



# THERAPEUTIC POTENCY OF A SIDDHA POLYHERBAL FORMULATION *INJI CHOORANAM*: A REVIEW

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## ABSTRACT:

Siddha system of medicine is one of the ancient medical systems that treat the body and the mind. This system has a vast repository of internal and external preparations which are obtained from herbals, metals, minerals, and animal products. "*Inji chooranam*" is one of the Siddha *Sasthric* poly-herbal formulations containing 21 herbal ingredients. It is indicated for *Vadha* diseases in the Siddha *Sasthric* literature *Agathiyar Paripooranam* 400<sup>[1]</sup>. Osteoarthritis is the most prevalent form of arthritis, which is associated with the most significant public health burden, particularly in the geriatric population. This review is aimed to bring out scientific evidence for the therapeutic usage of "*Inji chooranam*" in *Azhal keel vayu* (Osteoarthritis) and focused on the pharmacological activities responsible for the therapeutic nature of the drug in *Azhal keel vayu* (Osteoarthritis). Most of the ingredients used for the preparation of *Inji chooranam* have anti-inflammatory, anti-oxidant, analgesic, and anti-arthritis activities. Hence justifying its usage in *Azhal keel vayu* management.

**KEYWORDS:** Siddha Medicine, *Inji chooranam*, *Azhal keel vayu*, Pharmacological activities.

## INTRODUCTION:

Siddha system of medicine is one of the traditional systems of medicine that treats the body and the mind. This system deals with *Vatham*, *Vaithiyam*, *Yogam*, and *Gnanam*. It is bestowed with specialties which are *Varmam* (Pressure manipulation therapy), *Yoga* and *Kayakarpam* (Rejuvenation therapy). According to the Siddha text "*Siddha Maruthuvam - Pothu*", *Azhal keel vayu* (Osteoarthritis) is considered one of the 10 types of *keel vayu*. As per Siddha, *Azhal keel vayu* (Osteoarthritis) is a joint disorder produced by stimulation of *Pitham* (by foods and activities) when *Vatham* is already deranged<sup>[2]</sup>.

"*Inji chooranam*" is Siddha Polyherbal formulation which is mentioned in Siddha *sasthric* text of *Agathiyar Paripooranam* 400<sup>[1]</sup>, which is indicated for *Azhal keel vayu* (Osteoarthritis). The major ingredient in this formulation is *Inji* (*Zingiber officinale*). It is a *Kayakarpam* (Rejuvenation) medicine that is effective in the management of geriatric problems like Osteoarthritis. This review focused on the pharmacological activities of each ingredient which supports the traditional claim. All the ingredients were purified as per the methods mentioned in Siddha literature. The ingredients were dried and powdered separately then mixed well together and preserved in a tightly closed container. The ingredients and chemical constituents are mentioned in table 1.

