WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.084
Volume 12, Issue 20, 391-413. Review Article ISSN 2277–7105

A REVIEW ON MEDICINAL PLANT USED IN TREATMENT OF RHEUMATOID ARTHRITIS

Sanjay Vyas*[1], Pooja Khanpara[2], Vishva Khunt[3] and Dr. Shital Faldu[4]

[1]*B. Pharm Scholar, Smt. R. D. Gardi B. Pharmacy College, Gujarat Technological University, Rajkot, Gujarat, India.

[2]Associate Professor, Vice Principal, Department of Pharmacognosy, ORCID No: 0000-0003-1203-2969, Smt. R. D. Gardi B. Pharmacy College, Gujarat Technological University, Rajkot, Gujarat, India.

[3]B. Pharm Scholar, Smt. R. D. Gardi B. Pharmacy College, Gujarat Technological University, Rajkot, Gujarat, India.

[4]Principal, Smt. R. D. Gardi B. Pharmacy College, Gujarat Technological University, Rajkot, Gujarat, India.

Article Received on
27 September 2023,

Revised on 17 October 2023,
Accepted on 07 Nov. 2023

DOI: 10.20959/wjpr202320-30255

***Corresponding Author**
Sanjay Vyas
B. Pharm Scholar, Smt. R. D. Gardi B. Pharmacy College, Gujarat Technological University, Rajkot, Gujarat, India.

ABSTRACT

Rheumatoid arthritis is a kind of autoimmune disorder that occurs when the immune system mistakenly attacks healthy tissues in the body. Although the exact trigger is still unknown, the immune system typically produces antibodies that seek and destroy viruses and bacteria to protect against infections. Rheumatoid arthritis is an inflammatory condition characterized by swollen joints, which can affect various areas of the body, such as the hands, feet, and sometimes internal organs. It occurs when the immune system mistakenly attacks healthy tissues, particularly the joints. Natural plant extracts and compounds (NPECs) have been utilized from plants and herbs as a clinical therapy to treat rheumatoid arthritis (RA) in order to relieve such symptoms. Research into the potential use of NPECs as a novel treatment option for rheumatoid arthritis is a promising development.

KEYWORDS: Herbal plant, Rheumatoid arthritis, Traditional medicine, Medicinal plant.

1. INTRODUCTION

Rheumatoid arthritis is a joint disease that results from an autoimmune response causing chronic inflammation, which affects several aspects of the body.[1] Autoimmune diseases like Rheumatoid arthritis can have systemic impact on the body, affecting multiple organs beyond the joints such as the heart, kidneys, salivary glands, bone marrow, lungs, blood vessels, nerve tissue, and skin.[2] Despite attacking the joints primarily, Rheumatoid arthritis can potentially impact the health and overall quality of life of those affected. Epidemiological statistics suggest that Rheumatoid arthritis affects around 1% of the world's population, equating to approximately 700 million individuals, with over 80% of patients being women.[3] Although Rheumatoid arthritis stems from inflammation that affects small to medium-sized joints, it's also characterized by systemic inflammation. Different autoimmune and inflammatory processes can be active in Rheumatoid arthritis, contributing to a clinically and pathologically heterogeneous disease entity.[4] Certain herbs and plants have anti-inflammatory properties that can help relieve joint pain. Thyme, Cinnamon, and Ashwagandha are examples of medicinal herbs that have been used to treat rheumatoid arthritis.[5] Ethnobotany relies on knowledge about plants from indigenous people and their perceived effectiveness in different ethnic groups. Some researchers are exploring the use of stem cells to treat rheumatoid arthritis, which may offer new potential treatments.[6,7]

1.1 PATHOGENESIS

Rheumatoid arthritis is a chronic autoimmune disease that affects the joints and is characterized by inflammation of the synovial membrane, leading to joint pain, swelling, stiffness, and eventual joint damage. It is believed to be caused by a combination of genetic and environmental factors, although the exact cause is unknown.[8]

1.2 SYMPTOM[9,10,11]

1. Joint pain
2. Morning stiffness
3. More than one joint affected
4. Small joints affected first
5. Symmetrical joint pain
6. Joint tenderness
7. Joint swelling
8. Joint stiffness lasting for six weeks or longer

9. Fatigue
10. Weight loss
11. Fever
12. Numbness and tingling in the hands and feet

1.3 RISK FACTORS[12]

1. Gender
2. Genetics
3. Environmental exposure
4. Age

2. Herbal Plants Uses As Rheumatoid Arthritis Treatment

2.1 Himalayan cedar[14,15]

Biological name: *Deodar cedar*

Family: Pinaceae

Source: Afghanistan

Plant part: Wood of deodar cedar

Use: Reduce pain

Major constituents: The oil of cedar wood contains α-himachalene (12.5%) and β-himachalene (43%). It also contains sesquiterpene alcohols.

Fig. 1: Himalayan cedar.[13]

2.2 Ginger[17]

Biological Name: *Zingiber officinale*

Family: zingeberaceae

Source: India

Plant part: Root

Use: Reduce inflammation

Major constituents: phenolic compounds – shogaols, gingerols, zingiberone, zingerone, geraniol.

