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CITRULLUS COLOCYNTHIS

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Botanical name *Citrullus colocynthis* Linn. Schrad.

Synonyms *Colocynthis vulgaris* Schrad.
Cucumis colocynthis. Linn.

Family Cucurbitaceae

Classical names as adopted in various traditional systems of medicine viz, Ayurveda, Siddha, Unani, Homoeopathy etc.

Ayurveda Aindree, Gavaakshee, Chitraphala , Surendraahwa, Sukhaarunee, Kshudraphala, Vrishabhaakshee, Mrugabhaksha, Aatmaraksha, Sthaanukarnee, Chitradevee, Mahaaphala, Dhanuhshrenee, Trapusee, Gajachirbhatee, Gavaadanee, Hastidantee, Sooryaahwa, Marusambhava.

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Siddha	Kummatti
Unani	Hanzal
Homoeopathy	Colocynthis

Vernacular names

Bengali, Hindi: *Indrayan, Makal*; Gujarati: *Indrak, Indravana, Indrayan;* Kannada: *Pavamekkakayi, Tumtikayi;* Konkan: *Kavandali*; Malayalam: *Peykommutti;* Marathi: *Kaduvrindavana, Indrayan;* Punjabi: *Ghurumba*; Tamil: *Peykkumutti, Verittumatti;* Telugu: *Eetiputcha, Paparabundama*; Assam: *Mahakal;* Bihar: *Pair;* Sanskrit: *Chitraphala, Aindri, Gavaksi, Indravalli, Indravarooni, Mehendravaruni, Visala;* English: *Colocynth, Indian wild gourd, Bitter apple.*

Botanical description

A scabrid perennial with prostrate or climbing angular stems and bifid tendrils. Roots large, woody and branched. Leaves alternate, petiolate, ovate or triangular, deeply 3- lobed, lobes sinuately pinnatifid, variable in size. Flowers solitary, yellow, large, monoecious, pedunculate. Male flowers: peduncles 6-13 mm long, villous; calyx hairy, companulate, 5 mm long; corolla 6 mm long, segments obovate, apiculate. Female flowers: ovary ellipsoid, densely hairy. Fruit: globular, slightly depressed, 5-7.5 cm in diameter, variegated green and white, glabrous, when ripe, filled with a dry spongy very bitter pulp, epicarp thin. Seeds 4-7 mm long, white or brownish.

Distribution

It is found wild in the warm, arid and sandy parts throughout India, up to 1,500 m. It is most abundant in north- western plains of India, especially in the Barmer,Bikaner, Jaisalmer and Jodhpur districts of Rajasthan, and in Gujarat.

Availability(abundant/rare/ threatened/ endangered etc.)

Abundant

Part used

Pulp of the fruit excluding seeds (in Homoeopathy and Unani), leaves, fruits and roots (in Ayurveda)

Action and uses

Traditional system

Bhats used roots as abortifacient. Rural folk of Delhi used fruit as purgative. Tribes of Indian desert used fruit as galactagogue and purgative. Tribes of Saurashtra (Gujarat) used fruits and seeds as purgatives. Colocynth is used in folk remedies for amenorrhoea, ascites , bilious disorders, cancer, dropsy, fever, jaundice, leukemia, rheumatism, snakebite, tumors (especially of the abdomen), and urinogenital disorders. The plant figures into remedies for carcinoma, endothelioma, leukemia, corns, tumors of the liver, spleen, and even the eyes.

Ayurvedic and Siddha system

इन्द्रवारुनिका तिक्ता कटुशीता च रेचनी।
गुल्मपित्तोदरश्लेष्मक्रिमिकुष्ठज्वरापहा।।
(राजनिघण्टु)

Indravarunika tikta katusita ca recani
gulmapittodaraslesmakrimikusthajvarapaha.
(Rajanighantu)

Virechanee, vranahara, krimighna, shwaasahara, kaasahara, apacheeghna, kushtaghna, pleehodarahara, garavishaghna, kaamalaahara, moodhagarbhahara, pramehaghna, granthighna, gandamaalaahara, vishagna sleepadaghna, gulmahara, jwarahara.