**Table 1: Ingredients of *inji chooranam* and chemical constituents:**

S. No	TAMIL NAME	BOTANICAL NAME	PARTS USED	QUANTITY	CHEMICAL CONSTITUENT <sup>[3]</sup>
1	<i>Inji</i>	<i>Zingiber officinale</i>	Rhizome	350 gm	gingerols (23-25%), shogaol (18-25%), zingiberene, $\beta$ -bisabolene, $\alpha$ -farnesene, $\beta$ -sesquiphellandrene, $\alpha$ -curcumene and paradols.
2	<i>Elam</i>	<i>Elettaria cardamomum</i>	Seeds	8.75 gm	1,8-cineole, $\alpha$ -terpinyl acetate, limonene, sabinene, $\alpha$ -terpineol, $\alpha$ -pinene, linalool, 4,8,12-trimethyl, 4,8-dimethyl, 1,2,7,11-tridecatetraene.
3	<i>Chukku</i>	<i>Zingiber officinale</i>	Rhizome	8.75 gm	camphene, phellandrene, zingiberene, cineol and borneol.
4	<i>Milagu</i>	<i>Piper nigrum</i>	Seeds	8.75 gm	Piperine, piperidine.
5	<i>Thippili</i>	<i>Piper longum</i>	Fruits	8.75 gm	Piperine, fatty oil, resin and volatile oil.
6	<i>Kirambu</i>	<i>Syzygium aromaticum</i>	Flower buds	8.75 gm	volatile oil, $\alpha$ -humulene, $\alpha$ -cardinol, $\beta$ -caryophyllene, $\delta$ -decalactone, fenchone, hexanal, hexanone, methyl palmitate, palustrol, propyl benzoate, acetophenone and benzyl salicylate.
7	<i>Omam</i>	<i>Trachyspermum ammi</i>	Seeds	8.75 gm	caroptin, cumene, thymene, aromatic volatile essential oil.
8	<i>Vaaluzhuai</i>	<i>Celastrus paniculatus</i>	Seeds	8.75 gm	Alkaloids, glucosides, tannin and coloring matter.
9	<i>Sathikai</i>	<i>Myristica fragrans</i>	Seeds	8.75 gm	volatile oil, resin, proteids, myristin, myristic acid, myristicene and myristocol.
10	<i>Yanaithippili</i>	<i>Scidapsus officinale</i>	Fruits	8.75 gm	Alkaloids, gum and ash.
11	<i>Seeragam</i>	<i>Cuminum cuminum</i>	Seeds	8.75 gm	cuminaldehyde, cuminin, 1,3-p menthadien-7-al, 1,4-p menthadien-7-al, 8-terpinene, Bpinene, 7-1(0- - D-galalacturonide), 3,5-dihydroxy flavones, glycosides of luteolin and apigenin.
12	<i>Athimadhuram</i>	<i>Glycyrrhiza glabra</i>	Root	8.75 gm	glycyrrhizin, glycyrrhizic acid, giabraninis A&B, isoglabrolide, deoxoglabrolide, glabrolide, glycyrrhetol, liquoric, liquiritic, glycyrrhetic, glabranine, pinocembrin, prunetin, glucoliquitinapioside, prenyllic flavones A, echinatin.
13	<i>Kurosani omam</i>	<i>Hyocyanus niger</i>	Seeds	8.75 gm	hyoscyamine, hyoscyne, hyoscyprin, scopolamine, cholin, fatty acid, albumin potassium nitrate.
14	<i>Amukkara</i>	<i>Withania somnifera</i>	Root	8.75 gm	somniferin, phytosterol, ipuranol, mixture, saturated & unsaturated Acids.

15	<i>Kasakasa</i>	<i>Papaver somniferum</i>	Seeds	8.75 gm	morphine, codeine and narcotine
16	<i>Elavanga Pathiri</i>	<i>Cinnamomum tamala</i>	Leaves	8.75 gm	essential oil, eugenol, terpene, cinnamic and aldehyde.
17	<i>Thippili moolam</i>	<i>Piper longum</i>	Root	8.75 gm	piperine, fatty oil, resin and volatile oil.
18	<i>Kothamalli</i>	<i>Coriandrum sativum</i>	Seeds	8.75 gm	essential oil, linolool, monoterpene hydrocarbous, borneol, citrovellol, camphor, geraniol, geranyl acetalis, heterocyclic components, coriandrin, dihydrocoriandrine, coriandrones A-E, flavonoids, neochidilide, phenolic acids, sterols.
19	<i>Peritchai</i>	<i>Phoenix dactilifera</i>	Fruits	8.75 gm	iron in an assimilable form, tannin, mucilage, insoluble matter and lime.
20	<i>Munthirigai</i>	<i>Vitis vinifera</i>	Fruits	8.75 gm	tartaric acid, citric acid, racemic acid and malic acid, chlorides of potassium and sodium, potassium sulphate, alum, magnesia, iron and ozotised matters.
21	<i>Seeni</i>	<i>Saccharum officinarum</i>	-	350 gm	trolox, beta-carotene, linoleic acid, apigenin, catechin, caffeic, ferulic and chologenic acids.

## PHARMACOLOGICAL ACTIVITIES OF INGREDIENTS OF *INJI CHOORANAM*:

### 1) *Inji (Zingiber officinale)*:

#### Anti-Inflammatory Activity:

Rajesh Kumar Mishra et al., reported that ginger has been shown to share pharmacological properties with non-steroidal anti-inflammatory drugs (NSAIDs) because it suppresses prostaglandin synthesis through the inhibition of cyclooxygenase-1 and cyclooxygenase-2. However, ginger can be distinguished from NSAIDs based on its ability to suppress leukotriene biosynthesis by inhibiting 5-lipoxygenase<sup>[4]</sup>. According to Rasna Gupta et al., [6]-shogaol has significant anti-inflammatory properties. Macrophages are considered to be targets for the anti-inflammatory effects of [6]-shogaol<sup>[5]</sup>.

