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Review Article

Khatmī (*Althea officinalis* L. and Althea rosea): Medicinal importance in the perspective of Unani medicine and pharmacological studies

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Abstract

Althea officinalis L. is an important Unani Medicinal plant belonging to the family Malvaceae. The herb is commonly known as *Khatmī* and Marsh-mallow. All parts of the plant such as seeds, leaves, root and flowers are mainly used as medicine in Unani Medicine. It is used for many pharmacological actions like diuretic, lithotriptic, deobstruent, anti-inflammatory, emmenagogue which makes it useful in treatment of kidney stone jaundice, menstrual disorder, hepatitis, headache etc. Many scientific studies are done on the pharmacological actions of this herb. In this chapter both modern and Unani perspective of pharmacological properties of *Althea officinalis* L. along with its Phytochemistry and pharmacological studies are included.

Keywords: *Althea officinalis* L.; *Khatmī;* Malvaceae

Introduction

Khatmī is a common drug used in Unani System of Medicine which is obtained from two sources namely *Althea officinalis* L. (marsh-mallow) and *Althea rosea* (garden hollyhock) of Malvaceae family. The generic name of the plant derived from Greek word "*Altaia*" which means "rich in benefits" and the specific name *officinalis* means "found officially". Commonly it is known as *Khatmī* and marsh-mallow. Mainly its leaves, seeds and roots are used medicinally to cure various common diseases. The root is said to be better when used before one year, seeds before three years and flowers before seven days, after that their medicinal properties become weak. All parts have lubricant, sticky, relaxant, anti-inflammatory, analgesic, astringent, expectorant, anti-catarrh, laxative, diuretic, emmenagogue activities etc., which make it useful for the treatment of various diseases such as *Nazla* (catarrh), *Zukām* (nasal obstruction), *Su'āl* (cough), *Warm-i-Am'ā* (enteritis), *Ishāl* (diarrhoea), *Zahīr* (dysentery), *Sozish-i-Bawl* (urinary tract infection), *Fālij* (hemiplegia), '*Irq al-Nasā* (sciatica), *Warm-i-Pistān* (mastitis), *Ra'sha* (tremor), *Ihtibās-i-Ḥayḍ* (amenorrhea) and *Ihtibās-i-Bawl* (retention of urine) etc. [1,2,3,4,5]. The plant and its different parts have various bioactive compounds such as flavonoids include kaempferol, quercetin and diosmetin glucosides; polyphenolic acids include syringic, caffeic, salicylic, vanillic and *p*-coumaric acids which are responsible for its pharmacological actions. Various experimental studies have been done on this plant which have proved the claims of Unani physicians.

Materials and Methods

All materials available on printed, electronic and online were used to prepare this review. For its description, identification, temperament, pharmacological investigations, actions, therapeutic uses etc. both modern, Unani books were consulted and published articles and research papers were searched from Pub Med, Google scholar, Science direct, Scopus etc. The detail about the plant and its parts were searched by the key words *Khatmī*, *Althea officinalis* Malvaceae

The detail of various aspect of the plant is as follow:

1. Distribution

Native to Eastern Europe and Western Asia; in India it is found in Kashmir, Uttar Pradesh, Punjab, Rajasthan and Himachal Pradesh[6].

2. Botanical description

It is a downy perennial herb, up to 3 m tall, erect, hardy and velvety plant. Stem is hairy, up to 3 to 4 feet high, simple, or putting out only a few lateral branches, die down in the autumn; leaves are large, obovoid, rough, rugose (wrinkled), base scarcely cordate, 5-7 lobed or wavy angled, soft and velvety on both sides, due to a dense covering of stellate hairs; flowers are rosy in axillary clusters, crenate, nearly sessile (resting on the surface) in long racemes or spike, 7-8 cm in diameter; corolla are five heart shaped of all shaded of rose, purple, white or yellow, single or double, appears in July to October; carpels many on a small torus ultimately separating, forming mericarps each containing a seed. Stamens numerous united into a tube with kidney-shaped and one-celled anthers. roots are 0.2 to 3 cm in diameter, long thick, tapering (smaller and thinner towards one end), light brown in colour, strongly longitudinally furrowed, often spirally twisted; fracture short, texture rough, internally yellowish white; odour, pleasant; taste, sweet and mucilaginous; fruits flat, round 5-8 mm, breaks up into the mericarps, which are downy on the outside and have fine, branched and radiating ribs, fruiting occurs in November-December; seeds small to moderate size; approximately 6 mm, usually brownish-black, kidney shaped with rugose, hairy at margins and somewhat compressed. It becomes mucilaginous when soaked in water [7,8,9,10].

