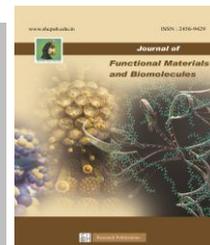




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PHYTOCHEMICAL EVALUATION OF SOLVENT EXTRACTS FROM TAMARIND SEED HUSK

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Abstract

Tamarind seed husk, the outer coat of *Tamarindus indica* seeds, is a lignocellulosic by-product traditionally discarded during fruit processing but now gaining importance due to its rich content of tannins, phenolics, and other bioactive compounds. Its antioxidant, antimicrobial, and functional properties enable diverse applications across food, pharmaceutical, and environmental sectors. The husk's polysaccharides act as natural thickeners, stabilizers, and hydrocolloids, widely used in ice creams, cakes, dairy products, and acidic formulations like sherbets. Additionally, *Tamarind* seed husk serves as a low-cost bio-adsorbent for pollutants, a precursor for activated carbon, and a component in biodegradable materials and bio-composites. Phytochemical analysis is essential to evaluate its secondary metabolites, optimize its biological activities, and support its integration into nutraceuticals, functional foods, and phytopharmaceutical products. Overall, *Tamarind* seed husk provides a sustainable, value-added solution for converting agricultural waste into beneficial industrial resources.

Keywords: Tamarind seed husk, *Tamarindus indica*, lignocellulosic waste, tannins, phenolics, polysaccharides, antioxidants, phytochemical analysis, bio-adsorbent, functional foods, sustainable utilization.

1. Introduction

The outer layer of *Tamarind* seeds, known as *Tamarind* seed husk, is frequently disposed away as trash while processing fruit. Tannins, phenolics, and other bioactive

substances are abundant in this lignocellulosic substance [1]. *Tamarind* seed husk is now being investigated for use in the culinary, pharmaceutical, and environmental industries due to its antioxidant capabilities and natural chemical makeup, making it a viable resource for sustainable extraction. *Tamarind* seed husk is of practical importance due to its high concentrations of tannins, phenolics and lignocellulosic materials. It is employed as a natural antioxidant in food and cosmetics production, low-cost adsorbent for dyes and heavy metals from water. The husk is also used for preparation of activated carbon, bio-composites and biodegradable products. Furthermore, its bioactive components make it useful for the formulation of herbal products, antimicrobials and natural preservatives [2-4]. These different practices demonstrate its possible application as a renewable material rather than waste. *Tamarindus Indica* is a leguminous plant hailing from the Fabaceae family. The plant is popularly grown in abundance in the Indian sub-continent and source of var-

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ious benefits in Food, Feed and Polysaccharide world. India is the major producer and exporter of *Tamarind* seed gum and *Tamarind* pulp to all over the world. *Tamarindus Indica* is a perennial shrub that grows up to 18 meters of height, with its crown forming an irregular shape, to that of a vase. *Tamarind* is a widely used and explored traditional medicine in India for the management of various diseases. *Tamarind* seed husk polysaccharide can prevent the growth of ice crystals on frozen foods due to its water-retaining capacity. Being a good resister against acid, polysaccharide is the perfect hydrocolloid for sherbets where acid is very strong. It is also good for the tissues. *Tamarind* seed husk polysaccharide is used as a food additive to its gelling capability. Henceforth, it is used as a thickener and stabilizer in Ice creams, cakes and dairy products. It is preferred as an essential tool in aqueous solution to control flow rate. Phytochemical analysis of *Tamarind* seed husk is essential for understanding its antioxidant, antimicrobial, and anti-inflammatory potential. It helps optimize its use in nutraceuticals, functional foods, and phytopharmaceutical formulations [5-8]. This supports its applications in biomaterials, bio adsorbents, and natural preservatives. It also promotes adding value to agricultural waste and supports sustainable use of biological resources. The testa (seed coat) of *Tamarindus indica* (*Tamarind*) seed, known as *Tamarind* seed husk, is a lignocellulosic waste material containing bioactive compounds. Traditionally the *Tamarind*-seed husk is being wasted in pulp-p recassing but now a days, it has been recognized as an important source of secondary metabo-

lites and becomes the valuable feedstock for both nutritional (food), pharmaceutical and industrial applications [9-11]. The phytogetic analysis of *Tamarind* seed husk involves the determination of these phytochemicals, assessing their qualitative and quantitative similarities, and evaluating their functional and biological activities.

Experimental

Tamarind seed classification

Kingdom : Plantae

Fig. 1. Tamarind seed husk



Division: Magnoliophyta

Class : Magnoliopsida

Subclass : Rosidae

Order : Fabales

Family : Fabaceae (Legume family)

Genus : *Tamarindus*

Species : *Tamarindus indica*

2.2. Collection and Extraction of sample

Collection of *Tamarind* seed in the *Tamarind* tree in and around of Tirupattur, Tirupattur district. Separate the seed husk from the seeds and dry separately for a week. After a week the shade dried seed husk are grind into fine powder then stored in an airtight container. For prepar-

ing the ethanolic extract 10 grams of fine powder of seed husk was mixed with 100 ml ethanol in 1:10 ratio for 24 hours in Soxhlet method. After 24 hours the contents are poured to petri plate and allow the air dry. ethanol was evaporated and dried sample stored in airtight container. Now, the seed husk extract was prepared.

2.3. Qualitative Phytochemical Screening

The qualitative tests were carried out in seed husk of Tamarind by adopting standard procedure [13] [14]. The Ethanol & Aqueous extracts were screened for the presence of phytochemicals.

