Ethnobotanical Leaflets 12: 734-40. 2008.

Review of Ethnomedicinal Uses and Pharmacology of *Evolvulus alsinoides* Linn.

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Issued 01 October 2008

ABSTRACT

Evolvulus alsinoides L. (Convolvulaceae) is used as nootropic or brain-tonic in traditional systems of medicine like Ayurveda and Unani. The plant is used by certain ethnic races across India, Africa and Philippines to cure fever, cough and cold, venereal diseases, azoospermia, adenitis, and depression. Pre-clinical (in vivo and vitro) investigations have demonstrated anti-amnesic, antistress (adaptogenic), antimicrobial and gastro protective activity. Although clinical-studies are warranted for potential use of *E. alsinoides* in treating dementia, pre-clinical research has justified the ancient claim of 'brain-tonic. The review summarizes ethno medicinal uses and pharmacological investigations carried on the medicinal plant.

Keywords: *Evolvulus alsinoides* -Traditional Indian Medicine-nootropic-pharmacology

INTRODUCTION

Drugs as nootropics, cognitives, and neuroprotectives are commonly used to treat Alzheimer's disease and other types of dementia. Some of these drugs have often side and undesirable effects. In recent years some natural substances like galanthamine, huperzine-A, vinpocetine, and standardized plant extracts including *Ginkgo biloba* L., *Centella asiatica* (L.) Urban, *Bacopa monniera* L., and *Evolvulus alsinoides* L.) are often used. These plant preparations produce fewer undesirable effects and the same effectiveness as the classic.[1] Several reviews have been published in support of above mentioned herbs except *E. alsinoides*. The present review is dedicated to traditional medicinal uses and pharmacological studies done on the plant.

BOTANY

E.alsinoides L. (dwarf morning glory) belonging to the family Convolvulaceae is a perennial herb with a

small woody and branched rootstock. Its branches are annual, numerous, more than 30 cm long, often prostrate, slender and wiry with long hairs. Leaves are small, entire, elliptic to oblong, obtuse, apiculate, base acute and densely hairy. Petiole is minute or nearly absent. Bracts are linear and persistent. Flowers mostly solitary in upper axils. Corolla blue rotate and broad funnel shaped, Calyx 4 is lobed, lanceolate and the tip acute. Peduncle is long and axillary. Capsule is globose and 4 valved. Seeds are 4 and glabrous. [2]

ETHNO MEDICINAL USE

E. alsinoides L. is used mainly in traditional medicine of East Asia. The plant is used in Ayurveda as a brain tonic in the treatment of neurodegenerative diseases, asthma and amnesia.[3] In Ayurveda, the plant is known as Shankpushpi. As regard origin, the plant is of controversial in origin. Several plants including *Convolvulus pluricaulis* Linn., *Clitoria ternetae* L. and *Canscora decussata* L. are also used as Shankpushpi..[3,4,5]

Some traditional uses in Traditional Indian Medicine (TIM) are listed below [3]:

1. The whole herb is used medicinally in the form of decoction with cumin and milk in fever, nervous debility, loss of memory and syphilis.
2. Decoction of the drug, with *Ocimum sanctum* is administered in fevers accompanied by indigestion or diarrhea. Decoction was given in cases of malarial fever.
3. The root is used by the santals, for intermittent childhood fever.
4. The leaves are made into cigarettes and smoked in chronic bronchitis and asthma.
5. The oil promotes the growth of hair.

In Sri Lanka, roots and stem extract of the plant are used to treat dysentery and depression. Leaves are recommended for asthma and mental disturbances (Rajaqkaruna, Harris and Towers, 2002). Decoction of roots, thrice a day, is consumed in Eastern Ghats of Andhra Pradesh, India for three days for curing cough and cold.[6] According to an ethno botanical survey conducted among Kani/Kanikaran ethnic groups in Southern Western Ghats of India, whole plant of *E. alsinoides* is used for the treatment of venereal diseases.[7] In Uttara Kannada district of Karnataka, *E. alsinoides* is used as spermopiotic.[8] The Valaiyan community of Piranmalai hills, Tamilnadu consumes leaf juice *of E. alsinoides* internally for three days for fever.[9]

Mohammedan physicians use the plant to strengthen the brain and memory. It is used in the Philippines for certain bowel irregularities. Infusions of roots, stalks and leaves are all used in Nigeria as stomachic. In Kenya

(Kwale Province) sores are treated by application of the powdered leaves, and in Tanganyika (Lake Province) the pounded leaves are put onto enlarged glands in the neck.[10] The plant is used to treat depression in Sekenani Valley, Maasai Mara, Kenya.[11]

CHEMICAL CONSTITUENTS (PHYTOCHEMISTRY)

The plant contains alkaloids: betaine, shankhapushpine and evolvine. Fresh plant contains volatile oil. It also contains a yellow neutral fat, an organic acid and saline substances. An unidentified compound has been isolated.[3] Scopoletin, scopolin, umbelliferone, 2-methyl-1,2,3,4-butanetetrol, ferulic acid esters with alcohols C14-C17 and palmitic, stearic, oleic, 8-methyldecanoic and heptadecanoic acids have been reported.[12,13] 2,3,4-trihydroxy-3-methylbutyl 3-[3-hydroxy-4-(2,3,4-trihydroxy-2-methylbutoxy)-phenyl]-2-propenoate (1) and 1,3-di-*O*-caffeoyl quinic acid methyl ester, caffeic acid, 6-methoxy-7-*O*-ß-glucopyranoside coumarin, 2-C-methyl erythritol, kaempferol-7-O-ß-glucopyranoside, kaempferol-3-O-ß-glucopyranoside and quecetine-3-O-ß-glucopyranoside were reported from *n*-BuOH soluble fraction from the ethanol extract of *E. alsinoides*.[14]