3. Taxonomical classification[13,31]

Kingdom:	Plantae
Division:	Magnoliophyta
Class:	Magoliopsida
Order:	Malvales
Family:	Malvaceae (mallow family)
Genus:	Althea
Species:	Althaea officinalis

Fig. 1. Showing Plants (*Althea officinalis*) with Flowers (a, b,c), Fruits (c, d), seeds (e)

4. Description in Unani Literature

The plant of *Khatmī* is up to 3 m in height; leaves rounded, rough; flowers beautiful bell shaped, white to reddish or bluish colour; fruits appear after shedding of the flowers, bear black and flat multiple seeds. The roots are *Reshadār* (fibrous) so called *Resha-i-Khatmī*, it is yellowish white in colour. According to Ibn Sina some species of marshmallow bear white flowers while some bear red flowers. The species which has red flowers are more detergent[2]. Different parts of the plant such as flowers (*Gul-i-Khayrū*), leaves (*Barg-i-Khatmī*) and roots (*Bīkh Khatmī* or *Resha Khatmī*) are used for the treatment of various ailments. Its seeds and roots both give mucilage when soaked in water. Roots are more mucilaginous than seeds. In Unani System of Medicine the drug has been used medicinally since the time immemorial[2,3,4,5]. Dioscorides (1st Century) mentioned the plant first time in his book *De Material Medica*. According to

Unani literatures the different aspects of the plant are as follows:

5. *Mutarādifāt* (Vernacular names):

Khatmī is obtained from the *Althea officinalis* of family Malvaceae. The plant is used by different vernacular names in Unani Medicine as: [6,13].

Arabic:	*Bazr al-Khatmī, Kathir al-Manfi'at*
Chinese:	*KeZhi Gen*
Danish:	*Altae*
Dutch:	*Heemst*
English:	Marsh Mallow, Sweet Weed, Hollyhock
French:	*Guimauve*
German:	*Eibisch, Ibisch*
Greek:	*Altaia*, *Hibiscos*
Hindi:	*Khatmī, Khyra*
Italian:	Bismalva
Kashmiri:	*Sazkul, Sazmūl, Sazposh*
Persian:	*Tukhm-i-Khatmī*, *Resha-i-Khatmī*
Portuguese:	Malvaisco
Rumanian:	Nalba mare
Russian:	Altei, Dikayaroja
Spanish:	Malvavisco
Swedish:	Altea
Tamil:	Shimaithuthi
Turkish:	Hatmi, Herbamalvae
Urdu:	Khatmī, Khitmī, Gul-i-Khayrū

6. *Ajzā-i-Musta'mal*a (Parts used):

Seeds (*Tukhm-i-Khatmī*), flowers (*Gul-i-Khayrū*) and root (*Bīkh Khitmī or Resha Khitmī*) are used medicinally in Unani System of Medicine.[4]

7. *Mizāj* (Temperament):

Cold and wet in 1st degree, but in *Advia Nafisi* it is mentioned to have hot temperament. According to *Ibn Rushd* its leaves and branches are hot and dry in 1st degree; roots hot and dry in 2nd degree; Galen told it cold and dry while Ibn Sina told moderately hot[2,14,15,16].

8. *Miqdār Khūrāk* (Dose): 4–7 g [4], 6–9 g, 5–7 g[5].

