

# ANTIBACTERIAL AND ANTIOXIDANT PROPERTIES OF HYDRO ETHANOL EXTRACT OF *ECHINOPS ECHINATUS* ROOT EXTRACT

Amrat Sareen<sup>1</sup>, Sabahat Abbas<sup>2</sup>

## ABSTRACT

*Echinops echinatus* Roxb is belonging to the Asteraceae family. It is found in Pakistan, India, Afghanistan, and other places. It is also known as Barhamdandi. This plant has gained significant attention due to its broad spectrum of medicinal properties. This study evaluates the antibacterial and antioxidant activities of *Echinops echinatus* root extract. The antioxidant activity was determined using established assays. The results indicate that *Echinops echinatus* root extract exhibits substantial antibacterial effects against both Gram-positive and Gram-negative bacteria, alongside significant antioxidant activity. These findings support the potential use of hydroethanol root extracts in developing natural antimicrobial and antioxidant agents. The evidence presented suggests that *E. spinosissimus* may be a source of phytochemicals with potential health advantages for humans due to its antioxidant and antibacterial qualities, but additional study on this species is required. The antioxidant activity was determined by DPPH (2,2-diphenyl-1-picrylhydrazyl) radical scavenging assay. The concentrations (10, 50, 100, and 200 µg/mL) were added in DPPH solution and incubated in the dark for 30 minutes. The absorbance was measured at 517 nm using a spectrophotometer. The radical scavenging activity was calculated as a percentage of inhibition compared to the control.

**KEYWORDS:** *Echinops echinatus*, Antibacterial Activity, Antioxidant Activity, Root Extract, Natural Remedies

## Authors Affiliation:

<sup>1</sup>Department of Biology, HITEC School and colleges, Taxila Cantt, Rawalpindi.

<sup>2</sup>Indus Hospital Qarshi Foundation Lahore

## Correspondence Author

Email:amratsareen@gmail.com

## INTRODUCTION

*Echinops echinatus* Roxb. is a therapeutic herb that has its place in the Asteraceae family and is found in India's tropical and subtropical regions. Roots are carminative and diuretic, according to the literature, and are used to treat cough. Its roots are in the form of powder blended in Acacia and used to kill the hair lice (1). The root is used as an aphrodisiac and abortifacient (2). The root's infusion is used to treat seminal weakness, erectile dysfunction, and frenzy, while its infusion is used to treat stomachache, TB of lymph nodes in the neck, fever, and syphilis. To expedite the delivery process, a paste made by its roots is applied to the lower abdomen area. Internal use of paste is also recommended for quick and safe delivery (3).

Aphrodisiac qualities can be found in both the plant's roots and seeds (5)(7). Traditional healers in Chhattisgarh use it to cure

Persons who have low libido. 1 hour before intercourse, a root bark paste is administered topically to the male genitals (8,9,10). In addition, aqueous root paste is administered to a pregnant woman's lower abdomen to aid in the birth process. For the same reason, it is also advised for internal use (11). During delivery plant's roots are inserted into the head hairs of pregnant women for easy birth, however, if the roots are not removed immediately after delivery uterus will be eliminated (12). Its roots contain erotic and abortifacient properties. To get rid of roundworms, mix the powder of leaf or extract obtained from its roots with honey and take it early in the morning. Leukorrhea is treated with a mixture of ash from the entire plant and ghee or butter. In Gujarat, people make a base of root bark and use it to treat diabetes. Ash is applied

locally for the treatment of eczema (13). Leaf paste is often applied externally to treat cutaneous papules (14). This plant is used to treat diarrhea in Orissa (15), and an infusion of the entire plant is used as an antipyretic in Maharashtra (16). Fumigation of its roots and leaves is used to treat respiratory disorders; inhaling the smoke can provide symptomatic alleviation for asthmatics. Extract from its roots is useful in the treatment of pertussis. Malaria as well as urinary tract pain is also treated with it. *Echinops echinatus* paste is applied to the soles and palms of the feet to treat heatstroke in Rajasthan (17). This herb is used to treat liver diseases by local inhabitants in Pakistan (18), Bhandara's tribe, and Maharashtra (19).