Test for alkaloids

Mayer's test: small portion of solvent free extract was stirred with few drops of diluted HCl and filtered. The filtrate was then tested for following colour test. (a) 1.36 gm of mercuric chloride was dissolved in 60 ml distilled water. (b) 5gms of potassium iodide was dissolved in 20 ml of distilled water (a) and (b) was mixed and the volume adjusted to 100ml with distilled water. Appearance of cream colour precipitate with Mayer's reagents showed the presence of alkaloids.

Test for flavonoids

Shinoda's test: 5 ml of 20% sodium hydroxide was added to equal volume of the extract. A yellow solution indicates the presence of flavonoids.

Test for steroids

Liebermann Buchard test: A small amount of sample is treated with 2ml of acetic anhydride followed by the addition of 3ml of H₂SO₄ Solution. Color changes from violet to green or blue indicates the presence of ster-

oids.

Test for terpenoids

Salkowski Test: To 1ml of extract add 0.5ml of chloroform followed by a few drops of concentrated sulphuric acid, formation of reddish-brown precipitate indicates the presence of terpenoids.

Test for Saponins

Froth test: 5ml of extract is diluted with 20ml of distilled water and agitated for 10 minutes. Foam is formed which indicates the presence of saponins.

Test for Carbohydrates

Fehling test: Two milliliters of each plant extract were hydrolyzed with dilute HCl, neutralized with alkali, and then heated with Fehling's solution A and B. The formation of a red precipitate was an indication for the presence of a reducing sugar.

Test for tannins and phenolic compounds

Lead Acetate test: 10% lead acetate solution, 0.5g of the extract was added and shaken to dissolved. A white precipitate observed indicate the presence of tannins and phenolic compounds.

Test for glycosides:

Keller-Killani test: To 2ml of extract, glacial acid, one drop 5% ferric chloride and concentrated sulphuric acid were added. Appearance of reddish-brown color at the junction of the two liquid layers indicates the presence of glycosides.

Test for Quinones

Sulfuric acid test: One drop of concentrated sulfuric acid was added to 5 ml of each extract dissolved in isopropyl

alcohol. Formation of red color indicates the presence of quinones.

Test for Phenols

The sample solution is treated with few drops of 10% ferric chloride. Formation of blue or green colour indicates the presence of phenols.

Test for saponins

To 2ml of distilled water was added with the sample solution and shakes well. Formation of foams indicates the presence of saponins.

3. Results and Discussion

Phytochemical analysis of Tamarind seed husk



Fig. 2. Photochemical analysis of Ethanolic extract of Tamarind seed husk

The analysis of preliminary phytochemical screening using Ethanolic extract of Tamarind seed husk concludes that presence of Carbohydrates, Tannins, Glycosides, Quinones, Phenols, Terpenoids and Steroids. it may possess a range of potential therapeutic and industrial applications, primarily due to its strong antioxidant and anti-inflammatory properties.

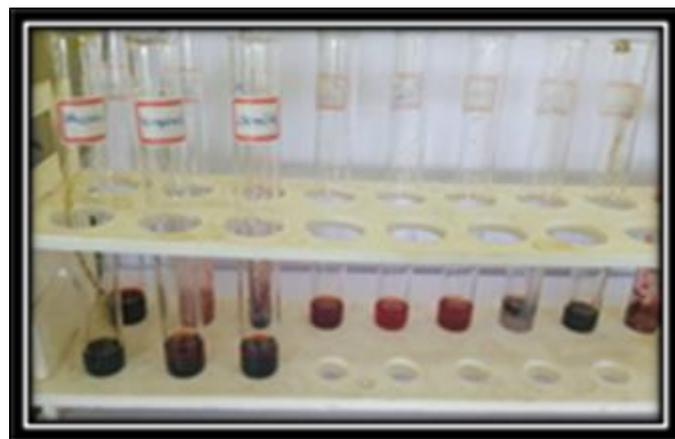


Fig. 3. Phytochemical analysis of aqueous extract of Tamarind seed husk

Table 1. Phytochemical screening of various solvent extracts of Tamarind seed husk

S. No.	Phytochemical constituents	Tamarind seed husk ethanol extract	Tamarind seed husk water extract
1.	Carbohydrates	+	+
2.	Tannin	+	+
3.	Saponins	-	+
4.	Alkaloids	-	+
5.	Flavonoids	+	-
6.	Glucosidase	+	-
7.	Quinones	+	+
8.	Phenols	+	+
9.	Terpenoids	+	+
10.	Steroids	+	+

The analysis of preliminary phytochemical screening using ethanolic extract of Tamarind seed husk concludes

that absence of Saponins, Alkaloids and Flavonoids.

The analysis of preliminary phytochemical screening using Aqueous extract of Tamarind seed husk concludes that presence of Carbohydrates, Tannins, Saponins, Alkaloids, Flavonoids, Glycosides, Quinones, Phenols, Terpenoids & Steroids. The analysis of preliminary phytochemical screening using ethanolic extract of Tamarind seed husk concludes that absence of Glycosides and Flavonoids.

4. Conclusions

The phytochemical analysis using Ethanolic extract of Tamarind seed husk demonstrates a complex matrix of secondary metabolites dominated by Carbohydrates, Tannins, Glycosides, Quinones, Phenols, Terpenoids and Steroids. The phytochemical analysis using Aqueous extract of Tamarind seed husk demonstrates a complex matrix of secondary metabolites dominated by Carbohydrates, Tannins, Saponins, Alkaloids, Flavonoids, Glycosides, Quinones, Phenols, Terpenoids & Steroids. These compounds confer significant antioxidant potential and other biological activities that support the husk's utilization in health-related and industrial applications.

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