9. *Af'āl* (Action):

Root: *Muzliq* (lubricant), *Mugharrī* (sticky), *Murkhī* (relaxant), *Muḥallil-i-Awarām* (anti-inflammatory), *Musakkin* (analgesic), *Ḥābis* (astringent), *Ḥābis-i-dam* (haemostatic), *Mujaffif* (desiccant), *Māni'-i-Surfā* (antitussive), *Mufattit-i-Ḥasāh* (lithotriptic); Seed: *Munaffith-i-Balgham* (expectorant), *Māni'-i-Nazla* (anti-catarrh), *Nāfi'-i-Su'āl* (antitussive), *Mulayyin* (laxative), *Rādi'-i-Mawād* (divergent), *Jāli* (cleanser), *Mulattif* (demulcent), *Munḍij-i-Balgham* (concoctive of phlegm), *Murkhī-i-Mi'da wa Adlāt* (emollient for stomach and tissues), *Mudirr-i-Bawl* (diuretic), *Mudirr-i-Ḥayḍ* (emmenagogue); leaves: *Muḥallil-i-Awarām* (anti-inflammatory); flowers: *Mufarriḥ* (exhilarant), *Muqawwi-i-Qalb* (tonic to heart), *Qābiḍ* (astringent), *Nāfi'-i-Suda'* (analgesic for headache), *Nāfi' Nafakh-i-Shikam* (anti-flatulence) etc. [2,3,4,5,15].

10. *Iste'mālāt* (therapeutic uses):

Due to the *Mulattif* (demulcent), *Mugharrī* (sticky) and *Musakkin* (analgesic) effects of root and seeds, they are used to cure *Nazla* (catarrh), *Zukām* (nasal obstruction), *Su'āl* (cough), *Waram-i-Am'ā* (enteritis), *Ishāl* (diarrhoea), *Zahīr* (dysentery), *Sozish-i-Bawl* (urinary tract infection) etc. due to the *Jāli* (cleanser) effect it has been found useful in *Bahaq* (pytriasis). *Resha Khitmī* has been also found effective in the treatment of *Fālij* (hemiplegia), *Irq al-Nasā* (sciatica), *Waram-i-Thadi* (mastitis), and *Ra'sha* (tremor). The decoction of roots is useful in *Ḥurqa al-Bawl* (burning micturition), '*Usr al-bawl* (dysuria), *Ḥurqa al-Am'ā* (burning sensation of intestine) and *Warm-i-Maq'ad* (anal swelling), which is attributed due to its *Mugharrī* (lubricant) and *Murkhī* (relaxant) effects. Leaves are used locally as a paste to cure *Waram al-Thadī* (mastitis). Many other diseases such as *Waram-i-Raḥim* (metritis), *Waja' al-Mafāsil* (arthritis), *Ḥasāh al-Kulya* (renal calculus), *Nafth al-dam* (haemoptysis), *Shahīqa* (whooping cough), *Niqris* (gout), *Dhīq al-Nafas* (asthma), *Dhāt al-Riyā* (pneumonia), *Dhāt al-Janb* (pleurisy), *Qurūh* (wound), *Qūlanj* (colitis), *Ihtibās-i-Ṭamth* (amenorrhea), *Ihtibās-i-Bawl* (retention of urine) etc. are also have been cured by using various parts of the plant [2,3,4,5,15].

11. *Tarkīb-i-Iste'māl* (Method of administration):

Mode of administration of drug in various diseases is as follows:

***Amrāḍ-i- A'sab wa Dimāgh* (Diseases of Nerve and Brain)**

Laqwa (Bell's palsy): A massage with *Roghan-i-Khatmī* on cervical vertebrae is very useful, when applied in case of bell's palsy which occurs due to *Yubūsat* (dryness)[17].

***Amrad-i- Ḥalaq* (Diseases of throat)**

Warm-i-Ghudda-i-Nakaf (Parotitis): A *Ḍimād* (paste) of marsh-mallow is applied to remove the swelling of parotid glands [2].

***Amrad-i-Ri'a* (Diseases of lungs)**

Dhāt al-Janb and Dhāt al-Riyā (Pleurisy and pneumonia): The leaves are incorporated in plasters for pleurisy and pneumonia [2].