In the case of scorpion bites, the uncooked root is eaten to alleviate discomfort (20). The whole plant decoction, leaf paste, and leaf powder cure diabetes in Kerala (21). It is used to treat gastrointestinal issues, respiratory illnesses, cardiovascular complaints, and circulatory diseases by the Pashto tribe of Malakand District, Pakistan. The herb is used to treat icterus, frenzy, stomachache, dysphonia as well as cough. Powder from the roots is used to treat the lice.

Moreover, it is used against maggots in livestock wounds (22). Root powder is used to kill lice. Polyuria is treated using a decoction of the root. It's also used as a specific feed for horses to help with their digestive issues (23). Hysteria, dyspepsia, jaundice, and scrofula are among the conditions for which it is prescribed. Colds, whooping cough in youngsters, fever, and wounds have all been claimed to benefit from its roots (24,25). In Ethiopia, it helps with brain disease, persistent fever, migraine, heart disease, urinary infection, worms, and hemorrhoids by increasing hunger and stimulating the liver (26). The plant also shows a lot of pharmacological

activities like anti-inflammatory, antifungal, Hepatoprotective, antioxidant, analgesic, diuretic, reproductive, wound curative, antipyretic, and antibacterial potentials.

## MATERIALS AND METHODS

### Plant Material and Extract Preparation

Fresh *Echinops echinatus* roots were collected from the local area of Bahawalpur City, the roots were thoroughly washed with water and dried under shade. After drying the roots were grounded in an electrical grinder to make a fine powder. 250gm of the powdered drug was taken and soaked in 70% ethanol for 72 hours with occasional stringing. After 72 hours the material was filtered with the filter paper 8. The extract was concentrated under reduced pressure using a rotary evaporator, a semisolid mass was obtained, and weighed for percentage yield. The percentage yield was 1.9%.

### Phytochemical Screening

The extract was evaluated for phytochemical constituents including alkaloids, flavonoids, tannins, saponins, and phenolic compounds, using standard qualitative methods.

### Antibacterial Activity

The disc diffusion method was used to assess the antibacterial activity of plant extracts against bacterial strains. Sterilized filter paper discs (7 mm in diameter) were prepared, with each disc impregnated with specific amounts of the test extracts (50, 100, 150 µg/disc) and placed on nutrient agar plates that had been uniformly inoculated with the test bacteria. Ciprofloxacin (5 µg/disc) served as the positive control, while discs impregnated with only the solvents (followed by evaporation) acted as negative controls. The plates were stored at 4°C for 24 hours to facilitate optimal diffusion of the test substances, after which they were incubated at 37°C for another 24 hours to encourage microbial growth. The antibacterial activity of the test substances was indicated by the formation of a clear zone of inhibition around

the discs. The diameter of these inhibition zones was measured in millimeters using a transparent ruler. The experiment was conducted three times, and the average diameter of the inhibition zones was calculated.

### Antioxidant Activity

#### DPPH Radical Scavenging Assay

The antioxidant activity was determined by DPPH (2,2-diphenyl-1-picrylhydrazyl) radical scavenging assay. The concentrations (10, 50, 100, and 200 µg/mL) were added in DPPH solution and incubated in the dark for 30 minutes. The absorbance was measured at 517 nm using a spectrophotometer. The radical scavenging activity was calculated as a percentage of inhibition compared to the control.

#### Ferric Reducing Antioxidant Power (FRAP) Assay

The FRAP assay was used to evaluate the reducing power of the extract. Different concentration of extract was mixed with FRAP reagent and incubated at 37°C for 30 minutes. The absorbance was measured at 593 nm, and the antioxidant activity was expressed as ascorbic acid equivalents.

