

## Ethnobotanical Study of Some Medicinal Plants with Special Reference to Mudakkaruthan Green (*Cardiospermum helicacabum* (L.))

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Plants are very useful source of various bioactive compounds which have direct or indirect use in the treatment of various human ailments. They are the god gift of mother nature in the world they are enormous amount of therapeutic, medicinal properties are rich in various parts and various ailments to cure some diseases in human, and animals in Veera chozhan river bank around two kilometer rich biodiversity conservation places. There are fifty-five medicinal plants are available. This type of herb, shrub and tree plants to cure many diseases in and around village peoples. Most of the plant parts to collect and make various ailments such as cough, sneezing, cold remedy, body pain, skin disorder, stomach problems, dysentery, diabetics, vomiting, itching, nervous disorders, leprosy, oral disorder, urinary problems, kidney stone, muscles infections, dandruff, foot crack, asthma, infertility, bronchitis, eye disorders, nasal disorders, anticancer activity, epilepsy, hemorrhoids, tuberculosis, piles, laxative, headache and wound healing, etc., In the above diseases local villages immediately to collect the plant parts are used to cure some diseases to heal some problems of human begins.

**Keywords:** medicinal plants, diseases, therapeutic uses, local ailments

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## 1. Introduction

Plants are the ebullient gift of Mother Nature which houses an enormous amount of compounds that possess therapeutic properties. Naturally, plants possess primary and secondary metabolites which play a significant role in regulating some of the vital functions necessary for plant growth and development.

Among them, the green leafy plants, consumed as food harbors essential minerals viz., Ca, Fe, Zn, Mg, Cu, Mn etc., and nutrients such as carbohydrates, proteins, fats and crude fiber.(Minmay *et al*, 2015). The usage of medicinal plants from the ancient period to present date reveals the importance in the treatment of various diseases. Plants are the good source of essential nutrients and minerals that contribute to the wellbeing of an individual.

On proper supplementation through diet, they can acquire, convert, allocate, distribute and pave way for proper utilization of all the essential components in the biological system. The physicochemical studies deal primarily with the adulterants detection and also to ensure the quality and purity of the drug (Majumder *et al.*, 2016).

Most developing countries depend on starch-based food as the main staple food for the supply of both energy and protein. India being blessed with a variety of natural surrounding and varying climates and seasons has a number of edible green leafy vegetables. Green leafy vegetables are an important component of the human diet, providing fibre, minerals and vitamins (Acikgoz, 2011, Emebu and Anyika, 2023).

Green leafy vegetables are rich sources of vitamins such as  $\beta$ -carotene, ascorbic acid, riboflavin and folic acid as well as minerals such as iron, calcium and phosphorous. They are also recognized for their characteristic color, flavor and therapeutic value. Green leafy vegetables are important protective foods and highly beneficial for the maintenance of health and prevention of diseases.

Recognizing the need for identification of such green leafy vegetables, which are believed to be nutritious, may help in achieving nutritional security. The diet and the food based approach in combating micronutrient malnutrition are essential for its role in increasing the availability and consumption of micronutrient rich foods.

*Cardiospermum halicacabum* traditionally, the leaves of the plant have been used in the treatment of skin and eye ailments, cuts and wounds and as an antidote for snake bite (Susilamma *et al.*, 2007). In the recent years, malnutrition is an overwhelming problem in the developing countries. Poor nutrition and inadequate supplements in the food thrive to be a reason for many diseases. This could be surpassed by the intake of foods rich in all the essential minerals, trace elements and vitamins (Suthinraj *et al.*, 2008).

### Taxonomic Position of Mudakkaruthan Green (*Cardiospermum halicacabum*(L.)).

Kingdom	Plantae
Clade	Tracheophytes
Order	Sapindales
Family	Sapindaceae
Genus	Cardiospermum
Species	Halicacabum (L.)

#### 1.1. Botanical Features

**Name:** *Cardiospermum halicacabum* L.

**Family:** Sapindaceae, the Soapberry family.

**Common Names:** Balloon Vine, Heart-seed, love in a puff, and in its native Mexico as frolitos (little lanterns).

**Etymology:** *Cardiospermum halicacabum* L., is the combination of the Latin words cardio, meaning heart, and sperma, meaning seed and refers to the white heart-shaped pattern on the seed. Halicacabum is derived from the Latin word halicacabus, a plant with inflated fruits.

