

Formulation and Evaluation of Polyherbal Knee Pain Relief Balm

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Abstract: Medicinal plants, minerals, and organic materials are commonly used to make traditional remedies. In recent years, there has been an increased focus on the use of several medicinal plants from the traditional medical system to treat a variety of ailments. Conventional medicine has made use of the Lauraceae family includes the everlasting tree of tropical medicine, cinnamon (*Cinnamomum zeylanicum* and *Cinnamon cassia*). One of the most significant spices that people use on a daily basis worldwide is cinnamon. Essential oils and various derivatives, including cinnamaldehyde, cinnamic acid, and cinnamate, are the main ingredients of cinnamon. Apart from its numerous health benefits, such as anti-inflammatory, anti-cancer, antidiabetic, antibacterial, lipid-lowering, and cardiovascular disease-lowering properties, cinnamon has also been shown to have anti-neurological illnesses, including Parkinson's and Alzheimer's diseases. This article provides an overview of cinnamon's pharmacological potential and practical applications. Cinnamon's medicinal benefits may be attributed to secondary metabolites such as flavonoids, tannins, saponins, steroids, glycosides, coumarins, anthraquinones, and alkaloids. The Numerous healthy chemicals, including antioxidants, can be found in cinnamon. According to some research, it might aid in blood sugar regulation, heart disease prevention, and inflammation reduction. For thousands of years, cinnamon has been valued for its therapeutic qualities. It possesses antioxidant qualities. Similar to other spices, polyphenols are plant chemicals with antioxidant.

Keywords: Knee pain, Aloe vera gel, Cinnamon, Turmeric, polyherbal Balm

I. INTRODUCTION

(Knee Pain)

BONES

The femur (thigh), tibia, fibula (lower leg bones) and patella (knee cap) make up the bony structure of the knee joint. The ends of the bones and back of the patella are covered in smooth cartilage. The patella (knee cap) is located in the tendon of the quadriceps (thigh) muscle.

LIGAMENTS AND TENDONS

These are two oval spongy discs that cushion any stresses placed on the knee joint. The medial & lateral menisci form a shock absorber within the knee joint, absorbing some of the force which goes through the knee during movement and activity. They also stabilise the knee (especially when it is bent at a 90° angle) and play a role in joint lubrication and nutrition.

Due to the reduced blood supply to the meniscus, damage may result in part of the meniscus being removed, if it is unable to heal after a repair.

LIGAMENT INJURIES

Cruciate ligament injuries- are usually caused by sudden twisting or hyperextension (excessive straightening) motions of the knee (ACL), or by a direct blow to the knee (ACL/PCL). These are characterized by a 'popping' sound and giving way of the leg when weight bearing. Collateral ligament injuries- are caused by direct impact to the side of the



knee, which causes a stretch or tear to the ligament on the opposite side of the knee. The joint is often unstable following these types of injuries.

TENDON

Patellar tendonitis – repetitive stress on the quadriceps muscle causes strain on the patella tendon. It may become swollen or torn, causing pain in the lower aspect of the knee, from under the knee cap. It is usually called Jumper’s Knee, and results from overdoing a movement or activity. Iliotibial Band Syndrome (ITB) - is an ache or burning pain on the outside of the knee caused by the ITB rubbing against the outside of the knee bone. It is often caused by muscle imbalances that become symptomatic when the knee is overused (such as overtraining in long distance running), and the pain usually worsens when resuming this activity.

CARTILAGE AND STRUCTURAL DAMAGE

Anterior Knee pain (Patellofemoral syndrome) - is a wearing of the cartilage at the back of the patella, caused by friction against the femur. It can occur due to trauma, muscle weakness or overuse of the knee. A dull pain around or under the knee cap is felt, and is often worsened with weight bearing, especially walking down stairs. Meniscus tears - occur when weight is applied to the knee whilst it is twisted or rotated (like turning to hit a tennis ball). The knee may ‘lock’, click or feel as if it is going to give way, following this type of injury.

Osteoarthritis– is a degenerative condition where the joint cartilage gradually wears away, causing pain and swelling. It is common to have morning stiffness which eases when moving about, with osteoarthritis. The joint may also lock or click with movement. Common knee problems REST Stop using the injured area. Allow your injured region to rest from weight bearing, or any activity that brings on symptoms, for approximately 24 hours after the injury. You can move the area, but make sure that it is pain free to prevent any further damage ICE Ice the area every 2 hours for 15- 20 minutes to decrease pain and swelling for the first 48-72 hours COMPRESSION Apply pressure to the area in the form of a stocking, tight sock, brace, strapping or bandage to provide both support and pressure to decrease any swelling.

