WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

FORMULATIONAND EVALUATION OF PIPER BETEL LEAF GEL FOR THE TREATMENT OF RHEUMATOID ARTHRITIS

S. YOGALAKSHMI*[1], Dr. J. KARTHI[2]

[1]Bachelor of Pharmacy, Pallavan Pharmacy College, Kanchipuram.
[2]M.pharm., Ph.D., Principal, Pallavan Pharmacy College, Kanchipuram.
*Corresponding author:
S. Yogalakshmi, Bachelor of Pharmacy,
Department of Pharmacognosy,
Pallavan Pharmacy College,
Kanchipuram – 631 502.
Email ID: yogalakshmi2004.yo@gmail.com

ABSTRACT:

Piper betel is a plant well-known for its medicinal properties, is chewed in Asian nations like India and Nepal. One well-known natural remedy for brain pain is betel leaf. Juice from betel leaves is said to have diuretic qualities. Both young and old can benefit from betel leaves in terms of aspirational fondness. Betel leaf is an excellent home remedy for sore throats and hacks. When used locally, betel leaves can be used to heal wounds and are beneficial in treating inflammation. Separate the juice from a couple of leaves and apply it to the wound. Piper betel displays rashes. Although there are many different kinds of topical medicine formulations available today, the study intends to revive the conventional pharmaceutical system since organic molecules cause our bodies to become dependent on them, which makes it easy for our bodies to develop resistance to the drug in question. The plant piper betel was used in our investigation to ascertain its antibacterial qualities. Plant selection, leaf collection, ethanolic extract, phytochemical analysis, and pharmacological research are all part of the activity. Rheumatoid Arthritis (RA) is a chronic autoimmune illness with an unknown cause that affects 0.5% of the population. It is characterized by increasing cartilage and bone degradation, joint synovial inflammation, and gradual immobility. The major disadvantage in the now available powerful synthetic medicines is in their toxicity and recurrence of symptoms after withdrawal. Patients with RA are becoming more interested in herbal medications due to the limitations of current pharmacological compounds. Medicinal plants are those that have natural active compounds that are used to treat illnesses or ease the symptoms of arthritis. This review goal is to provide current information on RA, including its causes, epidemiology, prevalence, symptoms, diagnosis, categorization, treatments, allopathic anti-rheumatic drug toxicities, and the value of herbal remedies for treatment.

KEYWORDS: Anti-inflammatory activity, Piper betel, Rheumatoid arthritis, Herbal gel, Microwave extraction method.

INTRODUCTION:

The betel leaf is a perennial and enduring, vine-like plant, featuring shiny heart-shaped and pale catkin. The genus Piper (Piperaceae) consists of primarily spread across tropical and subtropical areas of the globe. Pipe betel is grown in India, Sri Lanka, Malaysia, Indonesia, Filipinas, Island and Eastern Africa. It possesses a fragrant light yellow aromatic essential oil, with pungent flavor. various other uses like culinary items and seasonings, seafoodlures, aquatic toxins, psychoactive substances, pesticides, extracts,decorations, fragrances, etc.It serves as an efficient counter Wormal agent and outstanding anti-infectious agent. Aids in normalizing the digestive system, thus highly beneficial for supporting the digestive systemdue to its light characteristics. Additionally, it assists inremoving the mucus from the prepared infusion.The leaves and stems are believed to be beneficial.In managing indigestion, bronchitis, constipation blockage, coughing, and bronchial asthma.The juice from the leaf is administered systemically to address coughing and gastrointestinal discomfort in children. Numerous studies research conducted so far has provided significant promise details regarding Piper betel and its effects such as malaria-fighting properties, bacteria-fighting properties,anti-fungal research, insect repellent properties, antioxidant qualities activity, diabetes management activity, stomach-protectiveoperation, pain-relieving effect, cell-killing.