***Amrad-i-Mi'da w Am'ā'* (Diseases of stomach and intestine)**

Ḥurqa al-Am'ā (burning sensation of intestine): The decoction of its root is useful in *Ḥurqa al-Am'a* (burning sensation of intestine) and *Warm-i-Maq'ad* (inflammation of anus) [2].

Ishāl (diarrhoea): Its leaves are used in severe diarrhoea [2].

***Amrad-i-Kulya, Ḥālibayn, Mathāna, wa Raḥim* (Diseases of kidney, ureters and urinary bladder)**

Ḥurqa al-Bawl and *Sozish-i-Bawl* (burning micturition or urethritis): The decoction of its root is useful in *Ḥurqa al-Bawl and Sozish-i-Bawl* [2].

Hasāh al-Kulya (renal calculus): Oral intake of decoction of root with wine is useful in dysuria and calculi in urinary tract [2,18].

Salābat-i-Rahim (hardening of uterus): It is used as a suppository with the gum of *Baṭam* (terbinth) in uterine hardness [2,18].

Amrad-i-Jild wa Mafāṣil

Bahaq (Pytriasis): A paste of *Tukhm Khatmī* is painted over with vinegar and then the patient is exposed to sun light [2].

Awarām, Buthūr wa Khanāzīr (Swellings, furuncles and scrofula): Its local application softens and prevents swellings. It dissolves hematoma, mature furuncles, and helps in relieving flatulent swellings and scrofula. It is applied with Sulphur on scrofula [2].

Waja'al-Mafāsil (joints pain): It mitigates joints pain specially when used with goose fat [2,18].

***Tasmīm* (poisoning)**

To remove pain due to insect bite, it is applied as liniment with vinegar or olive oil. Same is used also for honey bee sting [2,18].

12. Medicinal uses in Kashmir Folklore

Root is used as abortifacient, for this purpose cervix is first slightly dilated and then the root of *Khatmī* is kept in the cervix for some time, due to its mucilaginous property without causing ulceration or irritation the cervix get dilated to the extent that the abortion takes place[7].

13. *Maḍarrat* (Toxicity, side effect and adverse effect)

Khatmī (*Althea officinalis*) may cause harmful effects on lungs and stomach if taken excessively.[1]

14. *Musleh* (Correctives)

Shahad (honey) and *Bādiyān* (*Foeniculum vulgare*-fruits), *Zarishk* (*Berberis vulgaris*-Berries) are the correctives of *Tukhm-i-Khatmī* (Althea seeds)[1] they are recommended to use along with *Khatmī* (*Althea officinalis*) to prevent from side effects.

15. *Badal* (Substitutes)

The following drugs are mentioned in the Unani text as substitutes for *Tukhm Khatmī*, they are *Khubāzī* (*Malva sylvestris* L. Fruits), *Nilofar* (*Nymphaea lotus* Flower); for roots (*Malva sylvestris* L. roots)[1] *Behman Surkh* (*Salvia haematodes* L. Roots), *Samagh-i-Arabī* (*Acacia arabica* Wild. Gum) and Tabāshīr (*Bambusa arundinacea*-Manna).

16. Compound formulations

Arq-i-Ambar, Arq ma al-Laḥm Mako Kasniwala; Dawā al-Misk Mu'tadil Jawāharwāli; Dayaqūza; Ḥabb-i-Shahīqa; Itrīfal Muqawwi-i-Dimāgh; Khamīra Abresham Sāda, Khamīra Gāozabān Ambarī, Khamīra Gāozabān Ambarī Jadwar Ood Salib wala Khamīra Gāozabān Sāda, Khamīra Murakkab, Khamīra Nazlī Jawāharwālā; Labub-i-Saghīr, La'uq Nazlī , La'uq Khyar shambar, La'uq Sapistan, La'uq Sapistan Khyar Shambarī; Ma'jūn Muqawwi wa Mumsik; Marham Dakhilyun; Matbukh Nazla; Sharbat Aijaz, Sharbat Khashkhāsh, Tiryāq-i-Nazla, Qayrūti Arad Bāqla, Qayrūti Bābunawali, Qayrūti Karnab, Qayrūti Ma'mul; Qurs Dhāt at al-Janb, Sharbat-i-Aijaz, Ḍimād Waram Kulya Qawī [8,14,19,20].

