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A review on pharmacognostical and phytochemical study of (*Digera muricata* L.)

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Abstract
The conventional medicine practitioners use the medicinal plants extensively in their day-to-day work to treat different diseases. The most useful traditional medicinal plant in India is *Digera muricata* (Amaranthaceae). While no such phytopharmacological research has been undertaken, it is still regarded as a promising source of specific natural products for medication production and battle against different diseases. The *Digera muricata* has demonstrated numerous pharmacological activities in each portion of its Allied Species (leaves, bovine, base, seed, root and also entire herb) including prophylactic, anti-microbial, anti-oxidant, anti-diabetic, anti-testicular, anthelmintic, allelopathic, and defensive effects thus utilized in the treatment of renal disorders, kidney stones, defective proteins, nephrotoxicity, dysfunctional proteins, increase level of urine creatinine, protein, nitrite, stercobilinogen, red blood cells, leucocytes count and levels of blood urea nitrogen. It is also observed to be successful against human carcinogenicity and also induces degradation of glutathione, contributing to intracellular oxidative stress. This study summarizes *Digera muricata's* literature on botanical and pharmacological discourse.

Keywords: *Digera muricata* L, indigenous medicinal plant, phytoconstituents, phytopharmacology

Introduction
Evaluating the rich legacy of traditional medicine is important with the growing worldwide involvement in embracing and researching new methods and leveraging their value centered on various healthcare systems. Herbal medicines are currently in demand and are increasing in popularity day by day. Therapeutic knowledge on these herbs is extensive from the literature on medicinal folk lore in many regions that is also documented. Health herbs move from fringe to mainstream with a larger range of people seeking solutions and health approaches free of synthetic chemical adverse effects. In that respect, *Digera muricata* is one such plant.
Digera is a genus with only one *Digera muricata* L. species of mart. (Synonyms: *Digeraarvensis Forssk; Achyranthesmuricata* L.) is a member of (family: Amaranthaceae). The plants grow up to 20-70 cm per annum depending on the species size. In several species / cultivars of Tartara (*Digera muricata*), the characteristic smell and scent are because of the presence of essential oils in the leaves and in other parts of the plants The Primary metabolites were studied in numerous samples of solvents, such as Carbohydrates, Proteins, Lipids, Phenols, Chlorophylls, and Amino acids. The plant consists of both α-spinasterol and β-spinasterol. Analysis of different Tartara fractions indicated the presence of flavonoids, alkaloids, terpenoids, saponins, coumarins, tannins, and cardiac glycosides and anthraquinones. This has found in the hexane extract of this plant rutin and hyperoside flavonoids

Fig 1: Show the an annual plant

Plant Description

It is an annual plant, growing to a height of 70 cm; plain or branched, subglabrous, crimsoned base. Leaves alternate, simple; petiole up to 5 cm long; blade linear to ovate, 1–9 cm×0.2–5 cm, base narrowed, apex accuminate, entire margin, glabrious. Inflorescence of a long pedunculate (up to 14 cm long), axillary, spike-like bracteate raceme up to 30 cm long, each bract subtending a partial sub-sessile inflorescence with a central fertile flower and 2 sterile lateral flowers. The flowers are carried on slender spikes with the length of 30 cm. Flowers are hairless, cream, rose or purple, typically greenish-white in the berries. Blossoming takes place in August and September. Fructuous flower, with 2 firm and boat shaped segments 3-5 mm long and 2-3 inner, slightly shorter, hyaline segments; stamens typically 5, free or strongly connate on the base; ovary superior, filiform style, up to 4 mm long, stigma 2 divergent, lateral flora, made up of accrescentanthus shaped scales. Fruit is sub-globose, hard, 2 mm in diameter, crimsoned and covered in the continuous perianth and dropping together with the sterile flowers and bracteoles. *Digera* consists of only 1 species. Based on the venation of Outer tepals 2 Digera muricatasubspecies is characterized: subsp. *Muricata* with outer tepals 7–12 veined, occurring primarily in Asia but also in eastern Africa and Madagascar, and subsp. *Trinervis* C.C. Towns with outer tepals 3–5-veined, occurring primarily in Africa. Based on hairness of leaves and on shape of scales in sterileflowers, many varieties have been differentiated in subsp. *trinervis*, in the var. *patentipilosa* C.C. Towns. This is more appropriate as a leafy crop as it has broad leaves.

