



SOME COMMONLY USED ANTI-INFLAMMATORY PLANTS AND THEIR ADMINISTRATION

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ABSTRACT

Medicinal plants are used traditionally all around the world as source of medicines. These are being used since centuries for flavoring and conserving food, to cure health disorders and to prevent diseases including epidemics. In humans, the immune system of humans gets activated when it recognizes anything that is foreign that may be a chemical, an invading microbe or plant pollen and this may cause inflammation. In this paper, some plants have been discussed which have anti-inflammatory properties which are clinically proven. Also, their administration in the humans has also been reviewed.

KEY WORDS

Medicinal Plants, Microbe, Diseases, Inflammation.

INTRODUCTION

Medicinal plants are used since centuries for prevention and treatment of diseases. In almost every country of the world, use of herbal medicines is based on their magical or religious beliefs, or popular experiences [1]. The references of medicinal plants in the ancient scripts date back to more than 5000 years in India, China and Egypt and at least 2500 years in Greece and Central Asia [2]. Medicinal plants are constantly acting as an overall indicator of ecosystem health [3]. There are various factors on which the results of any traditional treatment depends whether it is in experimental or clinical settings. These factors may include the beliefs or knowledge or practical abilities of the doctor, cultural differences in the acceptability of the treatment, the patient doctor mutual understanding and differences in access to other simultaneous treatments [4]. The word Inflammation is derived from Latin word *inflammatio* meaning action of setting ablaze. In humans, the immune system of humans gets activated when it recognizes anything that is foreign that may be a chemical, a pathogen, an invading microbe or plant pollen and this may cause

inflammation [5]. Inflammation is a protective response which may involve immune cells, blood vessels and molecular mediators. Inflammation is accumulation of fluid and leukocytes in extra vascular tissues. Inflammation destroys, dilutes or walls off the injurious agent and initiates the repair process. Inflammation can be beneficial sometimes e.g. if somebody's knee sustains a blow and tissues require protection and care. But in some cases, it may persist for longer time than required which may cause more harm than benefit. Inflammation may be potentially harmful and may lead to chronic diseases like arthritis, atherosclerosis, disfiguring scars, visceral adhesions, allergies, cardiovascular dysfunctions, metabolic syndrome, cancer, and autoimmune diseases [6]. There is an increased use of medicines like steroids, non-steroid anti-inflammatory Drugs (NSAIDs) and immunosuppressant to control or suppress inflammation but these medicines have severe adverse effects. So, there is a need to use plants having natural anti-inflammatory effects to achieve increased pharmacological response and the lowering adverse effects [7]. This review focuses on the plants which have anti-inflammatory effects naturally and their

administration on humans with available clinical evidences.

1. *Curcuma longa* (Turmeric)

Curcuma longa commonly known as turmeric is an herbaceous perennial plant with underground rhizome. It belongs to zingibericeae family [8]. It has been used traditionally for medicinal uses in Ayurvedic and Unani systems in South Asia since centuries.



The active ingredient in *Curcuma longa* is curcumin. Curcumin is also known as diferuloylmethane. Curcumin is a natural polyphenol found in the rhizome of *Curcuma longa* [9]. Curcumin has powerful anti-inflammatory effects and is a very strong antioxidant. It has been found that pure turmeric powder contains the highest curcumin concentration, averaging 3.14% by weight [10]. Some recent studies on turmeric are based on turmeric extracts having curcumin itself, with dosages usually exceeding 1 gram per day. But practically, It seems difficult to reach these levels just using the turmeric spice in your foods. Further it is also found that curcumin is poorly absorbed into the bloodstream. But if black pepper is consumed with it, which contains piperine naturally, the absorption of curcumin is increased by 2,000% [11]. It has been observed that piperine enhances the serum concentration, extent of absorption and bioavailability of curcumin. It has been observed that following curcumin supplementation, there is a significant decrease in serum cytokine concentrations in patients with metabolic syndrome. It has been shown that Curcumin block NF- κ B activation increased by several different inflammatory stimuli [12]. Also, turmeric exerts its anti-inflammatory activity by inhibition of a number of different molecules which play a role in inflammation [13]. Monocyte chemotactic protein-1 (MCP-1) is one of the key chemokines that regulate migration and tissue infiltration of monocyte. It has been observed that MCP-1 has role in several inflammatory diseases. This makes MCP-1 as an important target for anti-inflammatory treatments. In vitro studies have shown that curcumin can decrease MCP-1 production in various cell lines [14].

