



ANTHELMINTIC ACTION OF SIDDHA HERBAL FORMULATION SADHAKUPPAI CHOORANAM

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ABSTRACT

The chief cornerstone for the Siddha system of medicine is the Indian medicinal plants. Siddha medicine has illimitable wealth source of medicines for a vast wide variety of diseases, illness and ailments. But unfortunately only a handful of medicinal plants have been studied fully from among the untold volume of plants existing. Siddha system of medicine has been manoeuvred in treating diseases over centuries either by using single herbal therapy or polyherbal therapy (involving two or more number of plants) relying on different factors such as type of disease, severity of disease, site of activity etc.,. However combinational therapy have always had its upper hand in the success area. One such effective combination therapy in the treatment of Kudal Kirumi - Naakku puchi noi (Ascariasis) is *Sadhakuppai chooranam*. *Sadhakuppai chooranam* is the combination of ten medicinal plant parts namely *Anethum graveolens* (*Sadhakuppai*), *Cuminum cyminum* (*Cheeragam*), *Pimpinella anisum* (*Peruncheeragam*), *Nigella sativa* (*Karuncheeragam*), *Elattaria cardamomum* (*Elam*), *Cinnamomum verum* (*Lavangapattai*), *Glycyrrhiza glabra* (*Adhimadhuram*), *Coriandrum sativum* (*Kothamalli*), *Syzygium aromaticum* (*Lavangam*), *Cheena karkandu* – White sugar candy. The present review had fixed its focal point on exploring the phytochemical screening and showcasing the compounds responsible for antihelmenthic properties.

KEYWORDS: *Sadhakuppai chooranam*, antihelmenthic properties, Kudal Kirumi, Ascariasis.

INTRODUCTION

Kudal Kirumi - *Naakku puchi noi* is a *Siddha* medical terminology for Ascariasis, which is an infection of the small intestine caused by *Ascaris lumbricoides*. *A. lumbricoides* is a main species of roundworm family and it is the most common type of pediatric infection affecting one-fourth of the world population.^[1] Ascariasis is more prevalent in places devoid of modern sanitation. Its prime mode of transmission is via unsafe, unhygienic water and food. The infection is commonly observed with less or no symptoms, but intensified contaminations can wind up with serious complications in the lungs or intestines. Most of the clinical features of Kudal kirumi (*Naakku puchi noi*) described in *Siddha* literature are more or less similar to that of Ascariasis. In *Agathiyar Attavanai Vagadam*, a *Siddha* formulatory text, this polyherbal formulation named *Sadhakuppai choornam* is indicated for *Kudal Kirumi* (*Naakku Puchi noi*). This is herbal formulation mainly contain *Anethum graveolens* and *Nigella sativa*. Both of these drugs are well known for its anthelmintic activity.^[6] But its efficacy is not evaluated still now. Hence this review article deals with the estimation of the efficacy of *Sadhakuppai choornam*.

Epidemiology and burden of disease

The World Health Organization (WHO) has reported that the intestinal worms have made their impact by infecting about 10% of the populations in the developing world. This infection is casually obvious in the region where food and drinking water are unsafe and also when they are in contact with human fecal matter. *Ascaris* infections are predominantly widespread all over the tropics and subtropics. Climate plays a key role in the transmission of these helminths, with sufficient moisture and humidity required for larval development in the soil. On the other hand, poverty and water undersupply and poor sanitation also hold responsibility for the spread of *ascaris*.^[1-3] Intensity of infection is measured by the number of eggs per gram of faeces, generally by the Kato-Katz faecal thick-smear technique.^[4]

Children aged within 5–15 years are the most affected victims by *A. lumbricoides*, but significantly high incidence of cases were observed in the age ranging between 6–12 years (62%). The reason behind this fact may be that the school going children are more prone to this condition due to playing habit in dirt and soil, unhygienic food habit and contaminated water intake and

also due to overcrowded situations^[5]. Whereas the severity and chances of the infections sharply plummets to an all time low during adulthood. This declining fact in the severity and incidences of the infection during adulthood may be due to some factors such as changes in exposure, acquired immunity, or a combination of both remains controversial.^[6] Soil transmitted helminth infections are often referred to as being "overdispersed" in endemic communities, such that most worms are harboured by a few individuals in an endemic area.^[7] In India, the occurrences of the infection ranges between 80-100% in rural areas with improper sanitation. Lack of personal hygiene, contaminated food and poor socio-economic status, environmental sanitation all such factors congruently play their role for the occurrence for the infestation of the intestinal worm^[8]

