



FORMULATION AND EVALUATION OF POLYHERBAL ANTI-ARTHRITIC OINTMENT

VIGNESHWARAN L.V., SENTHIL KUMAR M., NITHEESH PRABHU S

Sree Abirami College of Pharmacy, Coimbatore, Tamil Nadu, India.

Email Id: vigneshwaran85@gmail.com

ABSTRACT

Keywords:

Anti-Arthritic,
Herbal, Balloon
Vine, Eucalyptus,
Guggul, TNF-A
Inhibitors.

In India over 210 million people were affected by arthritis, which counts around 15% from total population of India. Rheumatoid arthritis was arising due to the malfunction of our own immune system. Which means our body attacked by our own immune system with the help of antigens like Interleukin-2 (IL-2) and Tumor Necrosis Factor (TNF- α). In particularly, TNF- α which produce the inflammation of joints by proliferating the cells of synovial lining. Although the Arthritis was not completely curable without surgeries, we can reduce the disease condition and discomfort caused by the Arthritis. Even it is possible to prevent surgeries for arthritis if it is treated with effective topical agents in the very early stages. The TNF- α blocking agents from a herbal source will help to treat disease condition of arthritis by inhibiting the inflammatory factor like TNF- α and also result in reduced side effect. The following work deals with the formulation and evaluation of Polyherbal Anti-Arthritic ointment containing Guggul, Balloon vine and eucalyptus oil. All the above ingredients shows the Anti-Arthritic and Anti-Inflammatory effects. It involved in the reduction of stiffness of limbs. It also consist of agents like TNF- α inhibitors and suppress NF- κ B activity. Totally 5 formulations of batches were prepared using white soft paraffin, Cetostearyl alcohol, hard paraffin and wool fat as ingredients for ointment base.



INTRODUCTION

Arthritis, also called as joint disease is caused by inflammation of joints, such as knees, wrist or ankles. It begins with inflammation and gets worsen to stiffness of joints, swelling and joint pain. More than 100 different types of Arthritis are found globally, but Rheumatoid Arthritis and Osteoarthritis are the two common type of arthritis. In worldwide population 0.5-1% of people are affected by Rheumatoid Arthritis.

Pathology of Arthritis

Rheumatoid Arthritis (RA)

Rheumatoid Arthritis caused by the genetic factor called Human Leukocyte Antigen (HLA) in particular, HLA-DRB1 was the genetic risk factor for Rheumatoid Arthritis. The Rheumatoid Arthritis was triggered when the genetic factors of an individual interact with environmental factors like cigarette smoking and pathogens leads to the modification of our own antigens like IgG Antibodies or other protein called vimentin and type 2 collagen. These proteins are gets modified through the process called citrullination (1). It occurs when the amino acid arginine in these proteins converted into another amino acid called citrulline. These modified proteins are cannot be recognised by our own immune system. And the immune system secretes the inflammatory cytokines like Interleukin-1, Interleukin-6 and Tumor Necrosis Factor (TNF- α) as the immune response for the process of citrullination, which stimulates the proliferation of cells in the synovial lining and made it to swell and stiff, ultimately damage to the bone cartilage.

Pathology of Osteoarthritis

Osteoarthritis majorly affects the people above the age of 65. Spine, hands, knees and hips are affected by Osteoarthritis. It is characterized by inflammation of the bone in the joint cartilage. Age and inflammation of bone are the two major cause for the Osteoarthritis. Chondrocytes are the type of cell present in the cartilage, which is responsible for maintaining the articular cartilage over the process of Catabolism (breakdown of cartilage) and Anabolism (production of cartilage). Inflammation of bone caused due to the cytokines like Interleukin-1, Interleukin-6 and TNF- α . Some of this cytokines are responsible for increase in the degenerative enzyme and produce catabolic



activity of articular cartilage. Also, some of these are involved in the inhibitory action of formation of new cartilage results in decreased anabolism. This imbalance between the chondrocytes are the very important cause for the Osteoarthritis (2).