Osteoarthritis is a degenerative disease of the joint affecting aging populations worldwide. It has an underlying inflammatory cause. Therefore, medicines with anti-inflammatory properties provide treatment for osteoarthritis. It has been observed that the patients with osteoarthritis showed improvement in pain, physical function, and quality of life after taking curcumin [15].

2. *Piper nigrum* (Black Pepper)

Piper nigrum (Black Pepper) is one of the most commonly used spices. *Piper nigrum* belongs to the family Piperaceae. *Piper nigrum* is native to Southern India and is extensively cultivated in this tropical region. *Piper nigrum* is the commonly used herbs in Ayurvedic medicine system for centuries.



The reference of black pepper use for medicinal purposes can be found in ancient Sanskrit literature [16]. The pungency and irritant action of black pepper or its sharp and stinging qualities are because of the alkaloid compound piperine present in it [17, 18]. A lot of research has been done in recent times for studying anti-inflammatory properties of black pepper. It has been observed that Piperine or 1-peperoyl piperidine isolated from *Piper nigrum* acted significantly on early acute changes in inflammatory processes [19]. The anti-inflammatory property of piperine has been observed during in vitro tests on interleukin 1 β (IL1 β)-stimulated fibroblast-like synoviocytes which are derived from patients suffering from rheumatoid arthritis. The anti inflammatory effects in an arthritis animal model has been observed [20]. The research for effects of black pepper on inflammation in rat model with cerebral ischemia shows that Dichloromethane fraction exhibited anti-inflammatory activity by suppressing expression or production of IL-1, IL-6, and TNF as Piperine is a major component of dichloromethane fraction [21]. The in vivo acute and chronic models of inflammation have been assessed for piperine action. It has been found that anti-inflammatory piperine action

was significantly manifested during acute inflammation at early stages [22]. Also, the effect of piperine has been assessed on solid tumor development. It has been observed that piperine increased total leukocyte number at the tumor site [23]. In Okinawa island of Japan known as "The Land of Immortals", people daily use golden milk using the natural ingredients like ginger, turmeric, cinnamon, and black pepper. This may explain the fact that people of Okinawa have one of the world's longest average life spans of 81.2 years. Also, Okinawans have extremely low rates of heart disease, cancer, and dementia.

3. *Zingiber officinale* (Ginger)

Ginger is one of the healthiest spices on this planet earth. Ginger is a flowering plant which originated in China. Ginger belongs to the *Zingiberaceae* family. Its rhizome is often called ginger root, or simply ginger is the part commonly used as a spice.



Ginger has been used traditionally to help digestion, reduce nausea and help fight the flu and common cold. The bioactive compound in ginger is Gingerol which is responsible for much of its medicinal properties. It has powerful anti-inflammatory and antioxidant effects [24]. It is found that there is a significant increase in oxygenation of arachidonic acid during inflammation which leads to the production of prostaglandins and leukotrienes. It has been observed that the patients with rheumatoid arthritis, osteoarthritis and muscular discomfort experienced relief in pain and swelling after consuming powdered ginger [25]. In many surgical conditions, macrophages produce pro-inflammatory cytokines. 6-gingerol is one of the active ingredients of ginger which has anti-inflammatory properties. 6-gingerol inhibits macrophage activation especially it inhibits pro-inflammatory cytokines and antigen [26]. The discovery of ginger's inhibitory effects on prostaglandin identified ginger as an herbal medicine which has same pharmacological properties with non-steroidal anti-inflammatory drugs [27].

4. *Boswellia serrata* (Salai)

Boswellia serrata commonly known as Salai or Salai guggul belongs to family Burseraceae. It is a branching tree growing in dry mountainous regions of India and Arabia [28]. *Boswellia serrata* plant produces Indian frankincense which refers to a resin or "sap" that seeps from openings in the bark of several *Boswellia* species, including *Boswellia serrata*, *Boswellia carterii*, and *Boswellia frereana*.



