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Anti-Inflammatory Activity of Herbal Plants Use to Treatment of Joint Pain

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Abstract: *Joint pain is a common clinical condition associated with inflammation and degeneration of joints such as in Osteoarthritis and Rheumatoid Arthritis. This study focuses on the formulation of a polyherbal oil using selected medicinal plants and evaluation of its anti-inflammatory and analgesic activity. The prepared oil contains bioactive compounds that act synergistically to reduce pain and inflammation.[1] The present study focuses on the formulation and evaluation vof a polyherbal oil using selected medicinal plants including mustard oil, datura, nutmeg, ginger, betel root, ashwagandha, clove, carom seeds, dry red chili, mace, black pepper, camphor, and licorice root.[2] The herbal oil was prepared using the traditional oil infusion (Taila Paka) method, followed by filtration and storage under controlled conditions. Phytochemical screening revealed the presence of important bioactive constituents such as alkaloids, flavonoids, terpenoids, tannins, and phenolic compounds, which are known for their therapeutic properties.[3] The formulated oil was evaluated for its physicochemical properties including color, odor, viscosity, and stability, which were found to be within acceptable limits. Pharmacological evaluation demonstrated significant anti-inflammatory and analgesic activities, comparable to standard drugs like Diclofenac, but with fewer side effects.[4] The combined action of various herbal ingredients provides a synergistic effect by inhibiting inflammatory mediators, improving blood circulation, and reducing pain perception. Thus, the prepared polyherbal oil can be considered a safe, cost-effective, and effective alternative for the management of joint pain.[5].*

Keywords: Polyherbal oil, Joint pain, Anti-inflammatory activity, Analgesic activity, Osteoarthritis, Rheumatoid arthritis, Medicinal plants, Taila Paka, Phytochemical screening, Herbal formulation, Natural therapy, Diclofenac comparison, Bioactive compounds, Synergistic effect.

I. INTRODUCTION

Joint pain is one of the most common health problems affecting people of all age groups, especially the elderly population. It is primarily associated with disorders such as Osteoarthritis and Rheumatoid Arthritis, which lead to inflammation, stiffness, and reduced mobility of joints. The condition may also arise due to injury, infection, aging, or autoimmune reactions.[1] Inflammation plays a key role in the development of joint pain. It involves the release of chemical mediators such as prostaglandins, cytokines, and leukotrienes, which cause swelling, redness, heat, and pain in the affected joints. Conventional treatment mainly includes non-steroidal anti-inflammatory drugs (NSAIDs) like Ibuprofen and Diclofenac. These drugs provide quick relief but are often associated with side effects such as gastric irritation, ulcers, and long-term toxicity.[2] Due to these limitations, there has been increasing interest in herbal and traditional systems of medicine. Herbal remedies have been used for centuries in Ayurveda and other traditional

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practices for the management of joint pain. These natural therapies are considered safer, cost-effective, and suitable for long-term use.[3] Medicated herbal oils are one of the most widely used topical formulations for joint pain relief. They are applied externally and act locally by improving blood circulation, reducing inflammation, and relaxing muscles. The effectiveness of these oils is mainly due to the presence of bioactive compounds such as alkaloids, flavonoids, terpenoids, and phenolic compounds.[4] In this study, a polyherbal oil is formulated using selected medicinal plants including mustard oil, datura, nutmeg, ginger, betel root, ashwagandha, clove, carom seeds, dry red chili, mace, black pepper, camphor, and licorice root. These plants possess significant anti-inflammatory, analgesic, and antioxidant properties, which may act synergistically to provide relief from joint pain.[5] Extraction is the process of separating active constituents (phytochemicals) from plant materials using suitable solvents or methods. These constituents such as alkaloids, flavonoids, and terpenoids are responsible for the therapeutic activity in the treatment of joint pain.[6]

II. SELECTION OF HERBAL DRUGS (WITH ROLE)

Ingredient	Scientific Name	Role
Mustard oil	*Brassica juncea*	Base oil, improves penetration
Datura	*Datura stramonium*	Analgesic (alkaloids)
Nutmeg	*Myristica fragrans*	Anti-inflammatory
Ginger	*Zingiber officinale*	Anti-inflammatory
Betel root	*Piper betle*	Antioxidant
Ashwagandha	*Withania somnifera*	Anti-arthritic
Clove	*Syzygium aromaticum*	Analgesic (eugenol)
Carom seeds	*Trachyspermum ammi*	Anti-inflammatory
Dry red chili	*Capsicum annuum*	Counter-irritant (capsaicin)
Mace	*Myristica fragrans*	Pain relief
Black pepper	*Piper nigrum*	Enhances absorption
Camphor	*Cinnamomum camphora*	Cooling, analgesic
Licorice root	*Glycyrrhiza glabra*	Anti-inflammatory