Materials And Methods

Plan Of Work

- Collection of crude drugs and essential oil.
- Preparation of drug extracts.
- Preparation of ointment base.
- Evaluation of Polyherbal Anti-Arthritic ointment.

Materials

- Ethanol (Modern scientific company, NO.12, Grey town, Coimbatore).
- Guggul (Caaspy Pvt Ltd, Jaipur).
- Eucalyptus oil (Mediwish, Bangalore).
- Balloon vine was collected from Anaimalai, Pollachi (10° 35'02.9" N 76° 56'02.8" E).

Extraction Of Balloon Vine

100g of powdered balloon vine leaf was macerated with 98% of ethanol for 10 days. The ethanolic mixture after maceration was allowed to evaporate in partial shade of sunlight to get the ethanolic extract of Balloon vine.



Fig 1: Extraction of Balloon Vine (Cardiospermum Halicacabum)



Extraction of Guggul

100 g of Guggul powder was macerated with 98% of Ethanol for 10 days. After maceration the ethanolic mixture was evaporated in partial shade of sunlight at room temperature in a contamination free room to obtain Guggul extract.

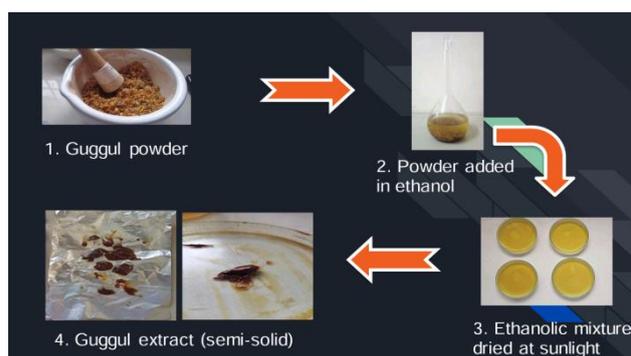


Fig 2: Extraction of Guggul (Commiphora Mukul)

Preparation of Polyherbal Ointment formulation

For the preparation of Polyherbal ointment base, required amount of hard paraffin was taken in a china dish and melt it in hot plate with low temperature. After that the required quantity of cetostearyl alcohol, wool fat, and white soft paraffin was weighed, added to the china dish one by one⁽³⁾.

After the preparation of base, the extracted herbal API of Balloon vine, Guggul and Eucalyptus oil were incorporated into the ointment by levigation method using a slab and knife.

Formulation

The Polyherbal Anti-Arthritic Ointment was formulated using the five different types of formulations as follows


Table 1: Formulation of Polyherbal Anti-Arthritic Ointment

Ointment Code	F1	F2	F3	F4	F5
White soft paraffin(g)	8.5	8.5	8	9	9.5
Cetostearyl Alcohol(g)	0.5	0.5	1	0.5	0.5
Hard paraffin(g)	0.5	0.5	0.6	0.3	0.3
Wool fat(g)	0.5	0.5	0.5	0.3	0.4
Guggul extract(g)	0.15	0.15	0.15	0.15	0.15
Balloon vine extract(g)	0.15	0.15	0.15	0.15	0.15
Eucalyptus oil(g)	0.4	0.6	0.4	0.4	0.4

Evaluation

The following parameters are used to evaluate the ointment,

Determination of pH

The mechanical evaluation parameter of pH 5 ± 1 in all the formulation indicates the better chemical compatibility of ointment with skin. The pH of ointment was measured using the digital pH meter by thoroughly dipping the glass rod into the ointment. Totally three readings were recorded for a individual batch and the average of three was considered as pH value of a formulation.

Viscosity

The viscosity is the measure of ointment's resistance to deformation at given rate. Viscosity of ointment was determined using Brookfield viscometer (S-63, model DVE) with a spindle speed of viscometer rotated at 60 rpm at 25°C.

Appearance

The formulation of Polyherbal Anti-Arthritic ointment was observed for general appearance and presence of suspended particles by naked eye for their characterization. The clarity of the formulation was determined under black and white background by visual inspection.