BETEL LEAF INFORMATION:

Betelleaves include tannins, sugars, and diastases along with essential oils. Essential oils are aromatic compounds extracted from plants.vivid yellow fluid featuring a delightful scent and a tangy flavor. It possesses a compound known as phenol.Chavicol possesses potent anti-inflammatory characteristics. The alkaloid is combined with cocaine.In certain respects, an analysis of betel leaf reveals it has 85.4 percent moisture content and 3.1

percent,protein, 0.8 percent fat, 2.3 percent minerals, 2 percent fiber, -2.3 and carbohydrates 6.1percent for every 100 grams. Its mineral and vitamin composition includes calcium, carotene, and thiamine,riboflavin, niacin, and vitamin C. Its energy content is 44.

Figure 1: Betel leaf

TAXONOMICAL CLASSIFICATION:

Table 1: Taxonomical classification

Kingdom	Plantae
Division	Magnoliophyta
Class	Magnolipsida
Genus	Piper
Order	Piperales
Family	Piperaceae
Species	Betel

CHEMICAL CONSTITUENTS:

Table 2: Chemical constituents and its percentage

Chemical constituents	**Percentage of components**
Chavibetol	53.1%
Chavibetol acetate	15.5%
Caryophyllene	3.71%
Allylpyrocatechol acetate	0.71%
Chavibetol methyl ether	0.48%
Eugene	0.32%
a-Pinene	0.21%
f-Pinene	0.21%
Safrol	48.7%
1,8-Cineole	0.04%
Allylpyrocatechol Monoacetate	0.23%
Tannins	0.1% to 1.3%

AYURVEDIC SIGNIFICANCE:

Piper betel is a plant mentioned in the Vedas, referred to as Saptasira and in Sanskrit called Tambool, Nagvelleri, and Nagani, utilized as a treatment for multiple ailments. Mention of Tambool is present from Vatsyayana's Kamasutra and Panchatantra to Kalhan'sRajatarngni (likely the final acknowledged ancient Sanskrit text of historical importance). Tambool has approximately been referenced over a span of around 2000 years. In the Ayurvedic medicinal system, the characteristics of betel leaf are outlined as follows:

- **Guna (Quality):** Light, Dry, Sharp
- **Rasa (Flavor):** Tikh
- **Vipak (Metabolism):** Katu
- **Virya (Potency):** Ushan
- **Prabhav (Influence):** Hridya

In Ayurveda, betel leaf extract is often utilized as an adjunct and combined with various medicines to enhance effects alongside its standalone application as a remedy. In the Sushruta Samhita, tambool leaves are characterized as fragrant, pungent, thermogenic, biting, and helpful for vocal health, digestive aid, and appetite stimulation, additionally, they soothe Vata and increase Pitta.

RHUEMATOID ARTHRITIS:

Arthritis, an inflammation of the joints, is among the oldest recognized diseases found in nearly allage categories. In India, over 20% of the entire population is affected by arthritis. Rheumatoid Arthritis (RA) is a long-term autoimmune condition with an unidentified cause, marked by the inflammation of joint synovial tissue.Inflammation accompanied by ongoing cartilage and bone deterioration leading to increasing immobility. It was initially discovered among early Native American groups thousands of years ago but could haveemerged in Europe following the 17th century. Pro-inflammatory cytokines like tumor necrosis factor-α,TNF-α, interleukin (IL)-1β, and IL-6 play crucial roles in the continuation of the disease. It seems that the text you've provided is incomplete. Please provide the full text you'd like me to paraphrase.Arthritis typically starts in the small joints of the hands and feet, later extending to the larger joints.The inflamed synovial membrane expands and subsequently wears away the articular cartilage and bone, leading tojoint impairment and advancing physical incapacity. Extra-articular characteristics encompass nodules, pericarditis.