Taxonomy

Kingdom	:	Plantae (plants)
Subkingdom	:	Tracheobionta (Vascular plants)
Superdivision	:	Spermatophyta (Seed plants)
Division	:	Magnoliophyta (flowering plants)
Class	:	Magnoliopsida (Dicotyledons)
Subclass	:	Caryophyllidae
Family	:	Amaranthaceae (Amaranth)
Order	:	Caryophyllales
Genus	:	DigeraForssk
Species	:	Muricata (False amaranth)
Subspecies	:	Muricata (False amaranth)
Subspecies	:	Digera muricatatrinervis
Variety	:	Digera muricatamacroptera
Variety	:	Digera muricatamuricata
Variety	:	Digera muricatapatentipilosa

Botanical Name: *Digera muricata* (L.) Mart.

Synonyms

Achyranthesalternifolia L., *Achyranthesmuricata* L., Digeraalternifolia (L.) Aschers., Digeraarvensis Forssk.

Common Names

English: False amaranth
Tamil: ToyaKeeri, kaatuKeerai
Hindi: Latmahuria, Lesua
Telugu: ChnchaliKoora
Sanskrit: Aranya, Aranyavastuka, kunanjara, kuranjara
Kannada: Chenchalisoppu, Goraji playa, Kankalisoppu
Marathi: Gitana, Getna
Bangali: LatamouriFul, Gun gutiya

Distributional Range: (Location)

The distribution of the *Digera muricata* from tropical Arabia and Yemen to Afghanistan, India, Malaysia, Indonesia and North and Eastern central Africa and Madagascar in Southern Asia. Their usage is very extensive. The species normally exists

relative to gram crops and human behavior in Pakistan, we find that this species was originally introduced to Taiwan by agricultural practices. In central Taiwan many colonies have recently been identified in a short period and this crop has the ability to be an aggressive weed. Tartara was native to Northeastern and Eastern Tropical Africa and Madagascar, but widely spread from Tropical Arabia and Yemen to Afghanistan, India (Maharastra, Rajasthan, Andhra Pradesh), Malaysia, and Indonesia in Southern Asia. Recently this species was found in central Taiwan as an alien species. This is a new record of the Amaranthaceae genus and species from Taiwan. The most common disruption of Tartara occurs on waste soil, though in a wide variety of habitats, from dry Savanna and semi-desert to wetlands on deep clay and mud soils, and from seabed to 1500 meters above sea level. It also occurs in fields as a weed, which is sometimes problematic. Their production takes place in tropical Northeastern areas.

Phytochemical Studies

Collection and Authentification

- In the month of August the entire *Digera muricata* plant was collected
- The fresh plant was used to analyze macroscopic and microscopic characters while the dried powder was used to determine physico-chemical parameters. Preliminary phytochemical analysis was carried out according to conventional methods.

Preparation of Extracts

Air dried coarse plant powder was packed into four sachets of muslin cloth and subjected to extractor for continuous hot extraction with petroleum ether, chloroform, methanol, and finally both individually and successively in water. Filtered all extracts and evaporated to dryness.

Macroscopic and Microscopic Characters

- The entire plant macroscopy was analyzed using standard methods.
- A thin transverse segment (TS) of stem and leaf was sliced and stained with various stains (safranin and aniline blue) by free hand sectioning.
- Powdered plants have different histochemicalcolor reactions with Ruthenium red for mucilage, weak iodine for starch and protein agent from Millon's and Dragendorff 's reagent is used for alkaloid detection.
- Aqueous NaOH was used by published methods to detect flavonoids and aqueous ferric chloride for the phenolic compounds.