Clinical manifestations

It is an infection of intestinal tract caused by the adult *Ascaris lumbricoides* and clinically manifested by vague symptoms of abdominal pain, nausea, anorexia and disturbed sleep with grinding teeth. Live worms are passed in stools or through vomiting. Roundworms in the lungs can cause coughing or gagging, vomiting roundworms, wheezing or shortness of breath, Roundworms in your intestines can cause nausea, vomiting, irregular stools, visible worms in the stool, stomach or abdominal pain and weight loss. Some people with a large infestation may have other symptoms, such as fatigue and fever. A major infestation can cause extreme discomfort. One may have all or many of the above symptoms if the patient fails to get proper treatment.^[9]

The metabolites of *Ascaris* may produce sensitisation phenomenon of allergic manifestation such as Urticaria, Rhinitis, Bronchial asthma, Intestinal diarrhoea, Conjunctivitis. The symptoms in a patient will depend on where the roundworms are in the body, but there can be complications when there is a large infestation.

Mode of transmission and pathogenesis of *Ascaris* (*Naaku puchi*)

A person can be infected with *Ascaris* after ignorantly intaking the eggs of the *A. lumbricoides* roundworm. The eggs of the worm may be present lively in the soil contaminated by human feces or uncooked food contaminated by soil that contains roundworm eggs. Ascariasis can also be transmitted directly from one person to another person. After ingestion, the *A. lumbricoides* roundworm reproduces inside the intestine and then traverses via bloodstream to the lungs. After maturing, the roundworms exit the lungs and makes its way to the throat. The patient may cough up or may swallow the roundworms in the throat. The worms that are swallowed will travel back to the intestine. Once the worms again get back to the intestine, they will mate and lay more eggs. Thus the life cycle of *A. lumbricoides* continues. Whereas, some eggs are excreted through faeces. Other eggs hatch and return to the lungs.

Complication

The Complications of Ascariasis in majority of cases are mild and are not observed to cause big havocs. However, heavy infestations can end up in severe complications. Threatening effects happens when worms gather in other areas of the body. They can include the Intestinal blockage when a mass of Worms blocks the intestines causing severe pain and vomiting. Duct blockages occur when the worms block the passageways to the liver or pancreas. Infections that lead to loss of appetite and poor absorption can cause slowed growth and poor nutrition.

Significance of siddha system of medicine for Ascariasis

The major side effects of conventional antihelminthic drugs are Anaemia. Anaemia has evolved to be a predominant problem all over the globe. Anaemia though sounds simple it had shoot up the mortality rates in mothers and children with severe anaemia, impaired cognitive and physical development of children, and reduced work productivity of adults.^[10] Anaemia is estimated to affect nearly a third of the global population.^[11] It is more widespread in South Asia (53%) than in other regions of the world.^[12] From a public health perspective, iron deficiency is believed to be the most important causal factor for anaemia. The fact that most anaemia control programmes, particularly in the developing world, rely on iron supplementation as the core strategy is therefore not surprising. An another similar systematic review study for randomised controlled trials of iron supplementation in children estimated that an average of between 38% and 62% of baseline anaemia (haemoglobin <110g/l) is responsive to iron supplementation among children aged under 6.^[13] Administration of intestinal anthelmintic agents have found to enhance the anaemic condition. 300 million people globally are with severe and permanent impairments and 2 billion people globally are estimated to be infested with helminths.^[14] Observational data suggest an inverse relation between intestinal helminthiasis and haemoglobin concentrations.^[15] Rational control of helminthic infections involves the regular use of the appropriate anthelmintic drugs. However, continuous administration of the drugs led to the development of resistance. Moreover, synthetic anthelmintics are well known to possess several adverse and/or side effects. Thus alternate therapeutic agents for the helminthic infections are needed to be constantly discovered.^[16]

