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A comprehensive review on Kanocha (*Phyllanthus maderaspatensis*): An important Unani drug

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Abstract
Kanocha are the seeds of *Phyllanthus maderaspatensis* belongs to the family Phyllanthaceae. Phyllanthus is the largest genus in the family Phyllanthaceae. It is commonly called as Madras Leaf-Flower. It grows upto 50 cm tall, well-branched and hairless. Leaves are arranged in two ranks and they are inverted lance shaped, 1–4 cm long, up to 5 mm wide. Kanocha (Bhuiaamlaki) is a well-known and important drug of Unani medicine which is extensively used as a hepatoprotective agent but it also possesses some other pharmacological actions like expectorant, diaphoretic, concoctus of inflammation, sedative and useful in strangury and sweats. The seeds have a bad taste and are carminative, laxative, tonic to the liver, diuretic and useful in bronchitis, ear-ache, griping, ophthalmia and ascites. It has many pharmacological activities like antimicrobial activity, cytotoxic effect, hepatoprotective activity, and chemoprotective effect. This paper provides an overview on pharmacological, phytochemical properties and therapeutic benefits of the seeds.

Keywords: kanocha, *Phyllanthus maderaspatensis*, unani drug, phytochemistry

1. Introduction
In Unani System of Medicine (USM) the plant *Phyllanthus maderaspatensis* is known by the name Kanocha and only seeds of the plant are used as medicine for treating various ailments of the liver, bladder and intestines but in other alternative systems of medicine whole plant is used. Kanocha (*Phyllanthus maderaspatensis*) belongs to the family Phyllanthaceae. In English it is known as Madras leaf flower as it is originated from the Madras region of India. The word kanocha is similar to the English word concha, which means the larger cavity of the external ear. Kanocha seeds resemble in appearance to concha, and hence name as Kanocha and it is mentioned in Unani texts that the infusion of leaves is given for earache and headache. Medicinally the dried fruit is valuable on account of its mucilaginous nature and diuretic properties; much used in ascites, ophthalmia, bronchitis and in infections of urinary passages [1, 2, 3]. The seeds have a bad taste and it is used as carminative, laxative, diuretic, diaphoretic and demulcent. With other demulcent decoctions, they are used in urinary affections such as gonorrhoea and internal inflammations [3, 4]. Seeds mainly contain linoleic acid, linolenic acid, myristic acid, oleic acid, palmitic acid and stearic acid [5]. The indications of leaves of *Phyllanthus maderaspatensis* Linn are ophthalmia, tenesmus, liver affections, cough, ascites, earache, headache [3, 6]. In Unani literatures Kanocha seeds are described as small seeds of greenish white (Safed Sabzi maa'il) in colour, they are tasteless and mucilaginous in nature. Branches are long; leaves are light pink in colour and fragrant [7]. Flowers resemble with the flowers of Alsi (*Linum usitatissimum*) and are yellow (Zard) and black (Siyah) in colour [1]. There are many types of Maru (Arabic name) some authors define four types whereas some others describe into five types that is *Marmazaad, Marmahooz*, *Marmatoos*, *Marmahoos* and *Suru*. *Marmahooz* is the most hot and fragrant variety. Some scholars stated that white Kanocha is the Gaozaban (*Borago officinalis*) whereas other authors said that there is another variety which is known as *Shehyaar*. It is cold in nature [8, 9].

2. Vernaculars
Hindi-Kanocha, Hazarmani, Bombay-Kanochha, Gujrati-Bazarmani, Ranavali, Tamil- Mela Nelli, Nala-Userekee, Arabic-Marur, Maru, Rehan-ul-Shyookh, Persian-Marushatu, Marushak, Urdu-Kanodcha Greek-Maalsulufan, Telugu-Nalla usirike [10, 11, 12, 13, 14, 3, 4].

3. Geographical distribution
It is widely distributed in dried parts of India; from Banda, Edge worth, throughout the Deccan Peninsula to Ceylon–Tropical Africa, Arabia, Java, China, Australia [15, 3]. The *Phyllanthus maderaspatensis* usually grows in deciduous wood land, wooded savanna and grass land, on beaches and dunes, and also near streams and ponds in cultivated and distributed localities, from sea level up to 1400 m altitude. Outside tropical Africa *Phyllanthus maderaspatensis* is often considered a weed [6].

4. Botanical Description
An erect or decumbent herb or sometimes an under shrub, 30-90cm. high, annual, very variable in habit. Stems are glabrous, slender, low and herbaceous or erect, woody with spreading branches and sometimes a woody perennial stock. Leaves scattered, variable, 6-32 by 3-16mm. glabrous, obovate-cuneate, and rounded. Truncate or somewhat obcordate at the apex, mucronate, much tapering into a very short petiole, glaucous and with a few lateral slanting nerves conspicuous beneath; stipules peltate, lanceolate membranous, very acute. Flowers axillary, the male flowers are minute in small clusters, sessile, the female flowers are

larger, solitary, shortly pedicellate. Sepals 6, obovate, obtuse, green with white margins. Stamens 3; filaments connate. Styles 3, distinct, very small, 2 lobed. Disc of glands in both sexes. Anthers almost sessile on the column, erect, apiculate. Capsules 3mm in diameter, depressed-globose, glabrous, 3-lobed [3, 15].