Fig. 2: Ginger.[16]

2.3 WILLOW BARK[19]

Biological name: *Salicis cortex*

Family: Salicaceae family

Source: India, China, Europe, Asia

Plant part: BARK

Use: Reduce pain

Major constituents: Willow contains Salicylates (Salicortin and Salicin) and Tannins. It is used for fever, rheumatism, and as an anti-inflammatory agent.

Fig. 3: Willow bark.[18]

2.4 Turmeric[21,22]

Biological name: *Curcuma longa*

Family: Zingiberaceae

Source: India, china, US

Plant part: Root

Use: Inflammation, pain, swelling

Major constituents: Curcumin

Fig 4: Turmeric.[20]

2.5 Indian olibanum / dhup[24]

Biological Name: *Boswellia serrata Roxb*

Family: Burseraceae

Source: India, Africa

Plant part: Resinous oils from trees

Use: Reduce inflammation

Major constituents: Boswellic acid

Fig. 5: Indian olibanum.[23]

2.6 Dhania[26,27,28]

Biological Name: *Coriander sativum*

Family: Apiaceae

Source: India, Canada, China, Turkey

Plant part: Leaf

Use: Anti-inflammatory

Major constituents: Essential oil, Alkaloids, Flavones, Resins, Tannins, Anthraquinones, Sterols.

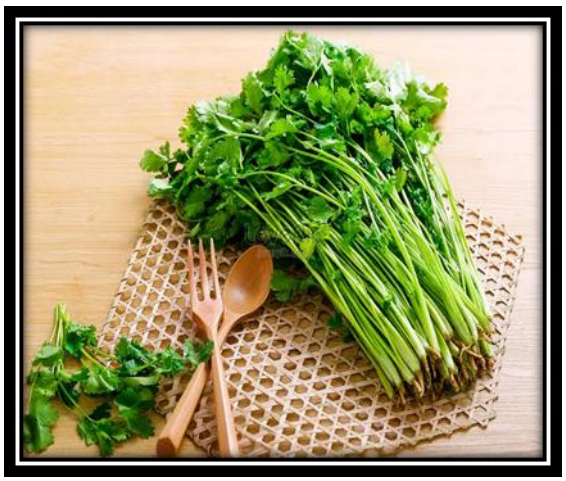

Fig. 6: Dhania.[25]

2.7 Dalchini[30]

Biological Name: *Cinnamomum zeylanicum*

Family: Lauracae

Source: Sri Lanka, India, Myanmar and South America

Plant part: BARK

Use: Anti-inflammatory

Major constituents: Cinnamaldehyde (65-80%)

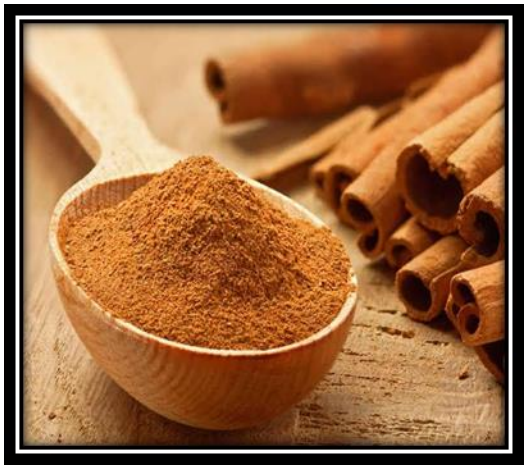

Fig. 7: Dalchini.[29]

2.8 Ashwagandha[32,33]

Biological Name: *Withania somnifera Linn*

Family: Solanaceae

Source: India, Pakistan, Africa, Srilanka

Plant part: Root

Use: Joint pain, Swelling

Major constituents: The root of ashwagandha contains alkaloids like withanine, pseudo-withanine, tropine, pseudo-tropine, somniferine, and somnine.

It also has acyl glucosidcalled sitoindoside-7 and sitoindoside-8.

These compounds contribute to the pharmacological activity of the root.

Fig. 8: Ashwagandha.[31]

2.9 Green Tea[35,36]

Biological Name: *Camellia sinensis Linn*

Family: Theaceae

Source: China

Plant part: Dried leaves

Use: Anti-inflammatory

Major constituents: Epigallocatechin-3- gallate (EGCG) (50-80%)

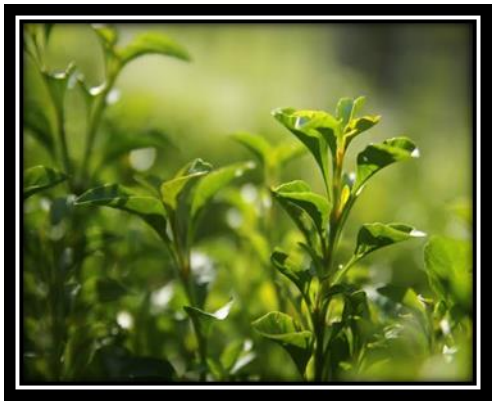

Fig. 9: Green tea.[34]

2.10 Ashoka tree[38]

Biological Name: *Saraca asoca Roxb.*

Family: Caesalpiniaceae

Source: South India, Assam, Srilanka, Orissa

Plant part: seed

Use: Anti-inflammatory

Major constituents: Preliminary phytochemical methanolic and ethanolic extracts indicate the presence Carbohydrates, tannin, flavonoid, saponin, glycosides, proteins and steroids.