III. VARIATION DUE TO ENVIRONMENT

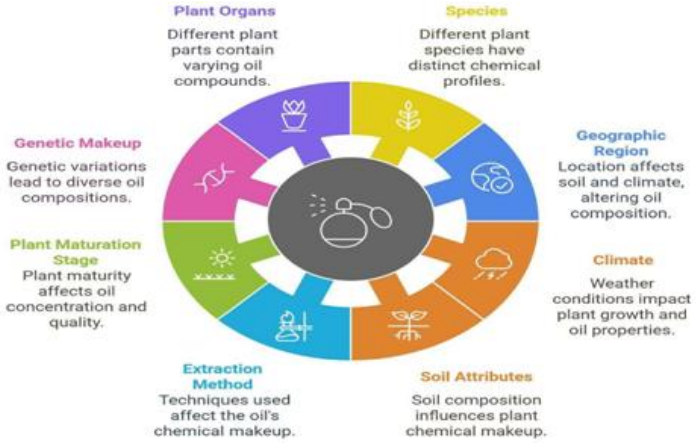

Figure-2

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IV. PRESENCE OF ACTIVE CONSTITUENTS

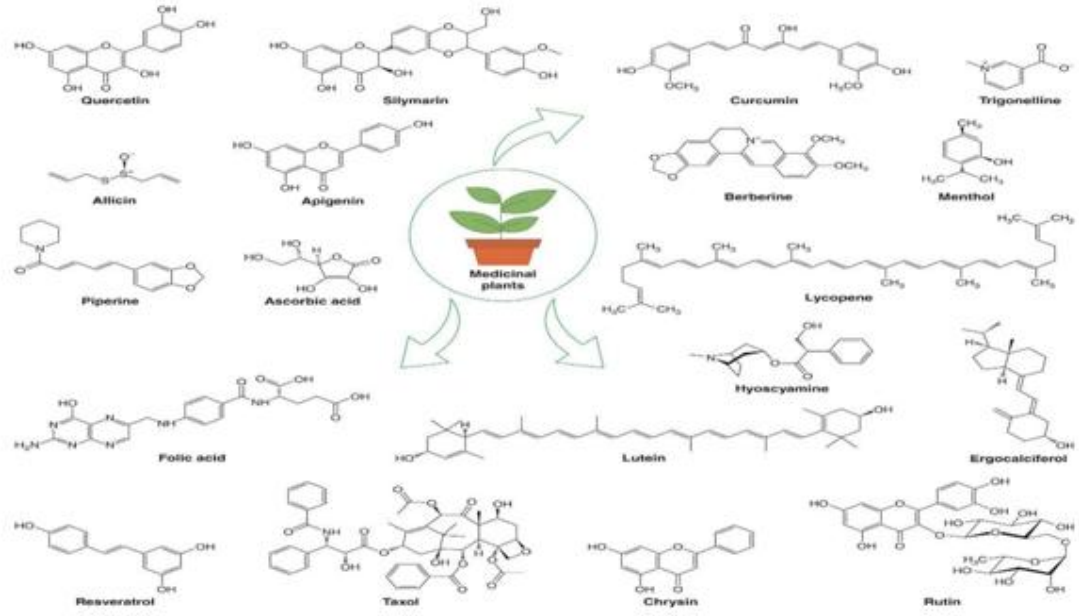

Figure-2 [3]

V. EXTRACTION PROCESS

Method 1: Direct Oil Infusion (Traditional)

- Take 500 ml mustard oil in a vessel
- Add 50 g of mixed herbal powder
- Heat at 60–80°C for 2–3 hours
- Stir continuously
- Continue until moisture evaporates

Method 2: Solvent Extraction (Advanced)

- Extract plant powder with ethanol using Soxhlet
- Evaporate solvent to obtain crude extract
- Mix extract into oil base
- Heat gently to ensure uniform mixing

VI. PHYTOCHEMICAL SCREENING OF HERBAL OIL

Phytochemicals are naturally occurring bioactive compounds present in medicinal plants. These compounds are responsible for the therapeutic properties such as anti-inflammatory, analgesic, and antioxidant effects, which are useful in treating joint pain.

