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ASSESSMENT OF ANTIMICROBIAL AND ANTIOXIDANT ACTIVITY OF *JUSTICIA CALIFORNICA*

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ABSTRACT

The present study focused on the exotic plant species *Justicia californica*, which is a native species of California. Phytochemicalanalysis was performed, which showed the presence of alkaloids, aminoacids, carbohydrates, glycosides, phlobatannins, and tannins in the root extract of *J.californica*, whereas amino acids, carbohydrates, and tannins were present in leaf and stems extract. In roots, 9.46%, and in leaf and stem, 13.35% flavonoids were found. Phenolics were found to be key phytochemicals, playing a role in antioxidant activity, which are about 8% in the sample of roots and 11.4% in the extract of leaf and stems. The DPPH assay, reducing power, and antibacterial assay was also tested, which showed the scavenging and antibacterial activity of *J. californica*. Thus, the preliminary study of *Justicia* species concluded that it can be used for medicinal purposes.

Keywords: antibacterial activity, phytochemicals, Inhibitory zones, *Justicia sp.,* crude methanolic extract (CME), DPPH Assay, Reducing Power.

INTRODUCTION

Justicia californica is a flowering shrub species and belongs to the family Acanthaceae. Acanthaceae includes 4000 species and 221 genera. This is part of the order Lamiales. Plants in the family Acanthaceae have sympetalous corolla and four stamens. In the family Acanthaceae, *Justicia* is a genus of plants which have flowers with different color variations. It contains 420 species. *Justicia californica* is native to the deserts of Southern Arizona and Northern Mexico, and is commonly known as chuparosa, hummingbird bush, and beloperone. It is distributed in the hot regions, deserts, sandy places, and on rocky slopes. The special characteristics of *J. californica* are that their flowers are multi-colored and edible, either raw or cooked. It is a popular ornamental plant and grows in gardens. The growth rate depends on the amount of supplemental water applied. The plant can tolerate the dry conditions and grow in 10 inches or less of annual rainfall. This preliminary study was designed to check the antimicrobial activity, scavenging, and reducing activity of *J. californica*. Besides this, phytochemicals, phenolics, and flavinoids were also determined.

MATERIAL AND METHODS

Disc diffusion method (Pa and Mathew, 2012) was used to check the antimicrobial activity of methanolic extracts against three bacterial strains: *Staphylococcus aureus, Pseudomonas aeruginosa* and *Escherichia coli*. The roots and aerial parts of *J. californica* were separately crushed into a fine powder. Roots and aerial parts of plant extract were prepared in methanol. The inoculums were prepared carefully in sterile conditions and were placed in the Orbital Shaker (OS-209 Technico) for 24 hours. Afterwards, they

were stored in a refrigerator. Bacteria were inoculated into broth media and incubated at 37ºC for 24 hours. Discs were prepared by using Whatmann No.1 filter paper. These discs were first autoclaved and kept in a Laminar Hood to avoid the contamination. The culturing plates were prepared by pouring autoclaved LB media in Petri plates. On the culture plates, sterile discs were placed. The following concentrations of aerial and root extracts of *J. californica* were loaded on the discs for assay: 1000 ppm, 100 ppm, 10 ppm, 1 ppm, and 0.1 ppm. For each organism, two replicate trials were conducted. DMSO (Dimethyl sulfoxide) was used as blank and Roxithromycin (antibiotic) was used as a positive control. The plates were incubated for 24 hours and the antimicrobial activity of *J. californica* was determined by the measurement of the zone of inhibitions that were formed around the paper discs. Antioxidant activity, phytochemical analysis, phenolics, and flavonoids tests were also performed by using the extracts of roots and aerial parts of *J. californica.* For phenolics and flavonoids analysis, protocols of Wolfe *et al*. (2003) and Ordenoz *et al*. (2006), respectively, were followed,while phytochemical analysis was carried out by following the protocol of Sofowora (1993), Harborne (1998) and Kokate (2008).

RESULT AND DISCUSSION

The plant extracts were made in methanol. The crude methanolic extract (CME) was used for antimicrobial assay. The zones of inhibition formed around the discs were measured (Table 1 and 2), which showed the antibacterial activity of *J. californica.*

According to Fujii *et al.* (1990; 1991; 2003), plants grown in different habitats have different biological potential. *Justicia californica* contains some components that have the biological activity of phenolic acids and flavonoids. Approximately 12% phenolics were present in the CME of leaf and stem and 8% phenolics were present in the CME of roots of *J. californoca.* Corresponding glycosides were also found in *J.californica,* which are used in the treatment of heart disease (Miliauskas *et al*. 2004 and Dai *et al*. 2010). CME of aerial parts of *Justicia californica* had 13.35% flavonoids while CME of roots contained 9.46% flavonoids. *J.californica* also showed the scavenging activity of aerial parts. The highest value was of concentration 10 µg/µL while the lowest activity was shown in 0.25 µg/µL. The reducing ability of the CME of roots was 65.1 µg and of aerial parts was 51.1µg. Reducing properties are generally associated with the presence of reductones (Duh *etal*. 1999). Qualitative tests indicated the presence of different components (Table 3).

Thus, *J. californica* tends to have antimicrobial activity and also contains phytochemicals, flavonoids, and phenolic compounds. It also showed scavenging and reducing activity. Thus, it is medicinally important plant species.

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Table 1: Inhibitory zones in mm of root extracts of *J. californica.*

Strains	250 ppm	100 ppm	10 ppm	1 ppm	+ve control	-ve control
E. coli	2.0±0	1.0±0	1.5±0.7	1.0±0	24±1.4	0
S. aureus	1.5±0.7	1.0±0	0.5±0.7	0.5±0.7	34±2.8	0
P.aerogenosa	2.0±1.4	1.0±0	1.0±0	1.0±0	21±2.8	0

Table 2: Inhibitory zones in mm of leaf and stem extracts of *J. californica.*

Strains	250 ppm	100 ppm	10 ppm	1 ppm	+ve control	-ve control
E. coli	2.0±0	1.0±0	1.5±0.7	1.5±0.7	21±0	0
S. aureus	2.5±2.1	1.0±0	1.0±0	1.0±0	31±0	0
P. aerogenosa	4.0±2.8	2.0±1.	1.5±0.7	1.5±0.7	13±0	0

Table 3: Results of qualitative phytochemical tests performed.

No.	Phytochemicals	Roots	Leaf & Stem
1	Amino acids	+	+
2	Anthraquinones	_	_
3	Carbohydrates	+	+
4	Glycosides	+	_
5	Phlobatannins	+	_
6	Saponins	_	_
7	Steroids	+	_
8	Tannins	+	+

(+) sign indicating the compounds which are present whereas (-) sign indicates the compounds which are absent**.**

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