Preliminary Phytochemical Analysis

Preliminary phytochemical analysis was carried out using standard protocols for the identification of different chemical constituents

TLC Identity Test

- At 300C in various solvent systems, thin layer chromatography of the petroleum ether, chloroform and

methanol was performed using silica gel G as adsorbent, and the Rf values were determined.

- Physicochemical analysis i.e. Loss on drying, total ash, acid insoluble ash, water soluble ash, sulphated ash and foreign matter were performed as per Indian Pharmacopoeia

Table 1: Chemical Constituents

Primary Metabolites	Secondary Metabolites
Proteins	Phenols
Carbohydrates	Flavonoids
Chlorophylls	Alkaloids
Amino acids	Terpenoids
Reducing sugar	Saponins
Lipids	Tannins

Table 2: Leaves and Sterol

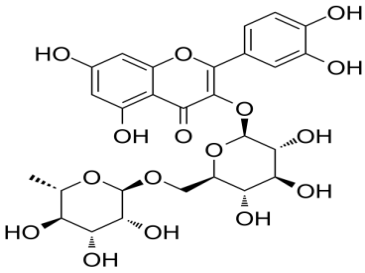
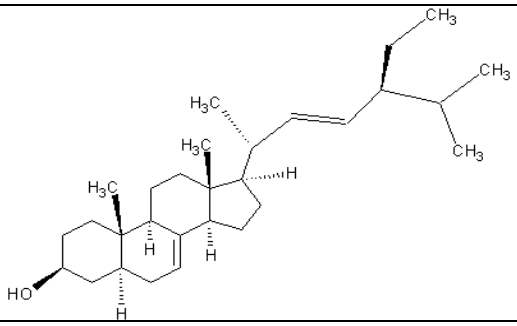
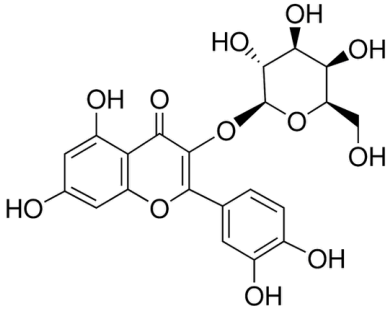
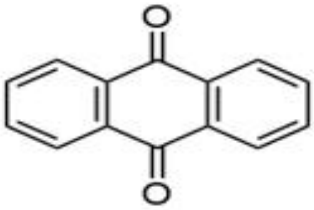
Leaves	Sterol
Lipid and fatty acid	α- & β-spinasterol
Mineral salts	β-sitosterol
Vitamins	Stigmasterol

Enzymes
Superoxide
Peroxidase

Table 3: Acids and Others

Acids	Others
Tetracosnoic acid	Tinosporin
Palmitic acid	Rutin
Octacosanoic acid	Hyperoxide
Betulinic acid	Mannitol

Table 4: Chemical Structures

Chemical Constituents	Chemical Formula	Chemical Structure
Rutin	$C_{27}H_{30}O_{16}$	
α-spinasterol	$C_{29}H_{48}O$	
Hyperoside	$C_{21}H_{20}O_{12}$	
Anthraquinone	$C_{14}H_8O_2$	

Uses

1. Potherb / fodder: Sheep and goats use the plant as potherb and forage.
2. Locally, leaves and young shoots are used as vegetables and given to alleviate constipation.
3. This has antioxidant ability and is used locally in different conditions such as nausea, urination, as a refrigerant, aperitif and sexual anomalies. It is also used internally against digestive system disorders and in India flowers and seeds are used totreat urinary discharges.
4. The plant's ethanol extract (50 per cent) is diuretic.
5. The leaf paste is spread locally to prevent the development of pus.
6. Boiled root infusion given to mother for lactation

following childbirth
7. It is also used to treat the nephrotoxicity &hepatotoxicity.
8. Plant also contains antimicrobial activity.

Other Uses

Because of its rich nutrient source, muricata is considered a famine food. In Kenya they 're particularly common among coastal tribes as a cooked vegetable. The leaves in India are made into curries, or the whole plant is boiled in water and seasoned with salt and chili. Also commonly the whole plant is grazed as a forage, particularly by sheep and goats. The flowers are rich in nectar that is often sucked out in Kenya by Children.