4.1. Macroscopic
Seeds appear rounded from distance but are three sided, 1.5mm long, smaller than those of bhanga (*Cannabis sativa*) triangular, highly polished, and of a grey colour or sometimes brown; surface reticulated or marked with fan-like, delicate dark lines, like basket work. One side of the seed is arched and the other presents two sloping surfaces united so as to form a longitudinal ridge. At the pointed end there is a smaller scar; the kernel is oily, with a sweet nutty taste [3, 4].

5. Cultivation
The plant grows on almost all kind of soils. Among all kinds of soil it likes heavy clay and alluvial soils of low altitude river valleys on river banks and in flood plains. It is usually found in calcareous sites in humid tropical areas [6].

6. Parts used *(Hisas-e- Mustamlah)*
Seeds [7, 11, 13, 17, 18].

7. Temperament (*Mizaj*)
With the consensus of various Unani authors the temperament of Kanocha is Hot and Dry 2° [1, 2, 7, 8, 9, 13, 19] along with the slight variation in the degree of temperament Hot and Dry [11, 14, 18].

8. Pharmacological Actions *(Af'al)*
Its chiefly possess Concoctus of Inflammation *(Mundij-e-Awram)*, Glutinous (*Mugharri*), Sedative (*Musakkin)* [1, 2, 13] Stomachic (*Muqawwi-i- Mi'da Wa Am'a)*, Carminative (*Kasir-e-Riyah)*, *Dafi'-e- Yaraqan*, Laxative **(***Mulayyin)* [1, 3, 8, 9, 13, 20] Deobstruent *(Mufattih-e-Sudad)*, Diuretic (*Mudirr-e-Bawl)*, Diaphoretic *(Mu'arriq)*, Demulcent (*Mulattif*) [1, 3, 4, 8, 9, 11, 14, 20] Antidiarrhoeal (*Habis-e-Ishal-e-Damwi*) [20] Cardio tonic (*Muqawwi-e- Qalb)* [9] properties.

9. Medicinal Uses (*Mahall-e-Istama'al*)
Kanocha seeds with Tukhme Hamaaz (*Rumex vesicarius*) are beneficial in diarrhoea *(Ishal Damwi)* [7, 8, 14]. Seeds roasted in almond oil are useful in the treatment of intestinal erosion (Sahj-*e-Am'a)* and dysentery (*Zahir)* [1, 7, 8, 13, 14]. Kanocha seeds are given with adjuvant of other demulcent decoctions in urinary affections (*Tadiya Majariye-e-Bawl)* such as gonorrhoea *(Sozak)* and internal inflammations on account of the mucilage they contain [3, 4]. Ingestion of decoction of its leaves and seeds in the amount of 7 grams with honey gives relief in ascites (*Istisqa)* due to its diaphoretic and diuretic properties [1, 7, 8, 11]. It is also used in other ailments like gastric insufficiency (*Du'f al-Mi'da)*, enteropathy (*Du'f-e-Am'a)*, gastralgia (*Waja' al-Mi'da)*, flatulence (*Nafkh-e-Shikam)*, coryza and catarrh (*Nazla-o-Zukaam)* [1, 7, 8, 14]. Kanocha is also reported to be used in bronchitis (*Iltihab al-Shu'ab)* and ophthalmia (*Iltihab-e-Ain)* [3]. Instillation of ear drop prepared from the seed mucilage with women's milk into the ear is beneficial for Otalgia (*Waja' al-Udhun)*, it also relieves headache *(Dard-i-Sar)* by dropping into nose [1, 2, 3, 7, 8]. In Southern India, an infusion of the leaves is given for headache [3, 7, 12]. Roasted seeds are given with almond oil to have astringent in diarrhoea and dysentery while unroasted produces laxative effect [1, 9, 11]. Paste of the seeds is applied to resolve the inflammatory conditions like boils [1, 8, 13]. In Asia, *Phyllanthus species* are used to treat diseases of digestive system, in South America, they are used to treat diseases of urinary system whereas in Africa, it is used to treat malaria and wound [21].

10. Adverse effects *(Muzir Atharat)*
It causes headache in persons having hot temperament [9] and causes headache specially after alcohol consumption [1, 8].