PREPARATION OF THE SADHAKUPPAI CHOORANAM

Source of trial medicine

The required drugs for preparation of Sadhakuppai chooranam are *Anethum graveolens* (*Sadhakuppai*), *Cuminum cyminum* (*Cheeragam*), *Pimpinella anisum* (*Peruncheeragam*), *Nigella sativa* (*Karuncheeragam*), *Elattaria cardamomum* (*Elam*), *Cinnamomum verum* (*Lavangapattai*), *Glycyrrhiza glabra* (*Adhimadhuram*),

Coriandrum sativum (Kothamalli), *Syzygium aromaticum* (Lavangam), all of which are taken in equal ratio of 35 grams and *Cheena karkandu* – White sugar candy is to be taken as 75gram.

Purification and preparation of drug

Sadhakuppai, *cheeragam*, *peruncheeragam*, *karuncheeragam*, *elam*, *lavangapattai*, *kothamalli* are to be dried in sunlight. For Lavangam, the flower bud is to be removed and dried in sunlight. The the outer layer of the root of the drug *Adhimadhuram* is to be removed and cut in to small pieces and dried in sunlight. Except *Cheena karkandu* (white sugar candy) all the dried drugs were powdered and then finally it was mixed with *cheena karkandu*. Then it was filtered with a piece of cloth and then stored in a air tight bottles. A vessel containing milk is to be taken along with a piece of cloth tied to its top. The powdered drug is to be placed on the cloth and heated until the milk dries. The boiled powder is to be taken and then dried. The trial drug *Sadhakuppai chooranam* is to be stored in clean and dry bottles. 5-10grams of the drug is to be taken with hot water as adjuvant for a period of 3 months.

SCIENTIFIC VALIDATION OF SADHAKUPPAI CHOORANAM

Anethum graveolens

Anethum graveolens L. is a member of the Apiaceae family and is more commonly known as dill. *Anethum graveolens* contained essential oils, fatty oil, proteins, carbohydrates, furanocoumarin, polyphenols, mineral and many other biologically active constituents. It is widely used traditionally. The pharmacological studies showed that *Anethum graveolens* induced antimicrobial, antiinflammatory, analgesic, gastric mucosal protective and antisecretory effects, smooth muscle relaxant effect, hyperlipidaemic, increased progesterone concentration, and many other effects. The plant is used both medicinally and as an aromatic herb and spice in cookery. The fruit of *A. graveolens* has been used for medicinal purposes to relieve digestive problems and also to stimulate milk for nursing mothers.^[17] It was used as a remedy for indigestion and flatulence and as milk secretion stimulant. Moreover, it is used as an anti-convulsion, anti-emetic, anti-cramp (in children), as a wound healer and to increase the appetite and strengthen the stomach.^[18-20]

Cuminum cyminum

Cumin is native to Egypt and has been cultivated in the Middle East, India, China and Mediterranean countries for millennia. Cumin has a deep impact in the food and medicine. In the Bible also Cumin has taken its part and it is mentioned that it has been used as a seasoning agents in various foods such as soup and bread. Traditional uses of cumin include to reduce inflammation, increase urination, prevent gas, and suppress muscle spasms. It has also been used as an aid for indigestion, jaundice, diarrhea, and flatulence. Wound-Healing Activity of cumin has also been reported and thus for this wound-

healing activity this plant has been added as one of the ingredients in the *Sadhakuppai chooranam* to heal the internal wounds caused by the protruding of the worms^[21]. Increasing problems of development of resistance in helminthes against antihelminthics have ended up in using the best optional medicinal plants for their anthelmintic activity.^[22-23] This plant is known to provide a rich source of botanical anthelmintics.^[24,25]

Pimpinella anisum

Anise (*Pimpinella anisum* L.) is an annual important spice and medicinal plant belonging to the family Apiaceae and is considered as a natural raw material and used for pharmaceuticals, perfumery, food and cosmetic industries.^[26,27] In recent times, this that is native to the Mediterranean region. Today, anise spice plant has attracted consumer attention due to its antimicrobial, antifungal, insecticidal, and antioxidative effect on human health.^[28,29]