**Botanical Synonyms:** none found

#### Notable Features:

- Inflated, papery, balloon-like fruits
- Large teeth and lobes found on leaflets of the compound leaves
- Forked tendrils borne at the base of inflorescences

**Plant Height:** *C. halicacabum* can grow up to 3m in height.

**Subspecies/varieties recognized:**  
*Cardiospermum halicacabum* var. *angustisectum* Griseb.,  
*Cardiospermum halicacabum* var. *microcarpum* (Kunth) Blume.

**Habitat Preference:** Prefers moist thickets, waste places (2, 4), and river banks (2).

**Geographic Distribution in Michigan:** *C. halicacabum* has been reported only in Wayne County.

**Complete Geographic Distribution:** Native to tropical America, *C. halicacabum* has been introduced throughout the southern and southeastern United States (Virginia to Georgia to Texas) as well as Michigan, New Jersey, Ohio, Illinois, and Montana. It is reported as a noxious weed or weed-seed in many southern states. (It can also be found in East Asia, India, Africa, and Southern Europe).

**Plant Description:** Woody annual, many-branched vine with bi-fid (forked) axillary tendrils that are used for climbing. Leaves are alternate and twice ternately compound. Leaflets bear toothed margins, are lanceolate in shape, 2-4cm in length, 1-2cm wide, and faintly pubescent with pinnate venation.

**Climbing Mechanism:** Uses the two-branched axillary tendrils often found at the base of the inflorescences.



**Flower Description:** Irregular flowers are borne in panicles. Each flower bears four sepals, two large and two small, four whitish petals 4mm long, and eight stamens. Petaloid appendages are at the base of each flower. The 3-celled ovary bears one ovule per cell.

**Flowering Time:** *C. halicacabum* flowers from July to August.

**Pollinator:** Pollinated by bees, wasps, flies, and butterflies.

**Fruit Type and Description:** An "inflated, green, papery capsule", with 3 chambers, 3- 4.5cm in diameter.

**Seed Description:** Black, opaque, smooth with a white, finely porous heart-shaped spot at the micropyle. Measures 5 mm in diameter. Seeds ripen from August to October.

### 1.2 Medicinal Features

*Cardiospermum halicacabum* works as diaphoretic, diuretic, emetic, laxative, refrigerant, stomachic and sudorific and has antibacterial, anti-diarrheal, antioxidant activities, exhibits anticancer, vaso depressant effect, rheumatism, severe bronchitis, snakebite. *C. halicacabum* shows various medicinal properties such as antibacterial, antifungal, antiparasitic, antidiarrhoeal, anxiolytic, rubefacient, antipyretic, anti-inflammatory, anticonvulsant, and anticarcinogenic. Earache can be treated by using leaves juice as eardrop. It enhances hair growth. Leaves of *C. halicacabum* are used to treat scalp. The extract is a good herbal treatment for skin redness. It acts as modulators in reactions. This gives antipruritic properties. This plant does not form hematoma hence, can be used for long term. It is effective in neurodermatitis like illness in chronic stages cardiac glycosides found in small quantities in the extracts (Deepan *et al.*, 2012).

Shyamala *et al.*, (2005) reported that the *A. sessilis* a branched, glabrous, succulent herb and leaves are simple or pinnately compound. The plant is accredited with galactagogue properties, good fodder for increasing the flow of milk in the cattle and also used to treat night blindness (Bhaskar Rao *et al.*, 2011). Elsewhere, in the world (i.e. Sri Lanka China,

Taiwan and India the plant is used as food, in traditional medicine and in Ayurvedic medicine. The leaves and shoots of the plant are boiled and drunk as an antihypertensive remedy and for antidiabetic activity (Acharya, 2006; Erna *et al.*, 2010). *A. sessilis* also reported to possess anti-microbial, molluscicidal, a moderate antimutagenic, anti-diarrheal, hepatoprotective, cytotoxic, haematinic activity and antiviral activities (Devi, 2003; Hossain *et al.*, 2014). Ferruziet *al.*, (2002); Ferruzzi and Blakeslee, (2007) due to the anti-oxidant, anti-atherogenic, anti-inflammatory and detoxification properties of chlorophyll and its derivatives, it is used in medicines and food supplements (Chernomorskyet *al.*, 1999; Kamatet *al.*, 2000; Fernandes *et al.*, 2007; Ferruzzi and Blakeslee, 2007).

Gayathri *et al.*, (2006) reported that the antimicrobial properties, wound healing abilities (Jalalpure *et al.*, 2008) and the ability to increase the production of milk in nursing mothers (Jayaweera, 1981) have also been reported.