#### Anti-oxidant Activity:

Rajesh Kumar Mishra et al., revealed that ginger oil has dominative protective effects on DNA damage induced by H<sub>2</sub>O<sub>2</sub>. Ginger oil acts as a scavenger of oxygen radicals and is used as an anti-oxidant<sup>[4]</sup>. According to Rasna Gupta et al., zingerone (a nontoxic and pungent component of ginger) can degrade free radicals generated by the radiolysis of various food products. Zingerone inhibits an enzyme, xanthine oxidase, which is mainly involved in the generation of superoxide radicals. Zingerone minimizes the oxidation of lipids and signifies its role as a good anti-oxidant<sup>[5]</sup>.

#### Anti-arthritis Activity:

Rajesh Kumar Mishra et al. stated that non-gingerol components enhance the anti-arthritis effects of the more widely studied [6]-gingerol<sup>[4]</sup>.

#### Anti-nociceptive activity:

Rajesh Kumar Mishra et al, stated that (6)-shogaol has produced anti-nociception and inhibited the release of substance P in rats, However, it was observed to be 100 times less potent and to elicit half the maximal effect of capsaicin<sup>[4]</sup>.

## 2) *Elam (Elettaria cardamomum)*:

### Anti-inflammatory Activity:

Cardamom oil was evaluated by Sanjay Kumar et al., for anti-inflammatory activity. Cardamom oil (280 µl/kg) exhibited 86.4% inhibition, while 175 µl/kg oil showed 69.2% inhibition, concluded that cardamom oil (175 µl/kg) provoked a significant suppressive action on carrageenan-induced edema but to a slightly lesser extent than indomethacin. However, at a dose of 280 µl/kg, oil exerts a more potent anti-inflammatory effect than indomethacin<sup>[6]</sup>.

### Anti-oxidant Activity:

The hexane extract was evaluated for in vitro antioxidant activity by Sanjay Kumar et al, Results revealed that extract (ERH) exhibited DPPH and metal chelating activity with IC<sub>50</sub> 464 µg/ml and 199 µg/ml, respectively, whereas the reducing power and antioxidant activities were found to be 289 AAE/mg, 468 GAE/mg. These results concluded that the extract of this plant possesses antioxidant activity<sup>[6]</sup>.

### Analgesic Activity:

Cardamom oil (133-400 µl/kg) was evaluated for analgesic activity by Sanjay Kumar et al., using the p-benzoquinone induced writhing method and compared with standard drug aspirin (50-175 mg/kg). It was observed that aspirin (175 mg/kg) and cardamom oil (400 µl/kg) prevented the writhing in treated mice by 100% protection of control values<sup>[6]</sup>.

## 3) *Chukku (Zingiber officinale)*:

### Anti-oxidant activity:

Zingerone (a nontoxic and pungent component of ginger) is present in a significant amount of about 9.25% in dry ginger. According to Rasna Gupta et al., zingerone inhibits an enzyme, xanthine oxidase, which is mainly involved in the generation of superoxide radicals. The observation that zingerone minimizes oxidation of lipids undoubtedly signifies its role as a good anti-oxidant<sup>[5]</sup>.

### Anti-inflammatory activity:

Yeon Choi et al., confirmed that orally administrated DZO greatly reduces the expression of iNOS and COX-2 and hence the expression of NF-κB. It is likely that the anti-inflammatory activity of DZO contributes to the reduced expression of iNOS and COX-2 in LPS-induced liver injury<sup>[7]</sup>.

## 4) *Milagu (Piper nigrum)*:

### Anti-oxidant activity:

Zoheir A. Damanhoury et al., revealed that Piperine inhibited free radicals and reactive oxygen species, therefore known to possess protective effects against oxidative damage. *Piper nigrum* or piperine was also found to decrease lipid peroxidation in vivo. *Piper nigrum* was reported to possess antioxidant activity that might be due to the presence of flavonoids and phenolic contents<sup>[8]</sup>.

