

Review Article

Pharmacognosy, Phytochemistry and Pharmacology of *Cucumis dipsaceus* Ehrenb.

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ABSTRACT

Cucumis dipsaceus Ehrenb. is a climbing annual herb, belongs to family *Cucurbitaceae*. Its common name is hedgehog cucumber. This herb's native distribution is in Sudan and Southern Egypt, Africa, widely spread in Ethiopia, Kenya, Somalia, Tanga Region and in northern and western parts of Tanzania and Uganda. It is also sometimes cultivated in other tropical regions but now found in forest of Maruthamalai, foothills (Western Ghats), Coimbatore (Tamil Nadu) and Mysore, (Karnataka), India. Traditionally, it shows anti-emetic, gastrointestinal diseases, stomach pain, diarrhoea, constipation, meningitis, gallstone, hepatitis, rabies, and haemorrhoid. *C. dipsaceus* is a valuable nutraceuticals supplement to the human diet because it contains significant amount of almost all essential amino acids and important minerals. Its fruit possess phytoconstituents like tannin, alkaloids, saponins, flavonoids, resins, steroids and Leave possess carbohydrates, proteins, amino acids, alkaloids, saponins, phenolic compounds, tannins, flavonoids, glycosides, cardiac glycosides, phytosterols and fixed oils and fats and showed antioxidant activity. A number of pharmacological activities like antioxidant activity (leave and fruit), antimicrobial activity, analgesic, anti-inflammatory activity and cytotoxic activity were reported on fruit. This review article is an attempt to compile all reported information regarding *Cucumis dipsaceus* Ehrenb..

Keywords: *Cucumis dipsaceus* Ehrenb., *Cucurbitaceae*, Antioxidant activity, analgesic, anti-inflammatory activity, Flavonoids.

INTRODUCTION

Cucumis dipsaceus Ehrenb. is annual climbing herb, belong to genus *Cucumis* L., family *Cucurbitaceae*. This herb is sometimes cultivated in other tropical regions. It is found in Tanga region and in northern and western parts of Tanzania as well as in the southern highlands, Uganda, Kenya in countries of Africa, Ethiopia, Kenya, Somalia, Sudan and Southern Egypt⁵. Commercially, this herb is sold in local markets of Tanzania. But it is now, available in forest of Maruthamalai foot hills (Western Ghats). District Coimbatore, (Tamil Nadu) and District Mysore, (Karnataka), India³.

Taxonomic status of *Cucumis dipsaceus* Ehrenb. has been well defined

Kingdom: Plantae, Subkingdom: Viridaplantae,
Infrakingdom: Streptophyta, Division: Tracheophyta,
Subdivision: Spermatophytina, Infradivision:
Angiospermae, Class: Magnoliopsida, Superorder:
Rosanae, Order: Cucurbitales, Family: *Cucurbitaceae*,
Genus: *Cucumis* L., Species: *Cucumis dipsaceus* Ehrenb.⁴.

Morphological description:

Root: It does not have a woody rootstock which is monoecious with lacking of tubers.

Stem is procumbent or climbing. It has hispid ridges and grooves with hispidulous. Also with the longer hairs 0.8-1.5 mm long and the shorter ones 0.3 or 0.8-1.5mm long.

Nodes are not geniculate and Internodes are 2-6 (-9) cm long.

Leaves: Petioles are weakly hispidulous to hispid with non break away hairs. 1.5 -5(-14) cm long and pubescence. Leaf blades are entire or trilobed with the margin regularly serrate to entire, ovate to broadly ovate in outline, Base of leaf blade is cordate and have basal sinus of 0.5 -2 (-3) cm deep, 3-7.5 (-12.5) × 2-7(-12) cm; 1.1- 1.5 times longer than wide. Its upper surface is hispidulous and hispid and not aculeate but hispid and hispidulous on the veins below with non break away hairs. Apex is broadly acute or obtuse (rarely) at the top. Central leaf-blade lobe entire, broadly ovate to shallowly ovate, broadly acute or obtuse (rarely) at the apex; 2-4(-6.5) × 1.5- 3.5(-7) cm. Lateral leaf is obtuse at the apex with 0.5- 1.5(-3) × (0.5-) 2-3 (-5) cm. Blade lobes are shallowly ovate and asymmetrical, entire. Tendrils are present, simple 1.5-6 cm long, solitary, not aculeate, apically glabrate and basally hispidulous.