The root is used for arthritic pain, breast inflammation, ophthalmia and uterine pain. The fruit is used for adenopathy, anaemia, ascites, asthma, bronchitis, constipation, dyspepsia, elephantiasis, foetal atrophy, jaundice, leucoderma, spleenomegaly, throat diseases, tubercular glands, tumors, ulcers, and urinary discharges. Indravaruni, an Ayurvedic preparation from leaves is used for treatment of cough and as a cholagogue. Oil from the seeds is useful in hair growth and maladu (sterility)

Unani system

The pulp of colocynth is widely used in different diseases e.g. ascites, bronchial asthma, joint pain, sciatica, gout, hemiplegia, palsy, leprosy and filariasis etc. For the purpose of abortion, this is used in the form of vaginal pessaries. Also used in medicines of Kala-azar.

Homoeopathic system

Proved by Hahnemann in 1821 and finds mention in Allen's Encyclop. Mat. Med. Develops most of its symptoms in the abdomen and head, causing intense neuralgia. It is especially suitable for irritable persons, easily angered, and ill effects therefrom, women with copious menstruation, and of sedentary habits. Persons with tendency to corpulency. The neuralgic pains are nearly always relieved by pressure. Cramps and twitching and shortening of muscles. Constrictions and contractions. Cystospasm following operations on orifices. Urinous odour of perspiration. Agonizing pain in abdomen, causing patient to bend double, is most characteristic. Sensations: cutting, twisting, grinding, contracting and bruised, as if clamped with iron bands.

Modern system

It is considered as cathartic, ecbolic, emmenagogue, febrifuge, hydragogue, purgative, and vermifuge.

Pharmacognostic

Macroscopic

Fruit: Pulp occurs in white or pale, yellowish- white, light, pithy fragments; odourless and has intensely bitter taste. Seeds about 7mm long and 4.5 mm wide, flattened-ovoid in shape, testa yellowish- white to dark brown, smooth, extremely hard and exalbuminous. The embryo contains large amount of fixed oil. The rind is about 1 mm thick, externally variegated green and white or buff-coloured, glabrous and granular, the inner surface whitish and marked by impressions of the seeds.

Leaves : Very variable, 3.6-6.3 cm long, 2.5-5.0 cm wide, pinnately lobed in outline, generally 3 lobed, sometimes 3-7 lobed, middle lobe largest, each lobe deeply pinnatifid; petiole 1.3-2.5 cm long, entire leaf densely hirsute; taste very bitter.

Microscopic

Pulp

Contains large, thin walled parenchymatous cells separated by intercellular spaces, occasional spiral or annular vessels; the absence of starch grains, crystals of calcium oxalate and of sclerenchymatous cells, excepting such small proportions as corresponds to an amount of seed not exceeding 5% and to an amount of outer sclerenchymatous part of the pericarp not exceeding 2%. Presence of the flat, rounded, pitted areas where the parenchyma cells are in contact with each other as mentioned in the literature have not been reported in the annual report of the D. S. U. (CCRH) Ghaziabad.

Leaf

Lamina in transection shows epidermis single layered; cuticle thin; stomata on both the surfaces, anomocytic, stomatal index on the upper surface 12.5 -28.5 and on the lower surface 25.0-31.2; trichomes of two types, glandular and non-glandular present on the lower surface only, but on both the surfaces at mid rib and veins. Non-glandular trichomes 3-5 celled, uniseriate with multicellular bulbous base; glandular trichomes with 2-3 celled stalk and 2-8 celled head. Mesophyll is differentiated into 1-2 layers of palisade and 6-7 layers of elongated spongy parenchyma cells oriented radially like palisade cells embedding the lateral bundles. Palisade ratio 2.75-3.75. Midrib and veins prominently projected on dorsal side and have small ventral ridge of collenchyma cells. Meristele consists of two separate vascular bundles, larger towards dorsal side. Vascular bundles conjoint, bicollateral, embedded in parenchymatous ground tissue and hypodermal collenchyma. Petiole shows ridged outline with collenchyma at the ridges and chlorenchyma at furrows below the epidermis; vascular bundles conjoint, bicollateral, arranged in a ring and embedded in parenchymatous ground tissue. Trichomes of glandular and non-glandular type, as described in leaf.

