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Review Article

Therapeutic Potential of *Evolvulus alsinoides*

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ABSTRACT

Background: *Evolvulus alsinoides* is a well-known herbal drug possessing various promising medicinal properties described by prominent ancient scholars and also numerous preclinical and clinical researches has been performed, thus at testing its ample of pharmacological actions. So, thorough review of classical as well as contemporary literature has been executed on *Evolvulus alsinoides* to validate the pharmacological actions mentioned.

Methods: For classical review, a comprehensive search of Unani literature is done and for latest research work on *evolvulus*, articles published in English language using PubMed, MEDLINE, and the Google scholar with search term including Sahnkpushpi, sankhaoli, *Evolvulus alsinoides* since 1991 to 2019 is done.

Results: The search includes contemporary literature, ethnomedicinal sources and 35 research articles from 1992 to 2019 which further ascertains various pharmacological actions being mentioned in Unani literature including anti-inflammatory, anti-diarrheal, anti-helminthic, anti-consultant and nootropic property of herb.

Conclusion: The pharmacological action and therapeutic application of *Shankhaholi/ Shankpushpi* which is mentioned in classical Unani literature are in accordance with latest research. Despite of having several researches on *Evolvulus alsinoides* there are still numerous indications mentioned in classical literature which are yet to be explored.

Keywords: *Evolvulus alsinoides*, herb, Unani, contemporary.

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Introduction

Modern lifestyles have resulted in stress-related disorders and various approaches, such as, yoga, meditation and anti-stress drugs, are used to counteract aversive stress effects. Plant drugs have come to the rescue to mankind in many ailments and may offer reasonable solutions to stress-induced perturbations (1). Plant materials are used all through developed and developing countries as home remedies, over-the counter drug products and raw materials for the pharmaceutical industry, and represents a significant share of the worldwide drug market.

According to the World Health Organization, the traditional medicines will continue to play a significant role in health care system as around 80% of the population in the world relies on the use of traditional medicines (2). More than 75 % of the population in India is residing in rural areas utilizing medicinal plants as they are close to natural resources. The medicinal value of plants lies in some chemical substances

that create a certain physiological action on the human body. The phytochemical research based on ethno pharmacological evidence is mostly considered effective approaches in the discovery of new anti-infective agents from higher plants (3). Plants contain many bioactive chemical substances that produce definite physiological and biochemical actions in the human body. These bioactive constituents are alkaloids, tannin, flavonoids, phenolic compounds etc (4). Plant derivative of natural products have established substantial attention in past recent years due to diverse pharmacological properties, including antioxidant and antitumor activity (5). Medicinal plants have been used indigenously in the treatment of numerous disorders. *Evolvulus alsinoides*, one of the important and widespread medicinal herb in India and other parts of the world is been extensively used as traditional medicine in various culture. *Evolvulus alsinoides*, also known as the slender dwarf morning-glory, of family Convolvulaceae is flowering plant, remarkably variable annual or perennial herb, typically roofed with somewhat

long patent silky hairs. *E. alsinoides* generally known as Shankhapushpi / Sankhaholi and it is found throughout India ascending to the 6000ft in the Himalayas subtropical countries of the world (6) (7). This plant is used in traditional medicine to cure fever, cough, cold, venereal diseases, azoospermia, adenitis and dementia in East Asia, India, Africa and Philippines. It has a known nootropic and anti-inflammatory activity (8). Traditionally, the herb is used in several ways like mentioned in classical unani literature as anti-tussive, antifungal, anti-convulsant, anti-emetic, anti-cancerous, anti-inflammatory, aphrodisiac, appetizer, astringent, blood purifier, diuretic, brain tonic, cardiac tonic, coolant, digestive, diuretic, exhilarant, eye tonic, febrifuge, hair tonic (9), (10) (11) and the herb is also indicated in various disorders by prominent unani physician like nervous debility, insanity, anxiety neurosis, epilepsy, melancholy, dysentery, asthma, chronic bronchitis, dry cough, heart disease, palpitation, hematological disorders, hemorrhage, leprosy, leukoderma, renal diseases, diabetes, syphilis, gonorrhoea, leucorrhoea, excessive emission, hemorrhoid, biliousness(9)(12)(13). Goyal & Singh (2005) (14) reported the use of the herb in the treatment of neurodegenerative diseases, asthma and amnesia. Pre-clinical research has justified its ancient claim as brain tonic (8). Several other uses reported for this plant include its ability to boost memory and improve intellect (15), immunomodulatory, adaptogenic as well as anti-oxidant properties (16). Singh (2008) reported that *Evolvulus alsinoides* used in the Philippines to cure certain bowel irregularities and as a vermifuge and febrifuge. Infusion of roots, stalks and leaves are all used in Nigeria as stomaachic. Bussman reported that in Kenya (Kwale Province) sores are treated by application of the powdered leaves of *Evolvulus alsinoides* and in Tanganyinka (Lake province), the powdered leaves are put onto enlarged gland in the neck. The objective of this research was to evaluate the antimicrobial activity of the extracts of *Evolvulus alsinoides* on some clinical microbial isolates(17). The potential therapeutic effect leads to its use in various disorders like insanity, epilepsy, memory enhancement and nervous debility in conventional system of medicine (18). Anti-oxidant properties of this plant used to treat low spirits and depression as shown in various strong memory enhancing activity (19) It is widely used as nervine tonic in various asian countries as it has strong memory enhancing activity.