The objective of the present study was to evaluate *Cardiospermum helicacabum* a potential source of extractable chlorophyll and to examine the ideal extraction, pre-processing and storage conditions.

So, the present study was undertaken with the survey on delta region of Komal to Nachinargudi riverbank, Kuttalam Taluk, Mayiladuthurai district of Tamil Nadu in around two kilometre for identifying fifty-five medicinal plants were collected and identified.

Mostly abandoned plant for using further studies. To find out the biochemical analysis, micro and macro nutrient contents, and the isolation of enzymatic activities of Mudakkaruthan Green *Cardiospermum helicababum* (L.).

## 2. Materials and Methods

The survey on medicinal plants on veerachozhan river basin, delta region of nachinargudi, riverbank in around one kilometres for identifying fifty-five medicinal plants were collected. The most dominant species repeatedly identified as Mudakkaruthan green (*Cardiospermum helicacabum* (L.)). Family Sapindaceae to study my research work was carried out.

### 2.1. Collection and Preparation of Dried Plant Materials

The green leaves of *Cardiospermum helicacabum* L., were harvested. The leaves were destalked, washed and shade dried to avoid destroying active compounds. The dried leaves were then ground to homogenous powder using Wiley mill grinder and then stored in air tight container for further analysis. The sample was then subject to biochemical analysis.

### 2.2. Biochemical Analysis

Chlorophyll (Arnon, 1949), Carotenoid (Kirk and Allen, 1965), carbohydrates (Dubois *et al.*, 1956), protein (Lowry *et al.*, 1951), amino acids (Moore and Stein, 1948), sugars (Nelson, 1944), and Non-reducing sugars (Nelson, 1944).

### 2.3 Estimation of Macro and Micronutrients

Total nitrogen (Yoshida *et al.*, 1972), Phosphorus (Yoshida *et al.*, 1972), Potassium (Williams and Twine, 1960), Calcium and magnesium (Yoshida *et al.*, 1972), Zinc, copper, iron and manganese (DeVries and Tiller, 1980).

## 3. Results and Discussion

Green leafy vegetables are important component of the dietary regime of humans because they provide the necessary vitamins and minerals. The awareness of the popularity on the significance of nutrition in health has resulted to an increasing quest for biochemical knowledge of composition of foods. Conventionally, food and health are strongly interrelated and traditionally, people have been using plants and plant extracts as food and also to cure various ailments. Different part of plants such as leaves, young shoots, stem, tender flowers, fruits, pods, roots, rhizome and tubers are used as vegetables.

Leafy vegetables are the major component in traditional diet due to its health benefits, which is mainly because of presence of more biochemical with potential minerals and enzyme properties. They are regarded as 'nature's anti-aging wonders' due to its medicinal properties beyond essential sustenance. Specially, leafy vegetable are cooked, boiled, eaten raw or dried and stored for uses round the year. They have long been recognized most abundant sources of proteins, vitamins and minerals.

### 3.1 Survey on Medicinal Pplants on Delta Region of Vera Chozhan Riverbank Near Nachinargudi to Komal, Mayiaduthurai, District of Tamil Nadu, India

The Cauvery river bank is rich in green biodiversity place. I will collect 55 varieties of plants and mostly abundant species such as Mudakkaruthan green is mainly to use for my research work. The Cauvery riverbank is mainly using for grazing animals such as buffalo, cow, and sheep's for early morning and evening times. Most of the old aged men and women have to collect some medicinal plants to use for various ailments. In this juncture mudakkaruthan mainly to collect and used for eye disorder, stomach pain, body heat, and various ailments used for surrounding people.

**Table 1.** Survey on medicinal plants on Veera Chozhan River Bank, Kuttalam Taluk, Mayiladuthurai District of Tami Nadu, India