Leaf powder

Coarse, olive green; shows entire or broken pieces of hair; epidermal cells polygonal, moderately thick-walled, 27.5-49.5 m long and 19-27m wide; palisade and spongy parenchyma cells; anomocytic stomata and xylem vessels.

Standards and tests

Pulp of the fruit

Acid insoluble ash	Not more than 4 %
Seed	Not more than 5 %
Epicarp	Not more than 2 %
Petroleum ether (b.p. 50 ^{o}-60 ^{o}) soluble extractive	Not more than 3 %.

Leaves

Foreign matter	Not more than 2 %.
Total ash	Not more than 18 %
Acid-insoluble ash	Not more than 6 %
Alcohol-soluble extractive	Not less than 7 %
Water-soluble extractive	Not less than 18 %

Chemical constituents

The mesocarp contains glucose (1.3% on fresh basis) and traces of a-spinasterol. The juice of the fruit contains a-elaterin, citrulluin, citrulluene, and citrulluic acid. A dihydric alcohol, citrullol and p-hydrooxy-benzyl-methylether have been isolated from the dried pulp and the unripe fruits respectively. The peel-free flesh of ripe fruit contains a yellow, bitter oil, citbittol. The petroleum ether extract of peels of the fruit contains a mixture of 22 hydrocarbons of which the major was hentriacontane (48.2%), fatty acids (lauric, myristic, palmitic, hexadecenoic, stearic, arachidic, oleic and linoleic), primary alcohols (hexadecan-1-ol,octadecan-1-ol, eicosan-1-ol, docosan –1-ol, tetracosan-1-ol and hexacosan-1-ol), odouriferous compounds (citronellal, methylheptenone, methyl eugenol, phenylethylalcohol and 3 unidentified compounds) and a long chain unsaturated ketone. Other compounds present in the peels are: docosan-1-ol acetate, 10,13-dimethylpentadec-13-en-1-al, 11,14- dimethylhexadecan-14-ol-2-one and 10,14-dimethyl-hexadecan-14-ol-2-one. Presence of citrullol and heptacosan-1-ol is also reported. Seeds contain phytosteroline, 2 phytosterols, 2 hydrocarbons, a saponin , an alkaloid, a polysaccharide or glycoside, and tannin. The two phytosterols may be b- sitosterol and lanosterol detected in all parts of the plant. Quercetin, and salts of acetic -, malic-, citronic-, and tartaric - acids as well as caffeic-, chlorogenic-, ferulic-and *m* - coumaric acids and a - spinasterol have also been reported. Seeds contain a pale brownish yellow fixed oil with a characteristic flavour and taste. Roots contain a-elaterin, hentriacontane and saponin.

Pharmacology

It exhibits uterine depressant property and decreases the rate and amplitude of contraction and shows anti-histaminic and anti-acetylcholine activity. The glycoside also shows cardiac depressant activity. The extract of dried pulp shows significant antibacterial activity against *Salmonella paratyphi.* In pharmacological trials, the fruit exhibited hypoglycaemic action. A potent anti-coagulant factor has also been reported. A compound preparation containing it has been proved useful in treating Kala azar caused by the protozoan parasite *Leishmania donovani* Laveran & Mesnil transmitted by sandfly.

Toxicology

The toxic dose of the glycoside is reported to be 0.5 to 1 g while a dose of 4 g is fatal.

Information related to therapeutic evaluation

Dose

Ayurveda	-	0.12 to 0.3 g
Homoeopathy	-	6th -30th potency

Formulations and preparations

A. Homoeopathic Mother Tincture preparation

Drug strength	1/10th
Colocynthis in coarse powder	100 g
Purified water	500 ml
Strong alcohol	537 ml

To make one litre of the Mother Tincture.

(i) Potencies

2x: to contain one part of the Mother Tincture, three parts of Purified Water and six parts of Strong Alcohol. 3x and higher with dispensing alcohol.

(ii) Standards of the finished product

Alcohol content	47.0 to 51.0 % v/v
pH	5.40 to 6.20
Wt. per ml.	0.910 g to 0.950 g
Total solids	Not less than 1.20 % w/v
l *max*	255, 310 nm

(iii) Identification

Evaporate 20 ml to remove alcohol. Extract the aqueous part with 3x20 ml chloroform. Concentrate the chloroform extract to 2 ml and carry out TLC using chloroform : methanol (9:1 v/v) as mobile phase. Under UV light four spots appear at Rf. 0.213, 0.52, 0.63 and 0.83 (all blue).

