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Total Phenolics and Flavonoids in Selected *Justicia* Species

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ABSTRACT

The phenolics and Flavonoids content of six *Justicia* species were determined in the present study. The phenolic content was determined using Folin-Ciocalteu assay. The total flavonoids were measured spectrophotometrically using the aluminum chloride colorimetric assay. The results showed that the different parts of selected *Justicia* species contain significant amount phenolics and flavonoids. The highest phenolic content was showed by leaf of *J. adhatoda* (38.75 mg GAE) and the least phenolics were observed for root of *J. beddomei* (22.65 mg GAE). In the case of flavonoids, maximum value was obtained for leaf of *J. betonica* (2.86 mg QE) and least flavonoid content was showed by root of *J. adhatoda* (1.25 mg QE).

Keywords: Phenolics, Flavonoids, Plant Extracts

1. Introduction

Phenolics are the largest group of phytochemicals that account for most of the anti-oxidant activity in plants or plant products. Flavonoids are the naturally occurring phenolic compounds, which occurs in different plant parts both in Free State and as glycosides. They are found to have many biological activities including antimicrobial, mitochondrial adhesion inhibition, antiulcer, antiarthritic, antiangiogenic, anticancer, protein kinase inhibition etc. The Flavonoids have two benzene rings separated by a propane unit. The flavones and flavonols are the most widely distributed of all the phenolics [1]. A variety of dietary plant Flavonoids inhibits tumour development in experimental animal models. The biflavonoids have the pharmacological effects like their ability to inhibit the release of histamines, the adhesion of blood platelets and the action of lens aldose reductase, to block the inflammatory effects of hepatotoxins, and to act as a heart stimulant [2].

The Acanthaceae family is an important source of therapeutic drugs and the ethnopharmacological knowledge of this family requires urgent documentation as several of its sps. are near extinction [3,4]. *Justicia* is the largest genus of Acanthaceae with approximately 600 species [5]. Various species of *Justicia* have been used variously for treating a variety of ailments by various tribal people [6]. Based on the strong evidence of biological activities of phenolic compounds, the study was focused on determination of total phenolics and Flavonoids in different parts of selected *Justicia* species such as *J. adhatoda*, *J. beddomei*, *J. betonica*, *J. gendarussa*, *J. montana* and *J. wynaadensis*.

2. Materials and Methods**2.1 Plant material**

The plant materials used in this study were originally collected from various parts of Western Ghats, South India, and are being maintained at Herb Garden, Arya Vaidya Sala, Kottakka, and Kerala and authenticated by the Plant Systematics and Genetic Resources division of Centre for Medicinal Plants Research, AVS, Kottakkal.

2.2 Sample Preparation

5 g each of the different parts such as root, stem and leaf were pulverized into coarse powder and subjected to alcoholic (methanol) extraction using reflux extraction method. The extracts were concentrated and final volume was made up to 50 ml in standard flasks.

2.3 Total Phenolic assay

The total phenolics content were determined using the Folin-Ciocalteu assay [7]. An aliquot (1 ml) of extracts or standard solution of Gallic acid (20, 40, 60, 80 and 100 µg/ml) was added to 25 ml of volumetric flask, containing 9 ml of distilled water. A reagent blank using distilled water was prepared. 1 ml of Folin-Ciocalteu phenol reagent was added to the mixture and shaken. After 5 minutes 10 ml of 7 % Na₂CO₃ solution was added to the mixture. The volume was then made up to the mark. After incubation for 90 minutes at room temperature, the absorbance against the reagent blank was determined at 550 nm with an UV-Visible spectrophotometer. Total phenolics content was expressed as mg Gallic Acid Equivalents (GAE).

2.4 Total Flavonoid Assay

Total flavonoid content was measured by the aluminium chloride colorimetric assay [8]. An aliquot (1ml) of extracts or standard solutions of quercetin (20, 40, 60, 80 and 100 µg/ml) was added to 10 ml volumetric flask containing 4 ml of distilled water. To the flask was added 0.30 ml 5 % NaNO₂, after five minutes 0.3 ml 10 % AlCl₃ was added. After five minutes, 2 ml IM NaOH was added

and the volume was made up to 10 ml with distilled water. The solution was mixed and absorbance was measured against the blank at 510 nm. The total flavonoid content was expressed as mg Quercetin Equivalents (QE).

3. Results and Discussion

The results for total phenolic and total flavonoid content are presented in Table 1. The results showed that the various parts such as root stem and leaf of selected *Justicia* species are rich sources of phenolics. The highest TPC was observed for leaf of *J. adhatoda* (38.75 mg GAE) and the least phenolics were observed for root of *J. beddomei* (22.65 mg GAE). In the case of flavonoids, maximum value was obtained for leaf of *J. betonica* (2.86 mg QE) and least flavonoid content was showed by root of *J. adhatoda* (1.25 mg QE). Among the various parts analysed leaf extracts showed maximum phenolic contents for all the six species and it follows the order *J. adhatoda* (38.75 mg GAE) > *J. gendarussa* (36.78 mg GAE) > *J. wynaadensis* (35.85 mg GAE) > *J. beddomei* (35.20 mg GAE) > *J. betonica* (30.90 mg GAE) > *J. montana* (29.80 mg GAE).

Table 1: Total contents of phenolics and flavonoids in various plant parts of different species of *Justicia*.

Species	Plant part	Total phenolics mg GAE/100 g	Total Flavonoids mg QE/100 g
<i>J. adhatoda</i>	Root	28.78	1.25
	Stem	32.50	2.20
	Leaf	38.75	2.80
<i>J. beddomei</i>	Root	22.65	1.80
	Stem	26.85	2.50
	Leaf	35.20	2.80
<i>J. betonica</i>	Root	26.85	2.30
	Stem	29.60	2.10
	Leaf	30.90	2.86
<i>J. gendarussa</i>	Root	30.84	1.65
	Stem	28.35	1.35
	Leaf	36.78	2.40
<i>J. montana</i>	Root	25.68	2.34
	Stem	28.56	2.20
	Leaf	29.80	1.89
<i>J. wynaadensis</i>	Root	23.95	1.75
	Stem	25.36	2.30
	Leaf	35.85	2.85

The variation of phenolic and flavonoid content may be due to various reasons. There is a positive correlation between phenolic content and free radical scavenging activity [9]. The present investigation showed that the selected six species are rich source of naturally occurring antioxidant phenolic compounds.

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