Int. J. Curr. Res. Chem. Pharm. Sci. (2025). 12(7): 42-51

INTERNATIONAL JOURNAL OF CURRENT RESEARCH IN CHEMISTRY AND PHARMACEUTICAL SCIENCES
(p-ISSN: 2348-5213: e-ISSN: 2348-5221)
www.ijcrcps.com
(A Peer Reviewed, Referred, Indexed and Open Access Journal)
DOI: 10.22192/ijcrcps Coden: IJCROO(USA) Volume 12, Issue 7- 2025

Review Article

DOI: http://dx.doi.org/10.22192/ijcrcps.2025.12.07.005

Biochemical components of ingredients of Murunkathylepa as a paste used in the external application therapy in Siddha medicine: A literature review

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Abstract

Murunkathylepa is one of the paste (in Tamil known as *pattru*) used in Siddha medicine as an external application. The ancient text reveals, that it is mentioned in ole leaves book. Siddha medicine use thirty two(32) types of internal medicine and thirty two(32) types of external medicine to treat illnesses. *Pattru* (paste) is an external medicine for treatment. The purpose of this paper is to examine the chemical constituents of *Murunkathylepa* ingredients, as well as their morphological characteristics and usage ingredients are *Moringa oleifera* (*Murungai*) stem bark (*pattai*), *Crateva religiosa* (*Mavilanku*) stem bark (*pattai*), *Cosinium fenestratum*(*Maramanjal*), and stem bark juice of *Moringa oleifera* (*Murungai pattai saru*). *Murunkathylepa* (paste) is used in the treatment of osteoarthritis (*Azhal keel vayu*). The constituents of *Murunkathylepa* contain various types of bio-chemicals. *Murunkathylepa* combined with internally administered medicines have a synergistic action to relieve *vatha* diseases. The used plants have distinct morphological characteristics and are highly effective in indigenous medicine.

Keywords: *Murunkathylepa pattru*, external application therapy, Siddha medicine, *Azhal keel vayu*

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Introduction

Siddha medicine uses thirty two(32) different types of external and thirty two(32) different types of internal medications (Janani et al., 2017) *Sidhamarunthumuraiiyal* text (Ramanathan, 2000) mentioned *Murunkathylepa* pattru is used for *vatha* diseases such as *Azal keel vayu* (knee osteo arthritis) and contains the following ingredients. *Moringa olefera* stem bark (*Murangaipattai*) – one part, *Cosinum fenestratum* (*Maramanjal*) stem – one part, *Creatava religiosa* bark (*Mavilankampattai*) – one part, *Moringa olefera* bark juice (*Murungai pattai saru*) in required amount. Fine powders of the aforementioned ingredients are combined with stem bark juice of *Moringa olefera* (*Murungai paddai saru)* to form a paste. That was used for osteoarthritis, a crippling disease that affected billions of people worldwide (Litwic, 2013)

Objectives

1. To discuss the bio-chemical composition of *Murungathylepa* ingredients,
2. To analyze the morphological characteristics of plant ingredients used in *Murunnkathylepa*
3. To describe the usage of ingredient plants in *Murungathylepa*

Methodology

A systematic search of multiple data bases was conducted using an established scoping review framework. The title and abstract of articles on traditional indigenous medicine published in Sri Lanka and South East Asian countries.

Results

A) *Moringa oleifera* (*Murunkai*)

- Botanical name:-*Moringa oleifera*
- Common name:- Ben oil tree, ‘Miracle tree’ and ‘Mothers best friend’, 'Drumstick' and Horse radish tree
- Family:-Moringaceae
- Habitat:- dry zone in Sri Lanka, India and Malaysia
- Parts used:- leaves, bark, seeds, flowers, roots, Gum and fruits (Bancesi et al,2020)
- Suvai(taste) /Gunam (Property) /veeriam(Potency)/vipakam (ultimate taste):-*inippu(Sweet)/Koormai(sharpness) and varadchy(dryness)/ Kulirchchi(cool)/ inippu(Sweet)*/In external application, property and potency are important because *Moringa oleifera* plant as a ingredient in *Murunkathylepa* apply externally

Morphology of *Moringa oleifera* plant

The tree is between 3m and 12m tall, has primary leaflets in 8 to 19 pairs and measure 5 to 25 x 3 to 14 mm. The leaves have 2-3 pinnate and are 20 to 60 cm long. Pedicles are 10–30 cm with fragrant, white or yellowish-white flowers are 18–45 cm long, costate, and with three blunt-ribbed valves. 3 winged, 1 cm in diameter seeds.