### Anti-inflammatory and anti-arthritis activity

The in vitro anti-inflammatory activities were evaluated by Zoheir A. Damanhoury et al., on interleukin 1β stimulated fibroblast-like synoviocytes obtained from rheumatoid arthritis. The pain and arthritic symptoms in rats were significantly reduced by piperine. It was concluded that piperine showed anti-inflammatory, analgesics, and anti-arthritis activities in the arthritis model of rats<sup>[8]</sup>.

### Analgesic activity:

In vivo analgesic activity of piperine in mice was evaluated by Zoheir A. Damanhoury et al. There was a significant inhibition in the acetic acid-induced writhing in mice after intra-peritoneal. These results revealed the analgesic activity of piperine which is possibly mediated via the opioid pathway<sup>[8]</sup>.

## 5) *Thippili (Piper longum)*:

### Anti-inflammatory activity:

Maitreyi Zaveri et al. reported that the fruit decoction showed anti-inflammatory activity against carrageenin-induced rat paw edema<sup>[9]</sup>.

### Anti-oxidant activity:

Maitreyi Zaveri et al., tested the anti-oxidant activity of *Piper longum*. The analysis revealed that *Piper longum* has anti-oxidant potential<sup>[9]</sup>.

### Analgesic activity:

By Maitreyi Zaveri et al., *Piper longum* root was tested for opioid type analgesia using the rat tail-flick method and for NSAID type analgesia using an acetic acid writhing method by using pentazocine and

ibuprofen as drug controls. The study accomplished that *P. longum* root had weak opioid but potent NSAID type of analgesic activity<sup>[9]</sup>.

#### 6) *Kirambu (Syzygium aromaticum)*:

##### Anti-oxidant activity:

Monika Mittal et al, revealed that clove and eugenol possess strong anti-oxidant activity, which is comparable to the activities of the synthetic antioxidants, BHA and pyrogallol. Clove oil inhibited 97.3% lipid per-oxidation of linoleic acid emulsion at 15 µg/mL concentration. The essential oil demonstrated scavenging activity against the 2,2-diphenyl-1-picryl hydrazyl (DPPH) radical at concentrations lower than the concentrations of eugenol, butylated hydroxytoluene (BHT), and butylated hydroxyl anisole (BHA)<sup>[10]</sup>.

##### Analgesic activity:

Monika Mittal et al, reported that the analgesic and anti-inflammatory effects of *S. aromaticum* have been attributed to its capability to suppress prostaglandins and other inflammatory mediators such as leukotriene. It is also believed to depress the sensory receptors involved in pain perception and inhibit the conduction of action potential in sciatic nerves and N-methyl-D-aspartate (NMDA) receptors<sup>[10]</sup>.

##### Anti-inflammatory activity:

Monika Mittal et al, stated that clove has anti-inflammatory activity matching that of etodolac and indomethacin. Eugenol (200 and 400 mg/kg) was also found to reduce the volume of pleural exudates without changing the total blood leukocyte count indicating its anti-inflammatory potential<sup>[10]</sup>.

##### Anesthetic activity:

Monika Mittal et al. suggest that eugenol could be an effective anesthetic for use with aquatic species, and when compared to MS-222, its benefits include a lower cost, lower required dosage, improved safety, and potentially lower mortality rates<sup>[10]</sup>.

#### 7) *Omam (Trachyspermum ammi)*:

##### Anti-inflammatory activity:

The anti-inflammatory potential of the total alcoholic extract (TAE) and total aqueous extract (TAQ) of the *Ajwain* seeds was determined by Ranjan Bairwa et al. The weights of the adrenal glands were found to be significantly increased in TAE and TAQ-treated animals. TAE and TAQ extract from the *ajwain* seeds exhibit significant anti-inflammatory potential<sup>[11]</sup>.

#### 8) *Vaaluzhuai (Celastrus paniculatus)*:

##### Analgesic and Anti-inflammatory activities:

The extract of CP (*Celastrus paniculatus*) was tested by M. Bhanumathy et al., for the oral analgesic and anti-inflammatory potentials. Results showed that CP had both analgesic and anti-inflammatory activities. The seed oil showed anti-inflammatory activity in carrageenan-induced rat paw oedema<sup>[12]</sup>.

