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Therapeutic uses of *Khaksi* (*Sisymbrium irio*) in Unani System of Medicine-A Review

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Abstract
Sisymbrium irio is commonly known as London rocket which have an important place in the Unani system of medicine. In Unani medicine it is known as *Khaksi*. It is an annual or biennial herb 90 cm. In India it is usually found in Kashmir, Punjab, Haryana and from Rajasthan to Uttar Pradesh in moist soils. It has many uses in folk medicines in treatment of inflammation and rheumatism. *Khaksi* has antipyretic, appetizer, digestive, aphrodisiac, deobstruent, expectorant, anti-inflammatory properties. In Unani system of medicine, it is used in vomiting, diarrhea, chickenpox, measles, fever, inflammatory conditions, mastitis etc. In ancient time it was also used in chronic fever and tuberculosis. Recent studies carried out in this plant have proven its hepatoprotective, antimicrobial, antipyretic, analgesic, antioxidant, anti-inflammatory, antibacterial against MDR pathogen, antifungal activity. Though this plant is used in variety of diseases but in Unani there are many areas in which the study can be conducted. So, This review will help to enlighten the unexploited potential of this plant.

Keyword : *Sisymbrium irio*, Unani, *Khaksi*

Introduction

Sisymbrium irio is an annual herb of family *Brassicaceae* or *Crucifera*. It is known as London rocket.[1] *Crucifera* family is a rich source of protein, mineral elements, Vitamin C and carotenes and their species are distributed in countries with varied climate.[2] It contain glycosinolates which are precursors of many volatile compounds, in nitriles and isocyanates.[3] Sisymbrium species is world-wide distributed from U.K. and Europe.[4] *S. irio* has many uses in folk medicines in treatment of inflammation and rheumatism and can be used for dietary purposes. Seeds are used as expectorant and as febrifuge and it is used in the treatment of voice disorders. It is also used in treating coughs and congestion , detoxify liver and spleen, reduces swellings and clean wounds.[5] In Unani System of medicine it is used as *mushtahi* (appetizer)[6,7,8] *muqawwi bah* (aphrodisiac)[7] *muqawwi-i-meda* (strenghthen the stomach)[7,8] *hazim*(digestive) *mufattih-i-sūdda*(deobstruent)[8] *dāfi-i-tip (*antipyretic)[9,10] *munaffis* (expectorant)[9] *muhallil-i-awram* (anti-inflammatory)[10] . The 70% ethanolic extract of this plant subjected to qualitatative phytochemical analysis showed the presence of pharmacological active componds such as nitrogen containing compounds, phenolic compounds, saponins, tannins, oils mucilage, saturated and unsaturated fatty acids, glycosides, proteins, amino acids, carbohydrate, phytoesterols and flavonoids.[11] The aim of this review is to reveal information of *Khaksi* available in Unani System of medicine.


KHAKSI (Sisymbrium irio)[12]

Plant taxonomical classification

- Kingdom : Plantae
- Division : Magnoliophyta
- Class : Magnoliopsida
- Order : Capparales[13]
- Family : *Brassicaceae, Crucifera* [1,4,5,13,14]
- Genus : Sisymbrium L
- Species : Sisymbrium irio L[13]

Vernacular names

- English : London rocket[14,15]
- Ayurvedic : Khaaksi[14]
- Hindi : Khubkalan[9,11,16,17,18]
- Punjabi : Naktrasa
- Sind : Jangli sarson[19]
- Persian : Khakshir ,Khakasi[11,16] Khakchi[17,18]
- Arab : Khubah [9,11,17,19] Bazrul Khatmi[7]
- Merwara : Parjan[16, 19]

Ethanobotanical description

An annual or biennial herb 90 cm.

Stem - The stems are erect, 15-50 cm tall, branched throughout or above the middle.[1]

Leaves- Lower leaves long, gradually reduced upward, upper ones sessile, Leaves runcinate or pinnatifid, lobes not auricled and terminally large.[20]

Flower - Petals are 2.5-4 mm long.[1] flowers minute, yellow in recemes, silique 3-5 cm.[20]

Seeds -Seeds usually in one series per loculeca.[1] seeds ovoid, reddish or yellow brown, 1.3 mm, mucilaginous when wet.[20] Seeds more or less ellipsoid, minute, size about a mm, orangish brown, mucilaginous with warty surface, odour pungent like mustard oil and taste like bitter mustard oil.[21]

Description in Unani (*Mahiyat*)

An erect herb. Flowers yellow, silique long, slender. Seeds oblong, minutely granulated, light brown.[15] The plant is 45-90 cm length.[9] Seeds are yellow reddish in colour which are smaller than *Tukhme khashkhash* (seeds of *Papaver somniferum*) .[9,10] Leaves are large, branches thin, *Phalyan* is full of *tukhm* (seed).[9,17] This herb grow along with wheat and barley.[17] The plant is of two type. One variety has small seeds which are reddish in colour while the second type has large and dark colour seeds. Both plants are *khudru* that grows more in spring time. Seeds which are red, saffron colour and sweet in taste are considered as high quality and are exported from the Iraq.[18]

Habitat

Kashmir, Punjab, Haryana and from Rajasthan to Uttar Pradesh in moist soils [14,16,20]

Chemical constituents

Leaves- rich in vitamin C (176mg/100g), Beta –carotene and mineral[14,22]

Seeds - Contains a flavonoid, isorhamnatin.

