



## Essential Oil Studies For Musculoskeletal Pain

### Antinociceptive Effects

[Planta Med.](#) 2009 Apr;75(5):508-11. doi: 10.1055/s-0029-1185319. Epub 2009 Jan 30.  
**Antinociceptive effect and GC/MS analysis of Rosmarinus officinalis L. essential oil from its aerial parts.**

[Martínez AL](#)<sup>1</sup>, [González-Trujano ME](#), [Pellicer F](#), [López-Muñoz FJ](#), [Navarrete A](#).

#### Abstract

The rationale of this investigation was to examine the antinociceptive properties of the essential oil obtained from Rosmarinus officinalis aerial parts, using a rat model of arthritic pain. The essential oil (100, 300 and 600 mg/kg, I. P.) produced a dose-dependent antinociceptive effect, manifested as a significant reduction in the dysfunction in the pain-induced functional impairment model in the rat (PIFIR model), mainly at high doses. Chemical constituents of the essential oil were further analyzed by gas chromatography-mass spectrometry (GC/MS). The major compounds in the essential oil were alpha-pinene (14.10 %), camphene (11.47 %), beta-pinene (12.02 %), myrcene (3.31 %), alpha-phellandrene (7.87 %), eucalyptol (8.58 %), 2-bornanone (3.42 %), camphor (8.75 %), isoborneol (3.48 %), borneol (4.85 %) and borneol acetate (6.49 %). The antinociceptive effects of R. officinalis essential oil were tested in combination with 0.12 mg/kg WAY100635, s. c. (an antagonist of 5-HT(1A) receptors) or 1 mg/kg naloxone, i. p. (an antagonist of endogenous opioids receptors), demonstrating in both cases an inhibition of the antinociceptive response. This study suggests an involvement, at least in part, of the serotonergic system via 5-HT(1A) receptors and endogenous opioids in the antinociceptive effect of R. officinalis essential oil in the PIFIR model.

### Neuropathic Pain

[Mini Rev Med Chem.](#) 2016;16(9):721-8.

**Rational Basis for the Use of Bergamot Essential Oil in Complementary Medicine to Treat Chronic Pain.**

[Rombolà L](#)<sup>1</sup>, [Amantea D](#), [Russo R](#), [Adornetto A](#), [Berliocchi L](#), [Tridico L](#), [Corasaniti MT](#), [Sakurada S](#), [Sakurada T](#), [Bagetta G](#), [Morrone LA](#).

#### Abstract

In complementary medicine, aromatherapy uses essential oils to improve agitation and aggression observed in dementia, mood, depression, anxiety and chronic pain. Preclinical research studies have reported that the essential oil obtained from bergamot (BEO) fruit (Citrus bergamia, Risso) modifies normal and pathological synaptic plasticity implicated, for instance, in nociceptive and neuropathic pain. Interestingly, recent results indicated that BEO modulates sensitive perception of pain in different models of nociceptive, inflammatory and neuropathic pain modulating endogenous systems. Thus, local

administration of BEO inhibited the nociceptive behavioral effect induced by intraplantar injection of capsaicin or formalin in mice. Similar effects were observed with linalool and linalyl acetate, major volatile components of the phytocomplex. Pharmacological studies showed that the latter effects are reversed by local or systemic pretreatment with the opioid antagonist naloxone hydrochloride alike with naloxone methiodide, high affinity peripheral  $\mu$ -opioid receptor antagonist. These results and the synergistic effect observed following systemic or intrathecal injection of an inactive dose of morphine with BEO or linalool indicated an activation of peripheral opioid system. Recently, in neuropathic pain models systemic or local administration of BEO or linalool induced antiallodynic effects. In particular, in partial sciatic nerve ligation (PSNL) model, intraplantar injection of the phytocomplex or linalool in the ipsilateral hindpaw, but not in the contralateral, reduced PSNL-induced extracellular signal-regulated kinase (ERK) activation and mechanical allodynia. In neuropathic pain high doses of morphine are needed to reduce pain. Interestingly, combination of inactive doses of BEO or linalool with a low dose of morphine induced antiallodynic effects in mice. Peripheral cannabinoid and opioid systems appear to be involved in the antinociception produced by intraplantar injection of  $\beta$ -caryophyllene, present in different essential oils including BEO. The data gathered so far indicate that the essential oil of bergamot is endowed with antinociceptive and antiallodynic effects and contribute to form the rational basis for rigorous testing of its efficacy in complementary medicine.

