall performance. Packaging compatibility and temperature stability are crucial for maintaining product integrity during storage and transportation. Microbial purity ensures safety for topical use. Physical stability, including homogeneity and resistance to degradation, guarantees long-term effectiveness. These properties collectively define the cream's quality, reliability, and suitability for pain relief [22]

Table 4: Observation of physical properties

Properties	Observation
Colour	Mustard
Oduor	Characteristics
Appearance	Semi solid



Fig. No. 9. Herbal Analgesic Cream

Viscosity test:

The viscosity test for herbal analgesic cream involves measuring its resistance to flow, which impacts its spreadability and effectiveness. Using a viscometer, the cream's viscosity is determined by observing the time it takes for a fixed volume to flow through the instrument under standardized conditions. A higher viscosity indicates thicker consistency, potentially affecting ease of application and absorption into the skin. Consistency in viscosity across batches ensures uniformity and reliability of the product. This test helps assess the cream's suitability for topical use, ensuring it maintains the desired thickness for optimal pain relief[23]



Fig. No. 10. Viscosity Measurement

Phase separation test:

The phase separation test for herbal analgesic cream evaluates its stability by assessing the potential for separation of ingredients into distinct phases. Samples are subjected to varying temperatures and storage conditions to induce phase separation. After specified intervals, the cream is visually inspected for any signs of separation, such as oil droplets or water pooling. Additionally, samples may undergo centrifugation to accelerate phase separation and facilitate observation. A stable cream will exhibit uniformity and resistance to separation, ensuring consistent quality and efficacy. This test helps ensure that the herbal analgesic cream remains homogeneous and effective throughout its shelf-life [24]

Table 5: Observation of phase separation

Formulation	Observation
Herbal Analgesic Cream	No phase separation



Fig. No. 11. Herbal Analgesic Cream

Determination of pH:

The determination of pH in herbal analgesic cream involves using a pH meter or pH indicator strips to measure the acidity or alkalinity of the product. A small amount of cream is diluted in distilled water, and the pH of the resulting solution is measured. The pH level indicates the cream's potential for skin irritation and compatibility. An optimal pH range, typically around 4.5 to 6.5, ensures skin-

friendly acidity and stability of active ingredients. Regular pH testing ensures consistency in product quality and safety, helping to maintain the cream's effectiveness and user comfort during application [25]



Fig. No. 12. pH test

RESULTS AND DISCUSSION

For the development of an herbal analgesic cream, three distinct formulations were created using varied ratios of excipients to optimize results. These formulations underwent extensive evaluation parameters, as outlined in Table. Subsequently, the analgesic efficacy of the cream was assessed.

Table 6. Formulation table

Ingredients	F1 (in gram)	F2 (in gram)	F3 (in gram)
Turmeric Powder	10	8	10
Ginger powder	6	6	7
Arnica powder	8	10	10
Lemon balm powder	4	3	6
Liquorice powder	5	6	7
Glycerin	10	9	10
Methyl paraben	1	2	3
Zinc oxide	5	4	5
Rose oil	2	3	2
Coconut oil	49	40	

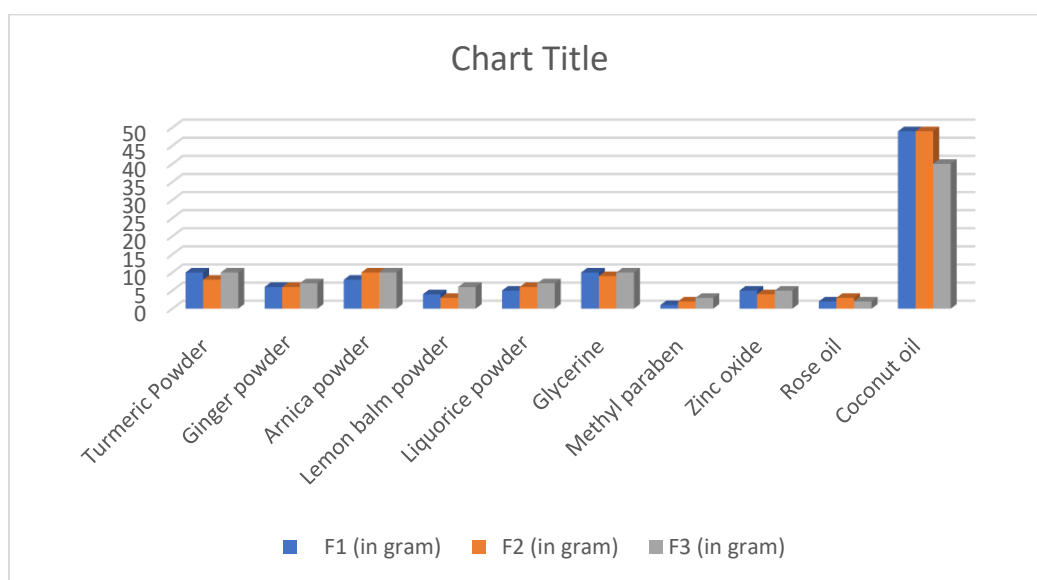


Fig. No. 13. Graph showing result of the respective project work

Formulation F1 exhibits a mustard colour with a semi-solid appearance and emits a herbal aroma. It has undergone stability testing, proving its stability even after 4 weeks. The pH of F1 is measured at 6.5, indicating a slightly acidic nature. Furthermore, F1 has been assessed in irritancy tests and is deemed non-irritant. Its spreadability is considered acceptable, ensuring ease of application. Importantly, F1 shows no signs of phase separation, indicating uniformity in its composition. Similar to F1, Formulation F2 presents a mustard colour with a semi-solid appearance and a herbal aroma. It also demonstrates stability after 4 weeks of testing, reflecting its robust formulation. The pH of F2 is slightly higher at 6.7 compared to F1, suggesting a slightly more alkaline nature. Like F1, F2 passes irritancy tests without causing irritation. Its spreadability is deemed acceptable, ensuring ease of use during application. Additionally, F2, like F1, shows no phase separation, indicating

homogeneity in its composition. Formulation F3 shares the same physical characteristics as F1 and F2, including a mustard colour with a semi-solid appearance and a herbal aroma. Stability testing confirms its endurance even after 4 weeks. Notably, F3 demonstrates the highest pH among the formulations, measured at 6.9, indicating a slightly more alkaline nature compared to F1 and F2. Similar to F1 and F2, F3 passes irritancy tests without any adverse effects. Its spreadability is considered acceptable, facilitating smooth application. Furthermore, F3, like F1 and F2, exhibits no phase separation, indicating uniformity in its composition. In summary, all three formulations (F1, F2, F3) share similar physical properties and perform well in terms of stability, irritancy, spreadability, and phase separation. However, F3 stands out for having the highest pH among the formulations, which may be a consideration depending on specific requirements or preferences.

Table 7: Evaluation table of herbal analgesic cream

Formulation	Physical Property	Stability Testing	pH Test	Irritancy test	Spread ability	Phase separation
F1	Mustard Colour with Semi solid appearance and herbal aroma	Stable after 4 weeks	6.5	Not irritant	Acceptable	No Phase Separation
F2	Mustard Colour with Semi solid appearance and herbal aroma	Stable after 4 weeks	6.7	Not irritant	Acceptable	No Phase Separation
F3	Mustard colour with Semi solid appearance and herbal aroma	Stable after 4 weeks	6.9	Not irritant	Acceptable	No Phase separation

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