PHARMACOLOGCAL, PHYTOCHEMICAL AND SYSTAMATICAL ANALYSIS OF *ECHINOPS ECHINATUS* ROXB. (AHERBALMEDICINALPLANT)

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ABSTRACT

Echinops echinatus Roxb. (*E. echinatus*), commonly known as "Usnakantaka," is a xerophytic herbaceous plant traditionally used as a stimulant to treat use the term Sexual debility in Indian traditional systems of medicine. The roots, leaves, fruit, and bark are extensively used in folk medicine as well as in Ayurveda. Also, the plant shows a wide range of pharmacological activities such as antifungal, analgesic, diuretic, reproductive, hepatoprotective, antioxidant, anti-inflammatory, wound-healing, antipyretic, and antibacterial properties. Among the several active constituents, apigenin, apigenin-7-O-glucoside, echinaticin, 5,7-dihydroxy-8,4'-dimethoxy-flavanone-5-O-α-L-rhamnopyranosyl-7-O - β-D-arabinopyranosyl-(1→4)-O-β-D-glucopyranosidearethemostimportantintermsof reported pharmacological activities. The current review focuses on the updated informationfromvariousscientificstudiesandreportsavailableinthecontextofthe phytoconstituents and pharmacology of this plant. This review also provides adequate information about the use of this plant in an Indian system of medicine, Ayurveda.

Keywords: Apigenin,Ayurveda,echinaticin,*Echinopsechinatus*,Usnakantaka.

INTRODUCTION

Bramhadandi common name of *Echinops echinatus* Roxb is a pubescent annual herb of 1-3ft height with branches generally spreading from the base. The speciesarefoundpracticallythroughoutIndiaandusefulforthetreatmentofvarious ailments in the Indian system of medicine. This literature search acknowledges that theplantisapopularremedy foravarietyofailmentsandverylittleefforthavebeen madetocheckitsefficacythroughscientificscreeningsinanimalmodel.Thepresent review focused on various folk, Ayurvedic uses, pharmacognostical, phytochemical and pharmacological studies conducted on *Echinops echinatus* Roxb, and also highlight unexplored potential of it.

Vernacularnames

English: IndianGlobeThistle
Hindi: Gokhru,Uthkanta,Utakatira
Gujarati : Shuliyo, Utkanto, Utkato
Sanskrit: Kantalu, Kantaphala, Utati, Utkantaka
Sindhi: Dammai
Urdu: Barhamdandi, Labh,Unt katara
Telugu: Brahmadandi
Kannada: Brahmadande
Marathi: Utkatar,Kate-chendu

SystamaticPosition

Kingdom : PlantaePhylum
: Magnoliophyta
Class: Magnolipsida
Subclass: Asteridae
Order: Asterales
Family: Asteraceae
Genus: *Echinops*
Species: *echinatus*

Distribution:

More orlessthroughoutIndiaandAfghanistan.

Leaves:

Alternatelyarrangedoblong,deeplypinnatifiedleavesare7-12cmlong.

Flowers:

Flower-headsoccur in solitarywhitesphericalballs, 3-5 cmacross. Petalsof the tiny white flowers are 5 mm long. Flowers are surrounded by straight, strong and white. Odour is pungent and taste is bitter.

Description:

Echinops echinatus Roxb,(Asteraceae) is a pubescent annual herb of 1-3ft height with branches widely spreading from the base. Is a perennial, 40-100cm high, Stems are simple or branching from the base, sparsely cobweb by-canescent. Leavesarelanceolateoroblong-lanceolate.Ithasshort,stoutstems,branching from

thebase,coveredwithwhitecottonyhair.Thespeciesisfoundpractically throughout India, Pakistan, Afghanistan, etc.