[Planta Med.](#) 2016 Feb;82(3):211-6. doi: 10.1055/s-0035-1558165. Epub 2015 Nov 19.

### **Ocimum gratissimum Essential Oil and Its Isolated Compounds (Eugenol and Myrcene) Reduce Neuropathic Pain in Mice.**

[Paula-Freire LI](#)<sup>1</sup>, [Molska GR](#)<sup>2</sup>, [Andersen ML](#)<sup>1</sup>, [Carlini EL](#)<sup>2</sup>.

#### **Abstract**

*Ocimum gratissimum* is used in popular medicine to treat painful diseases. The antihypernociceptive properties of *O. gratissimum* essential oil and two of its active components (eugenol and myrcene) were tested in a model of neuropathic pain induced by a chronic constriction injury of the sciatic nerve. In tests to determine chronic antinociception, adult male C57BL/6 J mice were treated orally with corn oil (control group), *O. gratissimum* essential oil at doses of 10, 20, or 40 mg/kg or eugenol or myrcene at doses of 1, 5, or 10 mg/kg for 14 days after surgery. Pregabalin (20 mg/kg) was used as a standard in this study. The treatment with 20 and 40 mg/kg of *O. gratissimum* essential oil and at doses of 5 and 10 mg/kg of the active components were able to promote antihypernociception in both mechanical (von Frey) and thermal (hot plate) tests. The treatment with the essential oil of the plant or eugenol was effective in reducing the levels of interleukin-1  $\beta$  in the sciatic nerve. Our findings demonstrate that *O. gratissimum* essential oil and its isolated active components possess antihypernociceptive activity in neuropathic pain models.

#### **Arthritis Pain**

[Biosci Biotechnol Biochem.](#) 2015;80(1):203-9. doi: 10.1080/09168451.2015.1075864. Epub 2015 Aug 19.

### **The effects of *Chamaecyparis obtusa* essential oil on pain-related behavior and expression of pro-inflammatory cytokines in carrageenan-induced arthritis in rats.**

[Suh HR](#)<sup>1</sup>, [Chung HJ](#)<sup>1</sup>, [Park EH](#)<sup>1</sup>, [Moon SW](#)<sup>1</sup>, [Park SJ](#)<sup>2</sup>, [Park CW](#)<sup>2</sup>, [Kim YI](#)<sup>1</sup>, [Han HC](#)<sup>1</sup>.

#### **Abstract**

*Chamaecyparis obtusa* essential oil (COE) has been widely used to treat allergic diseases and was suggested to exert anti-inflammatory, antioxidant, and antimicrobial effects. This study evaluated the effects of COE on pain-related behavior and pro-inflammatory cytokines in rats with carrageenan (CGN)-induced arthritis. Reduced dynamic weight load on inflamed joint in voluntarily walking rats was used as the behavior test for arthritic pain; 10% COE-treated group was significantly attenuated pain (6-8 h post-CGN injection) compared to VEH (mineral oil)-treated group. In addition, the protein levels of interleukin (IL)-1  $\beta$ , tumor necrosis factor- $\alpha$ , IL-6 (6-8 h), and cyclooxygenase (COX)-2 (8 h) within the synovial membrane, as well as IL-1  $\beta$ , COX-2 (6-8 h), and IL-6 (5-7 h) within the meniscus, of 10% COE-treated group were significantly reduced. The current results implicate that COE has anti-inflammatory and anti-nociceptive effects on arthritis in rats.

