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Traditional Unani Uses and Modern Pharmacological Insights of Ajwain-e-Khorasani (Hyoscyamus niger): A Detailed Review

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Abstract:

Objective: The objective of this review is to comprehensively evaluate the traditional Unani uses and modern pharmacological activities of Hyoscyamus niger (Ajwain-e-Khorasani). The review aims to compile and analyze available classical Unani literature and contemporary scientific studies related to its ethnomedicinal importance, phytochemical constituents, and therapeutic potential. Furthermore, it seeks to correlate traditional claims with experimentally proven pharmacological actions such as analgesic, anti-inflammatory, antispasmodic, sedative, antioxidant, antimicrobial, neuroprotective, and other medicinal properties, thereby highlighting its significance as a valuable medicinal plant for future research and therapeutic applications.

Methods: This review was conducted through a comprehensive literature survey of classical Unani texts and modern scientific databases regarding Hyoscyamus niger (Ajwain-e-Khorasani). Relevant information on traditional uses, phytochemistry, pharmacological activities, and therapeutic applications was collected from authoritative Unani literature including classical manuscripts and pharmacopoeias, as well as contemporary published research articles.

Results: The review demonstrated that Hyoscyamus niger (Ajwain-e-Khorasani) holds significant importance in Unani medicine and modern pharmacology. Classical Unani texts describe its use in the treatment of pain, inflammation, respiratory disorders, insomnia, spasmodic conditions, and nervous system ailments. Modern studies support these traditional claims and report analgesic, anti-inflammatory, antispasmodic, sedative, antimicrobial, antioxidant, anticonvulsant, and neuroprotective activities. Phytochemical investigations revealed the presence of important bioactive compounds including alkaloids, flavonoids, coumarins, glycosides, and phenolic constituents responsible for its therapeutic effects.

Conclusions The review highlights a strong correlation between the traditional Unani uses and modern pharmacological findings of Hyoscyamus niger. Various studies support its analgesic, sedative, antispasmodic, anti-inflammatory, antioxidant, antimicrobial, and neuroprotective activities due to the presence of bioactive compounds such as hyoscyamine and scopolamine. However, its toxic nature necessitates cautious therapeutic use and further clinical studies to establish safety, efficacy, and standardization.

Keywords: Hyoscyamus niger, Ajwaine Khorasani, Unani Medicine, Pharmacological insights, Traditional Uses

1. Introduction

Hyoscyamus Niger, commonly known as henbane, is a medicinal plant of the Solanaceae native to Asia and Europe. It contains toxic tropane alkaloids such as hyoscyamine and scopolamine and is found in India from Kashmir to the Garhwal Himalayas at elevations of 8000–11,000 feet.[1] Due to its toxicity, Hyoscyamus niger should be used with caution. Although traditionally used in Chinese and Indian medicine, limited scientific evidence supports its analgesic, anti-inflammatory, and antipyretic effects.[2]

Hyoscine is a volatile alkaloid that is therapeutically more potent than hyoscyamine. Recent cultivation of Hyoscyamus niger in Saharanpur and Kashmir has shown improved alkaloidal content, approaching British Pharmacopoeia standards.[3] Earlier Kashmiri samples of Hyoscyamus niger contained lower alkaloid levels (0.03%) than British Pharmacopoeia standards, but recent reports indicate that their alkaloidal content now matches imported B.P. (British Pharmacopoeia) varieties.[4]

1.1 Taxonomic classification:

Taxonomic classification of Hyoscyamus niger is depicted in Table 1 .

Table 1: Taxonomic classification of Hyoscyamus niger

Taxonomy Nomenclature

Taxonomy	Nomenclature	References
Kingdom	Plantae	[5]
Subkingdom	Viridiplantae	[5]
Infrakingdom	Streptophyta	[5]
Super Division	Embryophyta	[5]
Division	Tracheophyta	[5]
Subdivision	Spermatophytina	[6]
Class	Magnoliopsida	[6]
Superorder	Asteranae	[6]
Order	Solanales	[6]
Family	Solanaceae	[6]
Genus.	Hyoscyamus,	[6]
Species	Hyoscyamus albus, Hyoscyamus niger and Hyoscyamus reticulates	[6]