Fatty oil from seeds contain linolenic and oleic acids (as chief constituents), along with erutic, palmitic and stearic acid (as chief constituents), along with erutic, palmitic and stearic acids.

Glycoside, Alkaloids and flavonoids.[1,4]

Ethanolic extract of seeds exhibit marked antibacterial action, also antipyretic and analgesic effects. [4]

Part Used

Seeds[9,17]

***Mizaj* (Temperament)**

Haar (Hot) 2°, *Ratab* (Moist) 2° [6,8,17,18]

Haar (Hot) 2°, *Ratab* (Moist) 1° [7,9,10]

Adverse Effects (*Muzir*)

Headache[6,7,8]

Corrective (*Musleh*)

Kateera (*Sterculia urenus*)[6,7,8] *Qand wa shakr* (Sugar) [7]

Substitute (*Badal*)

Tudri (*Lepidium iperis*)[7,8]

Murakkabad

Sharbat khaksi [9,17]

Therapeutic dose (*Miqdar-e-Khurak*):

5-7 gram[9,10,17]

Large *khaksi*(large variety seeds) upto 9 gram

Small *khaksi*(small variety seeds) upto 13 gram [6,8]

Afa'al (Actions)

- *Mushtahi (*Appetizer) [6,7,8]
- *Muqawwi-i-meda* (strenghthen the stomach)[6, 7,8]
- *Hazim* (Digestive) [6,8]
- *Mufattih-i- sūdda* (deobstruent)[8]
- *Muqawwi bah* (Aphrodisiac)[7]
- *Dāfi-i-tapp (*Antipyretic)[9,10]
- *Munaffis* (Expectorant)[9]
- *Muhallil-i-awram* (anti-inflammatory)[10]

Istemal (Uses)

Eye disease:

- *Dimād*(paste) is used in eye disease(*qarha aankh*).[6,18]

Respiratory disorders:

- Roasted *khaksi* 3-4 gram along with *Sharbat banafsha* is useful in cough(*khansi*) and asthma (*zeequn nafs*).[17]

Gastrointestinal tract disorders:

- Sisymbrium irio boiled with rose (*gulab*) is useful in vomiting and thirst after cholera.[6,10,17]
- In *haiza safrawi* (bilious diarrhea) it is given along with *aab-i-kasni murawwaq*.[17]
- It is *mushtahi* (appetizer) and *hazim* (digestive)[8]
- In diarrhea *Khaksi* 4 gm boil in 250 gm *gulab* when it dissolves then give as luke warm orally.[18]

Gynaecological disorders:

- *Firzaja* (Pessary) of *sisymbrium irio* is effective in maintenance of pregnancy.[6,7,8] and *qurooh rehm* (cervical erosion).[18]

Others

Infectious disease

- *Sil wa diq* (Tuberculosis):
- Akseer Sil: *Khaksi Shasta musallam*(*Sisymbrium irio*), *tabasheer* (*Bambusa bambus*), *dana ilaichi khurd* (*Eletteria cardammum*), *tukhm-e-gauzaban* (*Borage officinalis*) each 10 ml, *satt-i-gilo asli* (*Tinosporia cardifolia*), *tukhm tulsi* (*Ocimum tenuiflorum*) 20 ml, *kushta abrak siyah* 3 gm, *kushta marjan*, 1.5 gm, *warq nuqrah* (silver warq) 15ml in powder form and 3gm morning and evening along with *arq gauzaban* and *Sharbat bazoori* use in tuberculosis (*Sil wa diq*) [18]
- *Joshanda* (decoction) is supposed to be useful in tuberculosis of children.[9,17]
- Chicken pox and measles:
- *Joshanda* (decoction) is used in chicken pox, measles and it is spray on the bed. [9,17]
- *Hummā mi'wiyya* (Enteric fever)-
- *Akseer hummā mi'wiyya* - *Khaksi* 5 gm, *maweez munaqqa* (*Vitis vinifera*) 9 , *anjeer vilaiti* (*Ficus carica*) 2, *arq mako* 120 ml boil and strain it use it along with *misri* or *sharbat*.

Miscelaneous :

- Weight gain: *Khaksi* powder along with milk helps in weight gain.[7,8]
- *Khaksi* 6 gm in *potli* (bag) and 1 *seer* (0.9 litre) milk boil on light heat, when milk left half then remove *khaksi* from it and use it and add *misri* in milk and drink it which is helpful in weight gain and helpful in fair complexion.
- *Khaksi* 3 gm in a bowl, *roghan zard* 20 ml, *shakartari* 30 ml add cow milk 250 ml and give it in early morning.
- *Dimād*(paste) is used in gout, cancer and hot inflammatory conditions. [8,18]
- *Sisymbrium irio* is useful in voice problem (*giraftgi awaaz*).[8]
- *Sisymbrium irio* along with milk is *Muqawwi bah* (aphrodisiac).[7]
- *Dimād* (Paste) is useful in orchitis and mastitis.[7,17]