Fig. 10: Ashoka tree.[37]

2.11 Buas buas[40]

Biological Name: *Premna corymbosa Rottl.*

Family: Verbenaceae

Source: Singapore

Plant part: Root

Use: Anti-inflammatory

Major constituents: alkaloids, glycosides, flavanoids, steroids and triterpenoids.

Fig. 11: Buas Buas.[39]

2.12 Anantamul[42,43]

Biological Name: *Hemidusmus indicus Linn.*

Family: Asclepiadaceae

Source: South Asia

Plant part: Root

Use: Anti-inflammatory

Major constituents: coumarin, starch, tannic acid, Triterpenoid saponin.

Fig. 12: Anantamul.[41]

2.13 Aloe vera[45,46,47]

Biological Name: *Aloe barbadensis*

Family: LLiliaceae

Source: Europe, Asia, America

Plant part: Leaf

Use: Anti-inflammatory

Major constituents: anthraquinone, chromone.

Fig. 13: Aloevera.[44]

2.14 Ice vine, patha[49,50,51]

Biological Name: *Cissampelos pareira Linn*.

Family: Menispermaceae

Source: Asia, Africa, South America

Plant part: Root

Use: Anti-inflammatory

Major constituents: Ethanolic extract.

Fig. 14: Icevine, Patha.[48]

2.15 Black adusa[53]

Biological Name: *Justicia gendarussa Linn.*

Family: Acanthaceae

Source: China

Plant part: Leaf

Use: Anti-inflammatory

Major constituents: Pyrroloquinazoline Alkaloids

Fig. 15: Black adusa.[52]

2.16 Raat rani, night blooming[55]

Biological Name: *Ncytanthes arbortristis Linn.*

Family: Oleaceae

Source: South Asia, West Indies

Plant part: Leaf

Use: Anti-inflammatory

Major constituents: Histamine

Fig. 16: Raat rani.[54]

2.17 Banyan tree[57]

Biological Name: *Ficus bengalensis Linn.*

Family: Moraceae

Source: Asia, China

Plant part: Bark

Use: Anti-inflammatory

Major constituents: β-sitosterol

Fig. 17: Banyan tree.[56]

2.18 Vasaka[59]

Biological Name: *Justicia gendarussa Linn.*

Family: Acanthaceae

Source: India, shrilsnka

Plant part: Leaf

Use: Anti-inflammatory

Major constituents: Alkaloid.

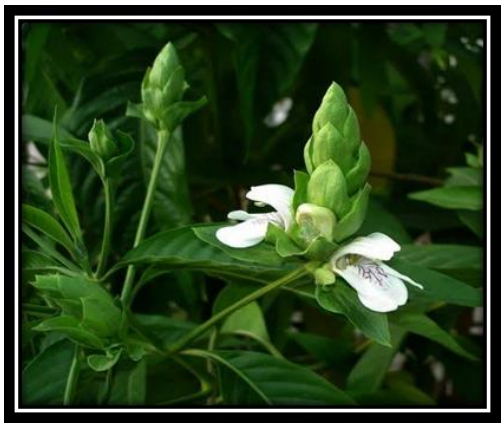

Fig. 18: Vasaka.[58]

2.19 Spanish lavender[61]

Biological Name: *Lavandula stoechas*

Family: Lamiaceae

Source: France, Spain, Italy, Portugal

Plant part: Flower

Use: Anti-inflammatory

Major constituents: linalool.

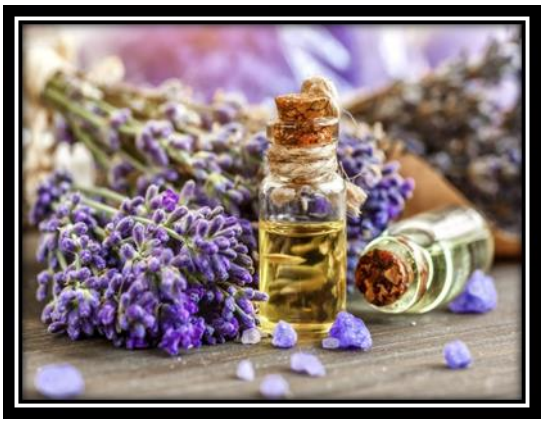

Fig. 19: Spanish lavender.[60]

2.20 Bitter apple[63,64]

Biological Name: *Citrullus colocynthis*

Family: cucurbitaceae

Source: Asia, Africa, Turkey

Plant part: Fruit

Use: Anti-inflammatory

Major constituents: Flavanoid.

Fig. 20: Citrullus colocynthis.[62]

2.21 Rice[66]

Biological Name: *Oryza sativa*

Family: Poaceae

Source: India

Plant part: Seed

Use: Anti-inflammatory

Major constituents: γ-oryzanol.