Nutrients in *Moringa oleifera* plant

Plants are important sources of dietary macro and trace elements, which are necessary for human nutrition and health. These components are crucial to many bodily physiological processes. The crucial macro elements are potassium, sodium, and magnesium and crucial trace elements (Nikuba & Mohamed, 2017). In the powdered seeds and leaves of *Moringa oleifera* (MO), Ferrum, Zinc, Manganese, Chromium, and Cobalt has been reported. Barium, Berlium, Aluminium, Argon, Cadmium, In, Caesium, Vanadium, Strontium, Bismuth, and Plumbum non-essential element amounts were also found. Iron and Manganese content in MO seeds were high, with 284.6 and 93.6 mg/ kg to L(Hectoliter) and Potassium and Manganese content were high in MO seeds 15,930.5 and 2229.3 mg/ kg to L respectively. Zinc levels were high in MO leaf powder with 51.0 mg/ kg to L values. Non-essential elements Aluminium, Barium, and Stronium were found in MO seeds in varying concentrations (Nikuba & Mohamed, 2017) did not analyze the bark of MO. In the siddha, one

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saying "*ver par thalai par melamellapaspasenthuram pare*" denotes that the ingredient's potency increase in the following ways: the root, the leaves, the *paspa*, and the *senthura*. The differences in macro and trace minerals in MO parts (leaves, pods, and seeds) from various places were confirmed by Anjorin et al. (2010). This discovery may serve as a benchmark for the formulation and choice of plant-based mineral supplements for animal and human nutrition.

Atomic absorption spectroscopy was used to estimate the concentrations of trace elements such as Arsenic, Calcium, Cadmium, Cobalt, Chromium, Cupper, Ferrum, Potassium, Magnesium, Nickel, Manganese, Plumbum, and Zinc. Beneficial elements like Ferrum, Zinc, Potassium, Magnesium, Manganese, Calcium, Cobalt, and Nickel are present, but in moderate amounts. While the levels of the heavy trace elements Chromium, Cadmium, and Plumbum are within acceptable limits, Cupper and Arsenic concentrations are high (Gupta et al, 2014). While trace elements are crucial for maintaining human health and preventing a number of diseases, they can also be dangerous in high concentrations. Calcium concentrations in stem bark samples from Agra and Aligarh cities in India are 2295.582 ppm and 2487.224 ppm, respectively. (Gupta et al, 2014) That suggests that the same plant contains different amounts of elements at various locations. In the sample from Agra, the amount of potassium in the stem bark of MO is 1963.421 ppm, while the amount in the sample from Aligarh is 1753.532 ppm. Various amounts of harmful heavy metals, including Arsenic and Cupper, are found in the stem bark of MO. These are the harmful substances that are removed during purification and reduced using other ingredients in the production of indigenous medical drugs. The following components and those activities as follows

Table.1 Elements in *Moringa oleifera* and its activity in human body

Elements	Activity
Ca	Strong bones and teeth, normal contraction of muscles, blood coagulation
K	Regulates acid base balance, reduce blood pressure, protein bio synthesis by ribosome, found in blood plasma, muscle and nerves
Fe	Formation of hemoglobin
Co	Formation of normal blood cells, synthesis of hemoglobin, DNA and several enzyme
Mg	Transmitting nerve impulse in brain, In plasma and extra cellular fluids, maintaining osmotic equilibrium
Mn	Activate metal enzymes, co-factor in respiratory enzymes, resistance to diseases, excessive manganese cause adverse effects on lungs and brain. Deficiency cause skeletal and reproductive abnormalities
Ni	Production of insulin in the body, deficiency cause liver disorder
Zn	Found in more than 200 proteins and enzymes, fore brain development, DNA synthesis, steroid genesis, bone formation, wound healing.
As	Permissible amount less than 1.0 ppm, more than permissible cause metabolic disorders, neurological disorders, dermatitis, lung cancer, cardio vascular effects
Cu	Permissible amount less than 3.00ppm, dermatitis, dermatitis, hair and skin discoloration, play role in neurological conditions like alzheimer's disease, Wilsons disease, prion disease, trace amount need for hemoglobin synthesis
Cr	Deficiency cause diabetes, growth failure, hyperglycemia, atherosclerosis
	(Silva et al, 2019; Biswas et al, 2020; Eric et al, 2017)