The current review is an effort to present out the traditional uses and the therapeutic potential of the this herbal drug in various disorders as well as establishing the evidence based facts of its pharmacological actions with reference to contemporary preclinical and clinical research.

Taxonomic classification of *E. alsinoides*

Kingdom	Plantae – Plants
Subkingdom	Tracheobionta
Superdivision	Spermatophyta
Division	Magnoliophyta
Class	Magnoliopsida
Subclass	Asteridae
Order	Solanales
Family	Convolvulaceae
Genus	<i>Evolvulus L.</i>
Species	<i>Evolvulusalsinoides (L.) – slender dwarf morning-glory P</i>

(USDA Plant Database)

Vernacular Names and Etymology(20) (21) (22) (23) (24)

Scientific Name	:	<i>Evolvulus alsinoides</i> (L.)
Bombay	:	Sankhaholi
English	:	Slender dwarf morning glory
Gujrati	:	Kalisankhaholi
Hindi	:	Shyamkranti, sankhpushpi
Malyalam	:	Vishnukranti
Marathi	:	Vishnukanta
Punjabi	:	Kodyali, Sankpushpi
Sanskrit	:	Vishnukranti, Vishnugandhi
Tamil	:	Vishnukarandi, vishukaranthi
Telgu	:	Vishnukranta, kancakura
Unani	:	Sankhaholi
Urdu	:	Sankhaholi

Habitat and Distribution

It has a natural pan tropical distribution encircling tropical and warm-temperate regions of Australia, Asia, Indomalaya, Polynesia, Sub-Saharan Africa and the Americas. It is extensively spread all over India. (25) (26) (20)

Pharmacognostical description of plant

It is prostrate, small, diffused, prominently branched and remarkably variable annual or perennial herb with small woody rootstock. The stem of the herb is spreading, thin, bushy and about 30 cm in length or more. Leaves are ample, sub sessile or shortly petioled, blade elliptic to linear-oblong, 8–26 mm long, 2–10 mm wide, acute or curved at both ends, silky pilose on both surfaces; petiole is short about 3 mm long. Inflorescence have lean peduncle with 1–5-flowers, 6–40 mm long with narrow bracts of about 5 mm. long and 0.75 mm wide. Pedicels is 2–10 mm long. Sepals are ovate-lanceolate with up to 5mm. length and 1 mm. width, acute. The length of capsule 3–4 mm which is seeded, globose in shape having 4-valve. Seeds are usually 4 in number, ovoid in shape with pale brown to black in color. It has funnel shaped corolla. Pollination is by means of insects and seeds are dispersed by winds (27) (28) (29) (30).

Phytoconstituents

The major therapeutic agents obtained from the plant are Evolvine, Pentatriacontane, Triacotane, β -sitosterol, Glycoflavone, 4' methoxyvitexin, p-hydroxybenzoic, Vanillic, Protocatechuic and Gentistic acids and Quinines. Thirty compounds were identified through GC-MS analysis in methanolic extract of the whole plant. The active principles and concentration (%) reported by Gomathi and Elango in 2015 Tricyclo[2.2.1.0] heptane, 1,7,7-trimethyl 0.28 Alfa-copaene 0.27 Cyclohexene,1-methyl-4- (1methylethenyl)-, @ 0.32 Caryophyllene 4.37 1,6-cyclodecadiene, 1-methyl-5-m 0.47 (-)-5-oxatricyclo[8.2.0.0(4,6)]dodeca 1.00 1hcyclopropa[A]Naphthalene, 1a 0.32 Dotriacotane 0.46 Tetradecanoic acid 0.69 2,6,10-trimethyl,14-ethylene-14-pe 0.48 Pentadecanoic acid 0.36 3,7,11,15-tetramethyl-2-hexadecen-1-ol 0.37 Oleic acid \$\$ 9-octadecenoic acid (z) 1.04 Nonanedioic acid, dibutyl ester 0.74 L-(+)-Ascorbic acid 2,6 dihexadecanoate 17.32 Heptadecanoic acid 0.82 Behenic alcohol 0.42 Phytol isomer 1.78 Methyl stearate 0.48 Oleic acid 25.39 Octadecanoic acid 25.39 Cis-11,14-eicosadienoic acid, methyl ester 3.13 Nonadecanoic acid 0.67 Hexadecanoic acid, 2hydroxy-1,3 0.64 Octadec-9-enoic acid 0.75 Oleic acid \$\$ 9-octadecenoic acid (z) 0.95 Icosanoic acid 5.46 2-Hydroxy-3-[(9e)-9-Octadecenoyl 1.04 Squalene 2.05 Glycidol stearate 1.43 (31)(32)(33)(34)