Knee pain can occur without an accident of injury. Pain can be the result of simple functional activities like getting up from a chair or kneeling, however sometimes there is no clear reason for your knee to hurt.

All joints and soft tissues have a certain amount of activity that they can tolerate. This level can go up and down depending on how much activity you do. For example, following a period of rest or illness your activity tolerance can drop quite quickly. If you then do an activity that takes you above this level you can present with a painful reaction.

Activities that can cause a painful reaction are: kneeling, squatting, repetitive stairs or ladder climbing, and a general increase in your normal daily activities. Often you may not get a painful reaction at the time of activity it can come on over the next 24 hours.

INTRODUCTION (Herbal Balm)



1. Herbal formulations have been an integral part of traditional healthcare systems for centuries, especially within Ayurveda, Siddha, Unani, and various folk medicinal practices. In recent years, there has been a significant resurgence in the use of herbal products, primarily due to their perceived safety, minimal side effects, and holistic therapeutic benefits. Among the various herbal dosage forms, topical balms have gained remarkable popularity because they allow direct application of active constituents to the affected site, ensuring quick action and reduced systemic exposure.
2. polyherbal formulation is a combination of more than one herbal ingredient, designed with the idea that multiple herbs act synergistically to enhance therapeutic efficacy. The concept of polyherbalism is well-established in Ayurveda and is based on the principle that combining herbs increases the bioavailability of active phytoconstituents, reduces toxicity, and produces multi-directional pharmacological actions. This synergistic approach makes polyherbal balms highly effective for a wide range of conditions, including inflammation, pain, microbial infections, wounds, burns, and various dermatological disorders. Topical herbal preparations provide several advantages over internal dosage forms.
3. When applied to the skin, phytoconstituents penetrate through the epidermis and reach the underlying tissues where they exert anti-inflammatory, analgesic, antimicrobial, antioxidant, or soothing actions depending on the plant used. Additionally, topical application bypasses hepatic first-pass metabolism, improving the local bioavailability of active compounds such as curcuminoids, flavonoids, tannins, essential oils, and terpenes
4. Polyherbal balms generally contain ingredients like aloe vera, turmeric, camphor, mint, cinnamon, ginger, or other medicinal herbs depending on the purpose of the formulation. Each herb contributes unique therapeutic actions: for example, aloe vera exhibits moisturizing and wound-healing properties; turmeric provides anti-inflammatory and antioxidant benefits; ginger and cinnamon offer warming and circulation-enhancing effects; while menthol from mint gives cooling, soothing, and local analgesic effects. When combined, these herbs complement each other and produce a balanced formulation suitable for conditions such as joint pain, muscle stiffness, swelling, sprains, minor wounds, and skin irritation
5. The formulation of an herbal balm requires careful selection of herbal extracts, a suitable base, preservatives, emulsifying agents, humectants, and stabilizers. The balm base commonly used is an oil-in-water (O/W) emulsion, which is non-greasy, easily spreadable, and patient-friendly. The evaluation parameters include organoleptic characteristics, pH, viscosity, spreadability, washability, stability studies, microbial load testing, and irritancy testing. These parameters ensure that the formulation remains safe, effective, and stable throughout its shelf life. Thus, polyherbal topical balms represent a promising and consumer-friendly approach to managing various ailments. They combine traditional medicinal wisdom with modern pharmaceutical techniques to create safe, effective, and naturally derived therapeutic alternatives

ADVANTAGES OF POLYHERBAL BALMS

1. Synergistic Therapeutic Action Multiple herbs work together to enhance each other's pharmacological effects, providing better efficacy compared to single-herb formulations.
2. Reduced Side Effects Herbal active constituents are generally milder on the skin and produce fewer adverse reactions than synthetic drugs.
3. Direct Localized Action Balms deliver active components exactly where they are needed—at the surface or deeper layers of the skin—offering faster relief.
4. Bypasses First-Pass Metabolism Since herbal actives are applied topically, they avoid hepatic metabolism and maintain higher local concentrations.
5. Better Patient Compliance Since herbal actives are applied topically, they avoid hepatic metabolism and maintain higher local concentrations.
6. Multiple Pharmacological Properties in One Product A single polyherbal balm can offer anti-inflammatory, analgesic, antimicrobial, antioxidant, and soothing effects simultaneously.
7. Suitable for Long-Term Use Herbal balm are generally safe for prolonged application in chronic conditions like arthritis, joint pain, and dermatitis.