1.2 Vernacular names:

The various vernacular names for the species are comprehensively listed in table 2

Table 2: Vernacular names of Ajwaine Khorasani (Hyoscyamus niger)

Language	Name	References
Arabic	Ajwaine kharasani, Bazrulbanj, bazriulabanja, sikram	[7][8][9][10] [11] [3]
Urdu	Khorasaniyajwan, ajwaine kharasni	[9] [10] [11]
English	Black henbane, Common henbane, Belene, Brosewort, Chenile, Henbane, Henbell, Hogsbean, Loaves of bread, sickly smelling henbane, Stinking roger, Symphonica, Hyosmamus	[12][8][9][6] [13] [11] [3]
Persian	Bang, Bazrulbanj	[7][9][3]
Bengali	Khorasaniajowan, Buzrool	[12][8][9][11]
Gujrati	Korasaniajowan, khorasaniajmo	[8][9][11]

Hindi	Khurasaniajavayan, Ajwainakurasam, Buzrool, khurasanijamani, khurasaniyamani	(2)[8][9]
Kannada	khurasanivadaki	[12]
Kashmiri	Bagarbhang, Iskiras	[8][11]
Marathi	Khorasanivova	[9][11]
North western Provinces	Khorasaniajwain	[9]
Punjabi	Bangidewana, Bazrbang, Damtura, Dandura, Datura, Dentura, Sura, ajwaine kharasani	[9][11]
Sanskrit	Dipya, Parasikava, yavani, Kuberakhya, Madaka, Madakarini, Mani, Parasikaya, Shyama, Tivra, Turushka	[12][8][9][11]
Tamil	Kurasaniyomam	[8][9]
Telegu,	Khurashanivamam, kurasaniyomam, Kurasaniyamani, Kurinjivamam	[12][8][9][14]
Shimla	Telingchi	[9]
Bombay	Khorasaniowa	[8][9]
Swedish	Bolmort, Honsable	[9]
Sindhi	Damtura. Jan kharashani	[9][1][10][15]
Greek	Afiyum, Hyoskyamos	[8][9]
Spanish	Beleno negro, Veleno	[9]
Russian	Byelena	[9]
French,	Jusquiame noire, Careillade, Clavalee, Feve de pore, Hannebene, Henbane, Hennebane, Bennebone, Herbe aux engelures, Herbe a la teigne, Feve de pourceau, Jusquiiame noir, Mort aux poules, porcelet, potelee, Tue poule	[8][9]
Germany	Dulldill, Dullkraut, Dulldaeg, Huehnertod, Saukraut, Schlafkraut, SchwartzesBilsenkraut, swartendaeg, Teufelakraut, Tollwurz, Wolfdistel, Zankkraut, Zankteufel, Zigeunerkraut	[9]
Portuguese	Meimendro, Meimendro negro, Miemendro, Velheno, Yosciamo	[9]
Syria	Ajmalus	[8]
Chinese	Lang TcheTehou, Lang Tang, Lao langHoa	[9]
Brazil	Meimendro negro	[9]
Danish	Eulme, Honsebane	[9]
Deccan	Khurasaniajwan	[9]
Dutch	Bilsenkruid	[9]
Italian	HerbaApollinaris, Fava porcina, Giusquiamonero	[9]
Romanian	Masalarita, Masalariu, Nebunarita	[9]

2. Materials and methods

2.1. Plant materials

2.1.1 Habitat:

Hyoscyamus species grow wild across the Himalayan range at altitudes of 8,000 to 11,000 feet, with presence in Kashmir. H. reticulatus, found in Baluchistan, Pakistan, Sindh, Punjab and Khorasan, features black seeds and purple flowers.[11][3] H. albus has white seeds and is favoured by medical practitioners. In India, several species of Hyoscyamus are recognized, including H. muticus, which grows in extensive patches along riverbanks in the western Punjab and Sind regions.[8] also found in Afghanistan, Iran, west & southeast Asia, Europe [11][3]

2.1.2 Botanical description of Ajwaine Khorasani (Hyoscyamus niger)

Plant: Its plant will be straight, more heighted than ajwain, usually 1 ½ - 4feet, its stem will be hard & thick with hairy structures all over. [11][3]

Structure of plant: [16]

Figure 1: Structure of plant of Ajwaine Khorasani (Hyoscyamus niger)