Temperament

Barid Ratab(9)(11)

Har Ratab(12)(35)

Therapeutic dose

7-10 g (10)(12)(11)

3-8 g (22)

Pharmacological Action as mentioned in classical Unani literature with contemporary evidence of pharmacological studies.

Antibacterial activity

The herb is mentioned as Anti-diarrheal(36) (28), antifungal(37) (38) and indicated in indigestion and dysentery (28) (24) (39) in classical unani literature and ethno medicinal sources. Various studies have verified the use of this herb for the same and they are mentioned below:

- Methanolic extract of *Evolvulus sinoides* (150 µl/disc) leaf shown to be having the broad-spectrum antibacterial activity against pathogenic bacterial strains like *Escherichia coli*, *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* etc which are responsible for several common infectious diseases.(40)
- The ethanolic extract of the whole plant of *Evolvulus sinoides* in an in vitro study demonstrated the broad-spectrum antimicrobial activity against many pathogens including *Salmonella typhi*, *Bacillus cereus*, *Pseudomonas*, *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Proteus*, *Streptococcus* and *Escherichia*(41)(42).
- Moreover, the ethanolic extract of the whole plant of *Evolvulus* was also found to have the bactericidal activity against numerous clinical pathogens including *Staphylococcus aureus*, *Vibrio cholerae*, *Salmonella paratyphi A*, *Salmonella paratyphi B*(43).
- In other study the ethanolic extract of *Evolvulus sinoides* of whole plant was shown to exhibit the antibacterial activity against *Pseudomonas aeruginosa* and *Escherichia coli* but found ineffective against *Staphylococcus aureus* and *Candida albicans*(44).
- The methanolic extract of *Evolvulus sinoides* leaf was found effective against gram-positive and gram-negative bacteria (45)
- Additionally, the methanolic extract of leaves, stem, flowers and root of *Evolvulus sinoides* was examined by Saranya et al for its antimicrobial activity using agar well diffusion method and found that root extracts of *Evolvulus sinoides* exhibited maximum antibacterial activity thereby showing the potential of this herb to be effective against various resistant strains of bacteria(46).
- Besides, the aqueous and methanolic extract of the whole herb revealed strong antimicrobial activity against certain agents like *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Staphylococcus epidermidis*, and *Vibrio cholerae*(47)(48)
- In the Previous studies the ethanolic and ethyl acetate extract of leaves of *Evolvulus sinoides* displayed bactericidal activity. The alkaloid and flavonoids present in the herb might be responsible for its antimicrobial activity. The maximum bactericidal

action against *Escherichia coli*, *Bacillus subtilis* and *Pseudomonas aeruginosa* was shown by ethanolic extract and outstanding growth inhibition against the *Bacillus subtilis* was indicated by the ethyl acetate extract.(49)

- The aqueous extract of the herb presented promising bactericidal activity against *Helicobacter pylori* which could be responsible for the gastro protective effect of this medicinal herb.(50)

Anthelmintic activity

The Anthelmintic property of the plant is mentioned in classical ethnomedicinal literature(36) (51) (23) (28)

- G.K Dash et al observed from the study that the ethanolic extract of *Evolvulus sinoides* was more compelling than the reference control piperazine citrate. It caused paralysis followed by death of the worms at all tested dose levels. (52)

Anti-diabetic Activity

In classical unani literature and ethnomedicinal literature the herb is indicated in Diabetes(9) (12)(10)

- The ethanolic extract of *evolvulus sinoides* prevented the pancreas from diabetes by suppressing the oxidative stress and also help to increase the insulin level by remodeling the structure of pancreas in streptozotocin induced diabetic rats (53).
- The Study reports of Prasoon Gupta defined the isolation and structure elucidation of the new flavonol glycosides, *evolvosides C-E* (1-3) and their anti-stress activity. The compounds have shown significant ($p < 0.01$) anti-stress activity by normalizing hyperglycemia, corticosterone level, creatinine kinase and adrenal hypertrophy(32).

Anticonvulsant Activity

The Anti-convulsant(9) activity of the herb is mentioned in classical unani literature and the therapeutic use of the drug in epilepsy (51) (21) (36) is mentioned in ethno botanical sources.

