

A Review On Herbal Based Painbalm Formulation For Pain Relief

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Abstract- *Menthol is naturally occurring cyclic terpene alcohol of plant origin, which has been used since antiquity of medicinal purpose. Its use in dermatology is ubiquitous, where it is frequently part of topical anti-pruritic, antiseptic, analgesic and cooling formulations. Despite its widespread use, it was only recently that the mechanism by which menthol elicits the same cool sensation as low temperature was elucidated upon, with the discovery of the TRPM 8 receptor. Although almost 5 years have passed since this receptor, many dermatologists are still unaware of menthols underlying target. In line with the advancement of our understanding of pain mechanisms, there has been a growing emphasis on the creation of novel drug delivery systems that can offer patients individualized treatments without compromising the effectiveness of analgesics. Acute pain serves as a warning, but chronic pain is a syndrome that necessitates careful selection of highly bioavailable analgesic medications for long term treatment. There has been an increasing focus on development of new routes of drug administration to provide tailored treatments for patients, without decreasing efficacy of analgesia, in proportion to the progression of the knowledge of pain mechanisms. While acute pain acts as an alarm, chronic pain is a syndrome requiring meticulous selection of analgesic drugs of high bioavailability for long-term use. Such criteria are challenges that topical medications aim to overcome, allowing progressive delivery of active component, maintaining stable plasma levels, with a good safety profile.*

Keywords: Balm, Muscle pain, Antioxidant properties, Herbal medicine, castor oil, Menthol oil, Eucalyptus oil, Analgesic herbal balm, Ayurvedic plant

I. INTRODUCTION

The pain balm works on the counter irritancy principal the where the instead of relieving the pain, the pain sensation is suppressed by causing the irritation to the point where formulation has been applied. The balm in common sense is defined as semisolid formulation(generally having medicament) and which is to be applied externally .Pain balm is such formulation that is intended to be used for the relief of mild to moderate rate pain.Tension headaches are very common, affecting up to 78% of people. Unfortunately, there also among the most neglected and difficult types of headache

to treat. Menthol is a natural compound of plant origin known to produce cool sensation. Menthol, the cooling natural product of peppermint, is widely used preparations for pain relief in sport injuries, arthritis and other painful conditions. [1]

Most pain resolves promptly hence the pain stimulus is removed and the body has healed, but sometimes pain persists despite removal of stimulus and apparent healing of the body and sometimes pain arrive in the absence of any detectable stimulus, damage or disease.[2]

1.1. Analgesic herbal pain relief balm pharmacological effect on body

Analgesic herbal 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. A combination of these three active ingredients is useful in case of head ache and rheumatic pains. The other ingredients in the pain the pain relief balm are eucalyptus oil, petroleum jelly, negundo oil, bees wax. Although these pain relief balms have a special pharmacological effect in relieving pain, it is actually the amount of pressure applied and the movement that plays a significant role. Role of the balm includes a local anesthetic effect and finally provides a comfortable stage. These products do not have any side effect or allergic reactions such as irritation or darkening of the skin or cause inflammation on the point of application.[3]

1.2 TYPES OF PAIN :-

Pain is usually transitory, lasting only until the noxious stimulus is removed or the underlying damage or pathology has healed, but some painful conditions, such as rheumatoid arthritis, peripheral neuropathy, cancer and idiopathic pain, may persist for years. Psychogenic pain is pain caused, increased, or prolonged by mental, emotional, or behavioral factors. Headache, back pain, and stomach pain are sometimes diagnosed as psychogenic. Sufferers are often

stigmatized, because both medical professionals and the general public tend to think that pain from a psychological source is not “real”.