Branches:

Its branches will be round with hairy structures, with a bunch of flowers at the tops. [11][3]

Leaves:

Leaves will be ovate, long near about 4-10 inches, width varying about 2-5inches. Leaves will get erupted from stem without stalk, but sometimes it may find with stalks to some leaves. Leaves get erupted from each of its bracts, with tiny hairy structures all over, edges are toothed irregularly, greenish to yellowish in colour, fresh leaves will be of strong unpleasant odour bitter to taste which will corrode the mucous membrane of oral cavity & throat, when the leaves get dried up its odour will get disappeared.[11][3]

Figure 2: Structure of Leaves Of Ajwaine Khorasani (Hyoscyamus niger) : [17]

Flower:

Flowers are found at the tops of stems in bunches, each flower consists of 5 petals, these flowers are like those of tambaku flowers, colour varies from white to yellowish & greenish in colour, it will be greenish in colour for 1-2

months later it gets dried up & falls, from there fruit gets erupted.[11]

Figure 3: Structure of Flower Ajwaine Khorasani (Hyoscyamus niger);[18]

Fruit and Seed:

Its fruits contain two parts, which when gets riped bursts up with a small, flat, tiny seeds which will be double the size of ajwain. Which are called as ajwaine kharasani with a strong, pungent & disagreeable odour, bitter & spicy to taste.[11][3]

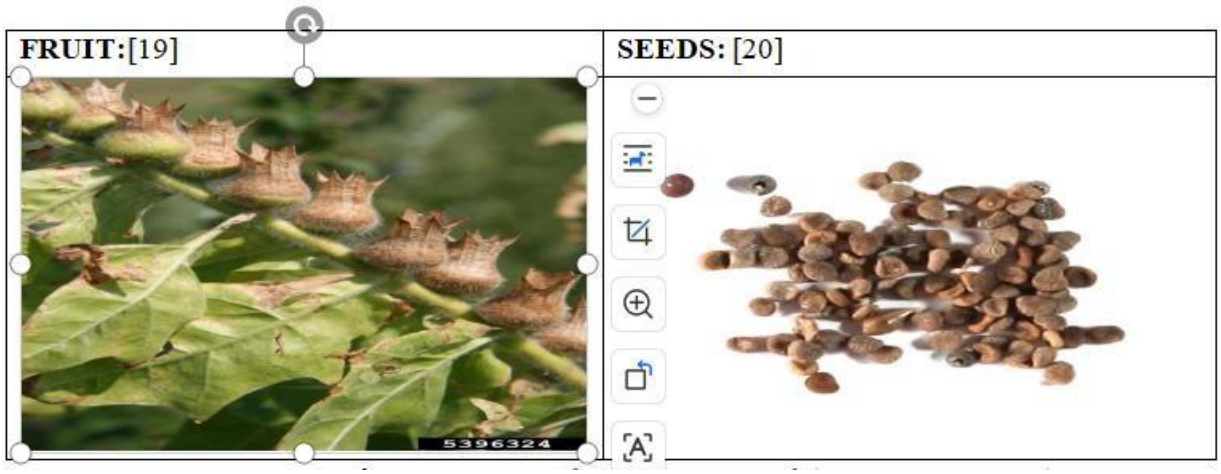

Figure 4: Structure of Fruit and seeds of Ajwaine Khorasani (Hyoscyamus niger);

2.1.3 Part Used:

Dried & fresh leaves, Flowering tops, flowers with the branches.[8]

2.1.4 Agro-morphological traits of Ajwaine Khorasani (Hyoscyamus niger):

Henbane is an erect, hairy, and viscid herbaceous plant with a disagreeable heavy odour [9][1][13]

The Table provides a detailed overview of the agro-morphological characteristic of the Ajwaine Khorasani (Hyoscyamus niger)

Table 3: Agro-morphological characteristic of the Ajwaine Khorasani (Hyoscyamusniger)