Inflorescence: Unisexual, Male inflorescence is a fasciculate or solitary flowering with 1-5-flowered and sessile. Male flower in cross section shows terete pedicel which is 5- 20mm long. It is hispidulous and without bracteoles with hypanthium (3.6- 5.2 mm long; 2.4- 2.8mm in diam; hispidulous) and narrowly infundibular. Calyx is 1.6-4 × 0.1-0.3 mm sparsely hispidulous. Its lobes are narrowly acute at the apex and narrowly oblong to linear



Figure 1: Morphological characteristics of *Cucumis dipsaceus* Ehrenb.

in outline. Corolla is infundibular. Its Corolla tube 1-1.5mm long and 3mm in diameter. It is glabrous inside and sparsely hispidulous outside. Corolla lobes obovate in outline, acute at the apex; 5.5-8.5 × 3-5mm, sparsely hispidulous outside, glabrous inside. Stamens and hypanthium are separated from each other. In cross section of filaments (terete) are glabrous with 0.4- 0.8 mm long and 0.2mm wide (in diameter).: Anther thecae ca. 2.5mm long; glabrous. Anthers are unilobate and broadly oblong. It is obtuse at apex with 0.6- 0.8 × 0.6- 1mm disc cylindrical; ca. 1.2mm long; ca. 1.5mm in diam. Anthers are transversely connected. Female inflorescence is a solitary flower. A female flower has pedicel which is cylindrical, 5-15mm long, with non breakaway hairs and hispid and hispidulous. The upper ¼ of hypanthium is free from the ovary. The lower ¾ of hypanthium is ellipsoid, 8-19 mm long x 4-8 mm in diameter, densely aculeate and glabrous. Free portion of hypanthium is 4-10mm long x 3-5mm in diameter and not aculeate from outside but hispidulous and glabrous from inside. Calyx lobes outline is linear and narrowly acute at the apex. It is 4.8 -5.6 (- 11) long × 0.4 – 0.6 (-1) mm diameter with sparsely hispidulous. Corolla outside is sparsely hispidulous but from inside glabrous. Its corolla tube is 1.5mm long x 2.5mm in diameter and from outside sparsely hispidulous. Corolla lobes outline is obovate and acute at the apex with 6.5-15 long × 3- 8.5 mm diameter. It is sparsely hispidulous from outside but glabrous from inside. Staminodes are present and glabrous. But separated from the free portion of the hypanthium. These are 0.4-0.8mm long x 1.3mm in diameter and 1.2mm above the ovary. Style is 1.5mm long x 0.6mm in diameter. It is subtended by a circular disc. Disc is 0.8mm long x 1.8mm in diameter. Stigma is 2.5mm long x 2.8mm in diameter and lobate. It is smooth with 5 finger – like stigmatic projections 0.8-1mm long x 0.4mm in diameter. Fruit is not geographic, readily visible and maturing above ground. Its pedicel is sulcate by cross section. It is cylindrical 1-3(-4) cm long with non breakaway hairs and hispid. Fruit monocolored, pale yellow and ellipsoid to globose. It is 3-6.5cm long and 2.5-4cm in diameter. It is densely aculeate and glabrous blunt at the apex. Seeds is elliptic, unwinged and 4-5 mm long × 2 mm diameter x 1mm thick.

Flowering is started from September – November and fruiting is from November – January. Ecology of this herb is uncommon in the scrub forest between 430 - 480 MSL of Maruthamalai foothills, Coimbatore District, Tamil Nadu, India.^[1] But is Common in dry bushland, especially

like in disturbed woodland and wooded grassland, and a weed of cultivation, 400.1,800 m.

Uses

Leaves and young shoots are cooked with coconut milk or groundnut paste as vegetable and then taken with staple food.

Medicinal

Poultice is prepared by leaves and tendrils for the treatment of wounds. Fruit juice is a acts an antidote in poisoning case⁵.

Traditional Uses

It is used as food in Nyasaland and Tanganyika. Its stems decoction used as anti-emetic. Its fruit used for gastrointestinal diseases, diarrhoea, stomach pain, constipation, meningitis. Roots are used as hepatitis, local application, snake bite, carnivore bite and gallstone. Extract of fresh leaves are used haemorrhoid for rabies. The above said all uses of this herb is popular in different countries of east African⁶. Leaves and fruit are used for fodder. Leaves are collected during the rainy season and dried and pounded leaves are stored in airtight containers. The management of this herb was usually done by collecting from the wild, but can be easily propagated from seed. The status this herb is common and easily accessible within its habitat from its native distribution.

