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Research Article

# THERAPEUTIC EFFECTIVENESS OF A SIDDHA FORMULATION *NILAVAAGAI CHOORANAM*: A REVIEW

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**ABSTRACT**

Siddha system of medicine is one of the ancient systems of medicine practiced among Tamil speaking community particularly in southern parts of India. The medicine in this system prepared from raw drugs which is obtained from herbals, mineral, metals and animal products. "*Nilavaagaichooranam*" is one of the Sastric Siddha herbo-mineral preparation with ingredients of 18 herbal and one mineral ingredient. It is used to treat the skin disorders particularly for "*Karappan* (Eczema)". This review is aimed to bring out scientific evidence for the therapeutic usuage of "*Nilavaagaichooranam"* in skin disorders particularly in *Karappan* (Eczema) and focused on the pharmacological activity responsible for the curative nature of the drug in *Karappan* (Eczema). Most of the raw drugs used for the preparation of *Nilavaagai chooranam* have antihistamine activity, anti-inflammatory activity, immunomodulatory activity hence justifying its usage in *Karappan* (Eczema).

**KEYWORDS:** Siddha Medicine, *Nilavaagaichooranam, Karappan*, Pharmacological activity.

## INTRODUCTION

Siddha system of medicine is the primary system of all system of medicine and is originated and practiced in southern India particularly in Tamilnadu. It is also called Tamil Maruthuvam because it evolved along with Tamilan's culture. Siddha medicines are known for its efficacy and safety. The reason for popularity of the Siddha system is attributed to its effective with minimal side effect. Siddhars, the founder of Siddha system possessed *Yoga siddhi* powers (supernatural powers). They have left their imprints in many disciplines like medicine, alchemy, philosophy, *Yogam* and *Varmam.*

*"Nilavaagaichooranam*" is classical Siddha compound drug which is mentioned in Siddha text book of *Aathma Ratchamirdhamenum Vaidhya Saara Sangirakam*. This drug used for skin diseases particularly for "*Karappan* (Eczema)". The drug review of "*Nilavaagaichooranam*", a herbo mineral drug gives evidence for its therapeutic action mentioned in literature. The major ingredients of this drug are herbal. This review focused on the pharmacological activities of each ingredient which supports the traditional claim and the literature search is confined to that area. The search was made from the textbooks in the library of National Institute of Siddha, journals, internet, databases etc.

### Standard operating procedure for preparation of *Nilavaagaichooranam*

### Purification of raw drugs

All the raw drugs are purified as per the methods mentioned in Siddha literature.

### Preparation of drug "*Nilavaagaichooranam"*

The raw drugs are dried and powdered separately, then mixed well together and then added with equal amount of white sugar and preserved in a tightly closed container. The drugs are mentioned in table-1.

**Table1: Method of preparation of "*Nilavaagai chooranam*"**[1]

| S.No. | Tamil name | Botanical name/ Chemical name | Parts used | Quantity |
|---|---|---|---|---|
| 1. | *Nilavaagai* | *Cassia senna* | Whole plant | 350 gms |
| 2. | *Milagu* | *Piper nigrum* | Seed | 8.75 gms |
| 3. | *Kadukkai* | *Terminalia chebula* | Fruit | 8.75 gms |
| 4. | *Thandrikkai* | *Terminalia bellirica* | Fruit | 8.75 gms |

| | | | | |
|---|---|---|---|---|
| 5. | *Seeragam* | *Cuminum cyminum* | Seed | 8.75 gms |
| 6. | *Valuluvai* | *Celastrus paniculatus* | Seed | 8.75 gms |
| 7. | *Sirunagapoo* | *Mesua ferrae* | Flower bud | 8.75 gms |
| 8. | *Ellam* | *Elettaria cardamomum* | Seeds | 8.75 gms |
| 9. | *Illavangapattai* | *Cinnamomum verum* | Bark | 8.75 gms |
| 10. | *Kadughurohini* | *Picrorhiza kurroa* | Root | 8.75 gms |
| 11. | *Sivathai* | *Operculina turpethum* | Root | 8.75 gms |
| 12. | *Thalisapathiri* | *Taxus baccata* | Leaves | 8.75 gms |
| 13. | *Jathikkai* | *Myristica fragrans* | Fruit | 8.75 gms |
| 14. | *Kirambu* | *Syzygium aromaticum* | Flower | 8.75 gms |
| 15. | *Thippili* | *Piper longum* | Fruit | 8.75 gms |
| 16. | *Seviyam* | Root of *Piper nigrum* | Root | 8.75 gms |
| 17. | *Indhuppu* | Sodiichloridum impure or Sodium chloride impura | - | 8.75 gms |
| 18. | *Koogaineeru* | *Maranta arundinacea* | Tuber | 8.75 gms |
| 19. | *Chukku* | *Zingiber officinale* | Dried rhizome | 8.75 gms |