Sl. No	COMMERCIAL NAME	BOTANICAL NAME	FAMILY NAME	PART USED	REMEDY
1.	ஆடாததா L	Justicia adhatoda L.	Acanthaceae	Leaf juice	Treatment of Dysentery, Diarrhoea, chronic bronchitis and Asthma.
2.	நித்திய கல் யாணி	Catharanthus roseus L.	Apocynaceae	Root and Leaves extraction Whole plant	Treatment of Diabetes, Malaria and Hodgkin's lymphoma. Antidote, Hypotensive, Antispasmodic and Leukemia.
3.	எருக்கு	Calotropis gigantea L.	Sub. Family: Asclepiadoideae Family: Apocynaceae	Plant sap with pepper Root	Treatment of Scorpion, Centipede and Spider bites. It is effective for toothache and cavities. It is against Antidote and also used as laxative.
4.	தெட்டுக் காயப் பூண்டு	Tridax procumbens L.	Asteraceae	Leaf juice Leaf extract Whole plant	Directly applied on Wounds. Treat infections of Skin disease. Liver disorders, Hepatoprotection, Gastritis and Heart burn.
5.	ததள் தகாடுக்கு	Heliotropium indicum L.	Boraginaceae	Leaf extraction	Treatment for Wounds, Skin ulcers and Furuncles. It is also used Eye drop for conjunctives.
S. NO	COMMERCIAL NAME	BOTANICAL NAME	FAMILY	PART USES	REMEDY
6.	சப்பாத்தி கள்ளி	Opentia ficus-indica L.	Cactaceae	Fruit syrup Plant	Control Spasmodic Cough. Antidote to Snake venom.
7.	நாய் க்கடுகு	Cleome viscosa L.	Capparidaceae (Cleomaceae)	Whole plants Leaves Leaf juice	Stimulant to improve Appetite. External application to treat Wounds, relieve rheumatism. Used to relieve earache.
8.	காணாங் தகாடை	Commelina benghalensis L.	Commelinaceae	Plant Mucilage from flower Leaf decoction Root decoction	Treat infertility, sore throats, sore eyes, dysentery and leprosy. Best remedy to treat infertility. Treat Malaria. Treat to relief stomach disorders.
9.	தநய் தெலி காட்டாம ணக்கு அல்ல F காட்டாம ணி	Ipomoea carnea Jacq.	Convolvulaceae	Latex of plant	To treat skin disease.
10.	குப்பதம ணி	Acalypha indica L.	Euphorbiaceae	Root decoction Root infusion	Intestinal worms and stomach ache. Asthma and clear the liver and kidney.
S. NO	COMMERCIAL NAME	BOTANICAL NAME	FAMILY	PART USES	REMEDY
11.	தகாடெ	Coccinia granelis L.	Cucurbitaceae	Fruit Roots Leaf paste Fruit gourd	Treat leprosy, fever, asthma, bronchitis and jaundice. Used to treat osteoarthritis and joint pains. Applied to skin to treat scabies. Used to diabetic patients.
12.	முசுமுசுக் டக	Mukia madeaspatana L.	Cucurbitaceae	Seed decoction Crushed leaves Seeds and Root decoction Roots	Used for flatulence. Used for aching bodies, especially sprained backs. Treat relieve toothache. Used as diuretic and as laxative in constipation.
13.	அம் மன் பசச் ரிசி	Euphorbia hirta L.	Euphorbiaceae	Whole plant Root	Treatment of asthma. Anti-emetic properties and can combat vomiting.
14.	ஆமணக்கு	Ricinus communis L.	Euphorbiaceae	Methanoli c extracts of leaves Root bark	Used in antimicrobial activity properties. Antihistamine and anti-inflammatory property.