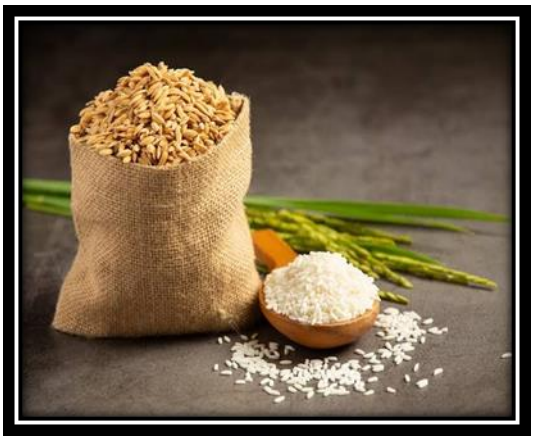

Fig. 21: Rice.[65]

2.22 Monachino[68,69]

Biological Name: *Glyphaea brevis*

Family: Tiliaceae

Source: Africa

Plant part: Bark

Use: Anti-inflammatory

Major constituents: Flavanoid.

Fig. 22: Monachino.[67]

2.23 Syzygium cumini[71]

Biological Name: *Syzygium cumini*

Family: Myrtaceae

Source: India

Plant part: Leaf

Use: Anti-inflammatory

Major constituents: Quercetin

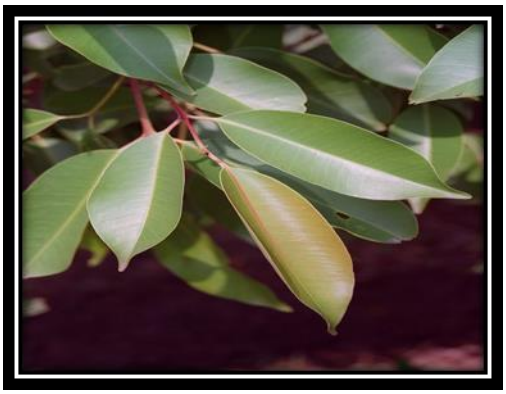

Fig. 23: Syzygium cumini.[70]

2.24 Crepe ginger[73,74]

Biological Name: *Costus speciosus*

Family: Costaceae

Source: Asia, Malaysia

Plant part: Rhizomes

Use: Anti-inflammatory

Major constituents: Methanolic extract

Fig. 24: Crepe ginger.[72]

2.25 Pencil tree.[76,77]

Biological Name: *Euphorbia tirucalli*

Family: Euphorbiaceae

Source: Africa

Plant part: Latex

Use: Antirhumatism

Major constituents: Triterpenes euphol

Fig. 25: Pencil tree.[75]

3. CONCLUSION

Herbal therapy is widely used by patients because herbal plants are a rich or primary source of extremely efficient conventional medications for the treatment of arthritis. Rheumatoid arthritis is a severe condition that typically shows up as many joints swollen. The condition can range in severity from mild pain to deformity of the joints. While several synthetic medications, such as DMARDs and NSAIDs, are the usual treatment for rheumatoid arthritis, their side effects may affect the efficacy of the therapeutic intervention. Several known ancient Indian Ayurvedic and Unani medicinal plants need to be screened and scientifically evaluated in order to develop better, safer treatment choices with the minimum avoidable adverse effects. An alternate and even successful approach of treating chronic illnesses with minimal or no adverse reactions is the use of herbal medications in the treatment of rheumatoid arthritis. It should be seen from the summary above that many different kinds of medicinal herbs have anti-arthritic properties. With regard to rheumatoid arthritis, this review aims to provide a scholarly overview of the usage of helpful medicinal plants.