Table 1: Compound formulations having *Althea officinalis* seeds or flowers as one of the ingredient, with their dose, method of administration, action and uses

S.N	Name of the compound	Parts used	Dose and method of administration	Action and uses
1	*Dawa-ul Misk Mu'tadil Jawahar Wali*[21]	Flowers	5 g/orally	It has astringent and cardio-tonic properties and used and used to strengthen vital organs (heart, brain and liver), it also used to cure palpitation and general weakness.
2	*Itrīfal Muqawwi Dimāgh*[21]	Flowers	10 g/orally	It is brain tonic, eye tonic and used in mental disorders, cold, coryza and headache.
3	*Khamīra Abresham Sāda*[21]	Flowers	10 g/orally	It is cardio-tonic, and brain tonic used for cerebral weakness and Palpitation.
4	*Khamīra Gāozabān Ambarī*[21]	Flowers	5-10 g/orally	It is cardio-tonic, and brain tonic used in cerebral weakness and Palpitation.
5	*Khamīra Gāozabān Ambarī Jadwar Ood Salīb Wala*[21]	Flowers	5 g/orally	It is vital tonic so useful in in Epilepsy, infantile convulsion and hysteria.
6	*Khamīra Gāozabān Ambarī Jawāhar Wala*[21]	Flowers	5 g/orally	It is cardio-tonic, and brain tonic used for cerebral weakness and Palpitation.
7	*Khamīra Gāozabān Sāda*[21]	Flowers	10 g/orally	It is cardio-tonic, and brain tonic used for cerebral weakness and Palpitation.
8	*Khamīra Marwārīd Banuskha Kalan*[21]	Flowers	3-5g/orally	It is cardio-tonic, exhilarant and used for palpitation, anxiety, cardiac weakness, general weakness which occurs due to typhoid, measles and smallpox.
9	*Khamīra Murakkab*[21]	Flowers	5 g twice a day.	It is cardio-tonic, and brain tonic used for cerebral weakness and fasciculation.
10	*Khamīra Nazlī Jawāharwālā*[21]	Flower	5 g/orally	It is cardio-tonic, and brain tonic used for cerebral and nerve weakness and chronic catarrh, cold, and general weakness.
11	*Kundri*[21]	Seeds	Adult - 6 g twice a day, Children - 3 g twice a day	It lesser the frequency of micturition and strengthen the bladder and kidney so useful in polyuria and urinary incontinence.

12	*Lauq Khyār shambar*[21]	Khitmī Siyāh (seeds)	10 g with warm water twice a day	It has expectorant, concoctive, and laxative properties and used for cold, catarrh and wet cough.
13	*Lauq Nazlī*[8]	Seeds	10 g thrice a day	It has expectorant property and useful in cold, catarrh.
14	*Lauq Sapistan Khyar Shambarī*[8]	Seeds	10 g thrice a day	It is antitussive and used for cold, catarrh and wet cough.
15	*Marham Dakhilyūn Murakkab*[21]	Seeds	15 g Marham mixed with Roghan-i-Gul, 25 ml and egg albumin properly and used as vaginal suppository.	It has anti-inflammatory, uterine tonic, properties and used for metritis, fibroid of uterus, uterine pain and weakness.
16	*Qayrūti Arad-i-Bāqla*[18]	Flowers	5-10 g for local application	It is anti-inflammatory and useful for pleurisy.
17	*Qayrūti Babūna Wālī*[18]	Seeds	Local application	It is analgesic, anti-inflammatory and useful for pleurisy and ribs pain
18	*Qayrūti Karnab*[18]	Mucilage of flowers	For local application	It is emollient and useful for cracked lips and cracked skin of hand
19	*Qayrūti Ma'mūl*[18]	Flowers	for local application	It is anti-inflammatory and useful for pleurisy, chest pain and ribs pain
20	*Qurs Dhāt-al-Janb*[18]	Seeds	5-10 g for local application	It is anti-inflammatory and useful for pleurisy
21	*Sadri* [21]	Flowers	3 g with lukewarm water twice a day	It has antitussive, expectorant properties and used for cough, and asthma.
22	*Sharbat Nazla*[21]	Seeds	20 ml twice a day	It has anti-catarrh property and used for cold, catarrh and wet cough.
23	*Ḍimād Waram Kulya Qawī*[18]	Seeds	Local application	It is anti-inflammatory and useful for nephritis