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S. NO	COMMERCIAL NAME	BOTANICAL NAME	FAMILY	PART USES	REMEDY
15.	தபயாமணக்கு	Baliospermum solanifolium Burm.	Euphorbiaceae	Root, seeds, Leaves and seed oil Root paste Seeds	Treat jaundice, constipation, piles, anaemia and conjunctivitis. Externally applied to painful swellings and piles. Drastic and purgative and used to cure snakebites.
16.	அவுரி	Indigofera tinctoria L.	Fabaceae	Root Root infusion Leaf ointment Leaf infusion	Relieve toothache, syphilis, gonorrhoea and kidney stones. To treat antidote against snakebites, insect and scorpion stings. Applied externally to treat skin disease wounds. To treat epilepsy, nervous disorders, asthma and bronchitis, fever, liver and kidney.
17.	சங் குபு	Clitoria ternatea L.	Fabaceae	Flower infusion Root bark Plant	To treatment for eye problems. Diuretic and laxative. To treatment for snakebites.
S. NO	COMMERCIAL NAME	BOTANICAL NAME	FAMILY	PART USES	REMEDY
18.	தபான் னெ டர்	Senna sophera L.	Sub. Family: Caesalpinioideae Family: Fabaceae	Seeds Leaf juice Bark infusion All parts	Reduce fever Applied against ringworm, remedy for rheumatic, inflammatory fevers and malaria. Treatment of diabetes. Extracts used to treat epilepsy.
19.	பங் டக	Pongamia pinnata L.	Fabaceae	Seeds oil extraction	Treatment of rheumatism.
20.	எளி	Ocimum sanctum L. (or) Ocimum tenuiflorum L.	Lamiaceae	Juice of leaf Decoction of leaf	To treat kidney stone. To treat bronchitis, asthma, cough and cold.
21.	கருதநாச் சி	Vitex negundo L.	Lamiaceae	Leaves Leaf infusion Dried fruit	Used as astringent, febrifuge and sedative. To treat joints from acute rheumatism. Used to treat colds, coughs, rheumatic difficulties.
S. NO	COMMERCIAL NAME	BOTANICAL NAME	FAMILY	PART USES	REMEDY
22.	மூக்கிரட் டு	Boerhavia diffusa L.	Nyctaginaceae	Whole plant	Cure intestinal colic, kidney disorders, cough, haemorrhoids, skin diseases, eye disease, asthma and jaundice.
23.	எத்திக்கீ டர் அல் லு டெட்டத்தி	Abutilon indicum L.	Malvaceae	Leaf Leaf decoction Root and bark Seeds	Treat to tuberculosis and Ulcers. Toothache and tender gums. Used as anti-diabetic. Urinary disease, laxative for piles and to treat cough.
24.	ஆடன தருஞ்சி	Pedaliium murex L.	Pedaliaceae	Root decoction Plant mucilage	To treat venereal diseases. Used as diuretic, tonic, demulcent to treat dysuria, gonorrhoea and to dissolve urethral stone.
25.	கைதநல் லி	Phyllanthus niruri L.	Phyllanthaceae	Whole plant	To treat liver, kidney, spleen, chronic fever, gallstones, jaundice and anemia. It protects eyes from infection and disease, liver from degradation.
S. NO	COMMERCIAL NAME	BOTANICAL NAME	FAMILY	PART USES	REMEDY
26.	அறுகம் பு ல்	Cyanodon dactylon L.	Poaceae	Whole plant	To treat many disease like wounds, piles, urticaria, injuries, eye problems, skin rashes, diabetes, epilepsy, gynaecological problems.
27.	தசாடக்கு தக்காளி	Physalis minima L.	Solanaceae	Fruit Leaf Plant extract Root decoction Leaf juice	Diuretic, laxative and tonic. Remedy for headache and itches. Anticancer activity. To treat hypertension and diabetes. Remedy for earache.
28.	ஊமட்டத	Datura metal L.	Solanaceae	Dried leaves (smoking) Seed oil	Used for relieving asthma, cough, tuberculosis and bronchitis. Using for massaging painful body parts.