The medicinal properties of *Boswellia serrata* are widely recognized, especially for the treatment of inflammatory conditions [29]. It has been observed that the patients with Osteoarthritis (Sandhigata vata) which is a degenerative joint disease show symptomatic improvement when administered with 500 mg capsule of *Shallaki*, 6 g per day with lukewarm water or capsule *Shallaki* as above along with local application of *Shallaki* ointment on the affected joints. Patients' mobility was improved significantly in both the case which indicates the efficacy of *Shallaki*. Reduction in serum triglycerides was seen in both the groups, which confirms that *Shallaki* has hypolipidemic effect [30]. Further it has been observed that the different formulations i.e. either dry or hydroenzymatic extracts from the same botanical species show different biological effects on endothelial cells. The anti-inflammatory activity of *Boswellia serrata* extracts on endothelial cells show a potential pharmaceutical application for cardiovascular health. But cytotoxicity or proliferative stimulation can occur instead of a protective effect which depend on its dose and formulation [31].

5. *Salvia officinalis* (Sage)

Salvia officinalis (Sage) is a shrub of *Lamiaceae* family. The largest genus of family *Lamiaceae* is *Salvia* which includes almost 900 species [32]. Sage has flavoring and seasoning values, so it is being used in preparation of many foods throughout the world. Sage is largely used either as dried leaves or essential oil as a savory food flavoring [33]. It is one of the oldest plants having medicinal value. The word *Salvia officinalis* is derived from the Latin word *salvare* means to save and *officinalis* means medicinal. In Asia and Latin America, it has been used traditionally for the treatment of ulcers, gout, rheumatism, inflammation, dizziness, tremor, paralysis, diarrhea, and hyperglycemia [34].



The effects of sage hydroalcoholic extract and sage essential oil on the inflammatory response has been studied using an experimental model of acute inflammation and a leukocyte migration assay. It is observed that sage hydroalcoholic extract exerts a topical anti-inflammatory effect by significantly inhibiting croton oil-induced ear edema. Sage essential oil inhibit leukocyte chemotaxis induced by casein and reduced the number of rolling, adhesion, and leukocytes migration to spermatic fascia after inflammatory stimulus [35]. It is found that *Salvia officinalis* contains α -Thujone, camphor and 1, 8-cineole as the major components of the oil. The results of the anti-inflammatory tests on these essential oils using murine macrophages indicate that these oils help in reducing nitric oxide and nuclear kappa B production in RAW 264.7 cells [36].

CONCLUSION

People need plants for medicine, in addition to the need of oxygen, food and forage. Medicinal plants are being used traditionally all around the world as source of medicines. These are being used since centuries for flavoring and conserving food, to cure health disorders and to prevent diseases including epidemics. There is an

extensive research on the plants having anti-inflammatory properties. The extracts or pure compounds of herbs open new venues for therapeutic interventions. Taking herbs as anti-inflammatory medicine is a safe strategy to treat chronic inflammatory conditions. There is an increased use of medicines like steroids, non-steroid anti-inflammatory Drugs (NSAIDs) and immunosuppressant to control or suppress inflammation but these medicines have severe adverse effects. So, there is a need to use herbs having natural anti-inflammatory effects to achieve increased pharmacological response and the lowering adverse effects.

REFERENCES

- [1] "Herbal Medicine Today: Clinical and Research Issues", Evid Based Complement Alternat Med., 2007 Sep; 4(Suppl 1): 37–40, doi: 10.1093/ecam/nem096.
- [2] Ang-Lee M.K., Moss J, Yuan C.S., "Herbal medicines and perioperative care", JAMA. 2001;286(2):208-216.
- [3] Singh JS. The biodiversity crisis: A multifaceted review. Curr Sci. 2002;82(6):638-47.
- [4] Cardini F, Wade C, Regalia AL, Gui S, Li W, Raschetti R, Kronenberg F., "Clinical research in traditional medicine: priorities and methods", Evid Based Complement Alternat Med. 2007 Sep; 4(Suppl 1): 37–40, doi: 10.1093/ecam/nem096
- [5] Ferrero Miliani L.,Nielsen O.H., Andersen P.S., Girardin S.E.,Nielsen, Andersen,Girardin (February 2007), "Chronic inflammation: importance of NOD2 and NALP3 in interleukin-1beta generation", Clin. Exp. Immunol. 147 (2), doi:10.1111/j.1365-2249.2006.03261.
- [6] A. S. Bagad, J.A. Joseph, N. Bhaskaran, and A.Agarwal, "Comparative evaluation of anti-inflammatory activity of curcuminoids, turmerones, and aqueous extract of *Curcuma longa*," *Advances in Pharmacological Sciences*, vol. 2013, Article ID 805756, 7 pages, 2013.
- [7] M. Ghasemian and M. B. Owlia, "A different look at pulsed glucocorticoid protocols; is high dose oral prednisolone really necessary just after initiation of pulse therapy?" *Journal of Case Reports in Practice*, vol. 3, no. 1, pp. 1–3, 2015.
- [8] Priyadarsini K.I., "The chemistry of curcumin: From extraction to therapeutic agent", *Molecules*. 2014; 19:20091–20112. doi: 10.3390/molecules191220091.