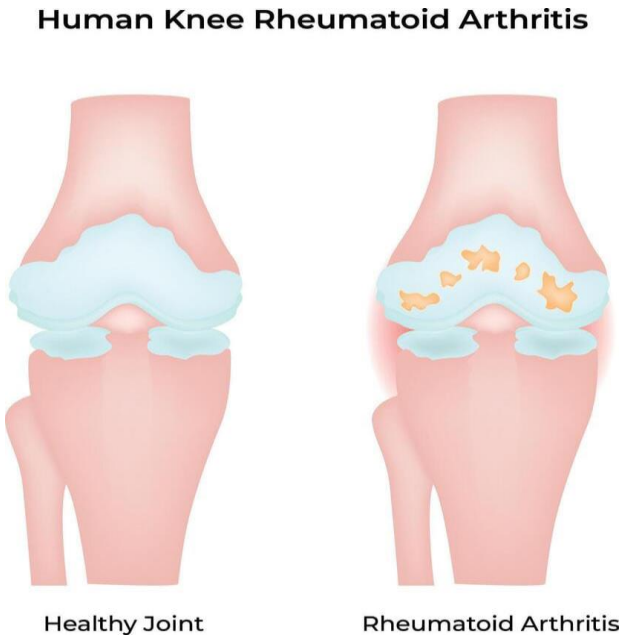

Figure 2 : Healthy and arthritis affected joint

CAUSES OF ARTHRITIS:

Cartilage deterioration is a component of arthritis. Normally, cartilage shields a joint, enabling smooth motion Due to synovial cell hyperplasia, excess synovial fluid, and the formation of synovial panes, the process results in an inflammatory reaction of the synovium (sinusitis). Alkalosis of the joints and the breakdown of articular cartilage are frequent outcomes of the disease process. Along with nodular lesions, which are most frequently found in subcutaneous tissue, rheumatoid arthritis can also cause diffuse inflammation in the lungs, pericardium, pleura, and sclera. Rheumatoid arthritis is regarded as a systemic autoimmune illness, and while its exact etiology is unknown, autoimmunity is a major factor in both its chronicity and progression.

SYMPTOMS AND DIAGNOSIS OF ARTHRITIS:

RA might start with mild symptoms like achy joints or mild stiffness, it can be challenging to diagnose. When RA is active, the stiffness is usually at its worst in the morning. It may go on for an hour or two, or possibly the entire day. Since few other arthritic conditions exhibit stiffness for an extended period of time in the morning, this is a sign that a person may have RA. Additional indications and symptoms of RA include: joint discomfort and swelling; decreased mobility; skin redness around a joint; warmth around a joint;loss of appetite and energy; mild fevers; dry mouth and eyes due to a linked illness; The Sjogren's syndrome Rheumatoid nodules are firm lumps that develop under the skin in areas like the hands and elbow. Imaging, laboratory testing, and clinical evaluation are several ways to identify RA. The "gold standard" is regarded as clinical evaluation and opinion. The symptoms of RA determine the diagnosis, and certain blood tests can also be used to confirm the condition. X-rays may not reveal any abnormalities in early arthritis, although they can be useful in identifying RA. Nevertheless, these initial X-rays might prove helpful in the future to demonstrate whether the illness is worsening. Ultrasound and MRI scans are frequently performed to assess the severity of RA.

CLASSIFICATON OF ARTHRITICS:

The way rheumatoid arthritis is classified

a) Stiffness in the morning stiffness in and around the joints in the morning that lasts for at least an hour before getting better. three joints or more.
b) Three or more joint regions with arthritis A doctor has noticed areas with simultaneous soft tissue enlargement or fluid (not only bony

expansion). Right or left PIP, MCP, wrist, elbow, knee, ankle, and MTP joints are among the 14 potential locations.

c) Hand joint arthritis At least one wrist, MCP, or PIP joint area that is inflamed (as previously described).

NEED FOR HERBAL DRUG FOR THE MANAGEMENT OF RHEUMATOID ARTHRITICS:

Herbal medications are necessary for the treatment of RA since studies have shown that people with chronic pain, like that of RA, and those who are unhappy with their present course of therapy are likely to look for alternative therapies. It is estimated that 60–90% of people with arthritis use complementary and alternative medicine. Research on the safety and effectiveness of herbal medicines is necessary given the rising interest in them among rheumatoid arthritis patients. In order to reduce pain, reduce inflammation, and restore joint function, rheumatoid arthritis is managed using a multidisciplinary approach. In actuality, the goal of intensive therapy is to decrease inflammation. Recently, rheumatoid arthritis has been treated with herbal remedies all over the world. Herbal medicine drug that interact with the mediators of inflammation are used in the treatment of rheumatoid arthritis.