Headache-Irritated, inflamed or damaged nerves

Foot pain-Arthritis, a fractured or broken bone, gout, tendinitis/plantar fasciitis

Arthritis pain-Enough damage can result in bone grinding directly on bone

Chronic pain -Ongoing cause of pain such as arthritis or cancer

Muscle pain - Tension, stress, overuse and minor injuries

Neck pain-Poor posture

1.3 Pain Relief Balm :-

Pain balm is something that is comforting and soothing. It is one which leads the pain. Thus the word relief is inbuilt in the word pain balm a balm in the physical sense is defined as a semi solid preparation applied externally as a remedy or for soothing and irritation. It is also defined as any of various aromatic resinous substances contained in a preparation used for healing and soothing.

When pain relief are rubbed, on the area where the pain exits, the pressure and movement produces excess of sensory input that blocks the pain sensation. Menthol is a natural compound of plant origin known to produce cool sensation. Menthol is the cooling natural product and peppermint is widely used preparations for pain relief in sport injuries, arthritis and other painful conditions.[4]

1.4 Treatment for pain

Analgesic herbal balm is something that is comforting and soothing. It is one which leads the pain. Thus the word relief is inbuilt in the word herbal pain balm a balm in the physical sense is defined as a semi solid preparation applied externally as a remedy or for soothing and irritation. It is also defined as any of various aromatic resinous substances contained in a preparation used for healing and soothing.[5] When pain relief are rubbed, on the area where the pain exits, the pressure and movement produces excess of sensory input that blocks the pain sensation. [6]

1.5 ADVANTAGES AND DISADVANTAGES

ADVANTAGES

1. Avoidance of first pass metabolism.
2. Convenient and easy to apply.
3. Ability to deliver drug more selectively to a specific site.

4. Improving physiological and pharmacological response.
5. Improving patient compliance.

DISADVANTAGES

1. Skin irritation of contact dermatitis may occur due to the drug and / or excipients.
2. Poor permeability of some drug through the skin.
3. Possibility of allergic reaction.
4. Can be used only for drugs which require very small plasma concentration for action.
5. Drugs of larger particle size not easy to absorb through the skin.[7]

1.6 PAIN MECHANISMS AND CONTROL

The definition of pain by the International Association for the Study of Pain (IASP), states “Pain is an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage”. There are two main types of pain: nociceptive and neuropathic pain. Pain that is characterized by both nociceptive and neuropathic properties is called nociplastic.

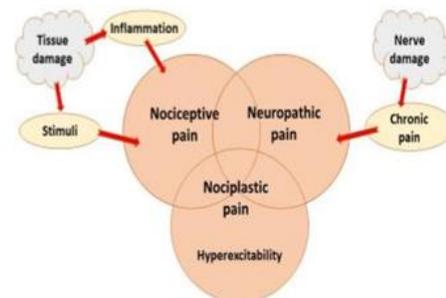


Fig 1. Main pain types.

The biggest difference between nociceptive and neuropathic pain is that nociceptive pain is caused by tissue damage. Nerve cell endings that initiate sensations of pain are nociceptors that can respond to chemical (inflammatory), mechanical, or thermal stimuli. Nociception involves the four processes of transduction, transmission, perception, and modulation. Neuropathic pain is caused by nerve damage and can occur without the presence of noxious stimuli. Much neuropathic pain is chronic. Furthermore, inflammation increases the expression of cyclooxygenase-2 (COX-2) and results in the production of prostaglandins (PGE). These agents can trigger a cascade of neuroinflammation-related events that may prolong and aggravate the initial insult, ultimately resulting in pain and chronicity. Metalloproteinases (MMPs) are predominantly associated with tissue remodeling and inflammation in neurodegenerative diseases. PGE2 is a factor that causes pain. It can sensitize primary sensory

neurons, induce central sensitization, and promote the release of pain-related neuropeptides. [8]

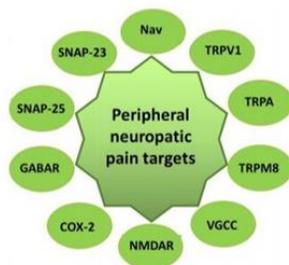


Fig 2. Peripheral neuropathic pain targets.