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This literature articles offers a fresh viewpoint on the presence of essential elements and heavy metals in medicinal plants. The above findings demonstrated that all other heavy metal and essential element concentrations, including potassium, Copper, Zinc, Plumbum, and Cadmium in MO, were absent from Magnesium, Manganese, Ferrum, and Nickel (Nikuba & Mohamed, 2017). In indigenous medicine, *Moringa oleifera* used after the purification and mixing with other ingredients for external use, which is lessened the toxic effect.

Plant usage

The anti-diabetic, anti-anaphylactic, anti-microbial, anti-oxidant, anti-bacterial, anti-biotic, anti-inflammatory, anti-thyroid, anti-ulcer, anti-spasmodic, cholesterol-lowering, anti-HIV, anti-fungal, diuretic, anti-hypertensive, hepatoprotective, and anti-tumor properties of MO makes it a specific plant ingredient (Gupta et al, 2014)

Crushed, flushed, and then wrapped in cloth, roots can be used to treat sprains and fever. Sprains are treated with stem bark. Fever, icterus, indigestion, pulmonary issues, malaria, stomach pains, and tooth decay (Burkill, 1985).In Sudan, seeds are used in phyto-chemistry to purify water. The seed oil, also referred to as "Ben oil" or "Behen oil," can be used for cooking, hair styling, lubrication, and the creation of perfumes (Bosch, 2004). To purify water, dried and crushed leaves act as an antibiotic, bacteriostatic, and fungi static agent. (Burkill,1985). Unlike other plants, this one has all nine essential amino acids. This is an exception for plant resources because most plants contain methionine and cysteine-containing sulphur. A good source of calcium, iron, and vitamins A, B, and C. (Panda & Sarkar, 2007). Another study referred to a specific area. The *Moringa oleifera* plant contains amounts above the recommended dosage, posing health risks. Because chemical analysis of the same plant growing on different sides is not as important, this point is crucial for Sri Lanka and India-like nations (Monika et al. 2015). For vegetables, *Murungai* leaves and capsules are used. phosparous and *Murunkachuranakarathathu* in seeds, leaves for a diuretic and laxative.

The following illnesses are treated with *Moringa oleifera* plant parts: Cancer, Diabetes, Asthma, Abscess, Anemia, Arthritis, Articular pain, Eye conditions, Cough, and Spasms, Dysentery, Dysmenorrhea, Epilepsy, and Diarrhea, Influenza and Sinusitis, Gonorrhea, Migraines, Headaches, Hemorrhoids, high blood pressure, infertility, digestive tract worms, Icterus, Indigestion, HIV-related immune impairment, Malaria, Oligospermia, Otitis, paralysis, Rheumatism, Dysfunctional sexual behavior, skin and mucosae infections, stomach discomfort, Fever, Liver disease, Varicella, Fever, and Sprain (Kasolo et al., 2010; Burkill, 1985)

B) *Crateva religiosa* (*Mavilanku*)

- Botanical name:- *Crateva religiosa*
- Common name:- Sacred garlic pear or temple plant
- Family:- Capparaceae
- Habitat:-E. Asia - China, Japan, India, Sri Lanka, Myanmar, Thailand, Cambodia, Vietnam, Malaysia, Indonesia, Philippines, New Guinea, Australia, Pacific Islands
- Parts for medicinal usage:- leaves, stem bark, and root (Sanjay et al, 2021)
- Action:-Leave- Stomachic, febrifuge, Tonic /Bark and root- Rubifacient, laxative, Lithontriptic
- *Suvai*(Taste)/*Gunam*(Property)/*veeriam*(potency)/*vipakam*(Ultimate taste):- Taste-*kaippu*/ Property-Febrifuge, Anti-vatha, antidote/potency-heat/ultimate taste-*karppu* (Murukesa Muthaliyar,)

Morphological characters

A deciduous tree called *Crateva religiosa* (CR) is about 15 meters (50 feet) tall and 9 meters (30 feet) wide. It prefers typically prefers moist, rich, neutral to acidic soil and thrives in full or partial sunlight. The wood is initially yellowish-white and eventually turns light brown. It is gray.