**Information on mineral ingredient (*Indu-uppu*) as per Siddha text *Gunapadam Thathu Jeeva Vaguppu: Indu-uppu***

Name in other language: Sanskrit: Saindhava, English: Rock salt, Sea salt, Bay salt, Hindi: Sendhalon, Sedhalon, Tamil*: Indu-uppu*. It is found in nature in extensive beds mostly associated with clay and calcium sulphate. *Indu-uppu* is a natural substance collected from Sindh and Northwestern parts of Punjab.[2]

*Indu-uppu* is found in small white crystalline grains or transparent cubes. It is brownish white externally and white internally. It has a pure saline taste and burns with a yellow flame. In small doses it is highly carminative, stomachic and digestive. It promotes the appetite and assists digestion and assimilation. In large doses it is cathartic; in still larger doses it is emetic. Rock salt possesses stronger purgative properties than cream of tartar, but like this it is not a satisfactory cathartic given alone. It is given in dyspepsia and other abdominal disorders.[3]

**Table 2: Information on herbal ingredients as per the Siddha text *GunapadamMooligai Vaguppu*[4]**

| S.No. | Botanical name | Vernacular name | | | | Parts used |
|---|---|---|---|---|---|---|
| | | Tamil | English | Hindi | Sanskirt | |
| 1. | *Cassia senna* | *Nilavaagai* | Tinnevelly senna | Sunnamakai | - | Leaves |
| 2. | *Piper nigrum* | *Milagu* | Black pepper | Kali-mirch | *Maricha* | Seed |
| 3. | *Terminalia chebula* | *Kadukkai* | Ink nut, Chebulic myrobalan | Pile Hara | *Haritaki* | Fruit |
| 4. | *Terminalia bellirica* | *Thandrikkai* | Beleric myrobalan | Bhairah | *Vebeethaki* | Fruit |
| 5. | *Cuminum cyminum* | *Seeragam* | Cumin seeds | Zira | *Jirakams* | Seed |
| 6. | *Celastrus paniculatus* | *Valuluvai* | Climbing staff plant | Mal-kangni | *Jyotishmati* | Seed |
| 7. | *Mesua ferrae* | *Sirunagapoo* | Ceylon Iorn Wood | Nag-kesar | *Naga-kesara* | Flower bud |
| 8. | *Elettaria cardamomum* | *Ellam* | Cardamom seeds | Elachi | *Ela* | Seeds |
| 9. | *Cinnamomum verum* | *Illavangapattai* | Bark of Cinnamon | Dar-Chini | *Twak* | Bark |

| | | | | | | |
|---|---|---|---|---|---|---|
| 10. | *Picrorhiza kurroa* | *Kadughurohini* | Picrorhiza | Katuka, Kutki | *Katurohini, Katuka* | Root |
| 11. | *Operculina turpethum* | *Sivathai* | Turpeth root | Nasvath | *Trivrith, Tributa* | Root |
| 12. | *Taxus baccata* | *Thalisapathiri* | East Himala fir yanssilva | Talispatri | *Talisapathra* | Leaves |
| 13. | *Myristica fragrans* | *Jathikkai* | Nut Meg | Jae-phal | *Jatphalam* | Fruit |
| 14. | *Syzygium aromaticum* | *Kirambu* | Clove tree | Long | *Lavangam* | Flower bud |
| 15. | *Piper longum* | *Thippili* | Long pepper | - | *Pippali* | Fruit |
| 16. | Root of *Piper nigrum* | *Seviyam* | | | | Root |
| 17. | *Maranta arundinacea* | *Koogaineeru* | East Indian Arrow root | Tikhar | - | Tuber |
| 18. | *Zingiber officinale* | *Chukku* | Dried Ginger | Sonth | *Nagaram* | Dried rhizome |

