Phytochemical Profiling, Quantification of Phenols and Flavonoids in Leaves of Artocarpus Heterophyllus

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Abstract

Plant-based medicine has been used cost-effectively throughout the world to prevent and treat diseases. Drugs commonly used today are structurally derived from natural compounds and are found in traditional medicinal plants. An attempt was made in the present study to explore the phytocomponents and quantify the phenols and flavonoids residing in the leaves of *Artocarpus heterophyllus.* The aqueous extracts of *Artocarpus heterophyllus* leaves was found to contain alkaloids, flavonoids, phenols, tannins, saponins and terpenoids. Total phenolic content in the aqueous extracts of *Artocarpus heterophyllus* leaves were found to be 73 mg GAE/g and that of flavonoids as 540 mg QE/g suggesting leaf extracts of *Artocarpus heterophyllus* possess high-value chemicals that may have health advantages **.**

Keywords

Medicinal plants, Phytocomponents, Total phenols, Total flavonoids

Introduction

Medicinal plants are the richest bio resource of drugs of traditional systems of medicine, modern medicines, nutraceuticals, food supplements, folk medicines, pharmaceutical intermediates and chemical entities for synthetic drugs. The beneficial medicinal effects of plant materials typically result from the combinations of secondary products present in the plant. The medicinal actions of plants are unique to particular plant species or groups are consistent with this concept as the combinations of secondary products in a particular plant are often taxonomically distinct.

Phytochemicals has been instrumental in the discovery of new plant natural products which are of commercial values in various industries such as the traditional and complementary medicine systems, pharmaceutical industries, nutraceuticals and dietary supplement industries The phytochemicals present in plants are responsible for preventing disease and promoting health and have important properties to prevent or to fight some common diseases. Knowledge about phytochemical is essential for drug discovery and for the development of novel therapeutic agents against major diseases.

Artocarpus heterophyllus or Jack fruit tree is a tree species belonging to the family *Moraceae*. *Artocarpus heterophyllus*, the largest fruit bearing tree, has been used for several decades in traditional medicine due to its medicinal properties. Traditional uses of parts of *A. heterophyllus* are numerable and are used extensively to treat various ailments due to its multifaceted properties. An attempt was made in the present study to understand the therapeutic effects of the phytocomponents residing in *A. heterophyllus.*

Methodology

Preparation of plant extract

The leaves of *Artocarpus heterophyllus* collected from the local areas were authenticated by Botanical Survey of India, Southern Regional Centre, Coimbatore. Leaves were washed , cleaned and then shade dried. 10 gm of the powdered leaf sample were suspended in 100ml of water. Phytocomponents were extracted by incubating at room temperature for 24 hours under continuous agitation using a mechanical shaker.

Qualitative phytochemical screening

The qualitative phytochemical screening of aqueous extract of *Artocarpus heterophyllus* leaves was conducted to detect the presence or absence of secondary metabolites. Qualitative phytochemical tests was performed, following the standard protocols of Treese and Evans (1989) and Harborne (1998).

Quantitative estimations Estimation of Phenol:

The total phenol content in the extracts was determined by slightly modified Folin and Ciocalteu method (Singleton and Rossi, 1965). To about 1ml of the leaf extracts added 0.2 ml of Folin Ciocalteu phenol reagent mixture and 1 ml of 20% sodium carbonate. The total content is then incubated at 45^0C in a water bath for 45 minutes. The absorbance was then measured at 765 nm. Gallic acid dilutions were used as standard solutions. The results of phenols are expressed in terms of Gallic acid in mg/ml of extract.

Estimation of Flavonoid:

Analysis of flavonoid content was done using the aluminium chloride colorimetric assay with slight modifications (Chang *et al.,* 2002). The assay is based on the formation of an acid-stable complex of aluminium chloride with the C-4 keto group and either the C-3 or C-5 hydroxyl group of flavonoids. 1 ml of leaf extracts were mixed with 0.1 ml of 10% aluminium chloride, 0.1 ml of 1 M Potassium Sodium tartarate and 2.8 ml distilled water. The mixture is incubated at room temperature for 30 minutes. Absorbance of the yellow-green complex was measured at 415 nm, using Quercetin as standard. Flavonoid content of the leaf extracts were expressed as mg quercetin equivalents per gram dried weight (mg QE/g dried weight).