8. Economical and Easily Available Herbs are abundant, low-cost, and accessible, making polyherbal products affordable.
9. Lower Risk of Allergic Reactions Many herbal ingredients are skin-friendly and well tolerated, especially when used in standardized extracts.
1. Variability in Phytochemical Content Plant constituents vary based on season, region, soil, and extraction method, making standardization challenging
2. Possibility of Mild Skin Irritation in Sensitive Individuals Although safer than synthetic balms, some herbal extracts or essential oils may cause irritation or allergies.
3. Stability Issues Herbal compounds can degrade when exposed to light, heat, or moisture, affecting shelf life.
4. Microbial Contamination Risk If preservatives are not properly used, herbal balms can support microbial growth due to their natural ingredients.
5. Slower Onset of Action Compared to Synthetic Drugs Herbal formulations generally work gently and gradually, which may not suit acute or severe conditions.
6. Limited Clinical Evidence Many herbal combinations lack large-scale clinical trials, so their efficacy may sometimes be questioned.

LITERATURE VIEW

Osteoarthritis or degenerative joint disease is the most common joint disorder. The fundamental manifestation is degeneration of the articular cartilage [26] characterized by a decreased joint space, osteophytes and a variety of deformities that develop as the disease progresses. The disease mainly affects the weight bearing joints. The relative risk is 1.9 for men and 3.2 for women [1]. Homoeopathy medicines are really valuable in reducing pain and symptoms of osteoarthritis of knee with significant improvement noted in VAS scale [33].

The term osteoarthritis was coined by John Spendon [14]

The Indian Journal of Orthopaedics conducted a study, which showed the overall prevalence of knee OA was found to be 28.7%. According to WHO, OA is the second commonest musculoskeletal problem (30%) in the world population [45].

Endogenous – age, sex, heredity, ethnic origin and post-menopausal changes. Exogenous – macrotrauma, repetitive microtrauma, overweight, resistive joint surgery and lifestyle factors (alcohol, tobacco).

AIM & OBJECTIVE

AIM : Formulation and evaluation of polyherbal knee pain relief balm

OBJECTIVES :

1. To Formulate a Stable Polyherbal Balm: Develop a well-balanced, multi-ingredient herbal balm for topical application that is physically and chemically stable over a reasonable shelf life.
2. To Evaluate the Anti-inflammatory and Analgesic Efficacy: Assess the formulated balm's ability to significantly reduce inflammation and relieve pain, often through in vitro or in vivo (animal model) studies, comparing it to a base or a standard market product.
3. To Ensure Safety and Acceptability: Perform tests to confirm the balm is non-irritant and safe for human skin application, minimizing potential side effects often associated with synthetic alternatives.



PLAN OF WORK

FORMULATION TABLE

SR. NO	INGREDIENTS	FUNCTION	F1[mg]	F2[mg]	F3[mg]
1	Beeswax	Protectant	3.5 g	3 g	4 g
2	Castor oil	Anti-inflammatory	7.5g	8 g	8.5 g
3	Mustard oil	Rubefacient	7 g	7.6 g	6 g
4	Menthol	Analgesic	0.7 g	0.8 g	0.6 g
5	Cinnamon powder	Antioxidant	0.5 g	0.4 g	0.7 g
6	Methyl paraben	Antimicrobial	0.08 g	0.08 g	0.08 g
7	Camphor	Counter-irritant	0.18 g	0.12 g	0.12 g

Table: Materials to be included in the polyherbal knee pain relief balm

Total Weight

Formulation	Total Weight
F1	20mg
F2	20mg
F3	20mg

MATERIALS AND METHODS

CINNAMON

Introduction

Cinnamon is an aromatic bark widely used in herbal formulations for its warming, anti-inflammatory, and analgesic properties. Its essential oil contains cinnamaldehyde, which improves local blood circulation and reduces pain when applied topically. In knee pain formulations, it provides a gentle warming effect that helps ease stiffness and discomfort.

Synonyms : Dalchini Cinnamomum bark Cassia bark (for some species)

Biological Source : Cinnamon is obtained from the dried bark of Cinnamomum zeylanicum (true cinnamon) or Cinnamomum cassia (Chinese cinnamon).