**Pharmacological activities of ingredients of *Nilavaagaichooranam***

**1) *Nilavaagai* (*Cassia senna*)**

Laxative and purgative, used in constipation, loss of appetite, hepatomegaly, splenomegaly, indigestion, malaria, skin diseases, jaundice and anaemia.[5] Purgative. Externally powdered leaves mixed with vinegar and made into a plaster are applied locally in certain skin diseases.[6]

**2) *Milagu* (*Piper nigrum*)**

**Antiasthmatic activity**

Most of the herbal practioners and old people believed that addition of powdered peppercorn to green tea reduced asthma.[7-8] Kim et al. reported that oral administration of piperine in different proportion to mice suppressed and reduced the infiltration of eosinophil, hyper responsiveness and inflammation due the suppression of the production of histamine, interleukin- 5, immunoglobulin E and interleukin-4.[9]

**Anti-inflammatory activity**

The in vitro anti-inflammatory activities were evaluated on interleukin 1β stimulated fibroblast like synoviocytes obtained from rheumatoid arthritis, while anti-arthritic including analgesic activities was evaluated on carrageen an induced acute paw model of pain and arthritis in rats. Te prostaglandin E2, cyclooxygenase 2, interleukin 6 and matrix metallo-proteinase levels were evaluated by ELISA and RT-PCR methods of analysis. Piperine treated groups were found to reduce the synthesis of prostaglandin E2in a dose dependant comportment at the concentrations of 10-100 µg/mL. It significantly inhibited the synthesis of prostaglandin E2 even at 10 µg/mL.Te expression of interleukin 6 and matrix metallo-proteinase 13 were also inhibited.[10]

**Immuno-modulatory activity**

In vitro immunomodulatory activity of piperine was evaluated to enhance the efficacy of rifampicin in a murine model of Mycobacterium tuberculosis infection. Mouse splenocytes were used to evaluate in-vitro immunomodulation of piperine for cytokine production, macrophage activation and lymphocyte proliferation. Piperine treated mouse splenocytes demonstrated an increase in the secretion of T-1 cytokines (IFN-γ and IL-2), increased macrophage activation and proliferation of T and B cell. Protective efficacy of piperine and rifampicin (1 mg/kg) combination against Mycobacterium tuberculosis was reported due to immuno-modulatory activity.[11]

**3) *Kaddukkai* (*Terminalia chebula*)**

**Immuno-modulatory activity**

Aqueous extract of *T. chebula* produced an increase in humoral antibody titre and delayed type hypersensitivity in mice.[12] *T. chebula* found effective against the progression of advanced glycation end products-induced endothelia cell dysfunction.[13] Crude extract of *T. chebula* stimulated cell mediated immune response in experimental amoebic liver abscess in golden hamsters.[14] The formulation showed highest cure rate of 73% at 800 mg/kg body weight in hepatic amoebiasis. In immune-modulation studies, humoral immunity was improved where T-cell counts remained unaffected in the animals, but cell-mediated immune response was stimulated.[15]

**Anti-inflammatory activity**

Aqueous extract of dried fruit of *T. chebula* showed anti-inflammatory activity by inhibiting inducible nitric oxide synthesis.[16] Chebulagic acid extracted from tender fruit of *T. Chebula* significantly suppressed the onset and progression of collagen-induced arthritis in mice. *T. chebula* in a polyherbal formulation (Aller-7) exhibited anti-inflammatory effect against arthritis in rats.[17]

**Immunomodulatory activity**

Ethanolic extracts- Study confirms the immunomodulatory activity of ripe *T. Chebula* fruits as evidenced By increase in the concentration of antioxidant enzymes, GSH, T and B cells, the proliferation of which play important roles in immunity. This phenomenon also enhances the concentration of melatonin in Pineal gland as well as the levels of cytokines.[18] Gallic acid and chebulagic acid were isolated from the extract of a herbal medicine, *Kasha* (*myrobalans*: the fruit of *Terminalia chebula*) as active principles that blocked the cytotoxic t lymphocyte (ctl)-mediated cytotoxicity.[19]