## RESULTS

### Phytochemical Screening

The phytochemical analysis revealed the presence of alkaloids, flavonoids, tannins, saponins, and phenolic compounds in the *Echinops echinatus* root extract, indicating a rich composition of bioactive compounds.

### Antibacterial Activity

The *Echinops echinatus* root extract exhibited significant antibacterial activity against all tested bacterial strains. The zones of inhibition increased with the concentration of the extract. *Staphylococcus aureus* showed the largest zone of inhibition (15 mm) at the highest concentration (150 mg/mL), followed by *Bacillus subtilis* (13 mm), *Escherichia coli* (12 mm), and *Pseudomonas aeruginosa* (10 mm).

### Antioxidant Activity

The DPPH radical scavenging activity of the *Echinops Echinatus* root extract increased in a dose-dependent manner, with the highest inhibition of 85% observed at 200 µg/mL. The FRAP assay also demonstrated significant reducing power, correlating with the concentration of the extract.

## DISCUSSION

*Echinops echinatus* Roxb belongs to the Asteraceae family. It is found in Pakistan, India, Afghanistan etc. It is also known as Barhamdandi. It is a pubescent annual herb with 1-3 feet in height and branches spreading widely from the base. It is used in different types of diseases. In impotence, hysteria and seminal debility roots infusion of *Echinops echinatus* are used. It is also used as an aphrodisiac and abortifacient. The plant also shows a lot of pharmacological activities like anti-inflammatory, antifungal, Hepatoprotective, antioxidant, analgesic, diuretic, reproductive, wound curative, antipyretic, and antibacterial potentials. The *Echinops echinatus* root extract exhibited significant antibacterial activity against all tested bacterial strains. The zones of inhibition increased with the concentration of the extract. *Staphylococcus aureus* showed the largest zone of inhibition (15 mm) at the highest concentration (150 mg/mL), followed by *Bacillus subtilis* (13 mm), *Escherichia coli* (12 mm), and *Pseudomonas aeruginosa* (10 mm). The antioxidant activity was determined by DPPH (2,2-diphenyl-1-picrylhydrazyl) radical scavenging assay. The concentrations (10, 50, 100, and 200 µg/mL) were added in DPPH solution and incubated in the dark for 30 minutes. The absorbance was measured at 517 nm using a spectrophotometer. The radical scavenging activity was calculated as a percentage of inhibition compared to the control.

## CONCLUSION

The study concludes that *Echinops echinatus* root extract exhibits significant

antibacterial and antioxidant activities, supporting its traditional use in medicine. Further research is needed to isolate and characterize the specific bioactive compounds responsible for these activities and to explore their potential therapeutic applications in clinical settings.

#### **DECLARATION**

#### **INFORMED CONSENT**

Not Applicable.

