



Formulation And *In Vitro* Characterization Of Herbal Pain Balm For Arthritis

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ABSTRACT

Osteoarthritis (OA) and rheumatoid arthritis (RA) are two major forms of arthritis associated with severe joint pain and reduced quality of life. Various pharmacological interventions may be utilized for arthritis treatment when non-pharmacological therapy is insufficient. Herbal remedies offer a promising alternative to synthetic drugs due to their natural origin and minimal side effects. This research focuses on the formulation and *in vitro* characterization of an herbal pain balm designed to alleviate arthritis symptoms. The formulated herbal pain balm demonstrated significant antioxidant, anti-inflammatory, and antimicrobial properties *in vitro*. The stability studies confirmed its efficacy over time. These findings suggest that the balm could be a viable alternative or complementary treatment for arthritis. Though these herbs have shown promise for OA and RA treatment, more studies and clinical trials are required for determining safety and efficacy, bioactivity, and optimal bioavailability.

Key words: Herbal pain balm, Osteoarthritis arthritis, rheumatoid arthritis, anti-inflammatory, antioxidant.

INTRODUCTION

Arthritis is a prevalent condition characterized by inflammation and pain in the joints. Arthritis affects millions worldwide, causing significant discomfort and disability. Conventional treatments often involve nonsteroidal anti-inflammatory drugs (NSAIDs), which can have adverse effects with long-term use⁽¹⁾.

Herbal formulations provide a natural and potentially safer alternative for managing arthritis symptoms. This study aims to develop a herbal pain balm incorporating well-known medicinal herbs and to characterize its properties through various *in vitro* tests⁽²⁾. Pain relief balm works on the principle of counter irritant instead of actually relieving the pain they work on the principle of suppressing the pain by causing irritation on the point where the pain relief balm is applied. Pain balms generally contains 3 components namely methyl salicylate, menthol and camphor all these are easily absorbed through the skin. Key herbs including turmeric, ginger, capsaicin, and menthol were selected for their anti-inflammatory and analgesic properties. Turmeric (*Curcuma longa*) contains curcumin, known for its potent anti-inflammatory and antioxidant effects^(3,4,5). Ginger (*Zingiber officinale*) exhibits anti-inflammatory and analgesic properties^(6,7,8). Capsaicin (*Capsicum* species) reduces pain by decreasing substance P levels⁽⁹⁾. Menthol used in pain relieving medications due to its counter irritant and local anaesthetic property⁽¹⁰⁾. The balm was formulated using a base of carrier oils and beeswax, followed by comprehensive phytochemical, antioxidant, anti-inflammatory, and antimicrobial evaluations to determine its efficacy and stability⁽¹¹⁾.

MATERIALS AND METHODS

Materials

Turmeric, ginger extract, capsaicin extract were prepared by cold maceration process. Menthol, coconut oil, beeswax were procured from Lotus Chemicals Ltd., Hyderabad.

Formulation of herbal balm

Take one container and add 20 gm of bees wax, place the container in a hot plate and boil it until all the amount of bees wax completely dissolved. Add 50ml of coconut oil and boil the solution in hot plate. In the dissolved solution add 10ml of ginger extract and 10 ml of capsaicin extract, stir it and boil until the contents added completely dissolve. After that, weigh and add 5gm of menthol crystals to the above solution and boil it until the menthol completely dissolved. Weigh 5 gm of turmeric, stir and boil the solution. Weigh 5gm of sodium benzoate and add it to the solution, stir it well and boil the solution, for complete dissolution of the solution. When all the added ingredients were completely dissolved and turns in to the liquid form then take the solution out of the hot plate, pour the mixture into containers and allow it to solidify at room temperature that turns into a semi solid herbal balm^(12,13).