Peripheral neuropathic pain targets (non-opioid). Nav—voltage gated sodium channels, TRPV1—transient receptor potential vanilloid 1 channel, TRPA—transient receptor potential ankyrin channel, TRPM8—transient receptor potential melastatin 8 channels, VGCC—voltage gated calcium channels, NMDAR—N-methyl-D-aspartic acid receptor, COX-2—cyclooxygenase 2, GABAR—GABA receptor, SNAP-23 and SNAP-25—SNARE protein complex components.

Based on the evidence from randomized clinical trials, the best options to alleviate local neuropathic pain are topical analgesics including 5% lidocaine patches, 8% capsaicin patches, and botulinum toxin A. Another group of topical local neuropathic pain-controlling drugs belongs to the transient receptor potential channel (TRP) family modulators. The proteins from this channel family are responsible for the development and support of chronic pain and, in preclinical models, lidocaine, phenytoin, and menthol. Lidocaine is a local anesthetic aminoamide acting mainly via blockage of voltage gated sodium channels (Nav). It binds preferably to the open or inactivated Nav, suppressing intracellular influx of Na⁺, thus inhibiting the electrical impulse initiation and propagation. [9]

2. Herbal Components of Analgesic herbal pain balm

2.1. Menthol:



Fig 3. Menthol

Menthol medicine stimulates nerves that help you sense pain or irritation. This counterirritation causes a cooling feeling on your skin and can help relieve pain or itching. Menthol is an organic compound, more specifically a monoterpenoid, made synthetically or obtained from the oils of corn mint, peppermint, or other mints. It is a waxy, clear or white crystalline substance, and melts slightly. Menthol is a monocyclic monoterpene that is obtained from plants of the genus *Mentha* as an essential oil. Menthol was first isolated in 1771 by the German, Hieronymus David Gaubius. Early characterizations were done by Oppenheim, Beckett, Moriya, and Atkinson. It was named by F. L. Alphons Oppenheim (1833–1877) in 1861. [10]

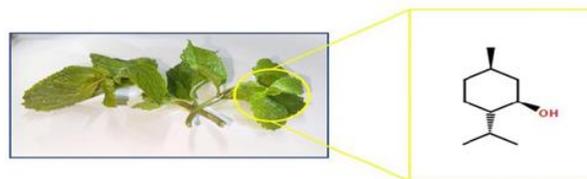


Fig4. Chemical formula of L-menthol from mint source.

- **Scientific name:** Hexahydrothymol.
- **Synonym:** Peppermint camphor.
- **Family:** Lamiaceae.
- **Botanical source:** It is the oil obtained by the distillation of *Mentha piperita*, belonging to family Labiatae.
- **Chemical constituents:** The chief constituent of Peppermint oil is Menthol, along with other constituents like menthyl acetate, isovalerate, menthone, cineol, inactive pinene, limonene, and other less important bodies.

Menthol separates on cooling it to a low temperature (–22°C). The flavouring properties of the oil are due to both the ester and alcoholic constituents, whereas the medicinal value is the chief constituent of Peppermint oil is Menthol, along with other constituents like menthyl Acetate,

isovalerate, menthone, cineol, inactive pinene, limonene, and other less important Bodies. Menthol separates on cooling it to a low temperature (-22°C). [11]

Uses :

- 1.Reduces spasm and pain caused by endoscopy.
2. In migraine headache.
- 3.To treat nausea.
- 4.To reduce inflammation.[12]

2.2.Beeswax :



Fig 5. Bess wax.