Spreadability

Spreadability apparatus, two glass slide having two pan on two sides and a wooden board having scale for measurement are used to calculate spreadability. Excess of ointment sample was placed in the middle of the two glass slides. A weight of 100g was placed on the glass slides for five minutes; allow the sample to compress uniformly. After that 250g weight was added to the pan. The time required to separates the two glass slides in seconds was taken as the spreadability value of the sample ⁽⁴⁾.

RESULT AND DISCUSSION

The topical Polyherbal formulation gives the advantage of delivering drug directly to the site of action at where it required. Generally, the topical preparation increases the duration of action of medicaments in the particular area which give convenience and comfort to the patients. By treating Arthritis with a topical herbal formulation will reduce the surgeries done for Arthritis, if it is treated in early stages. All the formulation has the pH range from 5.3 to 5.8, which shows the pH of better compatibility with skin so it may not cause any skin irritations. And most of the formulations has better spreadability value of 5.5 and above which indicates the formulation was easy to apply.

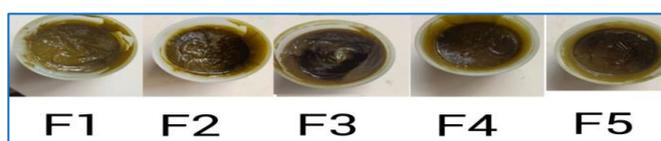


Fig 3: Prepared Polyherbal Anti-Arthritic Ointment



Fig 4: Labelled Polyherbal Anti-Arthritic Ointment


Table 2: Evaluation Results for Ointment

Code	pH	Viscosity (cp)	Spreadability (cm)	Appearance
F1	5.50	110	5.5	Pale Green Pleasant
F2	5.84	110	5.5	Pale Green Pleasant
F3	5.36	100	6	Pale Green Pleasant
F4	5.74	120	5	Pale Green Pleasant
F5	5.34	130	4.5	Pale Green Pleasant

CONCLUSION

The Anti-Arthritic activity of the ointment is due to the presence of TNF- α inhibitors and NF- κ B in the herbal ingredients. The Guggul present in the formulation will suppress the DNA binding of NF- κ B induced by TNF⁽⁵⁾. And the eucalyptus inhibits the protein denaturation and presence of tannis reduces the swelling of joints⁽⁶⁾. Presence of balloon vine in the formulation inhibits TNF activity⁽⁷⁾. All the above combined activity of the herbal ingredients in the formulation will helps to decrease the disease condition.

Acknowledgement

We sincerely express our deep sense of gratitude to The Management, Sree Abirami Institutions and Charitable Trust for providing the required facilities regarding this research and also for their support. We are highly indebted to Dr. M. Senthil Kumar, Principal, Sree Abirami College of Pharmacy who is our inspiration to pursue this undertaking. We are also obliged to our mentor and colleagues. This work would not have been possible without their worthy experience and enormous help.

REFERENCES

- 1) Genetics of rheumatoid arthritis: what have we learned? Marieke Bax & Jurgen van Heemst & Tom W. J. Huizinga & Rene E. M. Toes Immunogenetics (2011) 63:459–466 DOI 10.1007/s00251-011-0528-6
- 2) Clinical aspects, pathology and pathophysiology of osteoarthritis S.R. Goldring and M.B. Goldring J Musculoskelet Neuronal Interact 2006; 6(4):376-378.
- 3) Formulation and evaluation of herbal ointment containing Neem and Turmeric extract Shubhangi E. Sawant*, Monali D. Tajane Journal of Scientific and Innovative Research 2016; 5(4): 149-151.