Trait	Value/characteristics
Plant height	0.3-0.9 m[9] 6-12 feet[11]
Stem	Robust [9]
Shape	smaller, sessile, ovate, irregularly pinnatifid passing into bracts [9][1]
Leaves	Like badranjboya long & thick, green to blackish in colour, with hairy structures, spicy & bitter to taste like ajwain[1][3][21]
Arrangement:	Radical, stalked, coarsely sinuate- toothed[9]
Length	15-20cm[9] 10inches[3]
Shape	oblong-ovate [9][22]
Flower	
Colour	Pale yellow green, veined with purple darker in the centre[3], nearly sessile, lower ones in the forks of the branches, upper one's solitary in

	the axils of leaf like bracts, forming long one-sided spikes, rolled back at the top before flowering, ultimately becoming elongated & straight. [9][6]
Calyx	2cm[9]
Tube	Ovoid[9]
Limb	Funnel shaped, 5 toothed[9]
Corolla	Funnel shaped[9]
Size	2.5-3.2cm across[9]
Lobes	5, broad, short, slightly unequal[9]
Ovary	2-celled[9]
Style	Longer than the stamens[9]
Capsule	1.3 cm diameter, enclosed in the globose tube of the enlarged calyx, lower part membranous, top hard, rigid, opening transversely along the constriction between the 2 portions. [9][6]
Stamen	Protruding [9]
Seed	Sharp, pungent taste, tasty, heating, stomachic, astringent to the bowels, toxic[9]
Capsule	Sub discoid, compressed[6]
Wild or cultivated	Cultivated[6]
Parts Used	Seeds[6]

2.2 Unani description of Ajwaine khorasani (Hyoscyamus niger)

Ajwaine khorasani, refers to the seeds of a plant characterized by leaves resembling those of Badranjboya, albeit slightly broader and blackish in colour. The seeds resemble those of Hulba (methi) but are slightly smaller.[1][10][15][3]There are three types of Ajwain seeds: black, red, and white,[1] all possessing a strong odour & Bitter to taste like ajwain e desi. [7][10][1][13]

Fruits are present on the tips of branches like tukhme kasoos, In the ancient times ajwaine khorasni use to bring from Kharasan, & they were like ajwain, so they were named as ajwaine khorasani.[11][3]

It's fascinating how the use of plants for medicinal purposes has evolved over time across different cultures. In the case of ajwain, it's intriguing to see the variations in its usage from ancient times to the present day. Ancient Unani physicians had a comprehensive approach to using various parts of plants, including roots and seeds, for medicinal purposes. However, modern Unani hakims seem to prefer white ajwain seeds (ajwaine khorasani), though the seeds available in the market today are typically of khakastri colour. [11][3]

In Vedic tradition, ajwain seeds are also valued for their medicinal properties, aligning with the preference of Unani hakims for using the seeds. On the other hand, ancient Greeks and traditional healers (dawasaaz) preferred using the leaves and seeds of ajwain for medicinal purposes. Interestingly, nowadays, the usage has expanded to include not only the seeds but also the leaves and flowers, which are harvested once the plant is matured.[11]

This evolution in the usage of ajwain reflects the dynamic nature of traditional medicine practices and the ongoing exploration of plant properties for therapeutic benefits. Applying safoof of ajwaine khorasani to the part from where hair has been plucked then there will be no regrowth of hairs from the same part. giving its smoke in the house is like intoxicating the individuals in the home. [11] Instilling in the ear after mixing with sirka or shahed it relives all kinds of pain, its farzaja is beneficial in qurooheraham, this is khabis wa habis & mudir e haiz, Huboob are prepared in equal quantity of ajwaine Khorasani & afiyun, & given at night induces sleep, its laep over eyes reduces pain & tingling, gargling with its joshanda by mixing with roghane gul & sirka reduces tooth pain, if smoke is inhaled then it reduces dental caries.[11]

2.2.2 Mizāj (Temperament):

Sard wa khushk 3º[8][1][21]

Barid yabis 3º[23]

Siya:

- Sard wa khushk 3°[7][15]
- Sard wa khushk 4º[3]

Sufed:

- Garm wa Khusk 3° [7]
- Sard wa khushk 3º[23]
- Sard wa khushk 2º[3]

Surq:

- Garm wa Khusk 3° [7]

- Sard wa khushk 3º[3]

2.2.3 Dose (Miqdār-e Khurāk):

Kamil:

- Sufaed – 2-3 masha[7]
- Surq – 2-4 masha[7]

Naqis:

- Sufaed – 1- 2 ¼ masha[7]
- Surq – 2 masha[7]
- ½ -1 masha[1][21]
- 3 masha[24]

2.2.4 Adverse effects of Ajwaine Khorasani (Hyoscyamus niger)

- Produces sadar, dawar, Khunaaq & junoon,[7] subat, iqtalateaqal, saqle gosh after using for a prolong & over dosage[1][23][25]
- In overdoses it is a narcotic poison produces delirium, coma &death., its action is very rapid.[8][1][25]
- Sufed- khunaq [1]
- Siya – qatil[25]
- Hypertension, respiratory arrest, somnolence that followed by CNS excitation such as restlessness, hallucinations, delirium and manic episode., mydriasis, tachycardia, arrhythmia, agitation, convulsion and coma, induced dry mouth, thirst, slurred speech, difficulty in speaking, dysphagia, warm flushed skin, pyrexia, nausea, vomiting, headache, blurred vision and photophobia, urinary retention, distension of the bladder, drowsiness, hyper-reflexes, auditory, visual or tactile hallucinations, confusion, disorientation, delirium, aggressiveness, and combative behaviour, constipation and colic, dryness of the mucosa in the upper digestive and respiratory tract, pupil dilation (mydriasis), alterations in the heart rate and CNS effects like ataxia, irritability, restlessness, seizures and respiratory depression.

2.2.5 Musleh/Correctives for Ajwaine Khorasani (Hyoscyamus niger):

- Shahed, Anisoon[7][1][15][24][23]
- Sufed -shahed (12)
- siya- qai[1]

2.2.6 Badal (Substitute) for Ajwaine Khorasani (Hyoscyamus niger)

Afiyun, Ajwaine desi, Khashkhash siya[7][1][13][24]

3. Results

Table 4 : Af'āl (Pharmacological actions) and Mawāqi'Isti'māl(indications)

Sl.no.	Af'āl	Mawāqi'Isti'māl	Refrence
1.	Musakkin	Due to its musakkin & muqaddir property it is beneficial in balghami khansi, also used for external application in all kinds of pain like wajaulmafasil, irqunnisa, niqris	[1][3][21]
2.	Muqaddir	Buqoor is adopted after putting on fire in darde dandaan, by heating in roghane kunjad & instilling in the ear will reduce pain,	[1][3][21]
3.	Munavim	Beneficial in junoon, hizyan, beqwabi	[1][3]
4.	Habis	Beneficial in all the bleeding tendencies of each organ, reduces sailane rutubat & nuzlat towards eyes.	[3]
5.	Raddaemawad	Reduces awram by applying tila primarily	[1][3][24]

Table 5: Mawāqi' Isti'māl(indications) of Ajwaine Khorasani (Hyoscyamus niger) as described in Unani medicine.

Sl. No.	Mawāqi' Isti'māl	Refrence
1.	Hyoscine is commonly prescribed for various conditions, including mental and manic excitement, epileptic mania, chronic dementia with insomnia, paralysis, agitans, convulsions, neuralgia, hypochondriasis, functional palpitations, spasmodic cough, asthma, hiccup, laryngismus, urinary infections causing irritation to the kidneys, uterus, and bladder, tetanus, locomotor ataxia, mercurial palsy, and hysteria.	[8]
2.	Hyoscine exhibits a distinctive sedative effect, which is particularly beneficial in calming irritations affecting the lungs, bowels, and Genito-urinary organs, such	[8]