Results and Discussion

Medicinal plants play a vital role in traditional as well as the modern medicine. Plants are natural sources with many nutritive properties and are used in the treatment of various diseases. The results for the present study Phytochemical profiling, quantification of phenols and flavonoids in leaves of *Artocarpus heterophyllus* are discussed under the following phases.

Qualitative phytochemical analysis

The qualitative phytochemical analysis in the aqueous extracts of *Artocarpus heterophyllus* leaves were carried out using standard procedures and the results are shown in Table 1.

Qualitative analysis of the aqueous leaf extracts of *Artocarpus heterophyllus* revealed the presence of alkaloids, flavonoids, phenols, tannins, saponins and terpenoids. The results of the phytochemical analysis of the present study revealed the presence of many phytoconstituents which shows that the aqueous leaf extracts of *Artocarpus heterophyllus* possess potent medicinal properties.

Table 1: Qualitative phytochemical analysis of aqueous extracts of *A. heterophyllus* leaves

Phytocomponents	Results
Alkaloids	+
Phenol	+
Reducing sugar	-
Flavonoids	+

Phytosterol	-
Amino acids & Protein	-
Tannins	+
Steroids	-
Saponins	+
Cardiac glycosides	-
Terpenoids	+
Carbohydrates	-

('+' indicates Presence and '-' indicates Absence)

Suma *et al.* (2020) reported that Phytochemical analysis conducted on the *Artocarpus hirsutus* seed extracts revealed the presence of constituents which are known to exhibit medicinal as well as physiological activities. Qualitative phytochemical analysis of *Artocarpus hirsutus* carried out by Shamugapriya *et al*., (2017) revealed the presence of alkaloids, flavonoids, glycosides, saponins, tannins, phenols, terpenoids, and carbohydrates correlates with the present study.

Rajeswari *et al.,* (2019) reported the presence of alkaloids, terpenoids, flavanoids, and saponins in ethanolic leaf extracts of *Artocarpus hirsutus*. It was also reported that the flavonoids found in the leaves of *Artocarpus hirsutus* possess hypoglycemic activity.

The phytochemical analysis of *A. heterophyllus* ripe fruits by Anila *et al.,* (2018) revealed the presence of maximum number of phytochemical constituents such as quinones, alkaloids, tannins, gums and mucilages, steroids, phenols, saponins, flavanoids, terpenoids, betacyanin, volatile oils, coumarins, fixed oils and fats. This study shows that the fruits of *A.heterophyllus* also have health beneficial properties.

Above results of the phytochemical analysis carried in *A.heterophyllus* extracts revealed the presence of constituents such as phenols, tannins, flavonoids, saponins, glycosides, steroids, terpenoids, and alkaloids which are known to exhibit medicinal as well as physiological activities.

Quantitative analysis of phenol and flavonoids

The phenols and flavonoids are the most important phytocomponents present in most plant extracts which are responsible for the biological activities. In the present study levels of phenols and flavonoids were estimated using Gallic acid and Quercetin as standards respectively. Total phenolic content in the aqueous extracts of *Artocarpus heterophyllus* leaves were found to be 73 mg GAE/g and that of flavonoids as 540 mg QE/g .

The total phenolic and the total flavonoid content estimated by Raaman *et al*.,(2014) in the methanol extract of leaves of *A. heterophyllus* was found to be 524.86 mg/g and 86.75 mg/g . The results of the determination of total phenol and flavonoid content of Jackfruit peel done by Yamin *et al.*, (2021) showed that phenolic and flavonoid contents of ethyl acetate fraction was found to be 49.667±1.508 g GAE/100 g of sample and 70.199±0.374 g QE/100 g of sample, respectively.

The analysis of phenol and total flavonoids in *Mangifera* by Fitmawati *et al.,*(2020) revealed the presence of 125 mg/g of phenol and 720 mg/g of flavonoid in *M.indica* extract. The analysis of phenol and flavonoid content of *Mangifera*

indica carried out by Deepa and Nikhil, (2017) showed that the total phenol and flavonoid content in the aqueous extract was found to be 242.92 ± 15.67 and 681.92 ± 29.84 per gram of extract respectively which correlates with the results of the present study.

Conclusion

Natural antioxidant resides in plants in the form of phenolic compounds such as flavonoid, phenolic acids, and tocopherols . It is evident that the presence of high phenol and flavonoid content present in the aqueous extracts of *Artocarpus heterophyllus* attributes to its potent medicinal effects.

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