Nutritional Analysis

A healthy human diet required following amount of amino acids like threonine 15mg, cysteine 4mg, methionine 10mg, valine 26 mg, isoleucine 20mg, leucine 39mg, tyrosine 15mg , histidine 10mg, phenylalanine 25mg, and lysine 30mg per kg/day of body weight. Leucine, alanine, isoleucine, and valine enhance and are also stimulate energy production of muscular and metabolic signals. Several other amino acids are produced by above amino acids. 2, 2-diphenyl-1-picrylhydrazyl (DPPH) deleterious radical is quenched by above amino acids. *Cucumis dipsaceus* leaf posses above amino acids and these are quantified by following methods of nutritional analysis. Proximate composition can be determined according to Association of Official Analytical Chemists method of moisture content^{16,23}. Lowry et al.¹⁷ provided the method for determination of total protein. The carbohydrate can be determined according to the method by Sadasivam and Manikam¹². Amino acids can be determined in extracted sample of leave and fruit according to the methods of Ishida et al. The compilation of results can be made along with the recommended levels of amino acids by FAO/WHO/UNU^{13, 14}. The use of Flame Photometer can be

done to determine calcium (Ca), sodium (Na), and potassium (K) by the method of Allen¹⁵. The powdered leaf and fruit samples can be evaluated a synthetic substrate BAPNA for knowing ability of trypsin inhibition. It is expressed in TIU/mg protein as degree of inhibition by Sadasivam and Manikam method of trypsin inhibition (1992)¹². Anti-nutritional factor are 'Secondary metabolites', which are the side products of processes of synthesis of primary metabolites in plants. These are highly biologically active¹⁶.

Successive solvent extraction method is described by (Raaman, 2006)¹⁷. Each fractional extracted solvent was concentrated by rotary vacuum evaporator and then air dried. Then extracts were kept in freeze dried and stored in desiccators for next analysis.

Phytochemical analysis:

The phytochemical screening:

1. Fruit methanolic extract was analysed for presence of alkaloids, flavonoids, tannin, resin, steriods but carbohydrate, reducing sugar and phenol were absent.
2. Leaves extracts were analysed for the presence of saponins, phenolic compounds, carbohydrates, proteins, amino acids, alkaloids, cardiac glycosides, phytosterols, glycosides, flavanol, glycosides, tannins, flavonoids, gums and mucilages and , fixed oils and fats according to standard methods.

Pharmacological activities:

Total phenolics, Tannin content and flavonoid contents were determined and quantified by Siddhuraju and Becker¹⁸, Siddhuraju and Manian¹⁹ and Zhishenet al.²⁰ respectively on leave and fruit of *Cucumis dipsaceus*.

Antibacterial activity:

Fruit extracts of *Cucumis dipsaceus* was reported with solvent methanol and was used to test their antibacterial activity. Studies reported using bacteria such as *E- coli* (-ve), *Bacillus subtilis* (+ve), *Staphylococcus aureus* (+ve)³. *Analgesic, Anti-Inflammatory Activity of fruit of Cucumis dipsaceus:*

Extracts of petroleum ether, dichloromethane, methanolic and ethanolic *Cucumis dipsaceus* (fruit) showed high analgesic and anti-inflammatory activity as reported by authors but dichloromethane and methanolic extract showed highest analgesic effect and highest anti-inflammatory activity of dichloromethane extract²¹.

Cytotoxic and antitumor Activity of fruit of Cucumis dipsaceus:

The ethanolic extract of aerial part of *Cucumis dipsaceus* showed high % age cytotoxic effect against K562 and Hep-2 which are human tumoral cellular line. Anti tumor effect was performed by method carrot disk against the tumor produced by the microorganism *Agrobacterium tumefaciens* due to presence of sterol, triterpenes and flavonoids²².

CONCLUSION

Leaves and fruits of *Cucumis dipsaceus* Ehrenb. possesses nutritional factors like all amino acids, essential micro and macro minerals in very good quantity there for leaves and fruits are used for nutraceuticals

purposes. Anti-nutritional factors or secondary metabolites were reported in different quantities in different leave and fruit extracts. Flavonoids were present in very good concentration in methanol and water extract. Total phenolics concentration in ethyl acetate and methanol extract in fruit but in leave ethyl acetate and water extract reported high content of flavonoids. Chloroform and water extract contained good quantity of total phenolics. So, anti nutritional factors were responsible for strong antioxidant activities, antibacterial activities, cytotoxic activity and analgesic and anti- inflammatory activity. The review study of plant *Cucumis dipsaceus* Ehrenb. showed strong antioxidant activity due to presence of flavonoids which are very good research material for further exploring pharmacological evolutions.

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