	as cystitis.	
3.	Indian pharmaceutical manufacturers prepare tinctures and extracts from leaves grown in India.	[8]
4.	A paste made from the leaves mixed with flour is formed into small cakes that, when dried, retain their medicinal properties for a period.	[8]
5.	A poultice made from the juice of the leaves mixed with barley flour is applied to alleviate the pain of inflammatory swellings.	[8]
6.	Seeds have been utilized by various hakims (traditional healers) for an extended period.	[8]
7.	A paste made from the seeds mixed with wine or brandy is applied to treat gouty enlargements, inflamed breasts, and swollen testicles.	[8]
8.	A powder consisting of ½ drachm of henbane seeds, and 1 drachm of poppy seeds is administered with honey and water to address conditions such as cough, asthma, gout, and hiccup.	[8]
9.	A mixture of powdered seeds with pitch is applied to stuff the hollows of painful teeth.	[8]
10.	Hyoscyamus is utilized as a pessary in the treatment of painful infections of the uterus.	[8]
11.	A paste made from equal parts of malkangini, henbane seeds, khulanjan, Alpiniagalanga, and long pepper, mixed with honey, is administered in dracham doses twice daily for laryngitis, as mentioned in "Ilajul ghurba".	[8]
12.	When added to purgatives, seeds can prevent griping.	[8]
13.	As a stomachic, they are administered alongside carminatives and aromatics in cases of worm complaints, colic, and dyspepsia.	[8]
14.	Leaves are used as a gargle for toothache, bleeding gums, used for local application for pain in the liver, gouty swellings, inflammation of the breasts & testes.	[9]
15.	Powdered seed paste in water is externally applied abdominal pain	[26]

Table 6: Preprations with dosage as per unani texts

Sl.no	**Preprations**	**Dosage**	**References**
1.	Powder of the leaves	5-10 grains	[8]
2.	Fresh juice expressed & preserved	½- 1 dracham	[8]
3.	Tincture of the dried herb	¼-1 dracham	[8]
4.	Extract of the fresh plant	1-3 grains	[8]
5.	Hyoscine & hyoscyamine	1/200 -1/100 grain hypodermically	[8]
6.	Cataplasms, plasters, oil of hyoscyamous	External application	[8]

Table 7: Pharmacological Action of different parts of Ajwain-e-Khorasani (Hyoscyamus niger)

Sl. No.	**Pharmacological Action (Afʿāl)**	**Parts**	**References**
1.	Intoxicating	Seeds	[8]
2.	Narcotic	Seeds, leaves	[8][9][22]
3.	Anodyne	Seeds	[8]

4.	Digestive	Seeds	[8]
5.	Astringent	Seeds	[8]
6.	Anthelmintic	Seeds	[8]
7.	Anodyne	Leaves	[8][9][27]
8.	Sedative	Leaves	[8][9][28]
9.	Antispasmodic	Leaves	[8][29][28]
10.	Stimulant	Leaves	[8]
11.	Mydriatic	Leaves	[8][9]
12.	Deliriant	Plant	[8]
13.	Hypnotic	Plant	[8]
14.	Laxative	Plant	[8]
15.	carminative	plant	[8]
16.	Expectorant	leaves	[9]
17.	Aphrodisiac	seeds	[9]
18.	Hypnotic	seeds	[9]
19.	Haemostatic	seeds	[9]
20.	Depilatatory	seeds	[9]
21.	Astringent to the bowels	seeds	[9]
22.	Useful in nasal troubles	seeds	[9]
23.	Watering of eyes, ophthalmia	seeds	[9]
24.	Ear ache, fevers, headache, pain in the joints	seeds	[9]
25.	Smoke is useful in scabies, caries of the teeth, bronchitis, hypnotic	seeds	[9]
26.	Useful in irritable conditions, nervous affections, asthma, whooping cough	leaves	[9][27]

Table 8: Main functions (Nafa'-i Khās) of Ajwaine Khorasani (Hyoscyamus niger)

Sl.no.	**Nafa'-i Khās**	**References**
1.	Balghami khaansi	[7][1][3][25]
2.	Haemoptysis	[7][1][3]
3.	Coughs due to balgham	[8][1][3]
4.	Checks nazla	[8][1][3]
5.	Hypnotic	[8][1][3]
6.	Sedative	[8][1][3]
7.	Dries the rutoobat	[8][1][3]
8.	Mumsik wa Mughalize mani	[23][3]

Chemical compositions and phytocompounds.

