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RESEARCH ARTICLE

Total Phenolics and Flavonoids among The Selected Species of *Syzygium*, Gaertn.

Dr. D. Sheela, Maria Cheenickal*
Department of Botany, St.Teresa's College, Ernakulam, Kerala, India
*Corresponding Author E-mail: **mariacheenikkal@gmail.com, sheelaajayaghosh@gmail.com**

ABSTRACT:
Total phenolics and flavonoids contents among the selected species of *Syzygium,* Gaertn. of family Myrtaceae such as *Syzygium aqueum* Alston, *Syzygium cumini* (L.) Skeels, *Syzygium jambos* L.(Alston), *Syzygium malaccense* (L.) Merr. and L. M. Perry and *Syzygium samarangense* (Blume) Merrill and Perry were evaluated in the present investigation. The total phenolic content and flavonoid content was analyzed using spectrophotometer. The results revealed that *Syzygium* leaves were rich source of phenolic compounds and flavonoids than the *Syzygium* barks. Among the species, more phenolic content were found in *Syzygium cumini* leaves which is well known for diabetes treatment whereas the total flavonoid content was found to be prominent in *Syzygium samarangense* leaf , which possess antipyretic and diuretic property.

KEYWORDS: Total Phenolics Content, Total Flavonoid Content, *Syzygium aqueum* Alston, *Syzygium cumini* (L.) Skeels, *Syzygium jambos* L. (Alston), *Syzygium malaccense*(L.) Merr. and L. M. Perry and *Syzygium samarangense* (Blume) Merrill and Perry.

1. INTRODUCTION:

Syzygium, Gaertn. belonging to the Family Myrtaceae. *Syzygium aqueum* Alston known as the water jambu or water apple. Various parts of this plant have been used in traditional medicine and in particular as an antibiotic[1]. In Malaysia, the powdered dried leaves are used to treat cracked tongue and a preparation of its root has been used to relieve itching and reduce swelling[2]. Recently, *S. aqueum* Alston leaf extracts were used as cosmoceutic, antioxidant, antityrosinase, lipolytic and anticellulite activities[3]. *Syzygium cumini* (L.) Skeels is a large evergreen tree. It has been valued in Ayurveda and Unani system of medication for possessing variety of therapeutic properties such as antibacterial[4], antidiarrhoea effects[5] and anti-inflammatory activity of leaf and barks [6,7].

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Syzygium jambos L. (Alston) "rose apple", is an ornamental fruit tree .This medicinal plant is used to treat diabetes, inflammation, and gastrointestinal disorders [8, 9]. *Syzygium samarangense* (Blume) Merrill and Perry commonly known as 'makopa' is grown throughout Philippines for its fruits. The tree is used as an antipyretic and a diuretic [10]. Four flavonoids isolated from hexane extract of *S. samarangense* (Blume) Merrill and Perry showed dose-dependent spasmolytic activity [11]. An earlier study reported that the methanol extract of makopa leaves exhibited high antidiabetic activity[12]. *Syzygium malaccense* (L.) Merr. and L. M. Perry commonly known as Malay rose apple, Malay apple or mountain apple. The bark of Mountain Apple is traditionally used for medicine. The leaves are also used for medicine. Young leaves from saplings and the bark from mature trees are given as warm drink for the mother of a newborn baby, which helps for expelling the afterbirth and to cleanse the mother's body after giving birth or even after a miscarriage. The decoction of leaves is a good tonic, and the old fruit of this plant was

considered as remedy for sore throats. Seeded fruits, seeds, bark and leaves have shown antibiotic activity and have some effect on blood pressure and respiration[13,14]. In Malaysia and India, the Rose Apple represents the golden fruit of immortality and is associated with the Buddha. Phytochemical is biologically active, naturally occurring chemical compounds found in any parts of plants such as barks, leaves, flowers, roots, fruits, and seeds [15]. In the present work, qualitative and quantitative analysis of phenolics and flavonoids in stem bark and leaves were carried out in five tree species (*Syzygium aqueum* Alston, *Syzygium cumini*(L.) Skeels, *Syzygium jambos* L. (Alston), *Syzygium malaccense* (L.) Merr. and L. M. Perry and *Syzygium samarangense*(Blume) Merrill and Perry).

2. MATERIALS AND METHODS:

Syzygium, Gaetrn. species were collected from Ernakulam, Kerala, India and authenticated and the voucher specimens were deposited in the Dept. of botany, St. Teresa's College, Ernakulam for future reference. The fresh leaves and bark were washed thoroughly with running water and shade dried and powdered using electric homogenizer. The powdered samples were extracted with 150mL of hexane, methanol and ethyl acetate for 8-12 hours using soxhlet apparatus.

2.1 Qualitative Phytochemical Analysis:

Preliminary phytochemical screening of *Syzygium* Gaertn. bark and leaves for phenolics and flavonoids were done by following methods[16].

2.2 Total Phenolic Content (TPC):

Total phenolic content was determined by Folin – Ciocalteu method according to the procedure reported by[17] with some modifications. An aliquot (1mL) of methanolic extracts or standard solution of Gallic acid (20, 40, 60, 80 and 100mg/mL) was added to 10mL volumetric flask containing 4mL of dd H_2O. A reagent blank using dd H_2O was prepared. 5mL of Folin-Ciocalteu's Phenol reagent was added to the mixture and shaken. After 5 minute 4mL of 7.5% Na_2CO_3 was added. After incubation for 2 hours in the dark at room temperature the absorbance at 740nm was measured. The total phenolic content was calculated from Gallic acid (GA) calibration curve (20-100mg/L). Data were expressed as Gallic acid equivalents (GA)/g of extracts averaged from 3 measurements.