4. REFERENCE

1. Scott DL, Wolfe F, Huizinga TW. Rheumatoid arthritis. Lancet, 2010; 376(9746): 1094-108. doi: 10.1016/S0140-6736(10)60826-4.
2. McInnes IB, Schett G. The pathogenesis of rheumatoid arthritis. N Engl J Med., 2011; 365(23): 2205-19-2219. doi: 10.1056/NEJMra1004965, PMID 22150039.
3. Petsch C, Araujo EG, Englbrecht M, Bayat S, Cavallaro A, Hueber AJ et al. Prevalence of monosodium urate deposits in a population of rheumatoid arthritis patients with hyperuricemia. Semin Arthritis Rheum., 2016; 45(6): 663-8. doi: 10.1016/j.semarthrit. 2015.11.014, PMID 26743072.
4. Kerola A.Pathophysiology. Epidemiol Comor Bidities Early Rheumatoid Arthritis Emphasis Cardiovasc Dis., 2015; 1: 3.
5. Nwachukwu CU, Umeh CN, Kalu IG. Identification and traditional uses of some common medicinal plants in Ezinihitte Mbaise L.G.A of Imo State, Nigeria. Rep opinion, 2010; 2(6): 1-8.
6. Tor-Anyiin TA, Sha'ato R, Oluma HOA. Ethnobotanical survey of antimalarial medicinal plants amongst the Tiv people of Nigeria. J Herbs Spices Med Plants, 2003; 10(3): 61-74. doi: 10.1300/J044v10n03_07.
7. Igoli JO, Ogaji OG, Tor-Anyiin TA, Igoli NP. Traditional medicine practice amongst the Igede people of Nigeria Part II. Afr J Tradit Complement Altern Med, 2005; 2(2): 134-52. doi: 10.4314/ajtcam.v2i2.31112.
8. Woolf AD, Pfleger B. Burden of major musculoskeletal conditions. Bull World Health Organ., 2003; 81(9): 646-56. PMID 14710506
9. Ahmed SS: CQ Press. Physician assistant's clinical review cards. Philadelphia: F A Davis Company; 2002. Pp. p. 138-9.
10. McInnes IB, Schett G. The pathogenesis of rheumatoid arthritis. N Engl J Med., 2011 Dec; 365(23): 2205-19. doi: 10.1056/NEJMra1004965, PMID 22150039.
11. Chaudhari K, Rizvi S, Syed BA. Rheumatoid arthritis: current and future trends. Nat Rev drug Discov, 2016 May; 15(5): 305-6. doi: 10.1038/nrd.2016.21, PMID 27080040.
12. Deane KD, Demoruelle MK, Kelmenson LB, Kuhn KA, Norris JM, Holers VM. Genetic and environmental risk factors for rheumatoid arthritis. Best Pract Res Clin Rheumatol. 2017; 31(1): 3-18. doi: 10.1016/j.berh.2017.08.003, PMID 29221595
13. Available from: https://www.google.com/url?sa=i&url=https%3A%2F%2Fpaudhshala.com%2Fplantsnursery-in-india%2Fcedrus-deodara-himalayan-cedar plant.

14. Jain S, Jain A, Vaidya A, Kumar D, Jain V. Preliminary phytochemical, spharmacognostical and physico-chemical evaluation of Cedrus deodara heartwood. J Pharmacogn Phytochem, 2014; 3(1): 91-5.
15. Patel SJ, Lambole V, Shah P, Shah DP. pharmacological activities of Cedrus deodara: an overview. an International Journal of Pharmaceutical Sciences, 1 Apr-Jul; 2013; 4(3) Suppl -.
16. Available from: https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.medicalnewstoday.com%2Farticles%2F265990&psig=AOvVaw2WHW5aQW_iGRtbFsBgavD&ust=1697477315415000&source=images&cd=vfe&opi=89978449&ved=0CA8QjRxqFwoTCPinhfPJ-IEDFQAAAAAdAAAAABAD
17. Ghosh AK, Banerjee S, Mullick HI, Banerjee J. Zingiber officinale: a natural gold. Int J Pharm Biol Sci., 2011; Vol-2/Issue-1/Jan-Mar.
18. Available from: https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.clinikally.com%2Fblogs%2Fnews%2Fhow-to-incorporate-willow-bark-in-your-skin-care-routine&psig=AOvVaw3tkyQwY4vhaxZVo1grbyYq&ust=1697476890892000&source=images&cd=vfe&opi=89978449&ved=0CA8QjRxqFwoTCMCtmtDI-IEDFQAAAAAdAAAAABAD
19. Vane JR. The fight against rheumatism: from willow bark to COX-1 sparing drugs. J Physiol Pharmacol, 2000 Dec; 51(4 Pt 1): 573-86. PMID 11192932.
20. Available from: https://www.google.com/url?sa=i&url=https%3A%2F%2Fflorasense.com%2Fexplore-plants%2Fturmeric&psig=AOvVaw1WCCTZgwXZHl5hyqlRBA44&ust=1697477370187000&source=images&cd=vfe&opi=89978449&ved=0CA8QjRxqFwoTCICJ74_K-IEDFQAAAAAdAAAAABAD
21. Adaramoye OA, Medeiros IA. 2008Involvement of Na(+)-Ca (2+) exchanger in the endothelium- independent vasorelaxation induced by Curcuma longa L. in isolated rat superior mesenteric arteries. J Smooth Muscle Res., 2008; 44(5): 151-8. doi: 10.1540/jsmr.44.151, PMID 19122379.
22. Aggarwal BB, Ichikawa H, Garodia P, Weerasinghe P, Sethi G, Bhatt ID. et al. From traditional Ayurvedic medicine to modern medicine: identification of therapeutic targets for suppression of inflammation and cancer. Expert Opin Ther Targets, 2006; 10(1): 87-118. doi: 10.1517/14728222.10.1.87, PMID 16441231.
23. Available from: https://images.app.goo.gl/GFuiz4VPJ5BwYtnp6