Table 9: Chemical compositions Ajwaine Khorasani (Hyoscyamus niger)

Sl.no.	Compound	Plant part	Reference
1.	Coumarinolignans,	Seeds	[30]
2.	Cleomiscosin A methyl ether	Seeds	[30]
3.	Venkatasin	Seeds	[30]
4.	Hyosgerin	Seeds	[30]
5.	Cleomiscosin A	Seeds	[30]
6.	Cleomiscosin B	Seeds	[30]
7.	Hyoscyamine-N-oxide	Stems	[6]
8.	Hyoscyamine-N-oxide	Roots	[30]
9.	Hyoscyamine-N-oxide	Leaves	[11]
10.	Scopolamine	Arial parts, leaves	[31][8][11]
11.	Hyoscyamine	Leaves, Seeds	[31][8][11]
12.	Hyoscine	Leaves	[31][8][6][11]
13.	Skimmianine	Leaves	[31][6]
14.	Apohyoscine	Leaves	[31]
15.	Apoatropine	Leaves	[31][6][11]
16.	Tropine	Leaves	[31][6][11]
17.	α- Belladonines	Leaves	[31][6]
18.	β - Belladonines	Leaves	[31][6]
19.	ψ-Tropine	Roots	[32][31]
20.	Hygrine	Roots	[32]
21.	6β--Hydroxyhyoscyamine	Roots	[31]
22.	Littorine, Tropinone	Roots	[31]
23.	4-Hydroxylittorine	Roots	[31]
24.	N-methylpyrrolidinylcuscohygrine	Roots	(3)
25.	3-propionyloxytropane	Roots	[31]
26.	3-isobutyryloxytropane	Roots	[31]
27.	3-β tigloyloxynortropane	Roots	(3)
28.	6-Hydroxy-3-phenylacetoxytropane	Roots	[31]
29.	Hyosciprin	Leaves	[8]
30.	Cholin	Leaves	[8][11]
31.	Fatty oil	Leaves, seeds	[8]
32.	Mucilage	Leaves	[8]
33.	Albumen	Leaves	[8][11]
34.	Potassium nitrate	Leaves	[8][11]
35.	Empyreumatic oil	Seeds	[8][11]
36.	Hyoscine, Hyoscyamine	plant	[11]

Table 10: Alkaloids of Ajwaine Khorasani (Hyoscyamus niger)

Sl. No	Compound	Plant part	Solvent used/Method	Reference
1.	Hyoscyamine	Roots	100µL of 25% NH40H	[32]
2.	Scopolamine	Roots	100µL of 25% NH40H	[32]
3.	Tropinone	Roots	100µL of 25% NH40H	[32]
4.	Tropine	Roots	100µL of 25% NH40H	[32]
5.	ψ-Tropine	Roots	100µL of 25% NH40H	[32]
6.	Tropane	Roots	100µL of 25% NH40H	[32]

Table 11: Metabolites of Ajwaine Khorasani (Hyoscyamus niger)

Sl. No	Compound	Plant part	Solvent used/Method	Reference
1.	Hyoscyamine	Roots	100µL of 25% NH40H	[32]
2.	6β-Hydroxyhyoscyami	Roots	100µL of 25% NH40H	[32]
3.	Scopolamine	Roots	100µL of 25% NH40H	[32]
4.	Tropinone	Roots	100µL of 25% NH40H	[32]

Table 12: ketones of Ajwaine Khorasani (Hyoscyamus niger)

Sl. No	Compound	Plant part	Solvent used/Method	Reference
1.	2-piperidone	Roots	Tropine-forming TR-I activity and ψ-tropine-forming TR-II activity	[32]
2.	N-methyl-2-piperidone	Roots	Tropine-forming TR-I activity and, ψ-tropine-forming TR-II activity	[32]

3.	2-pyrrolidone	Roots	Tropine-forming TR-I activity and, ψ-tropine-forming TR-II activity	[32]
4.	N-methyl-2-pyrrolidone	Roots	Tropine-forming TR-I activity and, ψ-tropine-forming TR-II activity	[32]
5.	ψ-pelletierine	Roots	Tropine-forming TR-I activity and, ψ-tropine-forming TR-II activity	[32]
6.	2-carbomethoxy-3-tropinone	Roots	Tropine-forming TR-I activity and, ψ-tropine-forming TR-II activity	[32]
7.	N-methyl-4 piperidone	Roots	Tropine-forming TR-I activity and, ψ-tropine-forming TR-II activity	[32]
8.	4-methylcyclohexanone	Roots	Tropine-forming TR-I activity and, ψ-tropine-forming TR-II activity	[32]
9.	N-propyl-4-piperidone	Roots	Tropine-forming TR-I activity and, ψ-tropine-forming TR-II activity	[32]
10.	4-Ethylcyclohexanone	Roots	Tropine-forming TR-I activity and, ψ-tropine-forming TR-II activity	[32]
11	TBON	Roots	Tropine-forming TR-I activity and, ψ-tropine-forming TR-II activity	[32]