**Anti-allergic activity**

*T. chebula,* ingredient of a polyherbal formulation (Aller-7), showed potent in vitro anti-allergic activity.[20] Hydro-ethanol extract of *T. chebula* exhibit anti-histamine and anti-spasmodic in guinea pig ileum.[21] Oral administration of an aqueous extract of fruit significantly suppressed histamine release from rat peritoneal mast cells 117 and also significantly increased production of tumour necrosis factor (TNF) by anti-dinitrophenyl IgE.[22]

**4) *Thandrikkai* (*Terminalia bellerica*)**

**Immune response in vitro**

In vitro Phagocytic activity and lymphocyte proliferation assay were carried out in methanolic extract of on the mouse immune system (Aurasorn Saraphanchoti witthaya et al., 2008). In both assay, stimulation of macrophage phagocytosis and maximal activation of phytohemagglutinin were observed. Finally, the authors concluded that the methanolic extract of *T. belerica* affected the mouse immune system, specifically both the cellular and humoral immune response in vitro.[23]

**5) *Seeragam* (*Cuminum cyminum*)**

**Immunomodulatory**

The oral treatment of cumin stimulated the T cells (CD4 and CD8) T1 cytokines' expression in normal and cyclosporine-An induced immune suppressed animal. Cumin also depleted T lymphocytes, decreased the elevated corticosterone levels and size of adrenal glands and increased the weight of thymus and spleen in stress induced immune suppressed mice.[24]

**Immunological effect**

The health modulating effects and immunomodulatory properties of *Cuminum cyminum* were evaluated using flow cytometry and ELISA in normal and immune-suppressed animals. *Cuminum cyminum* stimulated the T cells and Th1 cytokines expression in normal animals. Swiss albino mice subjected to Cyclosporine-A induced immune-suppression were dosed orally with *Cuminum cyminum* (25, 50, 100 and 200 mg/kg) on consecutive days. The results showed that administration significantly increased T cells (CD4 and CD8) count and Th1 predominant immune response in a dose dependent manner, suggesting immunomodulatory activity through modulation of T lymphocytes expression. In restraint stress induced immune-suppressed animals, *Cuminum cyminum* countered the depleted T lymphocytes, decreased the elevated corticosterone levels and size of adrenal glands and increased the weight of thymus and spleen.[25]

**6) *Valluluvai* (*Celastrus paniculatus*)**

**Analgesic and Anti-inflammatory**

A methanolic extract of the flowers of *C. paniculatus* exhibits analgesic and antiinflammatory activities in the hot water tail immersion test in mice and carrageenan induced pedal edema in rats.[26]

**7) *Sirunagapoo* (*Mesua ferrae*)**

**Immunomodulatory activity**

*M. ferrae* flower buds in a poly herbal formulation, ACII was studied for immune modulation effect on radiation induced immune suppression. It is observed high increase in circulating antibody specially in animals treated with ACC II further there is no change in the weight of body. WBC count increased. Whereas no change in hemoglobin was seen in normal or drug treated animals. There is also no change in lymphocyte, neutrophil ratio. Bone marrow get improved along with this improvement is seen in α-esterase cells too, thymus weight increases.[27] Although ACII effect is seen in normal[28] and cyclophosphamide treated animals.[29] By using various specific and nonspecific immune response in animals for seeing Immuno modulatory activity of *M.ferrae* seed oil was studied by isolating mesuol from *M.ferrae* seed. It is observed that in humoral response model. Mesuol cause increase in dose dependent in antibody (9th and 6th day) as well as induced. Immuno suppression which is seen in sheep RBC (7th and 14th day) of experiment. Where as in cellular immune response model, an increase in Paw volume was observed on 23rd day in rat treated with SRBC (Sheep RBC). Further mesuol help in restoring hematological property in cyclophosphamide induced myelo-suppression model. So after discussing all this the

report indicate clearly the modulatory activity of mesuol.[30]