##### Anti-oxidant activity:

The methanolic extract of *Celastrus paniculatus* plant was investigated by M. Bhanumathy et al. for its free radical scavenging capacity and its effect on DNA cleavage induced by hydrogen peroxide UV-photolysis. CP extract showed a dose-dependent free radical scavenging capacity and a protective effect on DNA damage in human non-immortalized fibroblasts<sup>[12]</sup>.

##### Anti-arthritis activity:

The anti-arthritis effect of oral administration of petroleum ether and alcoholic extracts of CP seed on Freund's adjuvant arthritis has been studied by M. Bhanumathy et al. in Wistar albino rats. The swelling of the paw during the secondary lesions was markedly reduced. The results indicated that the seed of CP is endowed with anti-arthritis activity<sup>[12]</sup>.

#### 9) *Sathikai (Myristica fragrans)*:

##### Anti-inflammatory activity:

Manh Tuan Ha et al., stated that nutmeg oil showed pharmacological activities similar to those of non-steroidal anti-inflammatory drugs. The chloroform extract of *M. fragrans* seeds demonstrated anti-inflammatory activity by inhibiting carrageenan-induced rat paw edema, as well as exhibiting a strong analgesic effect. It also significantly suppressed the production of pro-inflammatory cytokine tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ) and interleukin-6 (IL-6)<sup>[13]</sup>.

**Analgesic activity:**

Manh Tuan Ha et al., revealed that an analgesic effect was produced by the oil in the acetic acid-induced writhing model, and in the late phase of the formalin-induced licking<sup>[13]</sup>.

**Anti-oxidant activity:**

A study by Kapoor et al. indicated that in vitro antioxidant properties of the essential oil and various oleoresins extracted from *M. fragrans* are as potent as those of known synthetic antioxidants such as butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT)<sup>[13]</sup>.

**10) Yanaihippili (*Scidapsus officinale*):****Anti-oxidant activity:**

Ethyl acetate and 50% ethanolic extract of *S. officinale* were investigated by Nikhil Shrivastava et al., for their anti-oxidant activity by using nitric oxide and DPPH radical scavenging activity methods. Ascorbic acid was used as standard. Both were found to exert concentration-dependent free radical scavenging activity but the former extract was more effective than the later one<sup>[14]</sup>.

**Anti-inflammatory and analgesic activity:**

Nikhil Shrivastava et al., studied that the ethanolic extract of *S. officinalis* showed statistically significant ( $p < 0.001$ ) analgesic activity in the albino rat in a dose-dependent manner. It was concluded that the ethanolic extract of the fruit of *Scindapsus officinalis* possesses anti-inflammatory and analgesic activities<sup>[14]</sup>.

**11) Seeragam (*Cuminum cuminum*):****Anti-oxidant activity:**

The antioxidant activity of cumin was studied by Prof Dr. Ali Esmail et al., The oil showed higher antioxidant activity. The cumin essential oil exhibited dose-dependent scavenging of DPPH radicals and 5.4 micro g of the oil was sufficient to scavenge 50% of DPPH radicals/m<sup>[15]</sup>.

**Anti-inflammatory and Analgesic activity:**

Prof Dr. Ali Esmail et al., revealed that the aqueous and ethanolic extracts showed highly significant analgesic activity in Acetic-acid induced writhing, while the ethanolic extracts were effective in the hot plate method. Both the aqueous and ethanolic extracts showed significant anti-inflammatory activity in Carrageenan-induced paw oedema and Cotton-pellet granuloma models when compared to the control group<sup>[15]</sup>.

**12) Athimadhuram (*Glycyrrhizaglabra*):****Anti-oxidant activity:**

Ajith Kumar Thakur et al. stated that high phenolic content compounds present in *Glycyrrhiza glabra* Linn. are responsible for their strong antioxidant activity due to free radical scavenging, metal ion chelating, hydrogen donating, anti-lipid peroxidative, and reducing activities. They reported that licorice flavonoids have 100 times strong anti-oxidant activity when compared with the antioxidant activity of vitamin E<sup>[16]</sup>.

**Analgesic activity:**

Ajith Kumar Thakur et al., investigated the anti-nociceptive activity of aqueous and ethanolic extracts of *Glycyrrhiza glabra* by using different pain models like acetic acid-induced abdominal constrictions, formalin-induced hyperalgesia, and tail flick method in Swiss albino mice<sup>[16]</sup>.

