

## SPECTROPHOTOMETRIC ESTIMATION OF TOTAL ALKALOIDS IN SELECTED *JUSTICIA* SPECIES

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### ABSTRACT

**Objective:** The objective of the present study was to determine the total alkaloid content in selected *Justicia* species such as *J. adhatoda*, *J. beddomei*, *J. betonica*, *J. gendarussa*, *J. montana* and *J. wynaadensis*

**Methods:** The total alkaloid content (TAC) was estimated spectrophotometrically using Bromocresol green method with caffeine as standard.

**Results:** The results showed that various parts like root, stem and leaf of the selected species are rich source of alkaloids. The leaf extract of *J. beddomei* showed highest alkaloid content (28.53) and root of *J. wynaadensis* showed least alkaloid content (8.45). Among the various parts analyses leaf extracts exhibited higher alkaloids.

**Conclusion:** The total alkaloid content of various species of *Justicia* with respect to the different parts was well established by spectrophotometric studies. The comparative estimation of total alkaloid in the selected species was done for the first time which can be used for further chemical and biological studies in these species.

**Keywords:** *J. waynadensis*, Alkaloids, *Justicia*, Spectrophotometer

### INTRODUCTION

*Justicia* is the largest genus of Acanthaceae with approximately 600 species. Various species of *Justicia* have been used variously for treating a variety of ailments by various tribal people. 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* [1].

Alkaloids are a diverse group of low-molecular-weight, nitrogen-containing compounds found in about 20% of plant species. The potent biological activity of some alkaloids has also led to their exploitation as pharmaceuticals, stimulants, narcotics, and poisons. Plant-derived alkaloids currently in clinical use include the analgesics morphine and codeine, the anticancer agents vinblastine and taxol, the gout suppressant colchicine, the muscle relaxant (C)-tubocurarine, the antiarrhythmic ajmaline, the antibiotic sanguinarine, and the sedative scopolamine. Other important alkaloids of plant origin include caffeine, nicotine, cocaine, and the synthetic O, O-acetylated morphine derivative heroin [2]

Based on the strong evidence of biological activities of plant alkaloids, the study was focused on determination of total alkaloid contents of selected *Justicia* species.

### MATERIALS AND METHODS

#### Plant Material

The plant materials were collected from Herb garden of Arya Vaidya Sala, Kottakkal, Kerala, India and authenticated by Taxonomy division of Centre for Medicinal Plants Research, Arya Vaidya Sala, Kottakkal, Kerala

#### Determination of Total Alkaloids

**Extraction:** The plant materials (100g) were ground and then extracted with methanol for 24 h in a continuous extraction (soxhlet) apparatus. The extract was filtered and methanol was evaporated on a rotary evaporator under vacuum at a temperature of 45°C to dryness. A part of this residue was dissolved in 2 N HCl

and then filtered. One ml of this solution was transferred to a separatory funnel and washed with 10 ml chloroform (3 times). The pH of this solution was adjusted to neutral with 0.1 N NaOH. Then 5 ml of BCG solution and 5 ml of phosphate buffer were added to this solution. The mixture was shaken and the complex formed was extracted with 1, 2, 3, and 4 ml chloroform by vigorous shaking. The extracts were collected in a 10-ml volumetric flask and diluted to volume with chloroform

**Preparation of solutions:** Bromocresol green solution was prepared by heating 69.8 mg bromocresol green with 3 ml of 2N NaOH and 5 ml distilled water until completely dissolved and the solution was diluted to 1000 ml with distilled water. Phosphate buffer solution (pH 4.7) was prepared by adjusting the pH of 2 M sodium phosphate (71.6 g Na<sub>2</sub>HPO<sub>4</sub> in 1 L distilled water) to 4.7 with 0.2 M citric acid (42.02 g citric acid in 1 L distilled water). Caffeine standard solution was made by dissolving 1mg pure atropine (Sigma Chemical, Bangalore) in 10 ml distilled water.