**Anti-inflammatory activity**

Using albino rats Mesuaxanthone A and Mesuaxanthone B (MXA and MXB) from *M. Ferrae* were observed by carrageenan induced hind Paw oedema and granuloma pouch tests. MXA shows 37% MAB showed 49% reduction when compound with normal group. But it is known than xanthones show signifcant anti-inflammatory property in normal and adrenalectomised rats. So xanthones used here for its important inflammatory activity.[31]

**8) *Ellam (Elettaria cardamomum*)**

The seeds are aromatic, acrid, sweet, cooling, stimulant, carminative, digestive, stomachic, diuretic, cardiotonic, abortifacient, alexeteric, expectorant and tonic and are useful in asthma, bronchitis, haemorrhoids, strangury renal and vesical calculi, halitosis, cardiac disorders, anorexia, dyspepsia, gastropathy, hyperdipsia, burning sensation, debility and vitiated conditions of vata.[5] Powerful aromatic, stimulant, carminative, stomachic and diuretic. These properties are due to the essential oil contained in the seeds.[6]

**9) *Illavangapattai* (*Cinnamomum verum*)**

**Anti-inflammatory activity: In vitro**

Various essential oils, including cinnamon bark oil, used in the treatment of rheumatism and inflammation as well as some of their main constituents and phenolic compounds known for their irritant and pungent properties were screened for activity as inhibitors of prostaglandin biosynthesis. A combination of a prostaglandin-synthesizing cyclo-oxygenase system from sheep seminal vesicles and an HPLC separation technique for the metabolites of arachidonic acid was used as test system. Cinnamon bark oil showed inhibitory cyclo-oxygenase activity. The active compound is probably eugenol (Wagner et al., 1986).

**Anti-inflammatory activity: In vivo**

Dry ethanolic extract of *Cinnamomum zeylanicum* administered orally to rats at 400 mg/kg body weight showed an anti-inflammatory effect against chronic inflammation induced by cotton pellet granuloma indicating an anti-proliferative effect (Atta & Alkofahi, 1998).

**Eugenol (*Cinnamomum verum*)**

**Anti-inflammatory**

The study concluded beneficial effect of eugenol administrated at 5 and 10 mg/kg per B.W. against lipopolysaccharide (LPS) induced acute lung injured (ALI) mice, for this purpose 0.5 mg/kg LPS was intratracheally infused. Examination of lung tissues and bronchoalveolar lavage fluid (BALF) suggested anti-inflammatory effect due to reduced production of pro-inflammatory cytokines.[32]

Additionally, in vitro studies revealed that clove oil polyphenol inhibits nuclear factor-kB (NF-kB) activation in lipopolysaccharides initiated macrophages induced by inactivated cyclooxygenase activity (COX-2) and tumor necrosis factor (TNFa). Cyclooxygenase activity is prompted by LPS, cytokines and growth factors.[31] During pulmonary inflammation in mouse, elevated TNF-a and neutrophils were significantly reduced by eugenol at a dose of 160 mg /kg per body weight. It also protected against chemically induced dysfunction of macrophages and balanced the pro-inflammatory mediators.[33]

**Immunomodulatory activity**

Mahapatra et al. investigated the in vitro protective effect of eugenol (1–20 μg/mL) against nicotine-induced (10 mM nicotine) cellular damage in mice peritoneal macrophages by analysing the radical generation, lipid, protein, DNA damage and endogenous anti-oxidant status. The results indicated that eugenol could be used as modulator of nicotine-induced cellular damage and immunomodulatory drug against nicotine toxicity. [34]