Actions and uses

Expectorant, restorative, febrifuge[14,22] rubefacient, antibacterial [14]

- Seeds are used in asthma.[14,16,20,22]
- Infusion of leaves given in affection of the throat and chest in spain.[16]
- It is used in treating coughs and chest congestion, rheumatism and to detoxify liver and spleen, reduce swellings and cleaning wounds.[1]
- Seeds expectorant febrifuge, and rubefacient, used in asthma, and employed in the preparation of stimulating poultice.
- They yield a semi-drying oil, used for soap making and lubrication.[22]
- Seeds are used as expectorant, febrifuge and used in treatment of voice disorders.[1]
- Leaves are eaten raw or cooked.[20]

Pharmacological activities

- **Hepato-protective activity**- Alsaffar DF *et al* reported that animal treated with CCl4 exhibit a significant rise in serum AST, ALT &ALP. Silymarin and *S.irio* extract both reduced CCl4 induced elevated levels in tested groups, this shows the protection of structural integrity of hepatocyte membrane or renewal of liver cells, which may be due to the presence of flavonoids.[1]
- **Protective role in bronchial asthma**- The result of the study reveal that sisymbrium irio has significant broncho protective role in mast cells degranulation induced by Comp48/80 & active anaphylaxis due to seeds are rich in glycosides, alkaloids and flavonoids.[4]

- **Antimicrobial activity**-Ethanolic extract of the seeds of S. irio exhibited marked antibacterial action against both gram positive and gram negative organisms.[1]
- **Antipyretic activity-** In trial, yeast produced stable pyrexia > 6 hours in all the animals after the injection. Both sodium salicyalate and the ethanolic extract of seeds exhibit significant antipyretic actions.
- **Analgesic-** Significant analgesic activity was observed with sodium salicyalates and ethanolic extract of *S. irio* seeds.[23]
- **Antioxidant activity**-Khalil *et al* reported that *Sisymbrium irio* phytochemically characterized by its chemical constituents as well as various organ extracts exhibit good antioxidant activities specially the ethyl acetate, butanol and aqueous fractions which could be attributed to the its higher content of phenolic and flavonoid constituents. The result showed that the ethyl acetate, butanol and aqueous of leaves, stems and flowers exhibited the higher antioxidant activity.[24] Jaber et al reported that *Sisymbrium irio* is a a medicinal plant as it possess anti-inflammatory, analgesic (due to high flavonoid content) and anti oxidant activities can be used as a remedy to treat disease condition. Antioxidant activities were assessed for all extracts and fractions (total, ether, chloroform, ethyl acetate and butanol) and isolated compounds, and showed variable antioxidant activity, with apigenin-7-o-galactoside being the most potent. [25]
- **Antibiotic and anticancer activity-** Massarani *et al* reported that the organic fraction obtained from the edible plant *S. irio* have powerful antibacterial and notable cytotoxic activity against the tested bacterial strains and the cancer cell lines, respectively. The results showed that both activities resides in the n-hexane and ethyl acetate fractions which can be potential source of antibiotic and anticancer compound.[26]Antimicrobial and reductive ability was reported by Chalabi *et al* reported that their findings support its uses in traditional medicine as they found it antimicrobial biogent. The medicinal plant containing a high percentage of active compound such as polyphenols, flavonoids and gucosinolates. The flavonoids and phenolic compounds in the plant have been reported to exert multiple biological effects including anti-oxidant, free radicle scavenging abilities, anti-inflammatory, anticarcinpogenic etc.[27] Khan *et al* reported that the *S. irio* were effective against *E. coli*, *S.aureus* and *B subtilis*.[28]
- **Effective against Multidrug resistant bacterial strains-** Mickymaray S reported that various concentration of silver nanoparticles were tested against MDR *pseudomonas aeroginosa* and *Acinetobacter baumanii* that causes ventilator associated pneumonia. The AgNPs effectively inhibited tested pathogens, even at the lowest concentration(6.25ug) used. So, the newly senthesised AgNPs could be a potential alternative candidate in biomedical applications in controlling spread of the MDR pathogens.[29] Sherbiny et al concluded that Sisymbrium irio extract has potential antibacterial action against multi drug resistant bacterial pathogen.[30]
- **Anti-inflammatory and bronchoprotective-** Singh RK reported that significant anti-inflammatry activity, swim stress immobility and brochoprotective role. He also reported the acute toxicity of *Sisymbrium* seed has safe up to the doses of 1000mg/kg and caused no mortality and normal behavior.[31]
- **Antifungal activity-** Akhtar *et al* reported that ethyl acetate fraction *S. irio* leaf extract possess the potent antifungal compound to control growth of *F. oxysporum f. sp. Cepae*.[32]
- **Bronchodilator and gut modulator activities** – Aqueous-methanolic extract of seeds *S. irio* possesses the gut modulator (spasmogenic and spasmolytic), and tracheal relaxant effect that may be associated through dual blockade of muscarinic receptors and Calcium channels whereas vasodilator effect may be due to calcium channel blockade.[33]

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