24. Henrotin Y, Mobasheri A. Natural products for promoting joint health and managingosteoarthritis. Curr Rheumatol Rep., 2018; 20(11): 72. doi: 10.1007/s11926-018-0782-9, PMID 30232562, Google Scholar.
25. Available from: https://www.google.com/imgres?imgurl=https%3A%2F%2 Fwatermark. lovepik.com%2Fphoto%2F20211120%2Flarge%2Flovepik-coriander-picture_500498960.jpg&tbnid=0jd3wKiSoiOuRM&vet=1&imgrefurl=https%3A%2F%2 Flovepik.com%2Fimages%2Fcoriander.html&docid=jOCGL0y1wcGGuM&w=1200&h=800&itg=1&source=sh%2Fx%2Fim%2Fm1%2F2&shem=uvafe2
26. Evans WC. Volatile oil and resins. In: Evans WC, editor. Trease and Evans pharmacognosy. New Delhi: Elsevier, 2006; 262.
27. Singh B, Chaurasia OP, Jadhav KL. An ethnobotanical study of Indus valley (Ladakh) JEcon Tax Bot ADDL Ser, 1996; 12: 92-101.
28. Said M, editor. Indian Medical Science Series, 55. Hamdard pharmacopoeia of Eastern medicine. Delhi: Sri Satguru Publications, 1997.
29. Available from: https://images.app.goo.gl/GFuiz4VPJ5BwYtnp6
30. Chou ST, Chang WL, Chang CT, Hsu SL, Lin YC, Shih Y. Cinnamomum cassia Essential Oil inhibits α-MSH-induced melanin production and oxidative stress in murine B16 melanoma cells. Int J Mol Sci., 2013; 14(9): 19186-201. doi: 10.3390/ijms140919186, PMID 24051402.
31. Available from: https://www.google.com/imgres?imgurl=https%3A%2F%2Ft4. ftcdn.net%2Fjpg%2F02%2F28%2F89%2F11%2F360_F_228891168_eiPu2AZANlmKTOSLxJ5yrOxMQmNc8Eid.jpg&tbnid=iUORjcIA2GYDqM&vet=1&imgrefurl=https%3A%2F%2Fstock.adobe.com%2Fsearch%3Fk%3Dashwagandha&docid=r5PFhWfnVztbyM&w=539&h=360&source=sh%2Fx%2Fim%2Fm5%2F2&shem=uvafe2
32. Patwardhan S K, Bodas K S, Gundewar SS Coping with Arthritis using safer herbal options. International Journal of Pharmacy and Pharmaceutical Science, 2010; 2(1): 6-7.
33. Mirjalili MH, Moyano E, Bonfill M, Cusido RM, Palajon J. Steroidal Lactones from Withenia somnefera, an ancientMirjalili MH, Moyano E, Bonfill M, Cusido RM, Palazón J.Steroidal lactones from Withania somnifera, an ancient plant for novel medicine. Molecules, 2009; 14(7): 2373-93. doi: 10.3390/molecules14072373, PMID 19633611.
34. Available from: https://www.google.com/imgres?imgurl=https%3A%2F%2Fimages. unsplash.com%2Fphoto-1582650859079-ee63913ecb84%3Fixlib%3Drb-4.0.3%26ixid%3DM3wxMjA3fDB8MHxzZWFyY2h8Mnx8Z3JlZW4lMjB0ZWF8ZW58MHx8MHx8fDA%253D%26w%3D1000%26q%3D80&tbnid=LnL05pCFkoDZkM&vet

=1&imgrefurl=https%3A%2F%2Funsplash.com%2Fs%2Fphotos%2Fgreen-tea&docid=OO0my9oZxGwBUM&w=1000&h=667&source=sh%2Fx%2Fim%2Fm5%2F2&shem=uvafe2

35. Ahmed S. Green tea polyphenol epigallocatechin 3-gallate in arthritis: progress and promise. Arthritis Res Ther, 2010; 12(2): 208. doi: 10.1186/ar2982, PMID 20447316.
36. Akroum S, Satta D, Lalaoui K. Antimicrobial, antioxidant, cytotoxic activities and phytochemical screening of some Algerian plants. Eur J Sci Res. 2009.27. Akroum S, Satta D, Lalaoui K Antimicrobial, Antioxidant, Cytotoxic Activities and Phytochemical Screening of Some Algerian Plants. European Journal of Scientific Research, 2009; 31(2): 289-295. Available from: https://images.app.goo.gl/NXTQykfTWM5iGZ6h7
37. Mallikharjuna PB, Rajanna LN, Seetharamand YN, Sharanabasappa GK. Phytochemical Studies of Strychnos potatorum L.f.- A Medicinal Plant. E-Journal of Chemistry, 2007; 4(4): 510-518.
38. Available from: https://www.google.com/imgres?imgurl=https%3A%2F%2 Fupload.wikimedia.org%2Fwikipedia%2Fcommons%2Fthumb%2F7%2F71%2FPremna_serratifolia.jpg%2F1200px-Premna_serratifolia.jpg&imgrefurl=https%3A%2F%2Fen.wikipedia.org%2Fwiki%2FPremna&docid=jMwEW7vtpbCXyM&tbnid=x0RGjQi6jUUFNM&vet=1&source=sh%2Fx%2Fim%2F2
39. Karthikeyan M, Deepa K. Effect of ethanolic extract of Premna corymbosa (Burm. F.) Rottl. & Willd. Leaves in complete Freund's adjuvant-induced arthritis in Wistar albino rats. J Basic Clin Physiol Pharmacol, 2010; 21(1): 15-26.
40. Available from: https://www.google.com/imgres?imgurl=https%3A%2F%2Faumswow.com%2Flife-veda%2Fassets%2Fimages%2Fherbs%2Fanantamul.jpg&tbnid=tkDqpyOEXzkhWM&vet=1&imgrefurl=https%3A%2F%2Faumswow.com%2Flife-veda%2Fherbs%2Fanantamul%3Flang%3Den&docid=xrM34rW0p9XiMM&w=1275&h=850&source=sh%2Fx%2Fim%2Fm5%2F2&shem=uvafe2
41. Shaikh PZ. Study of anti-inflammatory activity of ethanolic extract of Hemidesmusindicus roots in acute, subchronic & chronic inflammation in experimental animals. Int J Pharm Life Sci., 2011; 2(10): 1154-73.
42. Mehta A, Sethiya NK, Mehta C, Shah GB. Anti-arthritis activity of roots of Hemidesmus indicus R.Br. (Anantmul) in rats. Asian Pac J Trop Med, 2012; 5(2): 130-5. doi: 10.1016/S1995-7645(12)60011-X, PMID 22221757.
43. Available from: https://www.google.com/imgres?imgurl=https%3A%2F%2Fmedia.istockphoto.com%2Fid%2F1402438010%2Fphoto%2Faloe-vera-

