

Phytochemical Analysis, Antioxidant Activity and Biological Profiling of Prosopis Cineraria

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ABSTRACT

Introduction: Various natural sources are being explored for their therapeutical potential and nutritional significance. Among those, plants are an importantly used in ethnomedicinal purpose and are being investigated for their pharmacological potential in the management of human diseases. *Prosopis cineraria* (*P. cineraria*) is a member of the fabaceae plant family. It possesses a diverse of pharmacological activities, nutritional significance, and is extensively found in dry and arid regions [1] *P. cineraria* is primarily found in the Thar Desert of Pakistan and India, with lower-density in Arabian Peninsula, Iran and Afghanistan. It is commonly identified as Khejri, Ghaf, and Jand in India, Arabic-speaking regions and Pakistan, respectively [2]. It is conventionally utilized in several areas of Pakistan, such as the Thar Desert of Sindh and the Bahawalnagar and the Hafizabad of Punjab province. The pod, bark, leaves and stem of this plant are used in the management of health-related issues such as liver infections, diabetes, dysentery, urolithiasis, spasms and other diseases [3].

Objective: The present study was carried out to investigate the phytochemical content (total phenolic and flavonoid content), antioxidant activity through multiple assays, pharmacological potential, and anti-microbial potential of different parts of *P. cineraria*, significantly important plant from the Thar Desert, Sindh.

Methodology: All plant parts were collected, washed to remove the dirt, shade-dried, and coarse powder was prepared using grinder. Afterward, crude methanolic extract was prepared through maceration procedure. Total phenolic content and total flavonoid contents were investigated through colorimetric methods such as Folin-Ciocalteu- and aluminum chloride-procedures, respectively [4]. Gallic acid was used standard for phenolic compounds and quercetin was used as standard compounds flavonoids. Multimode antioxidant methods included 2,2-diphenyl-1-picrylhydrazyl (DPPH) scavenging potential, total antioxidant capacity using the ammonium molybdate method, and total reducing potential using the potassium ferricyanide method [4]. Ascorbic acid was used as standard compound for antioxidant assays. The toxicity of the *P. cineraria* samples was determined through the brine shrimp assay and hemolytic activity [5]. TritonX-100 was used as positive control for hemolytic activity. Antimicrobial activity was investigated through agar-well diffusion procedure against gram-negative bacterial strains (*Proteus mirabilis* and *E. coli*) and gram-positive bacterial (*Bacillus spp* and *S. aureus*). Ciprofloxacin was used as standard drug in antibacterial activity. The experiments were carried out in triplicate, repeated three times, and results are shown as mean $\pm$ standard deviation. Statistical analysis was carried out using GraphPad Prism software (Grahpad Software, Inc. version 8.3.0) through analysis of variance (ANOVA) followed by Tukey's test to assess the significance of differences among groups, with $p < 0.05$ considered statistically significant.

Key Findings: Phytochemical investigations demonstrated the distinct distribution of phytochemical content in different parts of *P. cineraria*. The present study exhibited significantly higher phenolic content in the Bark (17.59 ± 1.47 mg gallic acid equivalents per gram of extract sample). Leaves (37.61 ± 2.0 mg

Quercetin equivalents per gram of extract sample) showed the presence of higher total flavonoids contents among all samples. Among all investigated parts, the stem demonstrated higher antioxidant activity as evidenced by multiple antioxidant methods. The antioxidant results of the stem showed total reducing power, DPPH scavenging capacity, and total antioxidant potential as 52.42 ± 2.85 mg Ascorbic acid equivalents per gram of extract sample, $54.79 \pm 3.15\%$ free radical scavenging, and 29.40 ± 1.27 mg Ascorbic acid equivalents per gram of extract sample, respectively. In anti-bacterial activity assessment, the pod was active against *E. coli* (18 ± 2 mm zone of inhibition) and *S. aureus* (12 ± 2 mm zone of inhibition) strains, whereas leaves showed activity against *P. mirabilis* (12 ± 1 mm zone of inhibition) strain. All parts of this plant were found to be nontoxic and biocompatible as inspected through brine shrimp assay and hemolysis assays.

Conclusion: The present project signifies the importance of *P. cineraria* as a reservoir of phytochemicals and bio-functionalities, including antioxidant, antimicrobial capabilities, and non-toxic towards human red blood cells, which highlights its therapeutical potential. However, comprehensive studies are suggested to explore bioactive constituents along with their related mechanisms in other experimental models. This will be advantageous in improving health in underprivileged desert areas.

Keywords: *Prosopis cineraria*, Antioxidant Activity, Phytochemicals, Antimicrobial Activity.

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