[J Ethnopharmacol](#). 2011 Apr 26;135(1):126-34. doi: 10.1016/j.jep.2011.03.005. Epub 2011 Mar 9.

**Anti-inflammatory and anti-nociceptive effect of *Betula platyphylla* var. *japonica* in human interleukin-1  $\beta$ -stimulated fibroblast-like synoviocytes and in experimental animal models.**

[Huh JE<sup>1</sup>](#), [Hong JM](#), [Baek YH](#), [Lee JD](#), [Choi DY](#), [Park DS](#).

**Abstract**

**ETHNOPHARMACOLOGICAL RELEVANCE:**

Traditional medicine has widely been used *Betula platyphylla* var. *japonica* to treat various inflammatory diseases including arthritis.

**AIM OF THE STUDY:**

To determine the anti-inflammatory, anti-nociceptive, and anti-arthritic effects of *Betula platyphylla* in interleukin-1  $\beta$  (IL-1  $\beta$ )-stimulated fibroblast-like synoviocytes from human rheumatoid arthritis and in nociceptive and inflammatory animal model.

**MATERIALS AND METHODS:**

The inflammatory mediators such as IL-6, tumor necrosis factor (TNF)- $\alpha$  matrix metalloproteinase (MMP)-1, MMP-13, inducible nitric oxide synthesis (iNOS), nitrites, prostaglandin E(2) (PGE(2)) and cyclo-oxygenase 2 (COX-2) activity of *Betula platyphylla* were tested in IL-1  $\beta$ -stimulated fibroblast-like synoviocytes. Tail withdrawal in response to thermal stimulation in tail flick test or paw flinching and shaking in response to sc hind paw formalin injection was measured 1h after oral administration of *Betula platyphylla*. The former was evaluated with a paw pressure test, and the latter was measured using the squeaking score, and paw volume in inflammatory arthritis tests.

**RESULTS:**

*Betula platyphylla* significantly inhibited proliferation of IL-1  $\beta$ -induced synoviocytes. *Betula platyphylla* reduced the levels of inflammatory mediators, such as IL-6, TNF- $\alpha$ , MMP-1, MMP13, and PGE(2). In particular, *Betula platyphylla* significantly inhibited the releases of nitrites and iNOS, as well as release of NF  $\kappa$  B, into the nucleus of IL-1  $\beta$ -treated synoviocytes, even at concentrations as low as 1 $\mu$ g/ml. Oral administrant of *Betula platyphylla* at 400mg/kg significantly decreased about 27.8% of tail flick withdrawal and inhibited about the number of paw flinches in both phases 1 and 2 of the formalin test. In the carrageenan-induced acute pain and arthritis model, *Betula platyphylla* dose dependently reduced the nociceptive threshold and the arthritic symptoms at day 8, respectively, and *Betula platyphylla* at 400mg/kg markedly reduced the inflammatory area about 48% in the ankle joints. This capacity of *Betula platyphylla* at 400mg/kg was similar to that of the celecoxib-2 inhibitor in carrageenan-induced nociceptive and inflammatory arthritis model.

## CONCLUSIONS:

These results suggest that *Betula platyphylla* has anti-nociceptive and anti-inflammatory effects in IL-1  $\beta$  -stimulated RA FLS and in an animal model of arthritis. Thus, the use of *Betula platyphylla* as a pharmaceutical candidate for the treatment of arthritis should be further studied.

[Am J Chin Med.](#) 2013;41(4):913-26. doi: 10.1142/S0192415X13500614.

### **Anti-inflammatory activity of *Ocimum americanum* L. essential oil in experimental model of zymosan-induced arthritis.**

[Yamada AN<sup>1</sup>](#), [Grespan R](#), [Yamada ÁT](#), [Silva EL](#), [Silva-Filho SE](#), [Damião MJ](#), [de Oliveira Dalalio MM](#), [Bersani-Amado CA](#), [Cuman RK](#).