12.	Hygrine	Roots	Tropine-forming TR-I activity and, ψ-tropine-forming TR-II activity	[32]
13.	3-Quinuclidinone	Roots	Tropine-forming TR-I activity and, ψ-tropine-forming TR-II activity	[32]
14.	2-Methylcyclohexanone	Roots	Tropine-forming TR-I activity and, ψ-tropine-forming TR-II activity	[32]
15.	3-Methylcyclohexanone	Roots	Tropine-forming TR-I activity and, ψ-tropine-forming TR-II activity	[32]
16.	Tetrahydrothiopyran-4-one	Roots	Tropine-forming TR-I activity and, ψ-tropine-forming TR-II activity	[32]

4. Discussion

Hyoscyamus niger (Ajwaine Khorasani) is an important medicinal plant extensively described in classical Unani literature and increasingly investigated in modern pharmacological research. The present review highlights the close correlation between traditional therapeutic applications and experimentally validated pharmacological activities of the plant. Classical Unani physicians recognized Ajwaine Khorasani as a potent drug possessing musakkin (analgesic), munavim (sedative), muqaddir (narcotic), habis (astringent), and radda-e-mawad (anti-inflammatory) properties. These actions were traditionally utilized in the management of pain, insomnia, asthma, spasmodic cough, neuralgia, inflammatory swellings, hysteria, and nervous disorders.

Modern scientific studies strongly support many of these traditional claims. The pharmacological activities of Hyoscyamus niger are mainly attributed to the presence of tropane alkaloids such as hyoscyamine, scopolamine (hyoscine), atropine, and related metabolites. These bioactive compounds exhibit anticholinergic, antispasmodic, sedative, analgesic, bronchodilatory, and neuroprotective effects, thereby validating its historical use in respiratory, neurological, and painful conditions. Experimental studies have also demonstrated antioxidant, antimicrobial, anticonvulsant, anti-inflammatory, and cytotoxic properties, indicating the broad therapeutic potential of the plant.

The review further demonstrates that different parts of the plant including seeds, leaves, roots, and aerial parts contain diverse phytoconstituents such as alkaloids, coumarinolignans, flavonoids, glycosides, fatty oils, and phenolic compounds. These constituents contribute synergistically to the medicinal efficacy of the plant. The identification of compounds such as cleomiscosin A and B, hyosgerin, skimmianine, and other metabolites suggests that Hyoscyamus niger may serve as a valuable source for future drug development and pharmacological investigations.

Despite its therapeutic importance, Hyoscyamus niger is also known for its toxicity. Classical Unani texts clearly mentioned adverse effects such as delirium, dizziness, unconsciousness, and insanity following excessive use, which aligns with modern toxicological findings associated with tropane alkaloid poisoning. Contemporary reports describe symptoms including tachycardia, hallucinations, mydriasis, respiratory depression, convulsions, and coma. Therefore, careful dosage regulation, proper purification, and administration with suitable musleh (correctives) are essential to minimize

toxicity and ensure safe therapeutic use.

The review also highlights the need for further scientific exploration of Hyoscyamus niger. Although several pharmacological activities have been experimentally studied, many traditional claims still require detailed clinical validation. Standardization of extracts, isolation of active compounds, toxicological profiling, and well-designed clinical trials are necessary to establish its safety, efficacy, and therapeutic dosage. Moreover, integrating classical Unani knowledge with modern scientific methodologies may contribute significantly to the development of evidence-based herbal therapeutics.

Overall, the available literature suggests that Hyoscyamus niger possesses considerable medicinal importance with strong ethnopharmacological relevance. Its traditional applications in Unani medicine are substantially supported by modern pharmacological findings, emphasizing its potential as an important medicinal plant for future research and therapeutic utilization.

Conflict of interest statement

We declare that we have no conflict of interest.

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Authors contributions

SK conceptualized and wrote the manuscript. SAM collected and reviewed the literature on the chemical composition and biological activities, SF contributed to the manuscript editing and reviewing. SK revised the article critically for important intellectual content. All the authors read and approved the final manuscript.

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Declarations

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