The beeswax forms a protective barrier on the skin, while the wintergreen oil provides a cooling and soothing sensation, helping to reduce inflammation and ease discomfort. This balm is perfect for anyone who suffers from joint and muscle pain. beeswax's use in pain-relief balms due to its physical properties and potential therapeutic actions, including enhancing wound healing, reducing inflammation, and providing a protective skin barrier. Bees wax obtained from the honey comb of the bees *Apis mellifera* and other species of *apis* belonging to the family *Apidae*. Order *Hymenoptera*. It is also known as yellow wax, *cera alba*. It is yellow to yellowish – brown in colour. Insoluble in water and soluble in alcohol, ether, chloroform, carbon etc.[13]

- **Scientific name :** *Cera alba*.
- **Synonym :** Yellow wax.
- **Family :** *Apidea*.
- **Chemical constituents :** Myricylpalmitate (80%), free cerotic acid (15%), melissic acid Cerolein.

Uses :

1. Used as antibacterial, antifungal.
- 2.It has anti-inflammatory and anti-allergic properties.
3. It mainly use as an emulsifying agents, stiffener and gentle skin adhesive.
- 4.Relieves stress and promote relaxation.

5.Relieves pain. [14]

2.3 Castor oil



Fig 6. Castor oil.

Castor oil has long been used commercially as a highly renewable resource for the chemical industry. Castor oil may help fight swelling and pain caused by inflammation when applied to your skin. It is a vegetable oil obtained by pressing the seeds of the castor oil plant (*Ricinus communis* L.) that is mainly cultivated in Africa, South America, and India. Major castor oil-producing countries include Brazil, China, and India. This oil is known to have been domesticated in Eastern Africa and was introduced to China from India approximately 1,400 years ago. India is a net exporter of castor oil, accounting for over 90% of castor oil exports, while the United States, European Union, and China are the major importers, accounting for 84% of imported castor oil.[15]

- **Scientific name :** *Ricinus communis*.
- **Synonym :** Ricinus oil.
- **Family :** Euphorbiaceous.
- **Biological source :** Castor oil is the fixed oil obtained by cold expression of the seeds of *Ricinus communis* Linn.,
- **Chemical constituents :** Castor oil consists of glyceride of ricinoleic acid, isoricinoleic, stearic, and dihydroxy stearic Acids. Ricinoleic acid is responsible for laxative property. Castor oil also contains vitamin F. 90% Of the fatty acid content is ricinoleic acid. The ricinoleic acid is an 18-carbon acid having a double Bond in the 9–10 position and a hydroxyl group on the 12th carbon. This combination of hydroxyl Group and unsaturation occurs only in castor oil.[16]

Uses :

- 1.Castor oil is commonly used as the laxative.

2. Castor oil promote the wound healing.
3. Castor oil is a cathartic.
4. Castor oil used in arthritis and joint pains.
5. Castor oil helps to improve blood circulation.[17]

2.4 Eucalyptus oil



Fig 7. Eucalyptus oil

Osteoarthritis, the most prevalent musculoskeletal disorder throughout the world, is a common chronic disease that causes pain, restricts activity, and reduces quality of life. Osteoarthritis may occur in all joints, but the knee is the most frequent site.

The most common clinical features of osteoarthritis include pain, stiffness, swelling, and inflammation. Surgery may be considered in patients who do not show symptom improvements on nonsurgical treatments, especially when severe pain interferes with daily life. Total knee replacement (TKR) is a surgical procedure in which deformed knee cartilage is resected and replaced by a metal structure filled with polyethylene, resulting in a new joint structure. TKR has been shown to improve the quality of life of patients with severe arthritis by relieving knee pain and increasing knee function. [18]

- **Scientific name :** Eucalyptus globules,
- **Synonym :** Lemon scented gum.
- **Family :** Myrtaceae. [19]
- **Chemical constituents :** The main chemical constituents are 1,8-cineole (63.1%), p-cimene (7.7%), α -pinene (7.3%), and α -limonene (6.9%).[20]
- **Uses :**

1. Relieves stuff nose.
2. Eases sore muscle and joint pain.
3. Clears respiratory complaints.
4. Reduces stress.
5. Disinfects wounds and cuts. [21]

2.5 Camphor :



Fig 8. Camphor.