**Anti-inflammatory activity:**

The ability of glycyrrhizin to inhibit inflammatory events, such as oedema, apoptosis, iNOS expression and NF $\kappa$ B, was reported and marked by AjithKumarThakuret al.<sup>[16]</sup>.

**13) Kurosaniomam (*Hyocyamusniger*):****Anti-inflammatory activity:**

Sajeli Begum et al, tested the anti-inflammatory effect of major constituents i.e., cleomiscosin A and cleomiscosin Bin mice model. It was observed that cleomiscosin A in contrast to its isomer cleomiscosin B significantly reduced the wet as well as dry weight of cotton pellet granuloma<sup>[17]</sup>.

**Analgesic activity:**

Sajeli Begum et al., reported that the MHN (400 mg/kg) and pentazocine (10 mg/ kg), showed a significant increase in the latency period to heat response ( $P < 0.05$ ). MHN at a dose of 200 mg/kg was effective in the case of writhing response while 400 mg/kg was found to be effective in both hot plate as well as a writhing response<sup>[17]</sup>.

**14) Amukkara (*Withania somnifera*):****Anti-oxidant activity:**

G.Singh et al., have reported that some of the chemicals found in *Withania somnifera* are powerful anti-oxidants. Studies conducted on rats' brains showed the herb produced an increase in the levels of three natural anti-oxidants superoxide dismutase, catalase, and glutathione peroxidase<sup>[18]</sup>.

**Anti-inflammatory activity:**

G.Singhet al, explored the capacity of *W.somnifera* to ease the symptoms of arthritis and other inflammatory conditions. Its naturally occurring steroidal content is much higher than that of hydrocortisone, a commonly-prescribed anti-inflammatory. Rats given powdered root of *Withania somnifera* orally showed that it produced anti-inflammatory responses comparable to that of hydrocortisone sodium succinate<sup>[18]</sup>.

**Anti-ageing:**

*W.somnifera* was tested by G.Singhet al., for its anti-aging properties in a double-blind clinical trial. The subjects experienced significant improvement in hemoglobin, red blood cell count, hair melanin, and seated stature. Serum cholesterol decreased and nail calcium was preserved. Seventy percent of the research subjects reported improvement in sexual performance<sup>[18]</sup>.

**15) Kasakasa (*Papaver somniferum*):****Analgesic activity:**

The oripavine analgesic effects in mice were observed by Stanislav Baros et al.,. The compound showed significant analgesic action in the hot-plate method. It is known that centrally acting analgesic drugs can elevate the pain threshold of mice towards heat and pressure. From the above findings, it is clear that oripavine raised the pain threshold, which indicates that is centrally acting<sup>[19]</sup>.

**Anti-oxidant activity:**

M. P. Gomez-Serranillos et al., evaluated that the molecules possessing radical-scavenging properties present in methanolic poppy extract can quench DPPH free radicals. Most probably the mechanism proceeds through hydrogen donation or electron donation. The reaction results in conversion to a colorless product, resulting in a decrease in absorbance at the 517 nm band. Generally, the more rapidly the absorbance decreases, the more potent is the anti-oxidant activity of the extract<sup>[20]</sup>.

**16) Elavangapathiri (*Cinnamomum tamala*):****Anti-oxidant Activity:**

Anti-oxidant activity of essential oil and oleoresins was evaluated by Seema Mehta et al., against mustard oil. Authors demonstrated the essential oil and ethanol oleoresins showed better antioxidant activity, this could be due to the presence of phenolic compounds such as eugenol, spathulenol in essential oil. The sample with volatile oil and oleoresins was found to be significantly ( $p < 0.05$ ) more effective than the control<sup>[21]</sup>.

**Anti-inflammatory activity:**

Seema Mehta et al., reported the anti-inflammatory effect of the aqueous extract of *C. tamala* leaves showed an anti-inflammatory effect. The plant extract was inhibited significantly and dose-dependent edema induced by carrageenan in rats also reduced significantly acetic acid-induced vascular permeability in mice<sup>[21]</sup>.

**17) Thippili moolam (*Piper longum*):****Analgesic activity:**

By Maitreyi Zaveri et al., *Piper longum* root was tested for opioid type analgesia using the rat tail-flick method and for NSAID type analgesia using an acetic acid writhing method by using pentazocine and ibuprofen as drug controls. The study accomplished that *P. longum* root had weak opioid but potent NSAID type of analgesic activity<sup>[9]</sup>.