Nigella sativa

Nigella sativa (N. sativa) (Family- Ranunculaceae) is a widely used medicinal plant throughout the world. It is very popular in various traditional systems of medicine like Unani and Tibb, Ayurveda and Siddha. Seeds and oil have a long history of folklore usage in various systems of medicines and food. The seeds of *N. sativa* have been widely used in the treatment of different diseases and ailments. It has been widely used as antihypertensive, liver tonics, diuretics, digestive, anti-diarrheal, appetite stimulant, analgesics, anti-bacterial and in skin disorders. Extensive studies on *N. sativa* have been carried out by various researchers and a wide spectrum of its pharmacological actions have been explored which may include antidiabetic, anticancer, immunomodulator, analgesic, antimicrobial, anti-inflammatory, spasmolytic, bronchodilator, hepato-protective, renal protective, gastro-protective, antioxidant properties, etc. Due to its miraculous power of healing, *N. sativa* has got the place among the top ranked evidence based herbal medicines. This is also revealed that most of the therapeutic properties of this plant are due to the presence of thymoquinone which is major bioactive component of the essential oil. The present review is an effort to provide a detailed survey of the literature on scientific researches of pharmacognostical characteristics, chemical composition and pharmacological activities of the seeds of this plant.

In an experimental study performed in children infected naturally with the respective worms to study the Antinematodal efficacy of *Saussurea lappa* roots (Qust-e-Shereen) and anticestodal effect of *Nigella sativa* seeds (Kalonji). In this study, the results were interpreted based on the percentage reductions in the faecal eggs per gram (EPG) counts. Single oral administration of 40mg/kg of *N. sativa*, equivalent amount of its ethanolic extract and 50mg/kg of niclosamide reduced the percentage of EPG counts not significantly different from each other on the days 7 and 15. Hence this study exhibited the truth that

these indigenous medicinal plants contain active principles effective against nematodes and cestodes. The crude drugs did not produce any adverse side effects in the doses tested^[30] Seeds of *Nigella sativa* (family. Ranunculaceae) have been quite commonly used in “Unani” medicine for treatment of various diseases.^[31] The medicinal properties ascribed to these plant drugs include anthelmintic, anti-infectious, antiasthmatic, antiphlegmatic, anti-flatulent, diuretic and tonic. In addition, these medicinal plants have been used to cure paralysis, skin diseases, cough, rheumatism, epilepsy, cholera and dyspepsia^[32,33] Akhtar et al., have reported that *Saussurea lappa* roots and *Nigella sativa* seeds possess anthelmintic principles which are effective respectively against gastro-intestinal nematode and cestode infections of domestic animals. However, these antiparasitic activities have not been studied in humans so far. Therefore, a field trial was conducted to evaluate the efficacies of *Saussurea lappa* roots (Qust-e-Shereen) against nematodes and *Nigella sativa* seeds (Kalonji) against cestodes in children.^[34]

Thus possible use of these cheap indigenous plant drugs as they have proved to be potent and safe agents for the treatment of children against round and tape worm infestations. However, further comprehensive chemical, pharmacological and chronic toxicological investigations are yet needed to elucidate their exact mechanisms of anthelmintic actions and to isolate their active principle(s).

Elettaria cardamomum

Small cardamom of commerce, popularly known, as queen of spices is the dried fruit of tall perennial herbaceous plant, (*Elettaria cardamomum* Maton) belongs to the family Zingiberaceae. It is a shade loving plant cultivated at an altitude of 600 to 1200 m above MSL with an annual rainfall of 1500 to 4000 mm and a temperature range of 10 to 35 °C. Till recently India was the main producer and exporter of cardamom. Of late Guatemala has emerged as a keen competitor to Indian cardamom in the international market. Tanzania, Sri Lanka, El Salvador, Vietnam, Laos, Cambodia and Papua New Guinea are the other cardamom growing countries. In India cardamom is cultivated in the southern states of Kerala, Karnataka and Tamil Nadu. Kerala accounts for 60 % of the cultivation and production followed by Karnataka 30% and Tamil Nadu 105%.

In a study by Mehjabeen et al., 2015, *Elettaria cardamomum* extract showed insecticidal activity that is 20-40%. Significant anthelmintic activity was also found at a dose of 50mg/2ml showed 5 hour death time. Administration of drug showed the decrease in intestinal motility and softness of stool with increased diuresis. Therefore the carminative and anthelmintic property has been confirmed through this study.