17. Bioactive Compounds

- Flavonoids: Leaves, roots and flowers contains ypolaetin-8-glucoside, Isoquercitrin, kaempferol. [22]
- Polysaccharides: Seeds, leaves and flowers contains hemicelluloses, which is composed of D- xylose, 4-O-methyl-D-glucoronic acid and traces of D-galactose, L-arabinose, [23,24] Pectins[25].
- Phytosterols: Leaves, flowers and seeds contain β-Sitosterol and Stigmasterol. [24]
- Fatty acids: The fatty acid fractions of seeds were found dominating in linoleic and petroselinic acid. [24,26]
- Saturated fatty acids: Flowers and seeds contain stearic acid, Palmitic acid, Lauric acid, Myristic acid. [24]
- Fatty oil: In seeds (15.30%)- Oleic acid- 30.80%, linoleic acid- 52.90%, linoleic- 2.50%, palmitic- 9.70%, stearic- 9.70%. [26]
- Unsaturated fatty acids: In seeds Linoleic acid. [24]
- Mucilage: Mucilage (found in Seeds Leaves, flowers and roots), β-asparagine.2 Mixture of colloidally soluble polysaccharides, particularly galacturonicrhamnans, arabinogalactans, arabans, glucans, acidic heteropolysaccharide.[25] *Althaea officinalis* contained pectin's 11%, starch 25-35%, mono-, and di-saccharide, saccharose 10%, mucilage 5%. Mucilage polysaccharides contents reached 5- 11.6%. They were consisted of the mixture of colloidally soluble polysaccharides, particularly of acid arabinanogalactans, galacturonicrhamnans, arabans and glucans acidic heteropolysaccharide. Mucilage is present in root.[22]

18. Pharmacological studies

1. Wound healing properties

The wound healing property of *Althea officinalis* flower mucilage in the form of eucerin base ointment in with different concentrations (5%, 10%, and 15%) was studied on full thickness wound model in rabbit. AFM 15% ointments were found to reduce wound healing time without any significant difference with the phenytoin 1% ointment revealed by Valizadeh R et al. (2015)[27]

2. Antitussive activity

The antitussive activity of polysaccharide obtained from the flower and plant of *Althaea officinalis* was studied in cough induced cats of both sexes. The results revealed that the tested polysaccharide exhibited statistically significant cough suppressing activity due to the presence of higher proportion of uronic acid, which was noticeably higher than that of the nonnarcotic drug used in clinical practice revealed by Sutovska et al. (2007) [28]. Another study of Sutovska M et al., revealed the Antitussive Activity of polysaccharides rhamnogalacturonan. Result showed that rhamnogalacturonan isolated from *Althaea officinalis* mucilage possesses very high cough suppressive effect in guinea pig a test system which is shortened in conditions of experimentally induced airways allergic inflammation.[29]