11. Correctives *(Musleh)*
The musleh or correctives of Kanocha (*Phyllanthus maderaspatensis*) are Gulnaar Farsi (Flowers of *Punica granatum*) [11, 18], Roghan Badam (Oil of *Prunus amygdalus*) [1, 2, 7], Gulaab (Flowers of *Rosa damascena*) [1, 11, 18], Tukhme Hamaaz (Seeds of *Rumex vesicarius*) [1, 2] and Arq-e-Baadyan (Distillate of *Foeniculum vulgare*) [1].

12. Substitutes *(Abdaal)*
The various substitutes (Abdaal) of Kanocha (*Phyllanthus maderaspatensis*) mentions in various Unani literatures are Aspaghol (Seeds of *Plantago ovata*), Tukhme Alsi (Seeds of *Linum usitatissimum*) [11, 18], Tukhme Rehan (*Ocimum sanctum*) [1, 2, 7] and Baalangu (*Lallemantia royleana*) [1, 7].

13. Adulterants
Some other species of Phyllanthus are used as adulterants of Kanocha and they are *Phyllanthus amarus, Phyllanthus fraternus* and *Phyllanthus simplex* [5].

14. Miqdar-e-Khurak (Dosage)
The various dosages of Kanocha (*Phyllanthus maderaspatensis*) mentions in various Unani classical literatures are 6 gm [11, 18], 5 – 7 gm [2, 7], 6 – 9 gm (Kamil) **(**Adult dose) [1].

15. Unani Murakkabat *(Unani Formulations)*
The important Unani formulations of Kanocha in which the drug is used either as chief ingredient or one of the ingredients of the formulation are Marham-e-Dakhalyoon and Safoof-e-Teen [7].

16. Phytochemical constituents
16.1. Major
Seed contains linoleic acid, linolenic acid, myristic acid, oleic acid, palmitic acid, stearic acid.

16.2. Others
Maderin, β-sitosterol. Gallic acid has been isolated (in house), which is not so far reported from the plant [5].

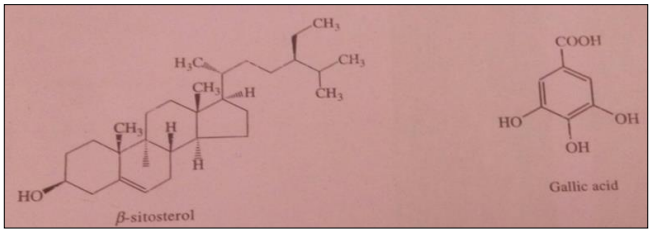

Fig 1

The dried seeds on extraction with light petroleum gave 8.1% of a clear deep yellow oil of a characteristic odour and having the following characteristics: specific gravity 0.7912; n^{30}, 1.4770; Acid value, 13.44; Saponification value, 179.13; Iodine Value (Hanus)., 95.6 and Unsaponifiable Matter, 1.5%. The fatty acid composition (saturated 10.2% and unsaturated 89.8%) revealed the presence of myristic, palmitic, stearic, oleic, linoleic, and linolenic acids. β-Sitosterol and a substance ($C_{22}H_{46}O$, m.p., 72˚) have been identified in the unsaponifiable matter. Seed contained 16.3% oil and 14.6% protein; linolenic acid (66.4%) was predominant fatty acid in oil [12, 22]. The defatted seeds yield 15.3% of dirty-white fibrous mucilage which turns brown on long exposure to air and, on hydrolysis with 2N-sulphuric acid yields galactose, arabinose and rhamnose, and aldobionic acid. The presence of a reddish-brown coloring matter, maderin ($C_{24}H_{20}O_8$, m.p., 290-291˚; yield 0.36%) and an essential oil has been reported in the seeds [12]. The preliminary phytochemical evaluation of petroleum ether, methanol and water extracts of the leaf, shoot and root showed the presence of alkaloids, anthocyanins, anthraceneglycosides, carbohydrates, catacholic compounds, coumarins, dihydrochalcones, flavonoids and flavones. Presence of phenols, steroids, triterpenoids, were also reported. The extracts of *P. maderaspatensis* are rich in maderin, mucilage, essential oil and β-Sitosterol whereas the seeds also contain long chain fatty acids. It has deep yellow coloured oil extracted from the seeds of *P. maderaspatensis* [23]. The n-hexane and methanolic extracts of the whole plant material were subjected to preliminary qualitative phytochemical screening and showed the presence of tannin, carbohydrates, amino acids and protein. HPTLC fingerprinting was also performed and reported to ensure the presence of Lupeol in hexane extract and Phyllanthin in methanol extract [24].

17. Pharmacological studies

17.1. Antimicrobial Activity

The aqueous extract of whole plant showed significant antimicrobial activity against wide variety of pathogenic bacteria such as *Bacillus subtilis, Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa, Klebsiella pneumonia* and *Salmonella typhimurium* [25]. In an another study, ethyl acetate, ethyl alcohol and aqueous extracts of the root and stem were tested for antimicrobial activity against *Staphylococcus aureus, Pseudomonas aeruginosa, Klebsiella pneumonia* and *Salmonella typhimurium* and *candida albicans* and the results showed that the alcohol and ethyl acetate extracts possess significant inhibition on pathogens than aqueous extract [23].