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S. NO	COMMERCIAL NAME	BOTANICAL NAME	FAMILY	PART USES	REMEDY
29.	கண்டங்கத்திரி	Solanum virginianum L. (or) Solanum xanthocarpum L.	Solanaceae	Whole plant	Treatment of bronchitis, fever, cough, cold, asthma, hoarseness of voice, headache, worms, loss of appetite. It is also used remedy for respiratory problems.
30.	மணதக்காளி	Solanum nigrum L.	Solanaceae	Whole plant Leaf infusion Root juice	Used in several ailments, such as pneumonia, aching teeth, stomach ache, tonsillitis, wing worms, pain, fever and tumour. Treat dysentery, stomach complaints, fever and tuberculosis. Used against asthma and whooping cough.
31.	நெறில்லி	Corchorus capsularis L.	Tiliaceae	Leaves Leaf infusion	Used to increase appetite, as a laxative, as a stimulant. Used to reduce fever. Used against dysentery.
32.	பாகற்காய்	Momordica charantia L.	Cucurbitaceae	Leaf and Fruits	Used to treatment for diabetes, fever, cough, respiratory Diseases and ulcer.
S. NO	COMMERCIAL NAME	BOTANICAL NAME	FAMILY	PART USES	REMEDY
33.	பிட்டு	Leucas aspera (Wild.) Link	Lamiaceae	Leaf sap Plant Juice Crushed plant leaves	To treat sores of the eye and nose. Treatment of fever, coughs and colds. Medicine for poultice on to wounds, rheumatism and snakebite.
34.	கொடாமல்	Gomphrena globosa L.	Amaranthaceae	Decoction of fresh plant Inflorescence Flower decoction	Used to wash sore. Used for bronchial asthma, chronic bronchitis and whooping cough. Used for inflammation of the eyes, difficulty urinating, headaches and dysentery.
35.	முடக்கு அறுத்தான்	Cardiospermum helicacabum L.	Sapindaceae	Whole plant	Used to treat diaphoretic, diuretic, laxative. It is also used to treatment for rheumatism, nervous diseases, snakebites. Leaf juice to treat earache.
36.	பாரதீனியம்	Parthenium hysterophorus L.	Asteraceae	Decoction of leaves and roots	Used to treat fever, diarrhoea, neurological disorders, urinary tract infections, dysentery and malaria.
S. NO	COMMERCIAL NAME	BOTANICAL NAME	FAMILY	PART USES	REMEDY
37.	சீமயகத்தி அல்லஃண்டுகால்	Senna alata L.	Sub.family: Ceasalpinioideae Family: Fabaceae	Plant Crude leaf extracts Bark Root and Root infusion	To treatment for skin diseases, including ringworm and scabies. Antimicrobial property, anti-fungal properties and anti- humor activity. Used to treat skin diseases, diarrhoea, worms, parasitic skin diseases. Root is laxative, infusion treat for diarrhoea and tympanites.
38.	காட்டுப் பிரண்டி	Cayratia trifolia L.	Vitaceae	Decoction of leaves and roots Stem Leaves and Roots	nose. Treatment for high fever. Used for blood purifier, carminative and expectorant. Used to treatment for fever and they are commonly used for poulticing ulcers of the
39.	குட்டி பளிசி	Ocimum canum L.	Lamiaceae	Leaves Plant	Colds, parasitic infections and headache. Used for type two diabetes levels.
S. NO	COMMERCIAL NAME	BOTANICAL NAME	FAMILY	PART USES	REMEDY
40.	முள்ளக்கீர	Amaranthus spinosus L.	Amaranthaceae	Plant Root paste Root juice	Used to treatment of internal bleeding, diarrhoea, snake bites, boils, stomach disorders, ulcerated mouths and vaginal discharges. Used to treat for monorrhagia and gonorrhoea. Used to treat fever, urinary troubles, diarrhea and dysentery.
41.	ததாய் யாக்கீர	Digera muricata L.	Amaranthaceae	Seeds and flower Plant	Used to treat urinary disorders. Used internally against digestive system disorders.

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42.	நாயுருவி	Achyranthes aspera L.	Amaranthaceae	Root extraction and Leaf decoction Plant juice Leaves paste	Used to treat diarrhoea and dysentery. Used to treat haemorrhoids, rheumatic pains, itches and skin eruptions. Used to treat rabies, nervous disorders, insect and snake bites.
S. NO	COMMERCIAL NAME	BOTANICAL NAME	FAMILY	PART USES	REMEDY
43.	கரிசிலாங்கண்ணி	Eclipta prostrata L. (or) Eclipta alba L.	Asteraceae	Leaves Leaves decoction Plant juice Leaf juice Roots Stem and Leaves	Used to treat fevers, eye diseases, asthma, bronchitis, liver problems and diarrhoea. Used to treat cancer. Used to treat jaundice. Preventing hair loss. Applied externally for as an antiseptic for ulcers and wounds. To treat anaemia and dysentery.
44.	ஆடுதீண்டாப்பாடள	Aristolochia bracteolata (Lam.)	Aristolochiaceae	Root powder Plant juice Infusion of dried leaves	Used to treat amenorrhoea, dysmenorrhoea, intermittent fever and worms. Applied externally to treat scorpion bites. To treat intestinal worms, skin itches and insect bites.
45.	நீர் ாடமல்லி	Gomogreba celosioides (Mart)	Amaranthaceae	Whole plant	Used to medicine for gastrointestinal and respiratory diseases and skin infections.
S. NO	COMMERCIAL NAME	BOTANICAL NAME	FAMILY	PART USES	REMEDY
46.	தபாந் னாங்கண்ணி	Alternanthera sessilis L.	Amaranthaceae	Plant infusion Whole plant Plant paste Root Juices	Used as a remedy for intestinal cramps, fever, diarrhoea and dysentery. External application to treat scabies, boils and wounds. Applied as a poultice on wounds. To treat dysuria, fever and bloody dysentery.
47.	எள்ளுக்கு சக்களத்தி	Cleome monophylla (L)	Cleomaceae	Root Whole plant Leaf sap	Treatment for cough. Externally as a treatment for swelling, Used to treatment of fevers.
48.	சிறு பூடனக்காலி	Passiflora foetida L.	Passifloraceae	Root Whole plant Dried plant decoction	Used as antiparasmodic. Used as children's anthelmintic, intestinal nematodes and flat worms. To treat colds, chest coughs. It is also used to treatment of tuberculosis, worms, coughs and colds.
S. NO	COMMERCIAL NAME	BOTANICAL NAME	FAMILY	PART USES	REMEDY
49.	நீர் ாடமல்லி	Gomphrena celosioides (Mart)	Amaranthaceae	Whole plant	Used to medicine for gastrointestinal and respiratory diseases and skin infections. Whole plant used to treat for jaundice and malaria.
50.	ஆலமரம்	Ficus benghalensis L.	Moraceae	Leaves Bark infusion Milky latex Decoction of root	Used as remedy for dysentery and diarrhoea. Used as an astringent in the treatment of leucorrhoea. To treat toothache, rheumatic joints and lumbago. To treatment against gonorrhoea.
51.	சிறுகண் பூடள	Aerva lanata L.	Amaranthaceae	Roots Decoction of plant	Used to treat headache, demulcent, to cure coughs and as a vermifuge. It is also used to treating snakebite and constipation. Taken internally for treat to dissolves the stone and to clear the urinary path.
S. NO	COMMERCIAL NAME	BOTANICAL NAME	FAMILY	PART USES	REMEDY
52.	தபாந் னாங்கண்ணி	Alternanthera sessilis L.	Amaranthaceae	Plant infusion Whole plant Plant paste Root Juices	Used as a remedy for intestinal cramps, fever, diarrhoea and dysentery. External application to treat scabies, boils and wounds. Applied as a poultice on wounds. To treat dysuria, fever and bloody dysentery.
53.	அவுரி	Indigofera tinctoria L.	Fabaceae	Root infusion Leaf ointment Leaf infusion	To treat antidote against snakebites, insect and scorpion stings. Applied externally to treat skin disease wounds. To treat epilepsy, nervous disorders, asthma and bronchitis, fever, liver and kidney.