- [9] Aggarwal B.B., Kumar A., Bharti A.C. Anticancer potential of curcumin: Preclinical and clinical studies. *Anticancer Res.* 2003; 23:363–398.
- [10] Tayyem RF, Heath DD, Al-Delaimy WK, Rock CL, "Curcumin content of turmeric and curry powders", *Nutr Cancer.* 2006;55(2): 126-31.DOI: 10.1207/s15327914nc5502_2
- [11] Shoba G, Joy D, Joseph T, Majeed M, Rajendran R, Srinivas PS, "Influence of piperine on the pharmacokinetics of curcumin in animals and human volunteers", *Planta Med.* 1998 May;64(4):353-6.
- [12] Yunes Panahia , Mahboobeh Sadat Hosseiniab , Nahid Khalilib , Effat Naimib , Luis E. Simental-Mendíac , Muhammed Majeedd , Amirhossein Sahebkar, "Effects of curcumin on serum cytokine concentrations in subjects with metabolic syndrome: A post-hoc analysis of a randomized controlled trial", *Biomedicine & Pharmacotherapy* 82 (2016) 578–582 <http://dx.doi.org/10.1016/j.biopha.2016.05.037>
- [13] Chainani-Wu N. "Safety and anti-inflammatory activity of curcumin: a component of tumeric (*Curcuma longa*)", *J Altern Complement Med.* 2003 Feb;9(1):161-8
- [14] Karimian MS, Pirro M, Majeed M, Sahebkar A, "Curcumin as a natural regulator of monocyte chemoattractant protein-1", *Cytokine Growth Factor Rev.* 2017 Feb;33:55-63. doi: 10.1016/j.cytogfr.2016.10.001. Epub 2016 Oct 8.
- [15] Chin KY, "The spice for joint inflammation: anti-inflammatory role of curcumin in treating osteoarthritis", *Drug Des Devel Ther.* 2016 Sep 20; 10:3029-3042. eCollection 2016. DOI: 10.2147/DDDT.S117432
- [16] Keith Singletary, "Black Pepper Overview of Health Benefits", *Nutrition Today*, Volume 45 Number 1 January/February, 2010
- [17] Govindarajan VS (1977), "Pepper - Chemistry, technology & quality evaluation" *Crit. Rev. Food Sci. Nutr.* 9: 115–225.
- [18] Musenga A, Mandrioli R, Ferranti A, D'Orazio G, Fanali S, Raggi M., "Analysis of aromatic and terpenic constituents of pepper extracts by capillary electrochromatography.", *J Sep Sci.* 2007;30:612Y619.
- [19] Mujumdar AM, Dhuley JN, Deshmukh VK, Raman PH, Naik SR, "Anti-inflammatory activity of piperine", *Jpn J Med Sci Biol.* 1990 Jun;43(3):95-100. PMID:2283727
- [20] Jun Soo Bang, Da Hee Oh, Hyun Mi Choi, Bong-Jun Sur, Sung-Jig Lim, Jung Yeon Kim, Hyung-In Yang, MyungChul Yoo, Dae-Hyun Hahm and KyoungSoo Kim, "Anti-inflammatory and antiarthritic effects of piperine in human interleukin 1 β -stimulated fibroblast-like synoviocytes and in rat arthritis models", *Arthritis Research & Therapy* 2009, 11:R49 (doi:10.1186/ar2662)
- [21] Bing Wang, Yuanbin Zhanga, Jun Huang, Lin Donga, Tingting Li, XueyanFua, "Anti-inflammatory activity and chemical composition of dichloromethane extract from *Piper nigrum* and *P. longum* on permanent focal cerebral ischemia injury in rats", *Revista Brasileira de Farmacognosia* 27 (2017) 369–374, <http://dx.doi.org/10.1016/j.bjp.2017.02.003> 0102-695X
- [22] Mujumdar AM, Dhuley JN, Deshmukh VK, Raman PH, Naik SR (1990), "Anti-inflammatory activity of piperine", *Jpn. J. Med. Sci. Biol.* 43:95- 100