#### **Abstract**

Essential oils are potential sources of novel components for medicinal use. The present study was performed to investigate the composition and anti-inflammatory activity of *Ocimum americanum* L. essential oil (OEO) and its components in an experimental model of zymosan-induced arthritis and paw edema. The essential oil was obtained by hydro-distillation and analyzed by gas chromatography-mass spectrometry. Twenty-six components, representing 98.9% of the total oil, were characterized, with linalool (19.63%) and 1,8-cineole (17.27%) as the main components. The OEO and its two constituents inhibited leukocyte influx into the synovial space and reduced paw edema induced by zymosan. The OEO also inhibited interferon-  $\gamma$  levels but did not reduce transforming growth factor-  $\beta$  levels. Additionally, the OEO protected against leukocyte influx into the synovial membrane and cartilage destruction in knee joints in arthritic mice. These findings indicate that the essential oil of *Ocimum americanum* L. exerted significant anti-inflammatory effects, likely related to its main compounds.

[Phytother Res.](#) 2012 Jan;26(1):54-9. doi: 10.1002/ptr.3509. Epub 2011 May 5.

### **Topical dermal application of essential oils attenuates the severity of adjuvant arthritis in Lewis rats.**

[Komeh-Nkrumah SA<sup>1</sup>](#), [Nanjundaiah SM](#), [Rajaiah R](#), [Yu H](#), [Moudgil KD](#).

#### **Abstract**

This study was aimed at examining the effect of an ointment containing essential oils (EO) on the severity of adjuvant arthritis (AA), an experimental model of human rheumatoid arthritis (RA), in Lewis rats and to define the underlying mechanisms. At the onset of AA, the rats received topical application twice daily of an ointment containing 20% EO or placebo ointment. The synovial fluid (SF) and synovium-infiltrating cells (SIC) of rats were tested for pro-inflammatory cytokines TNF-  $\alpha$  and IL-1  $\beta$  . The hind paws and skin were examined histologically. The activity/level of matrix metalloproteinases (MMPs) and anti-mycobacterial heat-shock protein 65 (Bhsp65) antibodies were tested. Arthritic rats treated with ointment containing EO developed less severe clinical arthritis compared with the controls, and this activity was attributable to EO and not to the carrier oil. The levels of TNF-  $\alpha$  and IL-1  $\beta$  , and the activity of MMPs in SF and SIC-lysate were significantly reduced in EO-treated arthritic rats compared with the controls. However, the levels of anti-Bhsp65 antibodies were unaffected by treatment. Thus, topical dermal delivery of EO-containing ointment down-modulates the severity of AA in Lewis rats by inhibiting defined mediators of inflammation. Such ointments should be tested in patients with RA and other arthritic conditions.

[J Agric Food Chem.](#) 2010 Jan 27;58(2):842-9. doi: 10.1021/jf9027206.

### **Anti-arthritic effects and toxicity of the essential oils of turmeric (*Curcuma longa* L.).**

[Funk JL<sup>1</sup>](#), [Frye JB](#), [Oyarzo JN](#), [Zhang H](#), [Timmermann BN](#).

#### **Abstract**

Turmeric (*Curcuma longa* L., Zingiberaceae) rhizomes contain two classes of secondary metabolites, curcuminoids and the less well-studied essential oils. Having previously identified potent anti-arthritic effects of the curcuminoids in turmeric extracts in an animal model of rheumatoid arthritis (RA), studies were undertaken to determine whether the turmeric essential oils (TEO) were also joint protective using the same experimental model. Crude or refined TEO extracts dramatically inhibited joint swelling (90-100% inhibition) in female rats with streptococcal cell wall (SCW)-induced arthritis when extracts were administered via intraperitoneal injection to maximize uniform delivery. However, this anti-arthritic effect was accompanied by significant morbidity and mortality. Oral administration of a 20-fold higher dose TEO was nontoxic, but only mildly joint-protective (20% inhibition). These results do not support the isolated use of TEO for arthritis treatment but, instead, identify potential safety concerns in vertebrates exposed to TEO.