**18) Kothamalli (*Coriandrum sativum*):****Anti-oxidant activity:**

Prof Dr. Ali Esmail al snafi stated that *Coriandrum sativum* has a very effective anti-oxidant profile showing 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging activity, lipoxygenase inhibition, phospholipid peroxidation inhibition, iron chelating activity, hydroxyl radical scavenging activity, superoxide dismutation, glutathione reduction and anti-lipid peroxidation due to its high total phenolic content<sup>[22]</sup>.

**Anti-inflammatory and analgesic activity:**

The anti-inflammatory and analgesic effects of *Coriandrum sativum* seeds were evaluated by Prof Dr. Ali Esmail al snafi in an animal model. The results showed that the essential oil (4ml/100g) had a significant effect ( $p < 0.01$ ). Polyphenolic extract and essential oil of coriander, had a significant effect in both phases of the formalin test<sup>[22]</sup>.

**19) Peritchai (*Phoenix dactylifera*):****Anti-oxidant activity:**

Hanen el abed et al., stated that the aqueous ethanolic extract of *P. dactylifera* showed a potential antioxidant activity in DPPH radical scavenging ( $p < 0.05$ ). It was shown to scavenge 94% of superoxide radicals ( $p < 0.05$ ). Moreover, the aqueous ethanolic extract from parthenocarpic dates exhibited high DPPH scavenging activity<sup>[23]</sup>.

**Anti-inflammatory activity:**

The aqueous ethanolic extract was evaluated by Hanen EL Abed et al., for its inhibitory effect on the pro-inflammatory PLA2 activity. The *in vitro* assay results revealed that the aqueous ethanolic extract showed significant inhibitory activity against PLA2 activity. *P.dactylifera* extract reduced by 50% the activity of the enzyme in a highly significant manner ( $p < 0.001$ )<sup>[23]</sup>.

**20) Munthirigai (*Vitis vinifera*):****Anti-oxidant activity:**

MarjanNassiri-Asl et al., evaluated that the aqueous extracts of *V. vinifera* L. tendrils have the potential to enhance the antioxidant capacity of human keratinocytes (NCTC 2544). This effect is important as keratinocytes are often exposed to oxidative stress and need sufficient anti-oxidant defenses<sup>[24]</sup>.

**Anti-inflammatory activity:**

MarjanNassiri-Asl et al., reported that a water extract from red vine leaves (*V. vinifera*) had inhibitory effects on TNF $\alpha$ -induced IL-8 secretion and expression via impairment of the NF- $\kappa$ B pathway in human gastric epithelial cells; this could be useful in attenuating gastric inflammation. It is suggested that quercetin glycosides are more responsible than anthocyanins for this anti-inflammatory effect<sup>[24]</sup>.

**21) Seeni (*Saccharum officinarum*):****Anti-oxidant activity:**

Sepideh Miraj reported that the phenolic compounds in sugar cane (*Saccharum officinarum*) juice showed a protective effect against *in vivo* MeHgCl intoxication and potent inhibition of *in vivo* lipoperoxidation of rat brain homogenates, indicating a potential use for beneficial health effects and/or therapeutic applications<sup>[25]</sup>.

**Anti-inflammatory activity:**

A mixture of fatty acids obtained from sugar cane (*Saccharum officinarum*) wax oil (FAM), in which the main constituents are palmitic, oleic, linoleic, and linolenic acids, was evaluated by Sepideh Miraj in two models of inflammation. The anti-inflammatory effects exerted by FAM may be due to its inhibitory effects on arachidonic acid metabolism. Hence, sugar cane by-products have an anti-inflammatory effect in experimental models of arthritis and psoriasis<sup>[25]</sup>.

**DISCUSSION AND CONCLUSION:**

Because of the above-mentioned pharmacological activities, most of the ingredients of *Inji chooranam* are found to possess Anti-inflammatory, Analgesic, Anti-oxidant and Anti-arthritic activities which can reduce the symptoms of osteoarthritis. With this proven efficacy, the drug is easily available to prepare, cost-effective, and safer treatment. *Inji chooranam* serves as a promising anti-arthritic drug for future research in the treatment of osteoarthritis. Further clinical studies and statistical data analysis help in exploring this Polyherbal Siddha formulation.



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