MATERIALS AND METHODS:

A. MATERIALS:

i. **Active Component :** Piper betel leaves (Desipaan).

ii. **Chemicals:** hydrogen peroxide (H2O2), distilled water, ethanol (C2H5OH), polyvinyl alcohol (PVA), glycerol (glycerine), polyethylene glycol (PEG), polysorbate 20 (Tween 20), methanol (CH3OH), and phosphate buffer pH 7.4.

iii. **Tools and Equipment:** Glass rod/stirrer, volumetric flasks, Vernier calipers, beakers, test tubes, porcelain dishes, pipettes, Petri plates, cotton, Soxhlet extractor, Considering balance, A refrigerator, a mixer grinder, a water bath, a heating mantle, a hot air oven, Digital pH meter, UV-VIS twin beam spectrophotometer.

B. METHODOLOGY:

Hand-picked fresh betel leaves were properly cleaned and then chopped into little pieces. A certain volume of distilled water (200, 300, and 400 milliliters) was added to 100 grams of pre-treated betel leaves in a one-liter round-bottom flask for each experiment. The Clevenger device is attached to the round-bottom flask and placed on top of the microwave through the aperture put inside the oven. The extraction procedure was started for 90 minutes by the chosen power levels of 250W, 300W, 400W, and 500W until no extraction was completed.The procedure was run for the aforementioned chosen power for the leaves to water ratio (1:2, 1:3, and 1:4). At the same time, microwaves heat the entire sample more quickly. To restore the water content of the plant material, extra water refluxed back to the extraction vessel. Decantation of the oil from the condensate is done following the extraction of the oil. By drying over anhydrous sodium sulfate, the moisture content of the extracted essential oils was eliminated. Prior to additional analysis, the oil was weighed and kept in vials. The oil output is determined by making and assessing herbal antibacterial gel. Method of preparation: A small amount of water was used to dissolve the triethanolamine. The blend's carboxy vinyl polymer was dissolved, and the remaining amount of water was added. The previous blend was added after the ingredients had been dissolved in propylene glycol. Perfume was added when the gel was uniformed.

PREPARATION AND EVALUATION OF HERBAL ANTI-INFLAMMATORY GEL:

METHOD OF PREPARATION:

A small amount of water was used to dissolve the triethanolamine. The blend carboxy vinyl polymer was dissolved, and the remaining amount of water was added. The previous blend was added after the ingredients had been dissolved in propylene glycol. Perfume was added when the gel was uniformed.

FORMULA:

Table 3: Preparation of herbal anti-inflammatory Betel leaf extract gel

S. No	Ingredients	Quantity In Gm (F1)	Quantity In Gm (F2)	Quantity In Gm (F3)
1.	Carboxyvinyl polymer	2.0	1.5	1.4
2.	Propylene glycol	9.0	9.5	9.6
3.	Triethanolamine	1.5	1.5	1.5
4.	Extract	5.0	5.0	5.0
5.	Water	82.5	82.5	82.5
6.	Perfume	q.s	q.s	q.s
7.	Preservative	q.s	q.s	q.s

EVALUATION:

1. Measurement of pH:

Using a sophisticated pH meter, the pH of the generated gel gels was determined. After dissolving 1 gram of the gel in 100 milliliters of purified water, it was set aside for two hours. In order to determine normal characteristics, the pH of each detail was estimated three times. Since the pH of adult skin is 5.5, the pH estimates of all prepared plans ranged from 6-7, which are thought to be worthy to avoid the risk of irritation upon application to the skin.

2. Spreadabilty:

The gadget, which consists of a wooden square with a pulley on one side, determined spreadability. This method was used to assess spreadability based on the gels' slide and drag characteristics. On this ground slide, an excess of the gel under inquiry (about 2 gm) was placed. After that, the gel was positioned between this slide and another glass slide that had the snare and the fixed ground slide element. To eliminate air and provide a consistent layer of gel between the slides, a weighted one kilogram was placed on the heads of the two slides for five minutes.

The equation used to calculate spreadability:

$$S=M \times L/T$$

Where S= Spreadability, M= Weight (in the slide),L= Length moved by the glass slide.