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Leaves are grouped at the ends of branchlets, with a common petiole measuring 5 to 10 centimeters in length, and tree leaflets growing at its summit. The leaflets of this plant are oval-lanceolate or ovate, 7.5 to 12 centimeters long, 4 to 6 centimeters wide, pointed at the base, and with a relatively slender point at the tip of the flower. They have a diameter of roughly 5 centimeters, are greenish-yellow in color, have purplish stamens, and grow in terminal corymbs. (Srinivas et al, 2018).

Bioactive substances

The plant is rich in phytochemicals like phenols, volatile oils, alkaloids, glycosides, saponins, terpenoids, and saponin glycoside. (Sanjay et al, 2021)

Aqueous extracts of *Crataeva religiosa* possess antioxidant potential. The capacity of the extracts to fight bacteria was evaluated. The micro-test method was used to test the antibacterial activity against the five microorganisms *Escherichia coli, Shigella sonei, Staphylococcus aureus, Pasteurela pestis,* and *Yersinia enterocolitica*. (Jaikanth et al, 2014)

In comparison to the aqueous extract, the alcoholic extract has a stronger anti-inflammatory effect against inflammatory substances like carageenan, histamine, and 5HT. (Srinivas et al., 2018).

Phytochemicals

Secondary metabolite concentrations were found to be higher in the apical stem bark and middle bark than in the mature inner bark by Patil & Gaikwad (2012). Examples of secondary metabolites include polyphenols, water soluble tannins, flavonoids, alkaloids, nitrate, and oxalate. Different techniques are used to evaluate the secondary metabolites in these three bark samples. The concentrations of the phytochemicals, excluding oxalate and total ash, were discovered to be higher in the apical stem bark and middle bark than in the mature inner bark.

According to Awagay, the roots of *Crataeva religiosa* were extracted using three different solvents: chloroform, dichloromethane, and 50% ethanol. Secondary metabolites like steroids, terpenes, and sugars have also been reported. Gas chromatography-mass spectrometry (GCMS) was used to separate and identify the individual compounds in each of the three extracts. It was found that dichloromethane extract contained many terpenes, such as camphor, menthol, caryophyllene, ar-curcumene, sesquiphellandrene, ar-tumerone, curlone, and a cardiac glycoside (strophanthin), whereas chloroform extract was rich in steroids, such as campestrol, stigmasterol, sitosterol, and phenolic compounds (methyl salicylate) (Srinivas et al, 2018)

Khan et al, found that chloroform and dichloromethane extracts did not contain as many phytoconstituents as water and 50% ethanol extracts did. Chloroform, dichloromethane, and 50% ethanol were used to extract the stem bark, and the extracts were then analyzed using gas chromatography-mass spectrometry (GCMS) to separate and identify the different compounds. The antimicrobial efficacy of the three extracts of the studied portion was examined against two fungi and four pathogenic bacterial strains. The outcome of the antimicrobial activity was compared with those of conventional antibiotics. The physiochemical results showed that 50% ethanol extracts had the highest extractive values of 15.85± 0.21 and the lowest moisture content of 6.70± 0.59. They also had the highest ash content of 22.18± 1.17. Each of the three solvents' functionality extracts had a big impact. Chloroform extracts were active against fungi but inactive against bacteria at a concentration of 10 mg/ml. The plant contained more flavonoids than alkaloids, which were closely followed by saponins. The least amount of phenols was found in the stem bark from the forest *Crateva religiosa* than harvesting CR (Srinivas et al, 2018) Dr.P.Gowsalya has reported that the ethanolic and aqueous fractions are having more Analgesic and Anti-inflammatory activity than petroleum ether and chloroform extracts.(Srinivas et al, 2018)The methanol leaf extract of CR has a stronger wound-healing effect than penicillin, according to