#### **FUNDING**

There is no funding for this research

#### **CONFLICTS OF INTEREST/COMPETING INTERESTS**

There is no conflict of interest among the authors

#### **AVAILABILITY OF DATA AND MATERIAL**

Data will be provided on demand

#### **AUTHORS' CONTRIBUTIONS**

All authors contributed equally

#### **ETHICS APPROVAL**

Not Applicable

#### **CONSENT TO PARTICIPATE**

Not Applicable

#### **CONSENT FOR PUBLICATION**

All authors agreed to the Publication

#### **REFERENCES**

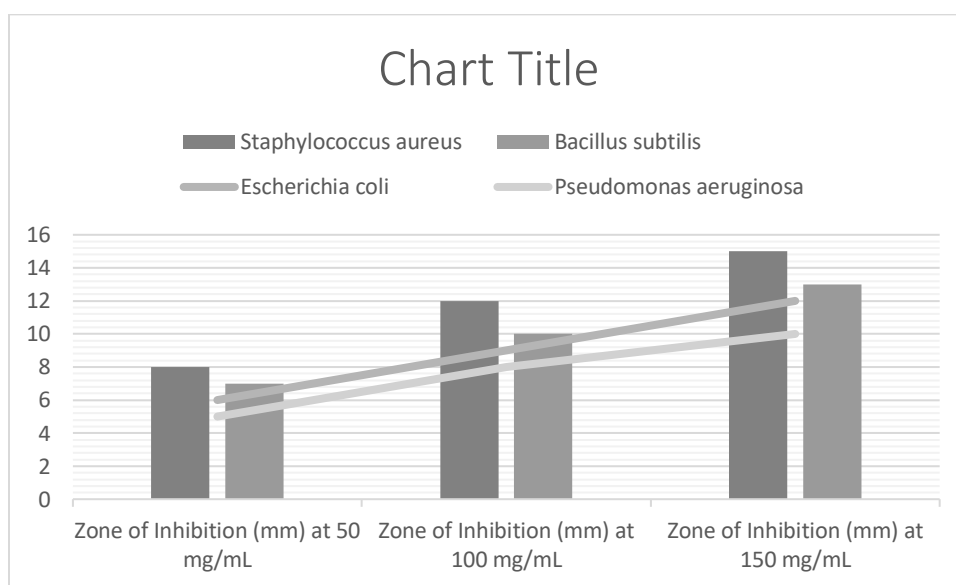
1. Afzal S, Afzal N, Awan MR, Khan TS, Gilani A, Khanum R, Tariq S. Ethnobotanical studies from Northern Pakistan. *J Ayub Med Coll Abbottabad*. 2009 Mar 1;21(1):52-7.
2. Kakrani HN, Kakrani BH, Saluja AK. Traditional treatment of diabetes through herbs in Kutch district, Gujrat state. *Planta Medica*. 2005;1(1):16-21.
3. Khan AS, Khan AS. Aphrodisiac and Abortifacient Activities of Important Trees. *Medicinally Important Trees*. 2017:187-209.
4. Verma N. Medicinal as well as sacred plants of Bilaspur town, district Rampur (Uttar Pradesh). *Bulletin of Pure & Applied Sciences-Botany*. 2018;37(2):67-78.
5. Patel AJ, Patel NM, Patel AA, Patel J, Patel S. Comparative diuretic activity of root and aerial part methanolic extracts of *Echinops echinatus* Roxb. *Der Pharmacia Lettre*. 2011 Nov 30;3(5):168-72.
6. Ghatapanadi SR, Johnson N, Rajasab AH. Documentation of folk knowledge on medicinal plants of Gulbarga district, Karnataka.
7. Qureshi R, Bhatti GR, Memon RA. Ethnomedicinal uses of herbs from the northern part of Nara desert, Pakistan. *Pak J Bot*. 2010 Apr 1;42(2):839-51.
8. Somashekar AP, Mishra SH. PHCOG MAG.: Research Article Pharmacognostic Parameters for Evaluation of the Roots of *Echinops echinatus* marketed as Brahmadandi. *Phcog Mag*. 2007 Oct;3(12):196.
9. Patil Sunil J, Patil HM. Ethnomedicinal herbal recipes from Satpura hill ranges of Shirpur Tahsil, Dhule, Maharashtra, India. *Research Journal of Recent Sciences*, ISSN. 2012;2277:2502.
10. Yesodharan K, Sujana KA. Ethnomedicinal knowledge among Malamalar tribe of Parambikulam wildlife sanctuary, Kerala.
11. Patil HM. Ethnobotanical notes on Satpura hills of Nandurbar district, Maharashtra, India. *Research Journal of Recent Sciences*, ISSN. 2012;2277:2502.
12. Sharma L, Khandelwal S. Traditional uses of plants as cooling agents by the tribal and traditional communities of Dang region in Rajasthan, India. *Ethnobotanical Leaflets*. 2010;2010(2):9.
13. Panhwar AQ, Abro HI. Ethnobotanical studies of Mahal Kohistan (Khirthar National Park). *Pak. J. Bot*. 2007 Dec 1;39(7):2301-15.