Camphor is derived from the wood of camphor laurel and other related trees of laurel family. Camphor is bicyclic mono terpenoid. It is a white crystalline substance with strong odor and plangent tast. It is a waxy flammable substance obtained from steam distillation, purification and sublimation of wood, twings and bark of the tree.[22]

- **Scientific name:** Cinnamomum camphora.
- **Family:** Lauraceae.
- **Synonyms:** Gum Camphor, Japan Camphor. Alcanfor
- **Biological Source:** Camphor is a solid ketone, obtained from the volatile oil of Cinnamomum camphora (L.) Nees et Eber, belonging to family Lauraceae. Synthetic camphor, which is optically inactive, is prepared From turpentine and would probably have completely replaced the natural product.
- **Chemical constituents :** Camphor oil contains camphor, cineole, pinene, camphene, phellandrene, limonene, and diterpenes. Camphor is entirely a monoterpenoid ketone. Its basic carbon framework is related to bofneol.[23]

Uses :

1. Provide relief from cold cough, chest congestion, bronchitis and asthma.
2. Improves blood circulation and help to curb muscular and joint aches.
3. Powerful analgesic oil that produces a cooling sensation to numb pain and a warming sensation to increase circulation.
4. Promote better sleep[24]

2.6 Betanin (from beetroot) :



Fig 9. Betanin (from beetroot)

Beetroot (*Beta vulgaris* L.) belongs to the Chenopodiaceae family. It has bright crimson colour. Beetroot is commonly known as beet, chard, spinach beet, sea beet, garden beet, white beet and Chukander (in Hindi). It has very medicinal properties which give some positive effect on the human body. In herbal pain relief balms, the primary role of Beetroot extract is to serve as a natural colouring agent. Since most balms contain herbal oil, waxes, and other plant-based ingredients, they often have dull or pale shades. Adding beetroot extract enhances the visual appeal of the product by imparting a rich, attractive colour, making the formulation more appealing to consumers. can be eaten raw, boiled, steamed and roasted.

Additional Benefits Beyond colour

Although its main function is colouring, beetroot extract can also provide supplementary benefits:

1. Antioxidant properties- Betalains have free radical scavenging activity, which can help reduce oxidative stress in the skin.
2. Anti-inflammatory Activity- some studies suggest beetroot pigment may help in lowering inflammation, indirectly supporting the balms pain-relieving effect.
3. Skin Compatibility- Being plant-derived, it is gentle on the skin, reducing the risk of irritation compared to some synthetic dyes.



Fig 10. fresh and sliced beetroot respectively.

Beets are used in molded vegetables, flowering roots, and beetles and in many product systems. Beetroots for processing and fresh market are harvested mainly in

September and October. A yield of 20,000 kg per hectare (Beetroot, 1983). The roots and greens are great for women health and for those planning pregnancies. Beetroot is a good tonic food for health. The market for beetroot is not a large market but it is significant and deliveries to wholesalers. In the long run the sales period can be extended to the roots (Boswell, 1967).[25]

Other language name of beetroot

Bitā gacha (Bengali), Bit (Malayalam), Bita (Marathi), Beet (Punjabi), Carkkarai vali kilanku ceti (Tamil), Dumpamokka (Telegu), Salada (Gujarati) and Gajarugadde (Kannada).