PHYTOCHEMICALSPRESENTINTHE*ECHINOPSECHINATUS*:-

Echinops plant was reported to possess varietyofcompoundsbelongingto various classes like: alkaloids, flavonoids, terpenoids, lipids, steroids and polyacetylenes. Manyliterature surveyrevealeddifferent pharmacologicalactivities of Echinops plant like, antibacterial activity, antifungal), antioxidant activity, protective effects on testosterone-induced prostatic hyperplasia, hepatoprotective andanti-ulcerogenicactivity.Flavonoids(Figure1)areaclassofnaturalproducts that gainsinterestduetothedifferentpharmacological activitiessinceFlavonoidsarepowerfulantioxidantsagainstfreeradicalsandaredescribe das free-radicalscavengers.Thisactivityisattributedtotheirhydrogen-donatingability. Indeed, the phenolic groups of flavonoids serve as a source of a readily available "H" atoms such that the subsequent radicals produced can be delocalized over the flavonoids structure. Also flavonoids have anti-inflammatory action, antibacterial, anti-fungal effect.

Flavonoids protect the gastrointestinal mucosa from lesions produced by variousexperimental ulcer models and against different necrotic agents, also they possess anticarcinogenic effects since they can interfere with the initiation, development and progressionof cancer by the modulation of cellular proliferation, differentiation, apoptosis, angiogenesis and metastasis.

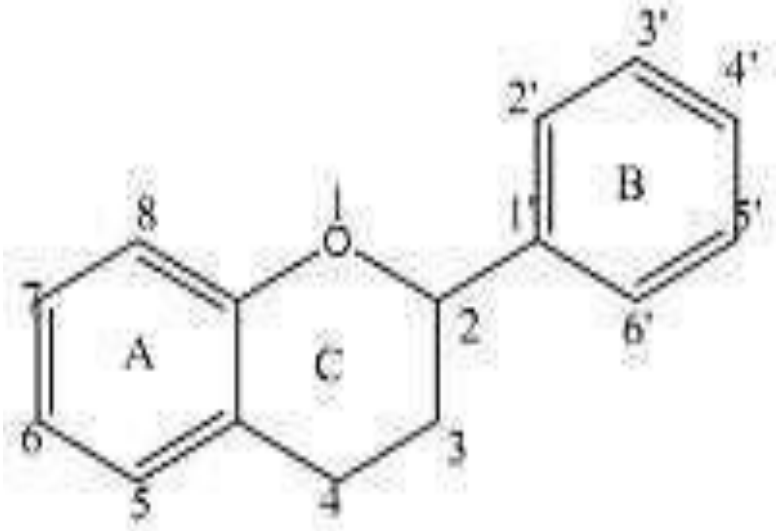


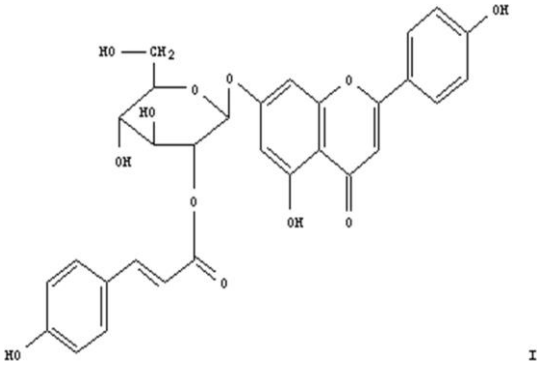
Figure 1.Basicstructureofflavonoids

The most important flavonoids glycoside isolated from different species of Echinops plant are listed in the following table (Table 1). This study was emphasized on the isolation and identification of flavonoids glycoside foundintheIraqispeciesofEchinopsplantbycolumnChromatography(CC),usingglass columnpackedwith polyamide 6 slurry in ethanol.

Table1.
FlavonoidsglycosideisolatedfromdifferentspeciesofEchinopsplant

Flavonoids	**Sources**
Kaempferol,kaempferol4'-methylether,kaempferol7-methylether,kaempferol3-O- alpha- L- rhamnoside, myrecetin-3-O-alpha-L-rhamnoside	*Echinopsechinatus*
Dihydroquercetin-4'-methylether, 5,7 -8,4 -dimethoxyflavanone-5-O- -L-rhamnopyranosyl-7-O- -Darabinopyranosyl-(14)-O--D-glucopyranoside	*Echinopsechinatus*
Silymarine	*Echinops tenuisectus*
Quercetin	*Echinops tenuisectus*
Apigenin(4',5,7-trihydroxyflavone,luteolin)	*Echinopsniveus*
Kaempferol	*Echinops galalensis and Echinopshussoni*
Apigenin,hispidulin,5,4dihydroxyflavoneand apigenin7-O-glucoside	*Echinops spinosissimus*
Apigenin	*Echinopslatifolius*
Kaempferol,myricetin	*Echinopsspinosus*
Neoflavonoidnivetin	*Echinopsniveus*
Apigenin,apigenin-7-O-glucoside,echinacin,and echinaticin	*Echinopsechinatus*