14. Rakhi Gupta RG, Vairale MG, Deshmukh RR, Chaudhary PR, Wate SR. Ethnomedicinal uses of some plants used by the Gond tribe of Bhandara district, Maharashtra.
15. Gayake DN, Awasarkar UD, Sharma PP. Indigenous Traditional Medicinal Plant Resources from Ahmednagar District, Maharashtra, India. *Asian Journal of Biomedical and Pharmaceutical Sciences*. 2013 Jul 1;3(22):1.
16. Jayakumar G, Ajithabai MD, Sreedevi S, Viswanathan PK, Remeshkumar B. Ethnobotanical survey of the plants used in the treatment of diabetes.
17. Murad W, Ahmad A, Gilani SA, Khan MA. Indigenous knowledge and folk use of medicinal plants by the tribal communities of Hazar Nao Forest, Malakand District, North Pakistan. *Journal of Medicinal Plants Research*. 2011 Apr 4;5(7):1072-86.
18. Qureshi RA, Ghufuran MA, Sultana KN, Ashraf M, Khan AG. Ethnomedicinal studies of medicinal plants of Gilgit District and surrounding areas. *Ethnobotany Research and Applications*. 2007 Dec 31;5:115-22.
19. Dadhich LK, Sharma N, Dadhich I. Medicinal plants in an urban environment: Study of some important medicinal plants in the urban area of Kota, Rajasthan. *Int Res J*. 2010;1:85-6.
20. Patel AJ, Patel NM, Patel AA, Patel J, Patel S. Comparative diuretic activity of root and aerial part methanolic extracts of *Echinops echinatus* Roxb. *Der Pharmacia Lettre*. 2011 Nov 30;3(5):168-72.
21. Padashetty SA, Mishra SH. Effect of terpenoidal fraction of *Echinops echinatus* roots on reproductive parameters of male rats. *Journal of natural medicines*. 2007 Oct;61:452-7.
22. Eram S, Ahmad M, Arshad S. Experimental evaluation of *Echinops echinatus* as an effective hepatoprotective. *Scientific Research and Essays*. 2013 Oct 18;8(39):1919-23.
23. Rudrappa JN, Mohmoud R. Free radical scavenging activity of *Echinops echinatus* Roxb, root.
24. Agrawal M, Nahata A, Dixit VK. Protective effects of *Echinops echinatus* on testosterone-induced prostatic hyperplasia in rats. *European Journal of Integrative Medicine*. 2012 Jun 1;4(2):e177-85.
25. Nahata A, Dixit VK. Evaluation of 5 $\alpha$ -reductase inhibitory activity of certain herbs useful as antiandrogens. *Andrologia*. 2014 Aug;46(6):592-601.
26. Zaheer M, Hussain N, Rahman S. Anti Irritant Activity of Extract from the Aerial Parts of *Echinops echinatus* Compositae: Anti Irritant Activity of *Echinops echinatus*. *Biological Sciences-PJSIR*. 2012 Oct 29;55(1):40-5.

## Tables for Results

**Table 1: Antibacterial Activity of *Echinops echinatus* Root Extract**

Bacterial Strain	Zone of Inhibition (mm) at 50 mg/mL	Zone of Inhibition (mm) at 100 mg/mL	Zone of Inhibition (mm) at 150 mg/mL
<i>Staphylococcus aureus</i>	8	12	15
<i>Bacillus subtilis</i>	7	10	13
<i>Escherichia coli</i>	6	9	12
<i>Pseudomonas aeruginosa</i>	5	8	10



**Table 2: Antioxidant Activity (DPPH Assay) of *Moringa oleifera* Root Extract**

Concentration of Extract ( $\mu\text{g/mL}$ )	Percentage Inhibition (%)
10	35
50	50
100	70
200	85