Cinnamomum verum

A test study was conducted whether cinnamon bark contained compounds with anthelmintic activity. In this study an extract was prepared using a procedure done by another previous study^[35] The resulting extract was then tested for in vitro activity against larvae of *Ascaris suum*, an important nematode parasite of swine that also serves as a model for the closely related human parasite *A. Lumbricoides*^[36] This study has revealed that these cinnamon for the first time anthelmintic potential property in vitro, and this derives both from its proanthocyanidin tannins and most notably from trans-cinnamaldehyde.

Glycyrrhiza glabra

Comparison with traditions of liquorice use outside Europe The major systems of phytotherapeutic knowledge outside Europe are found in the Ayurveda system in the Indian subcontinent and in China. In China, liquorice is used in almost all herbal preparations. The use of liquorice (“Gan Cao”) is documented in the oldest source on remedies in China, the Shennong bencao created 200b.c. According to legend this work is based on sources dating back to the Emperor Shennong (ca. 2700b.c.). The reported indications include some which were common in Europe like: pharyngitis, cough, palpitations, gastric pain, ulcers in the intestinal tract and sores. The latter indication of liquorice features also prominently in the Indian Ayurveda system. This is a system of medical knowledge including phytotherapy which started to be codified about 450b.c. in India, while the oldest surviving Sanskrit text dates from about 500 A.D.^[38] The uses of *Glycyrrhiza glabra* reported apart from its use in antidote mixtures for a variety of acute and chronic poisonings, include improvement of the voice, an indication mentioned in the context of viral respiratory tract infections, wound infections, operation wounds of the ear, excessively bleeding punctures from blood letting^[38,39] European, Indian and Chinese traditions all contain references to antiviral effects in the context of viral induced voice changes in laryngitis, pharyngitis, most likely viral induced cough, viral hepatitis and viral skin diseases like condyloma and ulcers.

Coriandrum sativum

Coriandrum sativum L. (Coriander) is an important spice crop and occupies a prime position in flavouring substances. The main coriander growing states in India are Andhra Pradesh, Rajasthan and Tamil Nadu. The seeds are used in medicine as a carminative, diuretic and also used in the preparation of many household medicines to cure bed cold, seasonal fever, nausea and stomach disorders. Coriander seeds contain petroselinic acid, linoleic acid, oleic acid and palmitic acid. Major components of essential oil are linalool, α-pinene, camphor and geraniol Coriander oil is used in baked foods, condiments and also functions as an essential ingredient in curry mixes^[40]

The study of antioxidants that are ubiquitously present in spices is gaining momentum in human health, as these are easily absorbable in human system. *Coriandrum sativum* is well known for its antioxidant properties and some of its active components have been identified. Coriander contains active phenolic acid compounds, including caffeic and chlorogenic acid. The flavonoids include quercetin, keampferol, rhamnetin and apigenin. Most of these compounds are known to inhibit free radicals generated in the cellular system, when they are obtained through the diet. While there is still limited understanding of the mechanisms through which they act, initial research indicates that *Coriandrum sativum* is effective as both a treatment and preventive agent for several chronic diseases^[41]

Syzygium aromaticum

The major component of *Syzygium aromaticum* essential oil is eugenol this oil was tested in vitro, in a study conducted by Asha et al 2001 and this study showed potent anthelmintic activity in the *Caenorhabditis elegans* model. Eugenol exhibited an ED of 62.1 50gml. Eugenol being the predominant component of the essential oil, is suggested as the putative anthelmintic principle^[42] Use in traditional medicine. As an anthelmintic, expectorant, antipyretic, insecticidal and in a variety of skin diseases.

The essential oil of *O. sanctum* and eugenol showed potent anthelmintic activity. The traditional use of the *syzygium aromaticum* is found to possess anthelmintic. Furthermore, eugenol, as its main and active constituent, could be the putative anthelmintic principle in the essential oil.^[43]

CONCLUSION

Through this review the scientific facts behind the traditional use of *Sadhakuppai Chooranam* has been traditionally validated. Further preclinical and clinical studies are warranted to prove its therapeutic efficacy.

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