B. Ayurvedic preparation

Indravaruni (from leaves),

C. Siddha preparations

Juice of the fruit is an ingredient of Arruttumatti camulam and unripe fruit is used in the preparation of Arruttumatti and Arruttumatti caru.

D. Unani preparation

Hanzal

Trade and commerce

In recent years colocynth has found a place in the oil industry of western Rajasthan where its cultivation serves three purposes, viz. continuous supply of seed (as cash crop) to oil industry for soap making, stabilization of shifting sand, and checking the danger of its becoming extinct due to over exploitation. The dried pulp of the mature fruit, freed from the rind and seeds, constitutes the drug 'Colocynth' which was an official drug in the Indian Pharmacopoeia but it is still an official drug in the Ayurvedic and Homoeopathic Pharmacoepia of India. The mature fruits are gathered and peeled to remove the epicarp and dried quickly.The powder is yellowish-orange to yellowish-grey with a slight odour and an intense bitter taste. The pulp constitutes roughly 15 percent of the fruit, the seed and rind forming 62 and 23 percent respectively. It is extremely irritating to the nasal mucous membrane and eyes, and requires careful handling.

Substitutes and adulterants

The fruits of *Cucumis trigonous, C. pseudocolocynthis* and *C. hardwickii* grow abundantly in the mountainous regions of Northern India and are frequently used to adulterate Colocynth sold in market. They can be differentiated by the shape and texture of the surface of the fruit.

Agrotechniques

Colocynth grows best in bright light and an annual rainfall of 150-300 mm. Fully developed yellow ripe fruits are available by Sept.-Nov.

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Fig. 1. A branch with fruit.

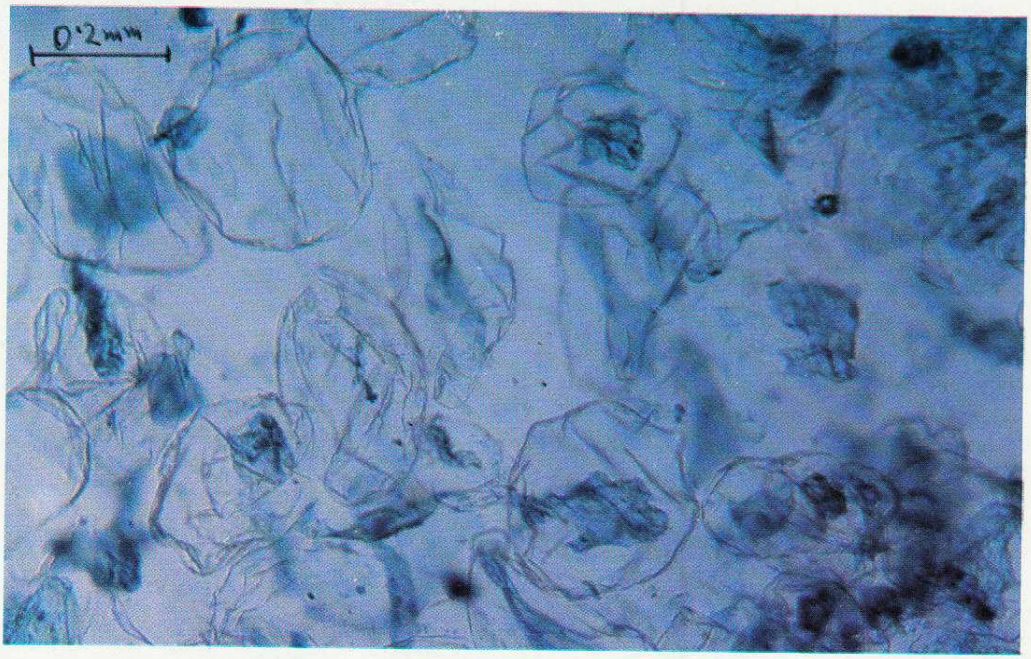

Fig. 2. Parenchyma cells of the fruit pulp.