Pharmacological Applications

Medicinal plants switch from minimal to common use, with more people finding treatments and health-related solutions exempt from toxic chemicals-induced side effects. Over 3000 plants are officially recognised in India for their medicinal benefit. In India, over 6000 plants are commonly known to be used as conventional, tribal, and herbal medicine. Modern Indian medicine is based on multiple methods including ayurveda, siddha, unani and homoeopathy. The evaluation of such medicines is focused mainly on pharmacological and related methods, including numerous analytical techniques such as chromatography, microscopy and others. Evaluating the rich legacy of western medicine is important with the growing worldwide involvement in embracing and researching new methods and leveraging their value centered on various healthcare systems. In this respect *Digera muricata* is one such herb. Tartara is a genus which has only one *Digera muricata* species. From the family Amaranthaceae. This plant's base, leaves, stem, seed, and flowers have medicinal propertiesand are historically used as medicinal herb. All parts of the plant were used as a crude drug for the treatment of urinary and kidney stone disorders.

Digera muricata Pharmacologically ethno has been used in liver, aperitif and refrigerant diseases. This plant also acts as a secondary infertility substitute. The *Digera* has anti-oxidant properties. It has been reported against CCl4-induced toxicity for the kidneys and testis [9]. This plant's leaves and young shoots are used locally as a vegetable and are provided to alleviate constipation. *Digera muricata* is used internally against digestive disorders, seeds and flowers are used to treat urinary disorders in India. To stop pus development, the leaf paste is spread locally [9]. Tartara is a wild herb that is edible and used by villagers. The herbal remedy is popularly known for various ailments. Herb is known as a soothing agent in Ayurveda, astringent to the intestines and often used as a laxative agent. The leaves are used to combat diabetes. But the medical justification for its therapeutic usage is to be tested, in particular for boiled root infusion provided to mother after childbirth to improve the function of lactation. The plants and seeds was used to handle discharges in the urine. Plant ethyl alcohol extract is diuretic in nature.

Prophylactic Agent

*Digera muricata*L. contain a number of phytochemicals and function differently with each. There are a few future acts. Most phytochemicals have antioxidant activity, defending our cells against oxidative damage and reducing the risk of certain types of cancer developing. Anti-oxidant active phytochemicals, allyl sulfides (onions, leeks, garlic), carotenoids (fruits, carrots), flavonoids (fruits, vegetables), polyphenols (tea, grapes). Iso-flavones, present in soy, resemble human estrogens and help alleviate effects of menopause and osteoporosis [10].

Anti-Microbial Activity

The numerous solvent extracts show anti-fungal and antibacterial action against identified bacteria and fungi. The *Digera muricata* organic successive soxhlet extracts. The petroleum ether, chloroform, ethanol and purified water have demonstrated substantial growth inhibition zone at 200 and 400 µg / well concentrations against test pathogen. This is also recorded to display maximum activity against test bacteria and fungi in the methanol extract [11].

Anti-Oxidant Potential

In various investigations [12] the plant has demonstrated anti-oxidant activity analyzing free radical scavenging and anti-oxidant activity of various solvent extracts such as hexane, petroleum ether, chloroform, methanol, ethanol and aqueous extracts. The maximum activity recorded in methanol and the least activity is recorded in hexane. The *Digera*methanolic crude samples DPPH (1,1-diphenyl-2-picryl hydrazyl) radical scavenging assay was tested for its free radical scavenging properties. In *Digera muricata*roots maximum activity was observed. Anti-oxidant Properties of *Digera muricata*. L'sMethanol extract was well known to cause CCl4-induced toxicity in the kidneys and testis [2].

Anti-Diabetic Effects

Tartara's methanol extract (MEDM) leaves demonstrated anti-diabetic function in diabetic-induced alloxane rats. These tests revealed that MEDM (200mg / kg) in diabetic rats displayed anti-hyperglycemic behavior. Other metrics, such as blood glucose rates, plasma HDL rates drop, and body weight increases [13].