plant.webp%3Fb%3D1%26s%3D170667a%26w%3D0%26k%3D20%26c%3DrCYcUIbSFi5UqGu3ue4BTC4FyN_PuPyvI58hx8UNfFw%3D&tbnid=OYzK_8YRsX6FHM&vet=1&imgrefurl=https%3A%2F%2Funsplash.com%2Fs%2Fphotos%2Faloe-vera&docid=bNK_wV6azLxANM&w=509&h=339&source=sh%2Fx%2Fim%2Fm5%2F2&shem=uvafe2

44. Davis RH, Agnew PS, Shapiro E. Antiarthritic Activity of anthraquinones found in aloevera for podiatric medicine. J Am Podiatr Med Assoc, 1986; 76(2): 1-8.
45. Joshph B, Raj SJ. Pharmacognostic and pharmacology properties of Aloe vera. Int J Pharm Sci Rev Res., 2010; 4(2): 106-9.
46. Devis RH, Agnew PS, Shapiro E. Anti arthritic activity of anthraquinones found in aloe for Podiatric Medicine. J Am Podiatr Med Assoc, 1986; 76(2): 61-6. doi: 10.7547/87507315-76-2-61.
47. Available from: https://www.google.com/imgres?imgurl=http%3A%2F%2F5.imimg.com%2Fdata5%2FSELLER%2FDefault%2F2020%2F9%2FVD%2FTR%2FVL%2F98607886%2Fnishoth-nisotar-trivrit-500x500.jpg&tbnid=c_0ZzSe6RtMKWM&vet=1&imgrefurl=https%3A%2F%2Fwww.indiamart.com%2Fproddetail%2Fvidhara-patha-mool-argyreia-nervosa-23068656188.html&docid=PCwmx4177yV5tM&w=500&h=333&itg=1&hl=en&source=sh%2Fx%2Fim%2Fm5%2F2&shem=uvafe2
48. Amresh G, Singh PN, Rao ChV. Antinociceptive and antiarthritic activity of Cissampelos pareira roots. J Ethnopharmacol, 2007; 111(3): 531-6. doi: 10.1016/j.jep.2006.12.026, PMID 17240096.
49. Singh A, Duggal S, Singh J, Katekhaye S. An inside preview of Ethnopharmacology of Cissampelos pareira Linn. Int J Biol Technol, 2010; 1(1): 114-20.
50. Arya V, Gupta VK, Kaur R. A review on plants having antiarthritic potential. Int J Pharm Sci Rev Res., 2011; 7(2): 131-6.
51. Available from: https://images.app.goo.gl/y9s7saDf8Ekhs4Rc7.
52. Khatijah H, Noraini T. Anatomical Atlas of Medicinal Plants. Vol. 1. Penerbit UKM, 2007; 106.
53. Available from: https://www.google.com/url?sa=i&url=https%3A%2F%2Fbudsnblush.com%2Fproducts%2Fraat-rani-extremely-fragrant-plant&psig=AOvVaw1ogpWZN8azv8tiqp4SdoMQ&ust=1697556602364000&source=images&cd=vfe&opi=89978449&ved=0CA8QjRxqFwoTCMC56qTx-oEDFQAAAAAdAAAAABAI