S. NO	COMMERCIAL NAME	BOTANICAL NAME	FAMILY	PART USES	REMEDY
54.	தபான் னெ டர்	Senna sophera L.	Sub. Family: Caesalpinioideae Family: Fabaceae	Seeds Leaf juice Bark infusion All parts	Reduce fever Applied against ringworm, remedy for rheumatic, inflammatory fevers and malaria. Treatment of diabetes. Extracts used to treat epilepsy.
55.	சிறுகண் பூ டள்	Aerva lanata L.	Amaranthaceae	Roots Decoction of plant	Used to treat headache, demulcent, to cure coughs and as a vermifuge. It is also used to treating snakebite and constipation. Taken internally for treat to dissolves the stone and to clear the urinary bath.

Chlorophyll is an integral component of plant pigments and plays a vital role in the process of photosynthesis. It is the molecule that absorbs sunlight and uses its energy to synthesis carbohydrates from CO<sub>2</sub> and water. It has been proved that chlorophyll play an important role in the ATP generation and prevention of essential plant constituents (Kochot *et al.*, 1998).The biochemical analysis such as young, mature and senescence leaves were isolated for the studying plant to observe the chlorophyll "a" chlorophyll "b" and total chlorophyll, carbohydrates, protein and amino acid contents were analysed. The maximum contents of chlorophyll "a" chlorophyll "b" and total chlorophyll, carbohydrates, protein and amino acid were identified in mature leaf contents followed by young and senescence leaves of mudakkaruthan green (Table 2).

**Table 2:** Biochemical Analysis of Mudakkaruthan Green (*Cardiospermum helicacabum* L.) on Various Types of Leaves

S. No	Biochemical analysis	Types of leaves		
		Young leaves	Mature leaves	Senescence leaves
1.	Chlorophyll "a"	0.620+0.01	0.642+1.93	0.615+1.84
2.	Chlorophyll "b"	0.518+ 0.01	0.523+ 0.01	0.510+ 0.01
3.	Total chlorophyll	1.138+ 0.635	1.165+0.657	1.125+0.033
4.	Carbohydrates	0.883 ±0.026	0.897 ±0.026	0.873 ±0.026
5.	Protein	18.621 ±0.558	19.582 ±0.587	14.328 ±0.429
6.	Aminoacids	4.756 ±0.142	5.548 ±0.166	4.598 ±0.137

± Standard deviation

Carbohydrate is one of the main constituents of living organisms. It mainly improves the plant growth and yield of crop plants. The accumulation of the carbohydrate contents due to various fertilizers application was conformity with the earlier studies of several workers in different species such as potato (Mahendran and Kumar, 1998),

Protein is one of the reserved food material which is utilized for the growth of seedlings and further growth of plants. The leaf portion of crop contains higher protein content than the root. Similar findings were recorded in various crops by Desai *et al.* (2001). Macronutrients are the nutrients your body needs in larger amounts, namely carbohydrates, protein, and fat. These provide your energy, or calories. Micronutrients are the nutrients your body needs in smaller amounts, which are commonly referred to as vitamins and minerals. Macronutrients, or macros, are essential nutrients the body needs in large quantities to remain healthy. Macronutrients provide the body with energy, help prevent disease, and allow the body to function correctly. There are three main types of macronutrients: proteins, fats, and carbohydrates.