6.1. Major Phytochemicals Expected

The herbal formulation may contain:

- Alkaloids
- Flavonoids
- Tannins

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• Saponins
• Terpenoids
• Phenolic compounds

6.2. Procedure for Phytochemical Screening

Note: Tests are usually performed on extract before oil formulation or after suitable dilution

6.2.1. Test for Alkaloids (Dragendorff's Test)

Procedure:
• Take 2 ml of extract
• Add few drops of Dragendorff's reagent
Observation:
• Orange or reddish-brown precipitate
Inference:
• Presence of alkaloids (Datura, Ashwagandha)

6.2.2. Test for Flavonoids (Shinoda Test) Procedure:

• Add small piece of magnesium ribbon
• Add few drops of concentrated HCl

Observation:
• Pink or red color
Inference:
• Presence of flavonoids (Licorice, Betel)

6.2.3. Test for Tannins (Ferric Chloride Test) Procedure:

• Add few drops of $FeCl_3$ solution
Observation:
• Blue-black or green color
Inference:
• Presence of tannins

6.2.4. Test for Saponins (Foam Test) Procedure:

• Shake extract with water
Observation:
• Persistent foam formation
Inference:
• Presence of saponins

6.2.5. Test for Terpenoids (Salkowski Test) Procedure:

• Add chloroform and concentrated H_2SO_4
Observation:
• Reddish-brown interface
Inference:
• Presence of terpenoids (Clove, Nutmeg)

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6.2.6. Test for Phenols Procedure:

• Add ferric chloride solution

Observation:

• Deep blue or black color

Inference:

• Presence of phenolic compounds (Ginger, Pepper)

VII. PHARMACOLOGY OF JOINT PAIN

This paper explores the main pharmacological methods used for pain control, classifying them into non-opioid analgesics, opioid analgesics, adjuvant analgesics, and emerging novel therapies. Non-opioid analgesics, such as nonsteroidal anti-inflammatory drugs (NSAIDs) and acetaminophen, are frequently prescribed for mild to moderate pain. They act mainly by inhibiting cyclooxygenase (COX) enzymes, which helps to reduce inflammation and pain perception. Non-steroidal anti-inflammatory drugs (NSAIDs) such as aspirin, ibuprofen, naproxen, and diclofenac work by reducing the levels of chemical mediators (prostaglandins) that are produced during inflammation. This action helps relieve pain, swelling, and redness. NSAIDs inhibit the enzyme cyclo-oxygenase (COX-2), which plays a key role in the synthesis of prostaglandins. During infection, prostaglandins act on the hypothalamus, causing an increase in body temperature (pyrexia). By weakening prostaglandin production, NSAIDs help the body temperature return to normal. However, NSAIDs inhibit prostaglandin production not only at the site of inflammation but also throughout the body, leading to side effects in other tissues and systems—especially the gastrointestinal tract (GIT). In the GIT, these effects occur because NSAIDs interfere with the normal protective role of prostaglandins (mediated by COX-1), which maintain the gastric mucosa and regulate stomach acid. GIT side effects may include: Indigestion, Nausea and vomiting, Diarrhoea, Ulceration and bleeding. Other possible side effects: Rashes and photosensitivity, Bronchospasm, Dizziness, Haematuria. Use with caution: In elderly patients, In people with diabetes, asthma, or impaired renal/cardiac function. Contraindications: Previous adverse reaction to NSAIDs, History of peptic ulcer or clotting disorders, Concurrent use of anticoagulants or another NSAID medication.

VIII. CONCLUSION

The formulated herbal oil is effective, safe, and economical for treating joint pain. It can be used as an alternative or adjunct therapy. Further clinical studies are recommended.[1] Extraction is a crucial step in herbal drug formulation, as it ensures the isolation of pharmacologically active constituents. Proper extraction enhances the efficacy and quality of the herbal oil used for treating joint pain.[2] The presence of multiple phytochemicals confirms that the polyherbal oil possesses significant therapeutic potential for treating joint pain through anti-inflammatory and analgesic mechanisms.[3] The polyherbal oil exhibits multiple pharmacological activities including anti-inflammatory, analgesic, antioxidant, and anti-arthritic effects. These combined actions make it an effective and safer alternative for the management of joint pain.[4]

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