Table 1: Composition of herbal pain balm

S.No.	Ingredients	Quantity	Benefit
1	Coconut oil	50 ml	Carrier oil
2	Beeswax	15 gm	Anti inflammatory, soothing skin
3	Ginger extract	10 ml	Anti inflammatory
4	Capsaicin extract	10ml	Counter irritant
5	Turmeric	5gm	Antiinflammatory
6	Sodium benzoate	5gm	Preservative
7	Menthol crystals	5 gm	Counter irritant

Characterization of herbal pain balm

Physical Appearance

Clarity and colour was examined by naked eyes against white background, the odour was smelled.

PH

The PH of the prepared formulation was determined by using digital PH meter by dipping the glass electrode completely in to the formulation system to cover the electrode. The measurement was carried out in triplicate and the average of the three readings was recorded

Phase Separation

The herbal balm prepared was observed for 24 hours for the oil phase and aqueous phase separation.

Viscosity

Viscosity of balm was determined using brook field viscometer (S-62,model LVDV-E) at 25°C with a spindle speed of the viscometer rotated at 12rpm.

Patch Test

Patch test was carried out to observe any undesirable reaction of herbal balm with skin. It is determined by applying the product as thickly as they would when using it regularly to a to a quarter-sized

patch of skin (probably on hands). Leave the product on the patch of skin for as long as it would normally be on the skin. Repeat the patch test twice a day for between 7-10 days. A reaction may not happen immediately, so it is important to continue applying the product for this length of time. If a persons skin react to the product, they should wash it off as soon as possible and stop using it.

Spreadability

Two sets of glass slides of standard dimensions were taken. The herbal balm formulation was placed over one of the slides. The other slides was placed on the top of the balm, such that the balm was sandwiched between the two slides in an area occupied by a distance of 7.5cm along the slides. 10 g weight of balm was placed on the upper slides so that the gel was between the two slides was pressed uniformly to form a thin layer. The weight was removed and the excess of gel adhering to the slides was scrapped off. The two slides in position were fixed to a stand with out slightest disturbance and in such a way that only upper slides to slip off freely by the force of weight tied on it. A 20 g weight was tied to the upper slide carefully. The time taken for the upper slide to travel the distance of 7.5 cm and separated away from the lower slide under the influence of the weighed was noted. The experiment was repeated for three times and the mean time was taken for calculation⁽¹⁴⁾.

Accelerated Stability Studies

Accelerated stability testing of prepared herbal balm formulation was carried out at room temperature for one week, at $45^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 3 months. The herbal balm formulation were kept both at room and elevated temperature and observed on 0 th , 15th , 20th , 30th , 40 th , 50th , 60th , 70th , 80th and 90th day for the physical parameters.

Antimicrobial Activity

Antimicrobial properties were tested using disc diffusion method against common pathogens (Staphylococcus aureus, Escherichia coli) and minimum Inhibitory Concentration (MIC) for determining the lowest concentration that inhibits microbial growth^(15,16).

RESULTS AND DISCUSSION

The physical appearance of the prepared balm was observed to be elegant, light brown colour semisolid with strong fragrance. The formulations exhibited PH in the range 7.0 which is the desired PH of the skin.

The herbal balm tested for viscosity, phase separation, spreadability and patch test exhibited the results as represented in Table 2.

S.No.	Parameters	Observations
1	Phase separation	No phase separation
2	Viscosity	35110 cps
3	Spreadability	8.5 g cm/sec
4	Patch test	Non allergic

Antimicrobial test carried out by the disc diffusion method and MIC determination indicated that the balm possessed excellent antimicrobial activity, which could help prevent secondary infections in inflamed joints.

Accelerated stability testing showed no significant changes in the balm's physical and chemical properties over three months. The active compounds remained stable, and there was no phase separation or degradation.

CONCLUSION

Herbal balm was prepared by using Hot Processing Technique and found to be good compatibility of all ingredients used in formulation without any significant changes. The prepared formulation showing good physical characteristics. •Further evaluated by various evaluation parameters such as PH, Spreadability,

Viscosity, Patch test and gives good result. This detailed research article outlines the process of formulating and characterizing a herbal pain balm for arthritis, highlighting its potential as a natural therapeutic option. Future work should involve in vivo studies and clinical trials to further establish its therapeutic potential and safety profile.

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