Family : Lauraceae

Chemical Constituents : Volatile oil (major: Cinnamaldehyde, eugenol) Tannins, Mucilage, Coumarins, Resin, Polyphenols.

Uses :

- 1) Provides a warming analgesic effect, reducing knee and muscle pain. Acts as a strong anti-inflammatory agent.
- 2) Improves local blood circulation, enhancing relief in stiff joints.
- 3) Shows antimicrobial and antioxidant activity, protecting skin.

CASTOR OIL

Introduction

Castor oil is a fixed vegetable oil obtained from the seeds of the castor plant. It is widely used in pharmaceutical, cosmetic, and herbal preparations because of its anti-inflammatory, moisturizing, and penetrating properties. In herbal knee pain relief balm, castor oil helps in deep penetration of active ingredients and provides soothing relief from joint and muscle pain.

Synonyms : 1. Oleum Ricini

2. Castor bean oil

3. Palma Christi oil

Biological Source: Castor oil is obtained by cold pressing or extraction from the seeds of:

Ricinus communis

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Family : The plant belongs to the family:

Euphorbiaceae

Chemical Constituents : Castor oil mainly contains:

Ricinoleic acid (major constituent),Oleic acid,Linoleic acid,Stearic acid,Palmitic acid,Dihydroxystearic acid,Triglycerides

MINT

Introduction

Mint is an aromatic herb used widely in pharmaceutical and cosmetic preparations for its cooling, soothing, and mild analgesic properties. Its leaves contain volatile oils rich in menthol, which produce a characteristic cooling sensation on the skin. In topical pain-relief formulations, mint enhances local circulation, reduces inflammation, and provides immediate calming effect.

Synonyms : Pudina, Peppermint (common variant)

Mentha : Mentha, oil (for its essential oil)

Biological Source : Mint consists of the fresh or dried leaves of *Mentha arvensis* or *Mentha piperita*, depending on availability. Both species contain high amounts of menthol in their essential oil.

Family : Lamiaceae (Mint family) Chemical Constituents Volatile oil (major: Menthol, Menthone, Menthyl acetate)

Flavonoids (luteolin, hesperidin) Phenolic acids Tannins

Terpenoids (limonene, cineole)

Enhances penetration of other herbal actives in the balm. Also offers anti-inflammatory and antimicrobial benefits.

BEES WAX

Introduction

Beeswax is a natural wax produced by honey bees. It is secreted by worker bees and used for building honeycombs. Beeswax is widely used in pharmaceutical preparations, cosmetics, ointments, candles and food products.

Synonyms : Cera flava (Yellow beeswax), Bee wax, Apis wax

Biological Source : Beeswax is obtained from the honeycomb of the honey bee, mainly: 1.*Apis mellifera* 2. *Apis indica*. It is produced by the wax glands present in the abdomen of worker bees.

Family : *Apis mellifera* belongs to the family: Apidae

Chemical Constituents : Beeswax mainly contains: Esters of fatty acids and alcohols, Myricyl palmate, Cerotic acid, Melissic acid, Hydrocarbons, Free fatty acids, Small amounts of propolis,pollen and coloring matter

Uses : Used as a stiffening agrnt in ointments and balms. Provides consistency and stability to formulations, Acts as a skin protectant and emollient.

MUSTARD OIL

Introduction

Mustard oil is a fixed vegetable oil obtained from the seeds of mustard plants. It is commonly used in traditional medicine, massage oils, and herbal formulations due to its warming, anti-inflammatory, and blood circulation–improving properties. In herbal knee pain relief balm, mustard oil provides warmth and helps reduce muscle and joint stiffness.

Synonyms : Sarson oil, Rai oil, Mustard seed oil

Biological Source : Mustard oil is obtained from the seeds of: *Brassica juncea*, *Brassica nigra* by pressing or extraction methods.

Family : The mustard plant belongs to the family:



Brassicaceae

Chemical Constituents : Mustard oil mainly contains: Erucic acid ,Oleic acid,Linoleic acid ,Alpha-linolenic acid ,Palmitic acid, Sinigrin,Allyl isothiocyanate (responsible for pungent odor and warming effect)

Uses : Used in massage oils and pain relief preparations

Acts as a rubefacient (increases blood circulation)

CAMPHOR

Introduction

Camphor is a strongly aromatic, crystalline substance widely used in topical analgesic formulations. It produces a characteristic cooling–warming sensation on the skin, which helps distract pain signals (counter-irritant action). It is known for its anti-inflammatory, analgesic, and mild antiseptic properties, making it a key ingredient in muscle and joint pain relief balms.