3. Antioxidant activity

Sadighara P et al. (2012) examined three colours of petals of *Althaea officinalis* flowers, i.e., pink, reddish pink, and white for total antioxidant activity and flavonoids content. The reddish pink flowers of *A. officinalis* have more antioxidant activity (reddish pink > pink > white).[30] The antioxidant activity of aq. and hydro alcoholic extracts of *A. officinalis* root were assessed using ABTS+ (2,2'-azino-bis (3-ethylbenzothiazoline-6-sulphonic acid), hypochlorous acid scavenging assay and iron-induced lipid per oxidation. The results showed that the extract prepared with water as extraction solvent did not possess antioxidant activity, whereas the extracts obtained using ethanol: water showed well pronounced antioxidant activity. In particular, the extracts obtained at low concentration of ethanol in the mixed solvent (50:50 and 70:30, v/v) showed higher scavenging activity for ABTS+ radicals and hypochlorite ions than the extract obtained with the higher ethanol concentration (90:10 v/v). These results correlated very well with phenolic and flavonoid content of the extracts. The extracts did not show cytotoxic effect on human BV-173 leukemic cells but may have immunomodulating effect due to their antioxidant properties [31]. Tabarsa M et al. (2017) evaluate the Rhamnan-rich polysaccharide gum from *A. officinalis* flower and found that the gum displayed negatively charged carboxyl groups and high antioxidant activity. [32]

4. Antimicrobial activity:

An in-vitro study of methanolic extract from marshmallow root has been done by European Medicines Agency on periodontal pathogens resident in the oral cavity. The study shown to possess an inhibiting activity on *Porphyromonas gingivalis, Prevotella spp. Actinomyces odontolyticus, Veilonella parvula, Eikenella corrodens, Fusobacterium nucleatum, Peptostreptococcus spp*. Antimicrobial activity against *Pseudomonas aeruginosa, Proteus vulgaris* and *Staphylococcus aureus* has also been documented for chloroform and methanolic extracts of marshmallow roots[33]. The hexane extracts of flower and root of *Althaea officinalis* exerted antimicrobial activity against Gram-positive and Gram-negative bacteria (*Escherichia coli, Pseudomonas aeruginosa, Klebsiella pneumoniae, Bacillus subtilis, Enterococcus faecalis, Staphylococcus aureus* and *Staphylococcus epidermidis),* as well as three fungi (*Aspergillus niger, Candida albicans and Saccharomyces cerevisiae*)[34] Rashidi *et al.* also found that 80 % ethanolic *A. officinalis* extract was active against *Aspergillus niger*, *Aspergillus fumigatus* and *Aspergillus flavus* species. MIC of *Althaea officinalis* 80 % ethanolic extract 50-100mg/ml[35] However, ethanol, water and hexane extracts of the dried seed at a concentration of 10.0 mg/ml, were inactive on *Candida albicans* and *Candida tropicalis.* [36]

5. Anti-inflammatory:

Aq. extracts of the *A. officinalis* roots stimulated phagocytosis, and the release of oxygen radicals and leukotrienes from human neutrophils cytokines, interleukin-6 and tumour necrosis factor from human monocytes in vitro. Thereby exhibiting anti-inflammatory and immune stimulant activity. A polysaccharide fraction (500mg/ml) isolated from a root extract had anticomplement activity in human serum in vitro[37]. Marshmallow mucilage polysaccharides administered intraperitoneally to mice at a dose of 10 mg/kg produced a 2.2-fold increase in phagocytic activity of macrophages in the carbon-clearance test[36]. Hypolaetin 8-glucoside has been tested for its anti-inflammatory, analgesic and anti-ulcer activity in rats. This flavonoid (30, 60 and 90 mg/kg i.p.) was more potent than phenylbutazone (30, 60 and 90 mg/kg i.p.) in suppressing the acute phase of adjuvant carrageenan-induced inflammation but had less effect in the prolonged inflammatory phase. In contrast to phenylbutazone, it did not cause gastric erosions. Analgesic activity of hypolaetin 8-glucosid has been found to be lower than the one of phenylbutazone. Hypolaetin 8-glucoside was also more potent than troxerutin (both at the doses of 100, 200, 300 and 400 mg/kg s.c.) in inhibiting histamine induced capillary permeability in rats[33]. An ointment containing an aqueous marshmallow root extract (20%) applied topically to the external ear of rabbits reduced irritation induced by UV irradiation or by tetrahydrofurfuryl alcohol. The ointment has been compared to pure dexamethasone 0.05% ointment and a combined marshmallow and dexamethasone product. The anti-inflammatory effect of marshmallow ointment was lower than that of a dexamethasone ointment. The combined product had higher anti-inflammatory effect than the ointments with the individual ingredients[33].