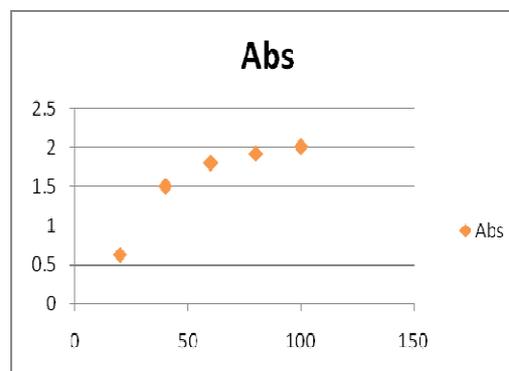


Fig. 1: Calibration curve (Caffeine)

#### Preparation of standard curve

Accurately measure aliquots (0.4, 0.6, 0.8, 1 and 1.2 ml) of caffeine standard solution and transfer each to different separatory funnels. Then, add 5 ml pH 4.7 phosphate buffers and 5 ml BCG solution and

shake a mixture with 1, 2, 3 and 4 ml of chloroform. The extracts were collected in a 10-ml volumetric flask and then diluted to adjust volume with chloroform. The absorbance of the complex in chloroform was measured at 470 nm against blank prepared as above but without caffeine [3].

## RESULTS AND DISCUSSION

The results for total alkaloid content (TAC) in the different parts of the various *Justicia* species are presented in the table 1.1. TAC was expressed in milligram caffeine equivalent (mg CE).

**Table 1: Total alkaloids in various parts of selected *Justicia* species**

| S. No. | Species selected       | Part investigated | Total alkaloids mg CE/100 g |
|--------|------------------------|-------------------|-----------------------------|
| 1      | <i>J. adhatoda</i>     | Root              | 16.2±0.10                   |
|        |                        | Stem              | 12.0±0.12                   |
|        |                        | Leaf              | 23.58±0.16                  |
| 2      | <i>J. beddomei</i>     | Root              | 12.8±0.13                   |
|        |                        | Stem              | 14.5±0.18                   |
|        |                        | Leaf              | 28.53±0.24                  |
| 3      | <i>J. betonica</i>     | Root              | 16.24±0.18                  |
|        |                        | Stem              | 12.63±0.46                  |
|        |                        | Leaf              | 26.18±0.12                  |
| 4      | <i>J. gendarussa</i>   | Root              | 13.50±0.14                  |
|        |                        | Stem              | 18.42±0.26                  |
|        |                        | Leaf              | 18.98±0.18                  |
| 5      | <i>J. santapau</i>     | Root              | 15.52±0.17                  |
|        |                        | Stem              | 12.82±0.24                  |
|        |                        | Leaf              | 22.53±0.14                  |
| 6      | <i>J. wayanadensis</i> | Root              | 8.45±0.13                   |
|        |                        | Stem              | 15.60±0.18                  |
|        |                        | Leaf              | 26.96±0.15                  |

The results showed that the leaf extract of *J. beddomei* showed highest alkaloid content (28.53mg CE) followed by leaf extract of *J. wynaadensis* (26.96 mg CE) and *J. betonica* (26.18 mg CE). The root of *J. wynaadensis* showed least alkaloid content (8.45 mg CE). The higher alkaloid content was revealed in the leaves. The alkaloid content was varied with respect to the parts analysed.

## CONCLUSION

The present study revealed the alkaloid contents of different parts of six *Justicia* species which are medicinally important plants. The comparative evaluation of total alkaloid content is the first report for these selected plants.

## REFERENCES

1. Biju John, VRK Reddy, Sulaiman C T. Total Phenolics and Flavonoids in Selected *Justicia* Species. Journal of Pharmacognosy and Phytochemistry 2013; 2 (4): 51-52
2. Peter J Facchini Annu. Rev. Plant Physiol. Plant Mol. Biol. 2001. 52:29-66
3. Fazel Shamsa, Hamidreza Monsef, Rouhollah Ghamooshi and Mohammadreza Verdian-rizi Spectrophotometric determination of total alkaloids in some Iranian medicinal plants, Thai J. Pharm. Sci. 32 (2008) 17-20