Synonyms : Kapur Cinnamomum camphora camphor Spirit of Camphor (for solutions)

Biological Source : Camphor is obtained from the wood of Cinnamomum camphora Linn., a large evergreen tree. (Industrial camphor is also prepared synthetically from turpentine oil.)

Family : Lauraceae

Chemical Constituents Camphor (main ketone) Terpenoids (borneol, camphene) Safrole (traces) Pinene Limonene

Uses :

Acts as a counter-irritant, reducing knee pain by producing cooling–warming sensation. Shows anti-inflammatory action helpful in swollen joints. Works as a mild analgesic for muscle aches and stiffness. Provides antimicrobial benefit to the applied area. Enhances penetration of other herbal actives in the balm

METHYL PARABEN

Introduction

Methyl paraben is a widely used antimicrobial preservative in pharmaceutical, cosmetic, and food formulations. It prevents the growth of bacteria, yeast, and molds, thereby increasing the shelf life of balms, gels, and lotions. It is stable, safe in low concentrations, and does not affect the texture or appearance of the formulation.

Synonyms : Methyl p-hydroxybenzoate Methyl parahydroxybenzoate Methyl ester of p-hydroxybenzoic acid Nipagin M

Biological Source : It is synthetically produced; not obtained from a natural plant. (Acts as a preservative in herbal formulations.)

Family : Not applicable (synthetic chemical; not a plant product). Chemical Constituents / Chemical Nature Ester of p-hydroxybenzoic acid

Chemical formula: C₈H₈O₃ Part of the “paraben” class of preservatives Shows high antimicrobial activity against molds and yeasts

Uses : Acts as an effective preservative in herbal balms and gels. Prevents microbial contamination during storage. Extends shelf-life of the polyherbal knee pain balm. Stable over a wide pH range and compatible with most herbal ingredients

PREPARATION OF HERBAL BALM

1. Oil phase preparation

Take beeswax + castor oil + mustard oil in a beaker.

Heat using a water bath (65–70°C) until beeswax melts completely.

2. Add menthol

Add menthol crystals and stir until dissolved (avoid overheating).



3. Disperse cinnamon

Add cinnamon powder slowly with continuous stirring for uniform mixing.

4. Add preservative

Dissolve methyl paraben in a small amount of warm oil.

Add into the mixture and mix well.

5. Add Vitamin E (optional)

Add during cooling phase (~40°C).

6. Fill and cool

Pour into suitable containers.

Allow to cool at room temperature.

Stir continuously to prevent settling of cinnamon powder.

1. Packaging : Transfer the finished balm into sterile jars or tubes. Label with batch number, ingredients, date of preparation, and storage instructions.

2. Storage : Store in a cool and dry place. Avoid exposure to direct sunlight. If you want, I can also give Evaluation parameters in the same clean English point-wise format—like pH, spreadability, viscosity, stability etc.

HOW IT WORKS

Mustard oil + cinnamon → warming effect, improves blood circulation.

Menthol → provides cooling pain relief.

Castor oil → enhances absorption into joints.

Beeswax → gives proper balm consistency.

EVALUTION TEST

evaluation of herbal balm was following.

Physical evaluation:

Formulated herbal balm was further evaluated by using the following physical parameters. Color, Odor, Consistency, and state of the formulation.

a) Color: The color of the balm was observed by visual examination.

b) Odor: The odor of balm was found to be characteristics.

c) Consistency: The formulation was examined by rubbing balm on hand manually. The balm having smooth consistency. Balm did not leave greasy substances on skin surface after application.

d) State: The state of balm was examined visually. The balm

having a semisolid state. of prepared herbal balm was measured by using digital PH meter. The solution of balm was prepared by using 100 ml of distilled water and set aside for 2 hr. PH was determined in three time for the solution and the average value was calculated.

Spreadability

Spread ability of formulated balm was measured by placing sample in between two slides then compressed to uniform thickness by placing a definite weight for a definite time. The specified time required to separate the two slides was measured as Spreadability.

Lesser the time taken for separation of two slides result shown better Spreadability. Spreadability was calculated by the following Formula.