- Phytochemical screening of the extract revealed the presence of secondary metabolites such as saponins, tannins and flavonoids. *Evolvulus sinoides* extract produced a 50 -100% protection of the mice against pentylenetetrazole (PTZ) induced seizure at doses of 100 400mg/kg. The protection of the extract against PTZ induced convulsion suggested that the extract interacts with GABA-ergic neurotransmission. The PTZ test is assumed to identify anticonvulsant drugs effective against myoclonic and absence seizures. *E. sinoides* significantly attenuated electrically induced seizure in mice. (54)

Anti-anxiety

The herb is indicated in Anxiety Neurosis (55) in ethnomedicinal sources.

- Clinical study on *Evolvulus sinoides* was evaluated for its anti-anxiety activity in Anxiety neurosis in 60 patients and revealed marked relief in anxiety symptoms without producing any side effects(56).

Nootropic Activity / Anti-Amnesic Activity

The herb is well known for its nootropic activity and mentioned as Brain Tonic (11) (10) (9) (12) (51) (21) (36) (28), and indicated in Nervous Debility (9), Insanity (9)

(10)(21), Melancholy (10), Hyposensitivity (20). The following studies mentioned below ascertain the strong neuropharmacological potential of the herb.

- Alcoholic extracts of *Evolvulus alsinoides* (250 mg/kg body weight) presented higher nootropic activity as compared to *Convolvulus pluricaulis* in terms of time spent in the enclosed arm in plus maze model and the mean avoidance response on the jumping box model (57).
- Crude ethanolic extract of EA was evaluated for its adaptogenic and memory enhancing properties in rodents and revealed marked improvement in the peripheral stress markers and scopolamine induced dementia this indicated the adaptogenic and anti-amnesic properties of the herb (58).
- It was observed by K. Yellamma that *Evolvulus alsinoides* extract has neuroprotective effect on cholinergic system which would pave new vistas in the discovery of safe and novel anti-Alzheimer's compounds (59).
- *E. alsinoides* was evaluated for anti-depressant activity using forced swim despair test with imipramine as standard exhibited reduction in immobility period in comparison to animals of control group. It produced significant activity at 50 and 100mg/kg doses and increase in mobility period at higher doses (60).
- In one more study the whole herb extract was examined for its anxiolytic activity and it was observed that at doses of 100, 200 and 400 mg/kg and the plant disclosed significant anxiolytic activity with the conclusion of most significant activity was observed at a dose of 200 mg/kg (20.4 s in open arm, $p < 0.001$) in comparison to the vehicle-treated group (60).

Anti-hypertensive activity

The herb is effective in various cardiovascular disorders and in symptoms like dyspnea, palpitations etc. (11) (9) (10)

- Profound antihypertensive activity of *Evolvulus alsinoides* herb was exhibited by Methanolic extract in adrenaline induced hypertensive model (61).
- The antihypertensive effect of methanolic extract of whole herb was apparent in DOCA salt induced hypertensive mice and the study also revealed that its activity was due to ACE inhibitor mechanism of *Evolvulus alsinoides* herb extract as the extract lowered the blood pressure as similar to enalapril without interfering with pulse rate (62).
- A clinical study done Qamar Alam Khan stated that the test drug Sankhaholi (*Evolvulus alsinoides* Linn.) has substantial efficacy as an antihypertensive drug as demonstrated in patients of essential hypertension (63).

Taste of *Evolvulus alsinoides*

The plant possesses the bitter and pungent taste (36)

Substitute

Bhrami (*Bacopamonnieri*) (12) *Bacopamonnieri* is been reported to have the following medicinal properties like anti-convulsant (64) (65), anti-depressant (66), analgesic (67) (68), anti-inflammatory (69), anti-microbial (70), anti-ulcerogenic (71), anti-*H. Pylori* (72), anxiolytic (73), adaptogenic (74), anti-neoplastic (75) (76), hepatoprotective

(77), immunostimulatory (78) (79) which proves to be used as a substitute of *Evolvulus alsinoides*.

Conclusion

It can be concluded from above mentioned facts that *Evolvulus alsinoides* possess various therapeutic effects and it is being used by eminent Unani physicians since ages in various neurological, respiratory diseases. The herb is capable of producing various pharmacological effects owing to several bioactive constituents. It is endowed with a number of phytoconstituents which shows their effect in various brain disorders such as memory enhancement, insanity, epilepsy, nervous debility and several other disorders like cardiovascular disorders as in hypertension, palpitations etc

Various in vivo and in vitro studies have been performed proving its abundant pharmacological actions like anti amnesic, antihypertensive, anti-convulsant, antimicrobial, anti-oxidant, anti-inflammatory and many other mentioned above supports the traditional use of this medicinal herb. Clinical trials are the need of an hour and further research is encouraged in the area of isolation and characterization of the bioactive compounds responsible to validate the efficacy of the drug against various disorders.

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Conflict of Interests

The authors declare that they have no conflict of interests.

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