- [23] Sunila ES, Kuttan G (2004), "Immunomodulatory and antitumor activity of *Piper longum* Linn. and piperine", *J. Ethnopharmacol.* 90:339-346
- [24] Wang S, Zhang C, Yang G, Yang Y, "Biological properties of 6-gingerol: a brief review", *Nat Prod Commun.* 2014 Jul;9(7):1027-30
- [25] Srivastava KC, Mustafa T, "Ginger (*Zingiber officinale*) in rheumatism and musculoskeletal disorders", *Med Hypotheses* 1992 Dec;39(4):342-8.
- [26] Tripathi S, Maier KG, Bruch D, Kittur DS, "Effect of 6 - gingerol on pro-inflammatory cytokine production and costimulatory molecule expression in murine peritoneal macrophages", *J Surg Res* 2007; 138:209-213.
- [27] Grzanna R, Lindmark L, Frondoza CG, "Ginger- an herbal medicinal product with broad anti-inflammatory actions", *J Med Food*, 2005 Summer;8(2):125-32. DOI: 10.1089/jmf.2005.8.125
- [28] Ammon, HP (2010). "Modulation of the immune system by *Boswellia serrata* extracts and boswellic acids". *Phytomedicine.* 17 (11): 862–7. doi: 10.1016/j.phymed.2010.03.003.
- [29] Siddiqui, M. Z. (May 2011), "Boswellia serrata, a potential antiinflammatory agent: an overview", *Indian Journal of Pharmaceutical Sciences.* 73 (3): 255–261. doi:10.4103/0250-474X.93507
- [30] P. K. Gupta, S. M. S. Samarakoon, H. M. Chandola and B. Ravishankar, "Clinical evaluation of *Boswellia serrata* (*Shallaki*) resin in the management of Sandhivata (osteoarthritis)" *Ayu.* 2011 Oct-Dec; 32(4): 478–482. doi: 10.4103/0974-8520.96119
- [31] Martina Bertocchi, Gloria Isani, Federica Medici, Giulia Andreani, Irvin Tubon Usca, Paola Roncada, Monica Forni, and Chiara Bernardini, "Anti-Inflammatory Activity of *Boswellia serrata* Extracts: An *In Vitro* Study on Porcine Aortic Endothelial Cells", *Oxid Med Cell Longev* 2018; 2018: 2504305. doi: 10.1155/2018/2504305
- [32] Bisset N.G., Wichtl M. 2nd ed. CRC Press; Boca Raton, FL: 2001. *Herbal Drugs and Phytopharmaceuticals: A Handbook for Practice on a Scientific Basis with Reference to German Commission E Monographs*; pp. 440–443.
- [33] N. B. Perry, R. E. Anderson, N. J. Brennan et al., "Essential oils from Dalmatian sage (*Salvia officinalis* L.): variations among individuals, plant parts, seasons, and sites,"

Journal of Agricultural and Food Chemistry, vol. 47, no. 5, pp. 2048–2054, 1999.

- [34] 5. Garcia C.S.C., Menti C., Lambert A.P.F. Pharmacological perspectives from Brazilian *Salvia officinalis* (Lamiaceae): antioxidant, and antitumor in mammalian cells. An Acad Bras Ciênc. 2016; 88:281–292.
- [35] Gessilda Alcantara Nogueira de Melo et. al., “Anti-inflammatory activity of *Salvia officinalis* L.” Journal of

Medicinal Plants Research Vol. 6(35), pp. 4934-4939, DOI: 10.5897/JMPR12.251

- [36] Alev Tosun et. al., “Essential Oil Composition and Anti-Inflammatory Activity of *Salvia officinalis* L (Lamiaceae) in Murin Macrophages”, Tropical Journal of Pharmaceutical Research June 2014; 13 (6): 937-942

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