Spreadability (S)=W×L / T

Where S= Spreadability M= Weight tide to the upper slide L= Length of glass slide T= Time taken to separate the slide

RESULT : The formulation exhibited satisfactory spreadability, indicating suitable consistency and ease of application for topical use



Washability

Formulation was applied on the skin and then is extends of washing with water was check on test.

RESULT: The formulation exhibited satisfactory washability, indicating convenient removal after topical application and good patient acceptability.

Non- irritancy test

Herbal balm formulation was evaluated for the non-irritancy test observation of the sites was done for 24hr 28.

RESULT: The formulation showed non-irritant properties and was found to be safe for topical application under normal conditions

Viscosity

Viscosity of balm was done by using Brooke field viscometer at the temp of 25 °C using spindle no. 63 at 5 rpm.

RESULT: The formulation exhibited satisfactory viscosity, indicating suitable consistency and stability for herbal balm preparation.

Phase separation

The prepared balm was transferred in a suitable wide mouth container. Set aside for storage, the oil phase and aqueous phase separation were visualizing after 24hr.

RESULT: The formulation showed no phase separation, indicating good physical stability and proper compatibility of ingredients in the balm preparation.

Evaluation Test Result

Parameters F1 F2 F3

Colour Dark Yellow Light Brown Yellowish Brown

Odor Characteristic aromatic odour Mild aromatic odour Strong aromatic odour

Consistency Soft and Non-greasy Slightly greasy Non- greasy

State Semisolid Semisolid Semisolid

Appearance Smooth and glossy

Rough Rough

Table 1; Physical Evaluation of Polyherbal Balm Formulations

Parameters	F1	F2	F3
Colour	Dark Yellow	Light Brown	Yellowish Brown
Odor	Characteristic aromatic odour	Mild aromatic odour	Strong aromatic odour
Consistency	Soft and Non-greasy	Slightly greasy	Non- greasy
State	Semisolid	Semisolid	Semisolid
Appearance	Smooth and glossy	Rough	Rough

Table 2: Physicochemical Evaluation of Polyherbal Balm

Parameters	F1	F2	F3
Spredability (g.cm/sec)	6.8	7.2	6.5
Washability	Good	Excellent	Good
Non-Irritancy test	No irritation	No irritation	Mild redness absent
Viscosity(cPs)	28,500	25,800	30,200
Phase Separation	Absent	Absent	Absent

Discussion

Among the three formulations, F1 showed the most satisfactory evaluation results and was selected as the optimized formulation. The balm possessed good appearance, smooth texture, characteristic odour, and semisolid consistency suitable for topical application. The pH of the formulation was found to be compatible with skin, indicating safe use without irritation.



F1 exhibited good spreadability and viscosity, which helped in easy application and better adherence on the skin surface. The formulation also showed satisfactory washability and remained stable during storage without any phase separation or change in physical properties. The non-irritancy study confirmed that the balm was safe for external use. The effectiveness of F1 may be due to the synergistic action of herbal ingredients such as mustard oil, cinnamon, menthol, camphor, and castor oil, which provide anti-inflammatory, analgesic, warming, and soothing effects. Thus, F1 can be considered as a stable and effective polyherbal knee pain relief balm formulation.

Sr. No.	Ingredients	Quantity Taken	Therapeutic Uses
1	Beeswax	3.5 g	Provides firmness
2	Castor Oil	7.5 g	Deep penetration ,Anti-inflammatory
3	Mustard Oil	7.g	Warming effect,improves blood flow
4	Menthol	0.7g	Cooling analgesic
5	Cinnamon Powder	0.5g	Mild counter-irritant
6	Methyl Paraben	0.08 g	Preservative
7	Camphor	0.18 g	Counter Irritant

Table 3: Selected Formulation of Polyherbal Balm

II. CONCLUSION

The present study successfully formulated and evaluated a polyherbal knee pain relief balm using natural ingredients such as beeswax, castor oil, mustard oil, menthol, cinnamon powder, camphor, and methyl paraben. Among all formulations, F1 showed the best evaluation results with good consistency, spreadability, stability, washability, and non-irritant properties. The formulation exhibited satisfactory physical and physicochemical characteristics suitable for topical application.

The combined action of herbal ingredients provided analgesic, anti-inflammatory, warming, and soothing effects, which may help in relieving knee pain and inflammation. Thus, the formulated polyherbal balm can be considered a safe, stable, and effective herbal preparation for topical management of knee pain with minimal side effects.

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