6. Immunomodulatory effects:

Althaea-mucilage O, an acidic polysaccharide isolated from marshmallow root, has been possesses anti-complement activity on normal human serum in concentrations of 100 – 1000 ug/ml [37]. An extract (extraction medium 45 % 1, 3-butylene glycol solution) of marshmallow root was found to inhibit intracellular calcium mobilisation in normal human melanocytes activated by endothelin-1, and to strongly inhibit endothelin-1-induced proliferation of melanocytes. The extract can diminish the physiological effect of endothelin-1 on normal human melanocytes following UVB irradiation[33]. Scopolamine produced dual action on tumoral lymphocytes exhibiting both a cytostatic and a cytotoxic effect on the cell, and also exert apoptosis. Proliferation of normal T lymphocytes was found due to the interaction with kinase C (PKC) protein. It indicates that scopoletin may be a potential anti-tumoral compound [38].

7. Demulcent and soothing:

The demulcent effects of Radix Althaeae are due to its high content of polysaccharide hydrocolloids, which form a protective coating on the oral and pharyngeal mucosa, soothing local irritation and inflammation[39]. However, weak inhibition (17%) of mucociliary transport in isolated, ciliated epithelium of the frog oesophagus was demonstrated after treatment of the isolated tissues with 200 ml of an aqueous root macerate (6.4 g/140 ml)[40]. Polysaccharides from marshmallow root showed moderate adhesion to epithelial tissue of porcine buccal membranes.

8. Effect on Thyroid Hormones

Effect of Marshmallow's root extract on Thyroid Hormones concentration in Broilers was studied by Roshangar et al. (2014). Results showed that the concentration of T3 hormone was decreased significantly ($p < 0.05$) whereas the concentration of T4 hormone was not affected by treatments. [41]

9. Hepatoprotective activity

The hepatoprotective activity of ethanolic extract of *Althaea officinalis* against carbon tetrachloride induced hepatotoxicity in rats was done by Ali Mohd et al. (2011). The serum biochemical analysis showed significant protective effect from hepatic damage in CCI4 induced hepatotoxicity model. [42]

10. Neuroprotective property

Neuroprotective activity of *Althaea officinalis* L. extract (10 mg/kg) against 6-OHDA-induced hemi Parkinsonism in rats revealed by Rezaei et. al. (2014)[43] It is also reported that Hollyhock leaf compress combined with performing routine interventions for breast engorgement can improve breast engorgement. [44]

11. Toxicity study

This study was conducted to evaluate the effects of marshmallow extract (*A. officinalis* L.) administration on blood

cells and biochemical parameters of carp liver. A total of 150 carps (*Cyprinus carpio*, initial body mass of 37.7 ± 4.4 g) were fed diets containing 0.0 (control diet), 2.5, 5, and 10 g marshmallow extract for 60 days. On days 30 and 60 of the experiment blood samples were collected and haematological parameters and liver enzyme activities—aspartate aminotransferase (AST), alanine amino transferase (ALT), lactate dehydrogenase (LDH), and alkaline phosphatase (ALP)-were measured. A significant increase was observed in AST, ALT, ALP, and LDH levels in livers of fish fed with extract 10 g, which may be attributed to cytotoxicity.[45]

Conclusion

The present review reveals that there is the tremendous scope of Unani single drugs *Khatmī* in management of resolvent of hard swelling, dysentery, intestinal Colic, ulcer and obstacle of intestine, bilious diarrhoea, dry cough and dysuria and it can also be utilized as a potent conventional traditional Unani drug due to its diverse and related beneficial pharmacological activity and suggest that further phytochemical, clinical and advance research should be done on this medicinal plant for the benefit of mankind.

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Conflict of interest

The authors declare no any conflict of interest.

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