3. Extrudability:

Standard topped folding aluminum tubes were used to fill the gel details, which were then secured with as much pleating as feasible. The cylinder loads were noted. The cylinders were supported and positioned between two glass slides. After placing 500 kg over the slides, the top was removed. The amount of gel that was ejected was measured and collected. Over 90% extrudability was deemed superb, over 80% extrudability was deemed great, and over 70% extrudability was deemed reasonable.

4. Rheological study:

A 10-gram sample of the gel was obtained, and a Brookfield viscometer (Brookfield viscometer RVT) with spindle number seven was used to determine the gel's consistency.

5. Stability study:

Gel stability tests were conducted in accordance with ICH recommendations. According to ICH guidelines, all of the selected setups underwent a month-long reliability test at 40 ±2 °C. Every preparation that was selected was examined for changes in appearance and pH (ICH rules eighth, 2003).

CONCLUSION:

Herbal medication formulation has less side effects as compared to Allopathic drug dose formulation. The herbal topical formulation may be an alternate therapy for skin illnesses. Our research study reveals that herbal medicine is convenient for both the doctor and the patient.Herbal medication formulation has less side effects as compared to Allopathic drug dose formulation. The herbal topical formulation may be an alternate therapy for skin illnesses. Our research study reveals that herbal medicine is convenient for both the doctor and the patient.

REFERENCE:

1. Nirmala Et Al; Phyto Chemical Analysis of Piper Betel Leaf Extract; World Journal of Pharmacy and Pharmaceutical Sciences, 2015; 4(1): 699-703.
2. Datta Arani, Ghoshdastidar Shreya; Antimicrobial Property of Piper betel Leaf against Clinical Isolates of Bacteria; Journal of Pharma Sciences and Research (IJPSR), 2011; 2(3): 104-109.
3. Amaresh, P Guha, Shafat Khan and Sumaiyah R Zari, Comparative Study of Microwave Assisted Hydro-Distillation with Conventional Hydro-Distillation for Extraction of Essential Oil from Piper betle L Biosciences Biotechnology Research Asia Vol. 14(1), 401-407 ,2017.
4. Annegowda HV, Mordi MN, Ramanathan S, Hamdan MR, Mansor SM, Effect of extraction techniques on phenolic content, antioxidant and antimicrobial activity of Bauhinia purpurea: HPTLC determination of antioxidants. Food Anal Methods 5:226–223, 2012.
5. V. Lobo, A. Patil, A. Phatak, N. Chandra. Free radicals, antioxidants and functional foods: Impact on human health. Pharmacogn Rev. Pubmed [Internet]. 2010 Jul-Dec [cited, Dec 16, 2019]; 4(8): 118-126.
6. Patwardhan S.K., Bodas K.S., Gundewar S.S. Coping with arthritis using safer herbal options. Int. J. Pharm. Pharm. Sci. 2010; 2(1):2-11.
7. Harris E.D. Rheumatoid arthritis: Pathophysiology and implications for therapy. N. Engl. J. Med. 1990; 322:1277-1289.
8. Firestein G.S. Evolving concepts of rheumatoid arthritis. Nature. 2003; 423:356-361.
9. Rathore B., Mahdi A.A., Paul B.N., Saxena P.N., Das S.K. Indian herbal medicines; possible potent therapeutic agents for rheumatoid arthritis. J Clin. Biochem. Nutri. 2007; 41(1):12-17.
10. Amaresh, P Guha, Shafat Khan and Sumaiyah R Zari, Comparative Study of Microwave Assisted Hydro-Distillation with Conventional Hydro-Distillation for Extraction of Essential Oil from Piper betle L Biosciences Biotechnology Research Asia Vol. 14(1), 401-407 ,2017.
11. Annegowda HV, Mordi MN, Ramanathan S, Hamdan MR, Mansor SM, Effect of extraction techniques on phenolic content, antioxidant and antimicrobial activity of Bauhinia purpurea: HPTLC determination of antioxidants. Food Anal Methods 5:226–223, 2012.
12. Golmakani, M. T., Rezaei,K,Comparison of microwave-assisted hydrodistillation with the traditional hydrodistillation met.