**Table 3:** Macro and Micronutrient Contents of Mudakkaruthan Green (*Cardiospermum helicacabum* L.) on Various Types of Leaves

S.No	Macro and Micronutrients	Types of leaves		
		Young leaves	Mature leaves	Senescence leaves
1.	Nitrogen	189.54±5.680	190.54±5.710	187.58±5.620
2.	Phosphorous	18.74±0.560	20.74±0.620	18.65±0.550
3.	Potassium	97.11±2.910	99.65±2.980	96.98±2.900
4.	Calcium	119.55±3.580	120.74±3.620	118.6±3.550
5.	Magnesium	39.00±1.170	41.32±1.230	38.15±1.110
6.	Zinc	26.98±0.800	27.55±0.820	25.11±0.750
7.	Copper	13.88±0.410	14.22±0.420	13.74±0.410
8.	Iron	182.71±5.480	184.52±5.530	175.12±5.250
9.	Manganese	25.65±0.760	26.74±0.800	24.04±0.720

± Standard deviation

The macro and micro nutrient contents of such as young, mature and senescence leaves were isolated for the studying plant to observe the Nitrogen, Phosphorous, Potassium, Calcium, Magnesium, Zinc, Copper, Iron, and Manganese contents were analysed.

The maximum macro and micro nutrient such as Nitrogen, Phosphorous, Potassium, Calcium, Magnesium, Zinc, Copper, Iron, and Manganese contents were observed in mature leaves of mudakkaruthan plant (Table 3).

**Table 4:** Enzymatic Studies of Mudakkaruthan Green (*Cardiospermum helicacabum* L.) on Various Types of Leaves

S.No	Enzymes	Types of leaves		
		Young leaves	Mature leaves	Senescence leaves
1.	Catalase	7.844 ±0.235	8.100 ±0.243	7.628 ±0.228
2.	Peroxidase	13.654 ±0.409	14.685 ±0.440	12.742 ±0.382

± Standard deviation

The enzymes such as catalase and peroxidase contents such as young, mature and senescence leaves were isolated for the mudakkaruthan plant. The maximum contents of catalase and peroxidase were observed in mature leaf of mudakkaruthan plant followed by young and senescence leaves (Table 3). The plant grows wild, but is also cultivated for food, herbal medicines, as an ornamental plant (red variety, as a hedging plant), in the aquarium trade (though it only grows submersed for short periods), and as poultry feed. In certain regions of South East Asia, the leaves and young shoots are consumed as vegetables, in Karnataka, Andhra Pradesh and Tamil Nadu, the leaves, flowers and tender stems are consumed as vegetables. As a herbal medicine, the plant has diuretic, cooling, tonic and laxative properties. It has been used for the treatment of dysuria and hemorrhoids. *Cardiospermum helicacabum*, the perennial herb possess good nutritive value and may be used as a food and fodder. It also found to contain a good amount of various macro and micro elements in appreciable quantities. This plant would be a promising source of carbohydrate, protein fat and fiber and may be recommended as nourishment to people suffering from malnutrition. Moreover, the minerals present in the leaves found to satisfy the RDA requirements. Recent clinical studies have confirmed the efficacy of *C. halicacabum* extracts for many pathologies, highlighting perfect tolerability and safety even after prolonged use. The variety of active substances present in the phytocomplex along with its high anti-inflammatory activity have made known this plant as "natural cortisone", and it was first used for the treatment of rheumatic pathologies.

The presence of an optimal level of nutrients in the plant at right proportions could be beneficial to human body. Thus, the presence of high protein, carbohydrate, fiber and minerals in the leaves of *C. helicacabum* would definitely increase the food value, including it in the daily food regimen to stay healthy.

#### Plate 1

Mudakkaruthan Green (*Cardiospermum helicacabum* L.,) River Basin of Nachinargudi to Komal, Kuttalam Taluk, Mayiaduthurai District



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