[J Nat Prod](#). 2009 Mar 27;72(3):403-7. doi: 10.1021/np8006183.

#### **Comparative effects of two gingerol-containing *Zingiber officinale* extracts on experimental rheumatoid arthritis.**

[Funk JL<sup>1</sup>](#), [Frye JB](#), [Oyarzo JN](#), [Timmermann BN](#).

#### **Abstract**

Ginger (*Zingiber officinale*) supplements are being promoted for arthritis treatment in western societies on the basis of ginger's traditional use as an anti-inflammatory in Chinese and Ayurvedic medicine. However, scientific evidence of ginger's antiarthritic effects is sparse, and its bioactive joint-protective components have not been identified. Therefore, the ability of a well-characterized crude ginger extract to inhibit joint swelling in an animal model of rheumatoid arthritis, streptococcal cell wall-induced arthritis, was compared to that of a fraction containing only gingerols and their derivatives. Both extracts were efficacious in preventing joint inflammation. However, the crude dichloromethane extract, which also contained essential oils and more polar compounds, was more efficacious (when normalized to gingerol content) in preventing both joint inflammation and destruction. In conclusion, these data document a very significant joint-protective effect of these ginger samples and suggest that nongingerol components are bioactive and can enhance the antiarthritic effects of the more widely studied gingerols.

[Phytother Res](#). 2007 Sep;21(9):895-7.

#### **Effects of thymoquinone (volatile oil of black cumin) on rheumatoid arthritis in rat models.**

[Tekeoglu I<sup>1</sup>](#), [Dogan A](#), [Ediz L](#), [Budancamanak M](#), [Demirel A](#).

#### **[Author information](#)**

#### **Abstract**

Many studies have been carried out in recent years on the pharmacological effects of *Nigella sativa* seeds that have uncovered their antiinflammatory and immunological effects. The objective of this study was to explore the antiinflammatory effects of thymoquinone on arthritis in rat models. Rats with arthritis induced by Freund's incomplete adjuvant were assigned to five groups: group 1: controls 0.9% NaCl (n = 7); group 2: 2.5 mg/kg thymoquinone (n = 7); group 3: 5 mg/kg thymoquinone (n = 7); group 4: Bacilli Chalmette Guerin (BCG) 6 x 10<sup>5</sup> CFU (n = 7); group 5: methotrexate 0.3 mg/kg (n = 7). Signs of inflammation on the claw and radiological signs were searched for and TNF-alpha and IL-1beta were measured. The results of the control and other groups were compared. As a

result, thymoquinone, confirmed clinically and radiologically, suppressed adjuvant-induced arthritis in rats.

[Taehan Kanho Hakhoe Chi](#). 2005 Feb;35(1):186-94.

**[The effects of aromatherapy on pain, depression, and life satisfaction of arthritis patients].**

[Article in Korean]

[Kim MJ](#)<sup>1</sup>, [Nam ES](#), [Paik SI](#).

**Abstract**

**PURPOSE:**

The purpose of this study was to investigate the effect of aromatherapy on pain, depression, and feelings of satisfaction in life of arthritis patients.

**METHOD:**

This study used a quasi-experimental design with a non-equivalent control group, pre-and post-test. The sample consisted of 40 patients, enrolled in the Rheumatics Center, Kangnam St. Mary's Hospital, South Korea. The essential oils used were lavender, marjoram, eucalyptus, rosemary, and peppermint blended in proportions of 2:1:2:1:1. They were mixed with a carrier oil composed of almond (45%), apricot(45%), and jojoba oil(10%) and they were diluted to 1.5% after blending. The data were analyzed using an 2-test, Fisher's exact test, t-test and paired t-test.

**RESULT:**

Aromatherapy significantly decreased both the pain score and the depression score of the experimental group compared with the control group. However, aromatherapy didn't increase the feeling of satisfaction in life of the experimental group compared with the control group.

**CONCLUSION:**

The result of this study clearly shows that aromatherapy has major effects on decreasing pain and depression levels. Based on our experiment's findings, we suggest that aromatherapy can be a useful nursing intervention for arthritis patients.