- **Scientific name:** Betacyanin.
- **Synonym:** Beet root
- **Family:** Cactaceae.
- **Chemical constituents:** water (87.1%), carbohydrate (7.6%), protein (1.7%), fat (0.1%), and betanin (0.03–0.06%).
- **Uses:**

1. Betanin can be used as a powerful antioxidant in the food industry in extract or powder form and is also applied as a natural pigment.
2. Betanin is used to color food and pharmaceutical products.
3. Used as anti-inflammatory, cognitive impairment, anticancer and anti-hepatitis properties, betalains are useful as pharmaceutical agents and dietary supplement
4. May improve muscle power in people with heart failure.
5. Betanin may induce phase II enzymes and antioxidant defense mechanisms.[26]

2.7 Tulsi(Holy Basil) :

Tulsi (Holy Basil) is used in pain relief balm for its anti-inflammatory and analgesic properties primarily attributed to compounds like eugenol. These properties help to soothe sore muscles and joints by reducing inflammation and easing pain. The balm can also provide a calming, aromatic scent and promotes relaxation, making it effective for both muscle aches and tension.

Tulsi belongs to the Lamiaceae family, and the botanical name is *Ocimum Sanctum*. Tulsi is also called as queen of herbs which shows numerous medicinal properties in herbal drugs. Green Tulsi (Ram Tulsi) and Black Tulsi (Krishna Tulsi) are two Tulsi types that nearly have the same characteristics. Tulsi (Holy Basil) is an important symbol of the tradition considering the hind religion. Tulsi has another

name called Vishnupriya, which means a person who pleases Lord Vishnu. In India, Tulsi is found in most houses and worshipped by all the Indians Active constituent in Tulsi Leaves .

Tulsi contains important bioactive compounds such as :

Eugenol – A phenolic compound with analgesic and anti-inflammatory properties

Ursolic acid , Rosmarinic acid –anti-inflammatory and antioxidant agents

Flavonoids – antioxidant that protect tissues from oxidative damage

Essential oils (camphene , cineole, limonene) – providing soothing and aromatic effects

Pharmacological Roles in Pain Relief Balm

Analgesic Effect (Pain – Reliving) : Eugenol and other essential oils in Tulsi help reduce pain perception by modulating inflammatory mediators.

Anti –inflammatory Action : Tulsi extracts lower the activity of enzymes like COX and LOX, reducing inflammation, swelling, and stiffness in affected areas.

Benefits in the Balm Formulation

Enhanced the therapeutic effectiveness by reliving pain and inflammation. Provides a cooling and soothing sensation on the skin. Acts as a natural preservation due to its antimicrobial natural. Complements other herbal ingredients (like camphor, menthol, or eucalyptus) by boosting the overall synergistic effect of the balm. [27]

TAXONOMY

- **Kingdom** - Plantae
- **Division** - Magnoliophyta
- **Class** - Magnoliopsida
- **Order** - Lamiales
- **Family** - Lamiaceae
- **Genus** - Ocimum
- **Species** – Sanctum
- **Binomialname** - Ocimum sanctum Linn [28]

CLASSIFICATION OF TULSI

Genus Ocimum has various species

1.Ocimum sanctum Linn (Tulsi)

2.Ocimum grtissium (Ram Tulsi)

3.Ocimum canum (Dulal Tulsi)

4.Ocimum bascillicum (Ban Tulsi)

5.Ocimum kilimandschricum

6.Ocimum Americanum

1. Ocimum sanctum Linn (Tulsi) :



Ocimum sanctum plant are Thin, wiry, branched in appearance; hairy, and soft in nature, while externally blackish-brown and internally pale violet in colour. The stem is erect, herbaceous,woody, branched by appearance; hairy, sub Quadrangular innature, externally purplish-brown to black, internally cream coloured; fracture, fibrousin bark and short in xylem; the odour of stem isfaintly aromatic.[29]

Medicinal uses of Tulsi :

Immunity, Anxiety, Diabetes, Divine tulsi, Ease inflammation, Lowering blood sugar, Oral Hygiene, Respiratory health, Antimicrobial, Hypertension, Kidney stones, Adaptogenic properties, can tulsi cure diabetes, cardiovascular Diseases, Cures respiratory disorder, Digestion, Headache, High cholesterol, Improves heart health, Tulsi as a stress buster, Tulsi for fever, A natural stress reliever, Anticancer, Antimicrobial benefits of tulsi. [30]

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