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Ajali et al, (2010). Indicating that the extract had a more potent wound healing mechanism than penicillin, the faces of wounds treated with it dried more quickly. Utilizing a soxhlet extractor, methanol was used to extract the dried CR leaves (penicillin). It was discovered that the extract's 50 mg/kg wound-healing effect was superior to penicillin's 50 mg/kg effect. The effects of 50 and 100 mg/kg on wound healing were remarkably similar. This suggested that at 50 mg/kg, the effective dose had been reached. Tannins and the fact that the extract dried more quickly than those who received penicillin treatment indicated that the extract had mechanism for extra-wound healing (Srinivas et al, 2018).

Usage

Bark- laxative also stimulate appetite.Juice of bark/root used for decoction- laxative against colic, febrifuge. Bark, leaves –poultice against joint disease.The leaves are heated and applied earache.To treat kidney stones, hypertension, malaria, diabetes, respiratory disorders, pain, inflammation, and other conditions, the leaves are heated and applied to the affected areas by various tribal public and rural communities. (Sanjay et al, 2021) The biological property of this plant has been supported by scientific evidence for its analgesic, anti-inflammatory, antimicrobial, antioxidant, hepatic protective, antifungal, and anti-arthritic effects. (Sanjay et al, 2021) CR has a sweet, sour, bitter, and astringent flavor. The bark and leaves of the tree are used medicinally. The most potent herbal remedy for a variety of urinary disorders is CR. For the treatment of male benign prostate hyperplasia, this herb is litholytic. Astringent, cholagogue, weight loss, immunity, restless legs syndrome, and other conventional uses for CR improves urination and excretion, reduces the risk of heart issues, and encourages healthy growth. Convulsions, swelling and burning in the soles of the feet, vesicant, antiemetic, snake bite antidote, aids digestion, stimulates appetite and biliary secretion, laxative, and neurologic pains (Srinivaset al.2018)

C) *Cosinium fenestratum* (*Maramanjal*)

- Botanical name:-*Cosinium fenestratum*
- Common name:- Tree turmeric
- Plant type:-woody climber
- Family:- Menispermaceae
- Habitat:- Sri lanka, southern India and Vietnam
- Parts of use:- Dry stem and root and fresh leaves.
- Action:-Febrifuge, Stomachic, Tonic
- Suvai(taste) / Gunam(property)/veeriam (Potency)/ vipakam (Ultimate-taste):-Taste-Kaippu/Property- cure piles, kanaisuram, internal fever/Potency-Heat/vipakam-Karppu (Murukesa Muthaliyar)

Morphological characters

A large woody climber that is dioecious and has both male and female plants. Young stems and branches have fuscous-cinerous, terete, distantly nodose, striated bark. The bark is heavily pubescent, yellow, corky, fissured, and lenticellate. Very rarely do slender tendrilla rbranchlets appear. When young, the lamina is thick, broadly ovate, acute or acuminate at the apex, rounded or truncate at the base, and the margin is entire. The petiole is up to 10 cm long, angular, thickened both at base and apex, densely at pressed, rusty pubescent, and the branches of the supra axillary inflorescence are finely to mentose. Male flowers have globose, densely flowered heads that measure 6 mm in diameter and are 2 cm long. There are petals of yellow. (Danapur et al, 2020)

Bio chemicals

Jatrorhizine, palmatine, berberine, and antibiotic properties are in *Cosinium fenestratum* (Jayaweera, 1982)

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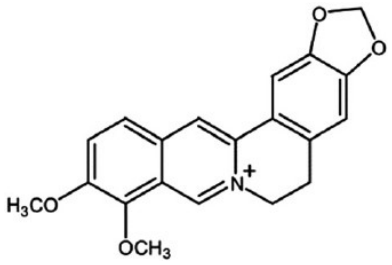