Anthelmintic Activity

Once checked against earthworms (*Pheretimaposthuma*) [14], the rudimentary extract from the leaves was provisional screened for anthelmintic behaviors.

Anti-Testicular Toxicity

The research also indicated *Digera muricata*L.'s defensive capacity for hexane. Against liver and testicular toxicity caused by CCl4. CCl4 can cause rapid oxidative stress as well as acute liver injury. In male rats, the liver cirrhosis causes hypogonadism which is cured by *Digera muricata* hexane extract. DMH therapy strengthened the hepatic injuries and subsequently enhanced the anti-oxidant level of various enzymes and compounds. In addition to repair of testis and accessory organs, testosterone levels were elevated with DMH. Owing to the existence of different bioactive groups and especially the rutin and hyperoside in DMH, the results of DMH against the toxicity of CCl4 may be related. *Digera muricata*L.is used in the traditional medicines method for renal disorders. This herb extract is used regularly for kidney stone treatment. Generation of reactive radicals has been implicated in CCl4-induced nephrotoxicity, which entails lipid, unstable protein aggregation, contributing to kidney injury. Nephrotoxicity is a harmful influence on the kidneys of certainchemicals. *Digera muricata*. L n-hexane and Methanolic Extract has carbon tetrachloride protective effects in rats [6].

Allelopathic Effects

The *Digera muricata* L. aqueous extract of base, root, and

leaves. Shows an allelopathic impact on *Pennisetumtyphoideum* (bajra) germination of *in vitro* crop. Various concentrations of different sections of weed demonstrated inhibitory effects on *Pennisetumtyphoideum* shoot and root development. By fact the leaf extract was inhibitory than stem and root [5].

Protective Effects

The *Digera muricata* L. Methanolic and Hexane Extract. Has a defensive function against oxidative stress in rats caused by CCl4. The defensive potentials can also contain *Digera muricata* L's preventive effects. Methanolic extract through oxidation suppression of CCl4. Furthermore, this research provides empirical rationale for its pharmacological application in oxidative stress diseases [15].

Renal Disorders

*Digera muricata*L.is used in traditional medicine for renal disorders. This herb extract is used regularly in the care of kidney stones. Generation of reactive radicals has been implicated in nephrotoxicity induced by CCl4, which is implicated in lipid peroxidation, aggregation of defective proteins, contributing to kidney injury. Nephrotoxicity is a harmful impact certain compounds have on the kidneys. *Digera muricata*L. n-hexane and Methanolic Extract. Have a defensive function against carbon tetrachloride that is caused in rats by nephrotoxicity [9].

Summary and Conclusions

Tartara (*Digera muricata* L.) belongs to the Amaranthaceae family and is an annual herb growing up to 20-70 cm tall. Tartara mainly contains flavonoids, alkaloids, terpenoids, saponins, coumarins, tannins, Cardiac glycosides and anthraquinones. The leaves and young shoots of this plant are locally used as a vegetable and given to relieve constipation. *Digera muricata* L. used internally against digestive system disorders and in India, its seeds and flowers are used to treat urinary disorders. Before the introduction of modern medicines, disease treatment was entirely managed by herbal remedies. It is estimated that about 80% of the world population residing in vast rural areas of the developing and under developed countries still rely mainly on medicinal plants. Phytochemical and pharmacological investigations were carried out for this plant which reveals its multidisciplinary usage. It is quite obvious that the plant is widely used in traditional medicinal system of India and has been reported to possess anti-bacterial, anti-fungal, anti-diabetic, hepato-protective, nephron-toxicity protective, anthelmintic and free radical scavenging properties. It is known as a rich source of phenols, tannins, terpenoids, flavonoids and glycosides present in *Digera muricata* L. that might be medicinally important and/or nutritionally valuable. The plant is rich in carbohydrates, calcium, potassium, ascorbic acid, iron and magnesium. The present review summarizes some important pharmacological studies on *Digera muricata* L. and phytochemical investigations and isolated principles from them, which can be investigated further to achieve lead molecules in the search of novel herbal drugs.

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