2.3 Total Flavonoid Assay (TFC):

Total flavonoid content was measured by the Aluminium chloride colorimetric assay[18]. An aliquot (1mL) of methanolic extracts or standard solution of catechin (20, 40, 60, 80 and 100 mg/mL) was added to 10mL volumetric flask containing 4mL of dd H_2O. To the flask was added 0.3mL 5% $NaNO_2$. After 5 minute, 0.3mL 10% $AlCl_3$ was added. At 6th minute, 2mL 1M NaOH was added and the total volume was made up to 10mL with dd H_2O .The solution was mixed well and the absorbance was measured against prepared reagent blank at 510nm. Total flavonoid content of *Syzygium* leaves and bark were expressed as mg catechin equivalents (CE)/100g . All the samples were analyzed in triplicates.

3. RESULTS AND DISCUSSION:

3.1 Phytochemical Screening:

The Phytochemical tests on methanol, hexane and ethyl acetate extracts of *Syzygium,* Gaertn. bark and leaves showed the presence of phytoconstituents like phenolics and flavonoids.

3.2 Total Phenolic Content:

The result for total phenolic content was shown in the Table 1. The result showed that leaves and bark are rich sources of phenolics. Among the *Syzygium,* Gaertn leaves the maximum TPC was observed in the methanolic leaf extract of *Syzygium cumini* (L.) Skeels (8.52±0.05%) and minimum in the methanolic leaf extract of *Syzygium aqueum* Alston(3.91± 0.055%). But in the case of bark, the least phenolics was reported in the methanolic extract of *Syzygium samarangense* (Blume) Merrill and Perry bark (0.41±0.075%) and maximum in methanolic extract in *Syzygium cumini* (L.) Skeels bark (6.03± 0.075%). Among the various parts of *Syzygium* Gaertn. analyzed leaves displayed the rich source of phenolic compounds when compared to bark. The results emphasized the key role of phenolic compounds to scavenge free radicals[19].

3.3 Total Flavonoid Content:

The result for total flavonoid was shown in the Table 1. In the case of leaves maximum flavonoid was obtained in the methanolic extract of *Syzygium samarangense* (Blume) Merrill and Perry leaf (1.117±0.006%) and least by *Syzygium aqueum* Alston (0.423± 0.021%) whereas in the case of bark, least flavonoid content was showed by *Syzygium malaccense* (L.) Merr. and L. M. Perry methanolic bark extract (0.024±0.005%) and maximum by *Syzygium cumini* (L.) Skeels(0.637± 0.008%). Among the various parts of *Syzygium* Gaertn. analyzed for TFC leaves showed the rich source of flavonoid compounds when compared to bark but in the case of *Syzygium cumini* (L.) Skeels bark (0.637± 0.008%) possess more TFC than their leaves (0.637± 0.008%). Compounds such as flavonoids, which contain hydroxyl functional groups, are responsible for the antioxidant effects of plants [20].

Table 1: Total phenolic and Total flavonoid contents among the *Syzygium*, Gaertn.

Species	Plant part	Total phenolics (%)	Total flavonoids (%)
Syzygium aqueum Alston	Bark	2.62± 0.051	0.151± 0.005
	Leaf	3.91± 0.055	0.423± 0.021
Syzygium cumini (L.) Skeels	Bark	6.03± 0.075	0.637± 0.008
	Leaf	8.52± 0.055	0.468± 0.005
Syzygium jambos L.(Alston)	Bark	2.32± 0.088	0.067± 0.006
	Leaf	7.59± 0.04	0.496± 0.014
Syzygium malaccense	Bark	0.67± 0.055	0.024± 0.005
(L.)Merr. and L. M. Perry	Leaf	6.11± 0.083	1.044± 0.007
Syzygium samarangense	Bark	0.41± 0.075	0.076± 0.005
(Blume) Merrill and Perry	Leaf	5.99± 0.061	1.117± 0.006

Sudha *et al.*, carried out TPC and TFC in acetone and aqueous extract of *Syzygium jambos* and *Syzygium cumini* (L.) Skeels leaves and come to a point of view that acetone extract is best for releasing phenolic metabolite from leaves than aqueous extract[21]. But Islam *et al.*, evaluated TPC and TFC in ethanolic extract of *Syzygium jambos* L. (Alston) bark as 299.64±5.38mg/gm and 782.86mg/gm respectively[22]. Dhanabalan *et al.*, also observed TPC and TFC in various extract (viz., ethanol, methanol, aqueous and chloroform) of *Syzygium jambos* L. (Alston) leaf and found out ethanol is the best solvent in liberation of phenolics[23]. Mohamed *et al.*, carried out TPC and TFC in methanolic and methylene chloride extract of *Syzygium cumini* (L.) Skeels leaf and detected more release of phenolic compounds in methanol than methylene chloride extract[24]. The status of the present study supported the opinion[25, 26].

4. CONCLUSION:

Thus, the result obtained in the present study indicates that the five selected species of *Syzygium*, Gaertn. leaves and stem were the best sources of phenolics and flavonoids. Further analysis is recommended to prove antioxidant property of the plants under study, for better understanding and to implement them as potent antioxidant drugs. The results are very much encouraging but advanced work is necessary before being put into practice.

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