PHARMACOLOGY

Antibacterial and anthelmintic.[15,16]

Adaptogenic (anti-stress) and anti-amnesic

Male Sprague–Dawley rats, weighing 180–200 g were immobilized for 150 min once only in acute stress model, whereas in chronic unpredictable stress model rats were subjected to different types of stressors daily for 7 days. Stress exposure has induced gastric ulceration with increase in adrenal gland weight, plasma creatine kinase, and corticosterone level in acute stress and chronic unpredictable stress. However, plasma glucose was increased only in acute stress. Rats were treated with graded doses of crude ethanolic extract of *E. alsinoides* (100, 200 and 400 mg/kg p.o.) for 3 days and subjected to acute stress on 3 day after 45 min of last dose. In chronic unpredictable stress, *E. alsinoides* at a dose of 200 mg/kg p.o. found effective in acute studies was administered 45 min prior to stress regimen for 7 days. *E. alsinoides* reduced the stress induced perturbations similar to *Panax quinquefolium* (PQ) (100 mg/kg p.o.), a well known adaptogen. *E. alsinoides* (100 mg/kg) administered orally for 3 days in adult male Swiss mice, was effective in decreasing scopolamine induced deficit in passive avoidance test.[17]

Phenolics and flavanoids, isolated form *n*-BuOH soluble fraction from the ethanol extract of *E. alsinoides* screened for anti-stress activity in acute stress induced biochemical changes in adult male Sprague–Dawley rats. Stress exposure has resulted in significant increase of plasma glucose, adrenal gland weight, plasma creatine kinase, and corticosterone levels. One constituent displayed most promising antistress effect by normalizing hyperglycemia,

plasma corticosterone, creatine kinase and adrenal hypertrophy, while other were also effective in normalizing most of these stress parameters. [14]

Antiulcer and anticatatonic activity

The in vivo evaluation of the alcoholic extract of *E. alsinoides* revealed its marked antiulcer and anticatatonic activity. [18]

Antioxidant activity

Ethanolic extracts and water infusion of *E. alsinoides* were tested for their antioxidant activity in the 2, 2'-azinobis-3-ethyl-benzothiazoline-6-sulfonic acid radical cation decolorization assay. Inhibition of lipid peroxidation by plant infusions was carried out using spontaneous lipid peroxidation of rat brain homogenate, and IC50 values were determined. The results from the ABTS assay showed that the ethanolic extract of *Sida cordifolia* was found to be most potent (IC50 16.07 µg/ml), followed by *Evolvulus alsinoides* (IC50 33.39 µg/ml) and *Cynodon dactylon* (IC50 78.62 µg/ml). The relative antioxidant capacity for the water infusions was observed in the following order: *E. alsinoides* (IC50 172.25 µg/ml)>*C. dactylon* (IC50 273.64 µg/ml)>*S. cordifolia* (IC50 342.82 µg/ml). The results of water infusions of the plants on lipid peroxidation were as follows: *E. alsinoides* (IC50 89.23 µg/ml)>*S. cordifolia*) (IC50 126.78 µg/ml)>*C. dactylon* (IC50 608.31 µg/ml). [19]

Gastro protective activity

The authors have demonstrated potential gastro protective of powdered drug of *E. alsinoides* but details are missing. [20]

Immmunomodulator activity

The crude extracts of *Emblica officinalis* and *E. alsinoides* were evaluated for immmunomodulator activity in adjuvant induced arthritic rat model. The anti-inflammatory response of both the extracts was determined by lymphocyte proliferation activity and histopathological severity of synovial hyperplasia. Both the extracts showed a marked reduction in inflammation and edema. At cellular level immunosuppression occurred during the early phase of the disease. There was mild synovial hyperplasia and infiltration of few mononuclear cells in *E.officinalis* or *E. alsinoides* treated animals. The induction of nitric oxide synthase (NOS) was significantly decreased in treated animals as compared to controls.[21]

Drug-interaction

Reduced levels of antiepileptic drug, phenytoin and loss of therapeutic activity were found in two patients who concomitantly were taking Shankhapushpi. Keeping in mind the observation, animal study was carried out to investigate pharmacological basis of drug-interaction between two drugs. Shankhapushpi and phenytoin were co

administered in single dose either orally or intra-peritoneal. This did not show any effect on plasma levels of phenytoin but the therapeutic (antiepileptic) activity of phenytoin was decreased significantly. When multiple-dose combination was co administered, decrease in plasma levels and therapeutic activity of phenytoin was observed. Shankhapushpi demonstrated significant antiepileptic activity as compared to placebo. However keeping in mind the drug-interaction, clinical usage of both the drugs concomitantly should be avoided. [22]

Toxicology

Moderate doses (200 mg/kg) of the alcoholic extract of *E. alsinoides* caused drowsiness, stupor and less mobility in albino mice; higher doses showed it to be neither toxic nor lethal. [23]

Evolvine hydrochloride

The hydrochloride of alkaloid, evolvine was reported to exhibit lobeline-like action on the cardiovascular system. In cats, the drug demonstrated sympathomimetic activity. The blood pressure remained elevated for a longer duration as compared to adrenaline. Increase in peripheral pressure was observed on local injection of the drug. [24]

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