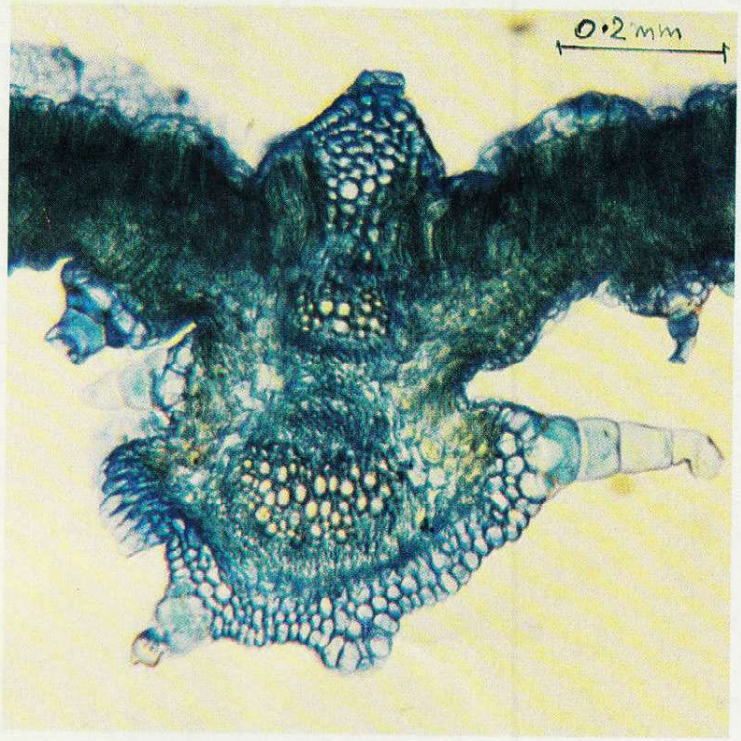

Fig. 3. Transection of leaf through midrib region showing dorsal and ventral bulge, trichomes and arrangements of vascular bundles.

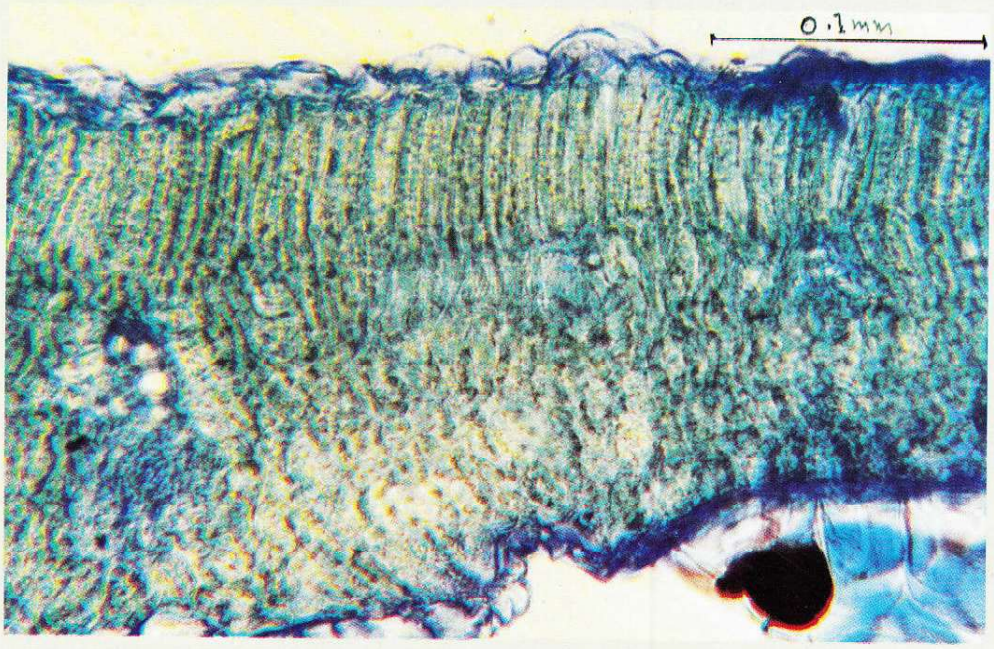

Fig. 4. Transection of leaf through laminar region, a portion enlarged.