54. Agrawal J, Pal A. Nyctanthes arbor-tristis Linn—a critical ethnopharmacological review. J Ethnopharmacol, 2013; 146(3): 645-58. doi: 10.1016/j.jep.2013.01.024, PMID 23376280.
55. Available from: https://www.google.com/imgres?imgurl=https%3A%2F%2Fi.ytimg.com%2Fvi%2FpH9fCF9ygDs%2Fhqdefault.jpg&tbnid=CzVw0MY4dI7IUM&vet=1&imgrefurl=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3DpH9fCF9ygDs&docid=YZcpNdcdsvAsTM&w=480&h=360&itg=1&source=sh%2Fx%2Fim%2Fm5%2F2&shem=uvafe2
56. Dhungana P, Devi P, Borthakur S. Pharmaceutical properties of Indian species of Ficus Linn. Int J Pharm Life Sci., 2013; 4(1). Available from: https://images.app.goo.gl/Vxy6zfZA9FqgFKvF9
57. Al-Shamma A, Drake S, Flynn DL, Mitscher LA, Park YH, Rao GS et al.. Antimicrobial agents from higher plants. Antimicrobial agents from Peganum harmala seeds. J Nat Prod, 1981; 44(6): 745-7. doi: 10.1021/np50018a025, PMID 7334386.
58. Available from: https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.ehow.com%2Fhow_7820966_tell-real-lavender-oil-fake.html&psig=AOvVaw1Fov3Vv5l2bifPPD7Gcpid&ust=1697556822988000&source=images&cd=vfe&opi=89978449&ved=0CA8QjRxqFwoTCMiQhZTy-oEDFQAAAAAdAAAAABAD2851451585997.html&docid=xc_hFTHLLq06vM&w=1536&h=1536&source=sh%2Fx%2Fim%2Fm5%2F2
59. Silva GL, Luft C, Lunardelli A, Amaral RH, Melo DA, Donadio MV, et al. Antioxidant, analgesic and anti-inflammatory effects of lavender essential oil. An Acad Bras Cienc, 2015; 87(2): 1397-408. doi: 10.1590/0001-3765201520150056, PMID 26247152. Google Scholar.
60. Available from: https://www.google.com/imgres?imgurl=http%3A%2F%2F5.imimg.com%2Fdata5%2FSELLER%2FDefault%2F2023%2F6%2F316483235%2FMA%2FZH%2FBQ%2F24745952%2Flavender-essential-oil.jpg&tbnid=v_hDzInNS5I_aM&vet=1&imgrefurl=https%3A%2F%2Fwww.indiamart.com%2Fproddetail%2Flavender-essential-oil-
61. Rajamanickam E, Gurudeeban S, Ramanathan T, Satyavani K. Evaluation of anti inflammatory activity of Citrullus colocynthis. Int J Curr Res, 2010; 2: 67-9.
62. Delazar A, Gibbons S, Kosari AR, Nazemiyeh H. Modarresi M. A. S. O. U. D. Nahar L.U. T. F. U. N., et al. Flavone C. Glycosides and cucurbitacin glycosides from Citrullus colocynthis. Daru, 2006; 14(3): 109-14.

63. Available from: https://images.app.goo.gl/wBKR7xfyi7B8Ubxe7
64. Brown JH, Mackey HK, Riggilo DA. A novel in vitro assay for anti-inflammatory agents based on stabilization of erythrocytes. Proc Soc Exp Biol Med., 1967; 125(3): 837-43. doi: 10.3181/00379727-125-32219, PMID 15938280.
65. Available from: https://images.app.goo.gl/2ENdb4HQeF1e7jXa8
66. M. C. V. Rizzo and D. Solé. Inhaled Corticosteroids Treat Respir Allergy Saf VS Effic Jornal de Pediatria 82., 2006; 5: S198-$ 205.
67. Loewen PS. Review of the selective COX–2 inhibitors celecoxib and rofecoxib: focus on clinical aspects. Can J Emerg Med, 2002; 4(4): 268-75. doi: 10.1017/s1481803500007508, PMID 17608990.
68. Available from: https://www.google.com/imgres?imgurl=https%3A%2F%2Fthumbs.dreamstime.com%2Fb%2Fyellow-mahogany-bark-texture-13836807.jpg&tbnid=o0ymVQLJBK0CfM&vet=1&imgrefurl=https%3A%2F%2Fwww.dreamstime.com%2Fphotos-images%2Fmahogany-bark.html&docid=SyB5jKrDJ1--MM&w=600&h=900&itg=1&source=sh%2Fx%2Fim%2Fm5%2F2
69. Ayyanar M, Subash-Babu P. Syzygium cumini (L.) Skeels: a review of its phytochemical constituents and traditional uses. Asian Pac J Trop Biomed, 2012; 2(3): 240-6. doi: 10.1016/S2221-1691(12)60050-1.
70. Available from: https://images.app.goo.gl/htSfxJpdBUYGqmTG8
71. Patil RB, Nanjwade BK, Manvi FV. Effect of Sesbania grandiflora and Sesbania sesban Bark on carrageenan induced acute inflammation and adjuvant-induced arthritis in rats. Pharm Sci Monitor: An Int J Pharmaceut Sci., 2010; 1: 75-89.
72. Ekambaram S, Perumal SS, Subramanian V. Evaluation of antiarthritic activity of Strychnos potatorum Linn seeds in Freund's adjuvant induced arthritic rat model. BMC Complement Altern Med, 2010; 10: 1-9.
73. Available from: https://images.app.goo.gl/ro2LHyRPv9mBAPoa8
74. Nadkarni KM, Nadkarni AK. Indian materia medica. 3rd ed. Vol. I. Bombay: Popular Prakashan, 2007.
75. The wealth of India. A dictionary of Indian raw materials and industrial products (raw materials). Vol. III (D–E). New Delhi: Central Institute of Medicinal and Aromatic Plants, 2003; 226-8.