Fig 1. Berberine

Thin layer chromatography (TLC) is used to determine the amount of berberine that has been isolated through maceration, percolation, or soxhlet extraction (Rojsanga et al, 2006). The berberine is an intriguing and essential component of *Maramanjal*, which comes from various plants.It's an alkaloid that was primarily discovered in *Hydrastis canadensis*. There are numerous other plants that contain berberine. Although it is generally toxic to children, it has been used orally to treat a variety of parasitic and fungus infections as well as diarrhoea. The group of organic compounds known as proto-berberine alkaloids and derivatives includes berberine. These are alkaloids with a 5,6-dihydrodibenzene moiety that is fused to a quinolizinium to form the 5, 6-dihydrodibenzo quinolizinium skeleton, or proto berberine moiety. Berberine's hetero aromatic ring and alky groups have an anti-inflammatory effect. (Parthpatil, 2021)The female *Cosinium fenestratum* (CF) plant has high levels of antioxidants and berberine (Roophasree et al, 2021)

Plant usage

For various disease conditions, different CF parts are used, fresh and dry parts are used, and internal and external modes of application have different effects on the body depending on the disease condition. CF is never used alone as a plant drug; instead, it is combined with numerous other plant drugs. (Roopa & Hosety, 2017) In *Murungathylepa*, *Maramanjal(CF)* is mixed with the other two plants (*Murungai and Mavilanku*)

The stem of the CF plant is beneficial for conditions like ophthalomopathy, inflammations, wounds, ulcers, skin diseases, abdominal disorders, jaundice, diabetes, tetanus, fever, and general weakness. (Nair et al, 2005)

Maramanjal decoction is an immune stimulant used for Tetanus and debilitating illnesses causing fever (Ekanayaka & Chandrasekara, 1989)

Table. 2. Parts and usage of *Maramanjal*

S/no	Disease conditions	Part of plant	Fresh/dried	Internal/external
1	Allergy	stem	dry	Internal, external
2	Asthma	root	dry	internal
3	Boiled filled with water on skin	Stem, root	dried	Internal, external
4	Blood purifier	bark	dry	internal
5	Back ache	stem	dry	external
6	Cancer	root	dry	internal
7	Crack in the heel	Root, bark	dry	internal

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8	Diabetes	root	dry	internal
9	Debility	root	dry	internal
10	Dimness of vision	leaves	fresh	internal
11	Eczema	Root, stem, bark, leaves	Fresh, dry	External, internal
12	Fresh wounds	Root, stem, leave	Fresh, dry	external
13	Gasterointestinal purification	bark	dry	internal
14	Itching and dryness of skin	Stem, bark	dry	external
15	Kidney stone	bark	dry	internal
16	Lump on surface of the body	Stem	dry	External, internal
17	Obstruction in urinary tract	leaves	fresh	internal
18	Pain in joints	Root, stem	dry	external
19	Pain relieve	stem	dry	internal
20	Pimples	stem	dry	external
21	Psoriasis	stem	dry	Internal and external
22	Piles (hemorrhoids)	Stem, root, bark	dry	external
23	Sleep stimulant	root	dry	internal
24	Small patches of scaly skin	root	dry	internal
25	Stimulating insulin production	root	dry	internal
26	Skin care	Root, bark, leaves	Fresh, dry	external
27	Snake bite	stem	dry	external
28	Swelling of testicles	root	dry	external
39	Thyroid	Stem, root	dry	internal
30	Ulcer(gastritis)	Stem, bark	dry	Internal
Roopa & Hosetti, 2017				

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Effect of *Murungathylepa* pattru

Anti-inflammatory, analgesic, and anti-arthritic medications worked together synergistically rather than separately.

Synergistic and agonizing effects of herbal drug ingredients

The plants mentioned above are cooperating to produce positive results and lessen negative effects, which agonist the individual herbs, which mean combined effects of individual plants.

Conclusion

The above mentioned three plants *(Murungai, Mavilanku and Maramanjal)* are very effective for treating a variety of illnesses both internally and externally. These are plants used in indigenous medical systems as protectors.

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Quick Response Code

DOI: 10.22192/ijcrcps.2025.12.07.005

How to cite this article:

K. Sivadharan, R. Sivakanesan, R. Sumadi Rangika. (2025). Biochemical components of ingredients of Murunkathylepa as a paste used in the external application therapy in Siddha medicine: A literature review. Int. J. Curr. Res. Chem. Pharm. Sci. 12(7): 42-51.
DOI: http://dx.doi.org/10.22192/ijcrcps.2025.12.07.005

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