- 4) Formulation and in vitro evaluation of the topical antiageing preparation of the fruit of Benincasa hispida, Vidya Sabale, Harish Kunjwani¹, Prafulla Sabale².
- 5) Guggulsterone Inhibits NF- κ B and I κ B Kinase Activation, Suppresses Expression of Anti-apoptotic Gene Products, and Enhances Apoptosis, Shishir Shishodia and Bharat B. Aggarwal, The Journal of Biological Chemistry Vol. 279, No. 45, Issue of November 5, pp. 47148–47158, 2004.
- 6) In-vitro studies suggest probable mechanism of eucalyptus oil for Anti-Inflammatory and Anti-Arthritic activity, Habibur Rahman, M. Chinna Eswaraiah, Kamala Vakati, Madhavi P, International Journal of Phytopharmacy Vol. 2 (3), pp.81-83, May-Jun 2012.
- 7) Pharmacological properties of Cardiospermum halicacabum – a review Krishna Murti¹, Mayank A. Panchal^{2*} Vijay Lambole² and Vipul Gajera², Pharmacologyonline 2:1005-1009 (2010).
- 8) Chhetri et al., "formulation and evaluation of antimicrobial herbal ointment." kathmandu university journal of science, engineering and technology, 2010: 102-107.
- 9) Dr Manish Nautiyal et al. "Ayurveda Kayachikitsa towards the management of joint pain: a review." Journal of Drug Delivery and Therapeutics, 2018: 314-317.
- 10) M. Z. Siddiqui et al. "Comparative Study of Hypolipidemic Profile of Resinoids of Commiphora mukul/Commiphora wightii from Different Geographical Locations." Indian Journal of Pharmaceutical Sciences, 2012: 422-427.
- 11) Madhavi G. Patel et al. "Anti-arthritic activity of a classical Ayurvedic formulation Vatari Guggulu in rats." Journal of Traditional and Complementary Medicine, 2015: 389-394.
- 12) Sarvananda Letchuman et al. "Immunomodulatory Effect of Cardiospermum Halicacabum against Cancer." Biomedical Journal of Scientific & Technical Research, 2018.
- 13) Shivraj Hariram Nile et al. "Chemical composition, antioxidants, anti inflammatory and antitumour activities of Eucalyptus globulus." Indian journal of experimental biology, 2018: 734-742.
- 14) Signalling, inflammation and arthritis NF- κ B and its relevance to arthritis and inflammation, R. E. Simmonds and B. M. Foxwell, Rheumatology 2008;47:584–590 doi:10.1093 Advance Access publication 29 January 2008.
- 15) A review of ointment and ointment bases, Rajveer Bhaskar, 1Monica Ola, 2Prakash H. Patil and 3Kalpesh S. Nawandar, Volume 5, Issue 9, 33534 5, ISSN 22777105.
- 16) Formulation and evaluation of herbal ointment containing Neem and Turmeric extract, Shubhangi E. Sawant*, Monali D. Tajane, Journal of Scientific and Innovative Research 2016; 5(4): 149-151.
- 17) Journal of Scientific and Innovative Research 2016; 5(4): 149-151, J. A. Roman-Blas M.D.* and S. A. Jimenez M.D, OsteoArthritis and Cartilage (2006) 14, 839-848.



- 18) Chhetri et al., "formulation and evaluation of antimicrobial herbal ointment." kathmandu university journal of science, engineering and technology, 2010: 102-107.
- 19) Shivraj Hariram Nile et al. "Chemical composition, antioxidants, anti inflammatory and antitumour activities of Eucalyptus globulus." Indian journal of experimental biology, 2018: 734-742.
- 20) Ayurveda Kayachikitsa towards the management of joint pain: a review, Dr Manish Nautiyal¹, Dr. Bhupendra Singh Chouchan, Dr. Surendra Singh Rajput, Dr. A. K. Singh, Journal of Drug Delivery & Therapeutics. 2018; 8(6):314-317.
- 21) Rheumatoid arthritis: pathological mechanisms and modern pharmacologic therapies, Qiang Guo, Yuxiang Wang¹, Dan Xu, Johannes Nossent, Nathan J. Pavlos and Jiake Xu, Bone Research (2018) 6:15.
- 22) Formulation and Evaluation of Polyherbal Ointment, Swati Siddheshwar Londhe*, Mangesh Gautam Bhosale, Amol. Arun Joshi, Geeta Sapkale, Mohini Khandagale, Amitkumar Jadhav, Londheet al., Int. J. Adv. Pharm. Biotech. (2020)6(3)12–14.