**10) *Kadughurohini* (*Picrorhiza kurroa*)**

**Anti-asthmatic activity**

*P.kurroa* has been studied extensively for its anti-asthmatic activity. The crude extract of *P.kurroa* roots reduced the frequency and severity of asthmatic attacks and the need for regular broncho-dilators. The activity has been attributed to compounds such as androsin and apocynin, which have been shown to inhibit allergen and PAF-induced bronchoconstriction.[35] Dorsch W et al (1991) reported the major anti asthmatic principle of *Picrorhiza kurroa*, was used as a lead compound for detailed structure- activity relationship. More than 25 synthesized or commercially available acetophenones with modified substitution patterns were screened in the Plethysmographic guinea pig model using PAF and/or ovalbumin as challenging agents for the generation of bronchial constriction. Whereas the aglycones in most cases were more effective than the corresponding glycosides, substitution patterns in position 3 and 4 of the phenyl ring and the keto function attached to the phenyl ring were found to be essential for marked anti asthmatic effect. 3,5-Dimethoxy-4-hydroxy-acetophenone showed the highest activity of all tested compounds. Initial in vitro studies on the mode of action could not sufficiently explain the mechanism of antiasthmatic activity.[36,37] Mahajani S.S. et al (1977) reported 4 weeks pre-treatment with disodium cromoglycate (DSCG) and the powdered

roots of the herb *Picrorhiza kurroa*, rendered guinea pigs less sensitive to histamine when compared with appropriate controls. The bronchodilator effects of isoprenaline and adrenaline were found to be markedly enhanced. The severity and duration of the allergic bronchospasm was significantly less in animals pretreated with the two drugs. Furthermore, the total histamine content of the lung tissue in animals pretreated with DSCG and *Picrorhiza kurroa* was significantly less than that in the untreated controls. The pretreatment was also found to exhibit inhibitory effect on the immunological release of histamine and SRS-A from chopped lungs.[38]

**Immunomodulatory activity**

The effect of an ethanolic extract of each drug was studied on delayed type hypersensitivity, humoral responses to sheep red blood cells, skin allograft rejection, and phagocytic activity of the reticuloendothelial system in mice. *Picrorhiza kurroa* was found to be a potent immunostimulant of both cell mediated and humoral activity.[35] Amit Gupta et al (2006) evaluated the effects of biopolymeric fraction RLJ-NE-205 from *Picrorhiza kurroa* on the in vivo immune function of the mouse. Balb/c mice were treated with the biopolymeric fraction RLJ-NE-205(12.5, 25 and 50 mg/kg body weight) for 14 days with sheep red blood cells (SRBC) as an antigen Haemagglutination antibody (HA) titre, plaque forming cell (PFC) assay, delayed type hypersensitivity (DTH) reaction, phagocytic index, proliferation of lymphocytes, analysis of cytokines in serum and CD4/CD8 population in spleen (determined by flow cytometry) were studied. At the dose of 50mg/kg significant increases in the proliferation of lymphocytes and cytokine levels in serum were observed.[39]

**Anti-inflammatory activity**

Apocynin is a constituent of root extracts of Picrorhiza and has been reported to possess antiinflammatory properties in laboratory animals. Apocynin concentration dependently inhibited the formation of thromboxane A2, whereas the release of prostaglandins E2 and F2α was stimulated. Apocynin inhibited arachidonicacid induced aggregation of bovine platelets, possibly through inhibition of thromboxane formation.[35] The rhizome of *Picrorhiza scrophulariiflora* is used to treat inflammatory diseases as a traditional medication. The ethanol extract of *Picrorhiza scrophulariiflora* in rabbits improves accelerated atherosclerosis through inhibition of redox-sensitive inflammation.[40]

**Anti- allergic and Anti- anaphylactic activity**:

C.C.Baruah et al (1998) studied a standardized iridoid glycoside fraction from the root and rhizome of *Picrorhiza kurroa* at a dose of 25mg/kg inhibited passive cutaneous anaphylaxis in mice, rats and protected mast cells from degranulation in a concentration dependant manner. Its effect was also studied in sensitised guinea pig ileum preparation in vitro (Schultz-Dale study) and in normal guinea pig in vivo (Konzett- Rossler, in preparation). There was inhibition of the Schultz-Dale response in sensitised guinea pig ileum, but the bronchospasm induced by histamine could not be antagonised or prevented by Picroliv, indicating the absence of a direct post- synaptic histamine receptor blocking activity.[41]