[Indian J Exp Biol](#). 2003 Aug;41(8):890-4.

**Phytochemical investigation and evaluation of anti-inflammatory and anti-arthritic activities of essential oil of *Strobilanthus ixiocephala* Benth.**

[Agarwal RB](#)<sup>1</sup>, [Rangari VD](#).

- <sup>1</sup>Department of Pharmacognosy, Bharati Vidyapeeth's Poona College of Pharmacy, Erandwane, Pune 411 038, India.

**Abstract**

Column chromatographic fractionation of essential oil obtained by hydrodistillation from the flowering tops of *S. ixiocephala* resulted in the isolation of beta-caryophyllene, fenchyl acetate, T-cadinol and a new sesquiterpene alcohol for which a name ixiocephol has been proposed. The beta-caryophyllene and fenchyl acetate were identified by Co-TLC with authentic samples whereas T-cadinol and ixiocephol were structurally elucidated by UV, IR, <sup>1</sup>H NMR, <sup>13</sup>C NMR and Mass spectral data. The GC-MS analysis of the essential oil has also revealed the presence of various monoterpenoids and sesquiterpenoids. The essential oil of *S. ixiocephala* demonstrated a dose dependant anti-inflammatory activity in carrageenan-induced rat paw oedema. It has also revealed good activity in cotton pellet granuloma and adjuvant induced arthritis model in rats.

[Hum Exp Toxicol](#). 2013 Apr;32(4):441-3. doi: 10.1177/0960327112457190. Epub 2012 Aug 23.

### **An unusual cause of factitious arthritis.**

[Süha T<sup>1</sup>](#), [Ali A](#), [Ozgen CG](#), [Ozgür T](#), [Yunus K](#).

#### **Abstract**

Septic arthritis and toxic synovitis are clinical conditions that can develop in association with various causes and involve symptoms such as pain, swelling, redness, sensitivity and restricted movement in the joint. A 42-year-old male presented to the emergency department with severe joint pain and nausea after injecting a 1-cc mixture of turpentine oil, eucalyptus oil, mint oil and thyme oil, which he purchased from an alternative medicine store, into his right knee with a syringe because of chronic knee pain. Ballottement and sensitivity were present at physical examination. Knee puncture yielded 60 cc of cloudy fluid. There was no growth in the material obtained. Improvement was observed following subsequent arthroscopic washing of the joint space and IV antibiotherapy, and the patient was discharged on day 21 of hospitalization with oral antibiotic and analgesic therapy. Intra-articular injection of foreign bodies into the knee joint space for therapeutic purposes, as in this case report, is a very rare occurrence, but may lead to potentially complicated arthritis.

#### **Knee Pain**

[Complement Ther Med](#). 2008 Jun;16(3):131-8. doi: 10.1016/j.ctim.2007.12.003. Epub 2008 Mar 4.

### **An experimental study on the effectiveness of massage with aromatic ginger and orange essential oil for moderate-to-severe knee pain among the elderly in Hong Kong.**

[Yip YB<sup>1</sup>](#), [Tam AC](#).

#### **Abstract**

##### **OBJECTIVES:**

To assess the efficacy of an aromatic essential oil (1% Zingiber officinale and 0.5% Citrus sinensis) massage among the elderly with moderate-to-severe knee pain.

##### **METHOD:**

Fifty-nine older persons were enrolled in a double-blind, placebo-controlled experimental study group from the Community Centre for Senior Citizens, Hong Kong. The intervention was six massage sessions with ginger and orange oil over a 3-week period. The placebo control group received the same massage intervention with olive oil only and the control group received no massage. Assessment was done at baseline, post 1-week and post 4 weeks after treatment. Changes from baseline to the end of treatment were assessed on knee pain intensity, stiffness level and physical functioning (by Western Ontario and McMaster Universities Osteoarthritis index) and quality of life (by SF-36).