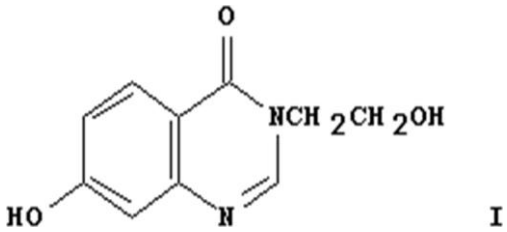
Aerial parts of the plant contain alkaloids, **echinopsine, echinopsidine and echinozolinone**. **Taraxasterol acetate**, **Apigenin** anditsderivatives, **echinacin** and **echinaticin**.



I

2',5,7-trihydroxy-3.6-imethoxyflavone-7-O-b-Dgalactopyranosyl-[1-4]-O-a-Lrhamnopyranosideisreportedfrom fromtheseedsofEchinopsechinatus. Apigenin,apigenin7-O-glucoside,anda new acylflavoneglucoside named echitin (I) were isolated from *Echinopsechinatus* flowers.

A minor alkaloid 7-hydroxyechinozolinone (I) is reported from the flowers of E.echinatus



I

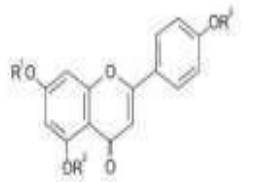
An antiinflammatory active flavanone glycoside 5,7-dihydroxy-8,4'-dimethoxyflavanone-5-O-**a**-Lrhamnopyranosyl-7-O-**b**-D-arabinopyranosyl-(1-4)-O-**b**-D-glucopyranosideAalongwithaknowncompd.dihydroquercetin-4'-Meether is also reported from the leaves of*Echinops echinatus.* A minor alkaloid 7-hydroxyechinozolinone(I)isreportedfromtheflowersofE.echinatus.Four phenolic compounds. apigenin, apigenin 7-Oglucoside, echinacin(I), and echinaticin (II), were are reported from E. echinatus Roxb. Isomeric acyl flavoneglycosides echinacin(I) and echinaticin (II) are reported from E. echinatus.ChaudhuriPK26(1997)isolatedEchinozolinoneanalkaloidfrom *Echinops echinatus*. In addition to echinopsine and echinopsidine, a new alkaloid, echinozolinone,hasbeenidentifiedin*Echinopsechinatus*as3(2hydroxyethyl)- 4(3H)-quinazolinonefromitsspectraldata.Beaidesapigcnin‘J-O-glucoside,anew

acylated l&one has been identified in *Echinops* echinatus as apigenin 7-0- (4”-cispcouyl~e from spectral and chemical analysis.

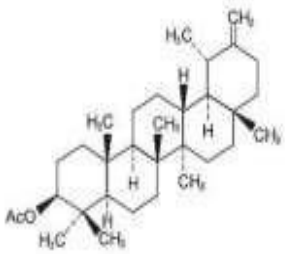
PHARMACOLOGICAL PROPERTIES AND MEDICINAL USE OF *ECHINOPSECHINATUS*:

Antifungalactivity:

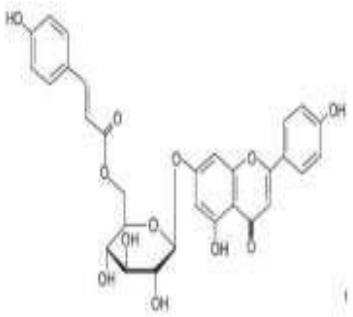
Four phenolic compounds, viz., apigenin, apigenin-7-O-glucoside, echinacin, and echinaticin, were isolated from the whole plant of *Echinops echinatus* Roxb. The latter two compounds were isolated for the first time. The two derivatives echinacinpermethyl ether and apigenin5, 4′-dimethyl ether were obtained by methylation of echinacin and apigenin-7-O-glucoside permethylate, respectively. All the compounds were assayed against germination of conidia of *Alternariatenuissima* (Kunz. ex Pers.) Wiltshire, which incites leaf blight diseasein pigeon pea (*Cajanuscajan*.). All showed high efficacy against the pathogen at concentrations ranging from 25 to 150^{-1}mL μg Echinacin, which was highly effectiveat150^{-1},is consideredthemostpromisingofthesecompoundsanditsuse as a control measure against *Alternaria* blight of pigeon pea under field conditions has been suggested.