**Immunostimulatory activity**

Sharma ML, Rao CS and Duda PL studied extract of *Picrorhiza kurroa* leaves (PKLE) was found to stimulate the cell mediated and humoral components of the immune system as well as phagocytosis in experimental animals. PKLE elicited a dose- related increase in SRBC, induced 4hr (early) and24hr (delayed) hypersensitivity reactions in mice and rats, andhorse serum induced Arthus reaction in guinea pigs. It also enhanced the humoral immune responses in mice and rats and phagocytic function of the cells of the reticuloendothelial system in mice. PKLE exhibited no mitogenic activity but augmented the responsiveness of murine splenocytes to T cells mitogens phytohaemagglutinin and concanavalin A and B cell mitogen lipopolysaccharide.[42]

**11) *Sivathai* (*Operculina turpethum*)**

**Anti-inflammatory activity**

An experimental study was carried out (Rajashekar M et al; 2006) to evaluate the effect of oral administration of root powder of *O. turpethum* and its polyherbal formulation *Avipattikarchurna* on rat paw edema in albino rats. Results indicated that pretreatment with the root powder of *O. turpethum* and *Avipattikara churna* (100 mg/kg body weight) reduced the formalin induced edema volume to the extent of 36.45% and 27.11% respectively.[43] Anti-inflammatory potential of different extracts (ethanolic, aqueous and ethereal) of *O. turpethum* has been reported in carrageenan-induced paw oedema, cotton pellet-induced granuloma and formalin induced arthritis animal model of rats. The aqueous extract was reported more potent fraction in all three animal models.[44]In another study, pre-treatment of roots of *Operculina turpethum* and its polyherbal formulation *Avipattikar Churna* (100 mg/kg body weight) showed anti-inflammatory activity in rat paw oedema induced by formalin in experimental animal model.[45]

**CLINICAL TRIALS**

In an open, uncontrolled clinical study (Shailej Gupta; 2009), powder of *O. turpethum* roots administered as a single dose of 30 gm with

fermented rice water (*Kanji*) for *Virechana* procedure produced strong purgation in 30 patients of *Amavata* i.e. Rheumatoid Arthritis. This purificatory procedure produced statistically significant improvement in the subjective parameters like joint pain, stiffness, swelling, tenderness, and in global assessment for overall improvement. Also there was a statistically significant reduction in the ESR values in the study patients.[46] Many patients may not tolerate one time dose of 30 Gms *Trivrit* powder. So it should not be recommended for each and every patient of rheumatoid arthritis.

**12) *Thalisapathiri* (*Taxus baccata*)**

Leaves are carminative, stomachic, tonic, astringent, antispasmodic and expectorant.[6]

**13) *Jathikai* (*Myristica fragrans*)**

**Anti-inflammatory activity**

The anti-inflammatory activity of *Myristica fragrans* was evaluated in carrageenan-induced edema in rats and acetic acid induced vascular permeability in mice. It was observed that the antiinflammatory effect was approximately the same as that of Indomethacin. The results propose that myristicin present in mace is responsible for anti-inflammatory action.[47] The antiinflammatory property of myristicin might be due to inhibition of chemokines, cytokines, nitrous oxide and growth factors in double stranded RNA (dsRNA) stimulated macrophages via the calcium pathway.[48] The methanol extract from seeds of *Myristica fragrans* used for the treatment of inflammatory diseases also had inhibitory effects on nitric oxide (NO) production.[49]

**14) *Kirambu* (*Syzygium aromaticum*)**

**Antiallergic effects**

Kim et al (1998) investigated the effect of a hot water extract (DER app. 14:1) of clove on the immediate hypersensitivity in rats. The extract inhibited the compound 48/80-induced systemic anaphylaxis in rats with an IC50 of 31.25 mg/kg when administered intraperitoneally. The extract also inhibited the local immunoglobulin E-mediated passive cutaneous anaphylactic reaction (IC50 = 17.78 mg/kg, i.v., IC50 = 19.81 mg/kg, p.o.). The extract also inhibited dose-dependently the induced histamine release from rat peritoneal mast cells. Clove essential oil increased the total white blood cell count and enhanced the delayed-type hypersensitivity response in mice. Moreover, it restored cellular and humoral immune responses in cyclophosphamide-immunosuppressed mice in a dose-dependent manner. The immunostimulatory activity found in mice treated with clove essential oil is due to improvement in humoral and cell mediated immune response mechanisms (Carrasco et al 2009).