##### **RESULTS:**

There were significant mean changes between the three time-points within the intervention group on three of the outcome measures: knee pain intensity ( $p=0.02$ ); stiffness level ( $p=0.03$ ); and enhancing physical function ( $p=0.04$ ) but these were not apparent with the between-groups comparison ( $p=0.48$ ,  $0.14$  and  $0.45$  respectively) 4 weeks after the massage. The improvement of physical function and pain were superior in the intervention group compared with both the placebo and the control group at post 1-week time (both  $p=0.03$ ) but not sustained at post 4 weeks ( $p=0.45$  and  $0.29$ ). The changes in quality of life were not statistically significant for all three groups.

##### **CONCLUSION:**

The aroma-massage therapy seems to have potential as an alternative method for short-term knee pain relief.

Arthritis [Rheum](#). 2001 Nov;44(11):2531-8.

### **Effects of a ginger extract on knee pain in patients with osteoarthritis.**

[Altman RD](#)<sup>1</sup>, [Marcussen KC](#).

#### **Abstract**

##### **OBJECTIVE:**

To evaluate the efficacy and safety of a standardized and highly concentrated extract of 2 ginger species, *Zingiber officinale* and *Alpinia galanga* (EV.EXT 77), in patients with osteoarthritis (OA) of the knee.

##### **METHODS:**

Two hundred sixty-one patients with OA of the knee and moderate-to-severe pain were enrolled in a randomized, double-blind, placebo-controlled, multicenter, parallel-group, 6-week study. After washout, patients received ginger extract or placebo twice daily, with acetaminophen allowed as rescue medication. The primary efficacy variable was the proportion of responders experiencing a reduction in "knee pain on standing," using an intent-to-treat analysis. A responder was defined by a reduction in pain of  $\geq 15$  mm on a visual analog scale.

##### **RESULTS:**

In the 247 evaluable patients, the percentage of responders experiencing a reduction in knee pain on standing was superior in the ginger extract group compared with the control group (63% versus 50%;  $P = 0.048$ ). Analysis of the secondary efficacy variables revealed a consistently greater response in the ginger extract group compared with the control group, when analyzing mean values: reduction in knee pain on standing (24.5 mm versus 16.4 mm;  $P = 0.005$ ), reduction in knee pain after walking 50 feet (15.1 mm versus 8.7 mm;  $P = 0.016$ ), and reduction in the Western Ontario and McMaster Universities osteoarthritis composite index (12.9 mm versus 9.0 mm;  $P = 0.087$ ). Change in global status and reduction in intake of rescue medication were numerically greater in the ginger extract group. Change in quality of life was equal in the 2 groups. Patients receiving ginger extract experienced more gastrointestinal (GI) adverse events than did the placebo group (59 patients versus 21 patients). GI adverse events were mostly mild.

##### **CONCLUSION:**

A highly purified and standardized ginger extract had a statistically significant effect on reducing symptoms of OA of the knee. This effect was moderate. There was a good safety profile, with mostly mild GI adverse events in the ginger extract group.

### **Antiinflammatory Drugs**

[Phytother Res](#). 2004 May;18(5):343-57.

### **Patented antiinflammatory plant drug development from traditional medicine.**

[Darshan S](#)<sup>1</sup>, [Doreswamy R](#).

#### **Abstract**

Patents secured on antiinflammatory plant drugs derived from 38 plants are reviewed. An attempt has been made to compare the modern and traditional use of plant drugs and to establish the relevance of folk claims in developing modern drugs. The role of plant botanicals such as polysaccharides, terpenes, curcuminoids, alkaloids, etc. in alleviating inflammatory diseases including arthritis, rheumatism, acne skin allergy and ulcers is highlighted. Chemicals that alleviate swelling are derived from plants including grape, boswellia, turmeric, devil's claw and some essential oils such as clove, eucalyptus, rosemary, lavender, mint, myrrh, millefolia and pine have been patented and used as mixed

formulations. Plants containing polysaccharides are the most potent in curing inflammatory diseases.