Apigenin $R^1=R^2=H$
Apigenin-7-*O*-glucoside $R^1=Glc$, $R^2=R^3=H$

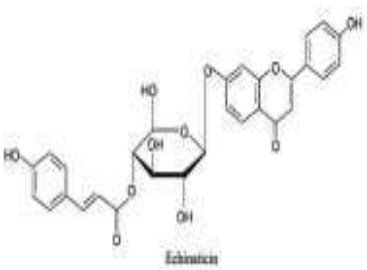


Taraxasterol acetate

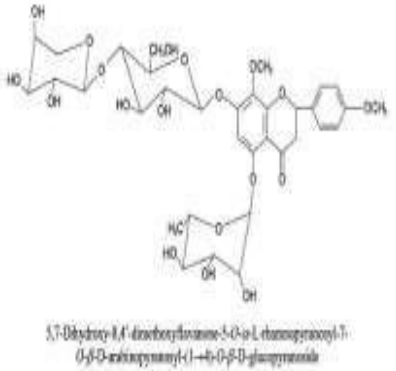


Echinacin

Ethyl palmitate



Echinacin



5,7-Dihydroxy-3,4'-dimethoxyflavanone-5-*O*-α-L-rhamnopyranosyl-7-*O*-β-D-arabinopyranosyl-(1→6)-*O*-β-D-glucopyranoside

Anti-inflammatory:

Anti-inflammatory studies were conducted on an ethanol extract of *Echinops echinatus* whole plant. The extract effectively inhibited the acute inflammation induced in rats by carrageenan, formaldehyde, adjuvant and the chronic arthritis inducedbyformaldehydeandadjuvant.Theextractwasmoreeffectiveparenterally than orally. The toxicity studies showed reasonable safety warranting further studies**.**

Analgesic:

The Analgesic potential of methanolic extracts of the aerial parts and roots was assessed in albino rats using Hot plate, Tail immersion and Tail flick models. The reaction time was the parameter of the study. Pentazocine was used as standard. The results indicate that methanolic extracts at 250 mg/kg and 500 mg/kg body weight shows a significant increase in reaction time when compared to control. Boththeextractsshowsignificant Analgesicactivity.Fromthepresentstudyitmay

be concluded that the constituents present in methanolic extracts may be responsible for Analgesic activity**.**

Diuretic:

The diuretic potential of methanolic extracts of the aerial parts and roots was assessed in albino rats using in-vivo Lipschitz test model. The volumes of urine, urinary concentration of sodium and potassium ions were the parameters of the study.Frusemidewasusedasstandard.Theresultsindicatethatmethanolicextracts at 250 mg/kg and 500 mg/kg bodyweight shows a significant increase in the urine volumeandelectrolyteexcretionwhencomparedtocontrol.Boththeextractsshow significant diuretic activity. From the present study it may be concluded that the constituentspresent in methanolicextractsmay beresponsible for diuretic activity**.**

Protectiveeffect:

E. echinatus extracts attenuated the increase in the prostatic/body weight ratio induced by testosterone. Butanolic fraction of ethanolic extract exhibited the best activity. Testosterone levels measured weekly and prostatespecific antigen (PSA) levels. Further histological studies have shown a considerable improvement in medicine.

CONCLUSION

*Echinopsechinatus*Roxb,hasbeeninusesinceancienttimes totreat widerangeof diseases in traditional system medicine.The present review provides information regarding scientific and conventional use of the plant. It is an attempt to unite the relevant available information of the species and proven its antidiabetic, antihypertensive, analgesic, antiinflammatory, antifungal activity, hepatoprotective,antifertility,antioxidant,diureticandprotectiveeffects.Fromthe above information it is concluded that it is a unique natural product for the developmentofmedicinesagainstvariousdiseasesandalso forthedevelopmentof industrial products.

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