17.2. Cytotoxic Effect

The hexane and methanol extracts of the whole plant material were screened for their cytotoxic potentials against Ehrlich Ascites Carcinoma using Trypan blue method. The results revealed that methanolic extract possess good cytotoxic potentials [24].

17.3. Hepatoprotective Activity

The hepatoprotective activity of alcohol and aqueous extracts were determined by paracetamol induced liver damage and compared with that of standard drug Silymarin. The study showed that both the extracts possess hepatoprotective activity but the alcoholic extract showed significant hepatoprotective activity [26]. In another study the remarkable hepatoprotective activity of the plant powder (water suspension) at a dose of 500mg/kg was reported against acetaminophen induced liver damage in Wistar rats. Antihepatotoxicity of the hexane extract was found to be better than Silymarin which suggested an excellent hepatoprotective herbal drug. The ethyl alcohol and water extract showed moderate activity. The hexane extract exhibited Cholerectic activity, hydroxyl radical scavenging activity and inhibition of lipid peroxidation [27].

17.4. Anticataleptic Effect

The aqueous extract of leaves of *Phyllanthus maderaspatensis* was investigated for the antihistaminic activity using clonidine-induced catalepsy and haloperidol induced catalepsy in Swiss albino rats. The results revealed that aqueous extract inhibit clonidine induced catalepsy and not haloperidol induced catalepsy. It may be concluded that it may be useful as antihistaminic and may be used in the treatment of Asthma [28].

17.5. Antinociceptive and Anti-Inflammatory Activity

The chloroform extract of the plant showed antinociceptive and anti-inflammatory activity through carrageenan induced hind paw oedema test and hot plate method respectively, in male wistar rats. Chloroform extract of *Phyllanthus maderaspatensis* significantly increases the basal reaction time and also showed significant inhibitory effect on the oedema formation [29].

17.6. Antifibrotic Effect

The hexane extract of *Phyllanthus maderaspatensis* (200mg/kg dose) was evaluated against liver fibrosis in male wistar rats. Hepatic fibrosis was experimentally induced with CCl_4, and the fibrosis was studied using various biochemical and histopathological techniques. Hexane Extract of *Phyllanthus maderaspatensis* (PmHE) was also subjected to toxicity evaluation in rats, and it was found that post treatment with PmHE almost normalised CCl_4 induced fibrotic changes, reduced lipid peroxidation and maintained the normal level of reduced glutathione pool [30].

17.7. Chemoprotective Effect

The Ethanol extract of *Phyllanthus maderaspatensis* (PME) was studied on Cisplatin induced nephro and genotoxicity in male Swiss albino mice to evaluate its chemoprotective effect. differrent doses (400 & 600mg/kg/ body weight) for 7 days before the administration of a single i.p dose of cisplatin (5mg/kg) exhibited significant chemoprotective activity. Renal dysfunction was evaluated biochemically by measuring the concentration of blood urea nitrogen (BUN) and serum creatinine. Genotoxicity was evaluated by the bone marrow micronucleus assay. A single dose of cisplatin

significantly elevated the levels of BUN, serum creatinin, micronucleated polychromatic erythrocytes ($MNPCE_S$) in bone marrow. But pretreatment with PME (600mg/kg/b.w.) for 7 days significantly attenuated the cisplatin induced nephrotoxicity & genotoxicity [31]. This extract is also taken as a popular dietry supplement in the southern part of India. It has been experimented as an ameliorative for Adriamycin induced toxicity and oxidative stress in mice [32].

17.8. Antispasmodic activity

The 50% ethanolic extract of the drug showed antispasmodic activity in guinea pig ileum and antitumour activity in rat [5].

18. Conclusion

This literature survey shows that *Phyllanthus maderaspatensis* plant has been extensively used in Unani system of medicine and use of this plant by various ancient Unani scholars is not just a myth but this practice was time tested. Its pharmacological effects were well confirmed by its repeated use in human beings and cattle. Various parts mainly seeds of this plant is used as anti-diarrhoeal, anti-dysenteric, antiseptic, anti-inflammatory agent and used to treat various gastric and urinary affections. Kanocha has been extensively tested for their anti-inflammatory and hepatoprotective activities by many scholars but this drug should also be tested for its other activities which are mentioned in Unani texts on modern scientific parameter so that this drug may be used in other conditions also and it will further authenticate the wisdom of ancient Unani scholars and tribal peoples. However there is further need to identify and isolate the pharmacologically active molecules from different parts of this plant so as it can be better utilized.

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