**15) *Thippili* (*Piper longum*)**

**Piperine (*Piper nigrum, Piper longum*)**

**Antiasthmatic activity**

Kim et al., 2009 induced asthma in Balb/c mice by ovalbumin sensitization. Piperine (4.5 and 2.25 mg/kg) was orally administered 5 times a week for 8 weeks and it was found that piperine- treated groups had suppressed eosinophil infiltration, allergic airway inflammation and airway hyper responsiveness and these occurred by suppression of the production of interleukin-4, interleukin-5, immunoglobulin E and histamine.[50]

Roots and fruiting spikes are used in treating diarrhoea, indigestion, jaundice, urticaria, abdominal disorders, hoarseness of voice, asthma, hiccough, cough, piles, malarial fever, flatulence, vomiting, thirst, oedema, earache, wheezing, chest congestion, throat infections, worms, sinusitis. This considered as rejuvenating plant.[5] Infusion is stimulant, carminative and alterative, tonic more powerful than black pepper; also aphrodisiac, diuretic, vermifuge and emmenagogue. Externally rubefacient. Root is stimulant.[6]

**16) *Seviyam* (Root of *Piper nigrum*)**

It cures Deep seated pain, Ageusia, Tridosha diseases, Chronic fever, Prolonged cough, Tuberculosis, Hoarseness of voice, Throat disorders, Fever.[2]

**18) *Kughaineer* (*Maranta arundinacea*)**

Starch obtained from rhizome is astringent, sweet, refrigerant, tonic, aphrodisiac, emollient, expectorant, febrifuge and rubefacient. It is useful in dysentery, diarrhoea, dyspepsia, bronchitis, cough and also as a nourishing food for infants, invalids and convalescents.[5]It is nutrient and demulcent.[6]

**19) *Chukku* (*Zingiber officinale*)**

**Antiinflammatory activity**

Recent study documented the ability of a hexane fraction of dried ginger methanolic extract to suppress proinflammatory gene expression in LPS-activated BV2 microglial cells, thus displaying anti-neuroinflammatory activity.[51] Gingerol and structurally related pungent principles of ginger including shogaol exert inhibitory effects on biosynthesis of prostaglandins and leukotrienes through suppression of prostaglandin synthase or 5-lipoxygenase.[52-53] Several reports have addressed the anti-inflammatory effects of whole ginger extract on the production of NO/iNOS, PGE2/COX-2, TNF-a, IL-1b, and macrophage chemoattractant protein-1 (MCP- 1) in murine macrophages, such as RAW264.7 cells and J774.1 cells, as well as human monocytes,

U937 cells.[54-56] The proposed mechanism behind 6-shogaol inhibition of NO evolution in stimulated macrophages involves down regulation of inflammatory iNOS and COX-2 gene expression by inhibition of the activation of NF-jB, because NF-jB plays a critical role in the coordination of the expressions of proinflammatory enzymes.[57] For the human being, the consumption of fresh ginger demonstrated promising results for the decrease of arthritis-induced.[58] These results show that ginger could be used as anti-inflammatory agent and thus as anti-pain.[59]

**Immunomodulatory activity**

The beneficial effects of ginger in treating coughs, colds and flu is probably linked to immune-boosting properties of the plant.[60]Few studies have examined the potential immunomodulatory activity of ginger. Non-specific immunity was increased in rainbow trout eating a diet containing 1% of a dried aqueous ginger extract for three weeks.[61]Mice fed a 50% ethanolic ginger extract (25 mg/kg) for seven days had higher haemagglutination antibody titre and plaque-forming cell counts, consistent with improved humoralimmunity.[62] One in vitro study found that ginger suppressed lymphocyte proliferation; this was mediated by decreases in IL-2 and IL- 10 production.[63]

**CONCLUSION**

From this literature review it is evident that the most of ingredients of *Nilavaagai chooranam* has pharmacological activity like anti histamine activity, anti-inflammatory activity, immunomodulatory activities which are responsible for its therapeutic activity claimed in literature.

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