

PHYTOCHEMICAL SCREENING OF MANGO PEEL POWDER*(Mangifera indica L.)***Priyanka Asai Thambi^{a*}, Sheila John^b, Esther Lydia^c and Sarah Jane Monica^d**

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ABSTRACT

Fruit peels which are a major by-products of fruit processing are traditionally and agriculturally used as a fertilizer. In the present day scenario fruit peels are slowly gaining importance as they represent a novel source of therapeutic bioactive components which imparts potential health benefits. The present study was carried out to determine the presence of phytochemicals present in mango peel powder using various extracts such as aqueous, acetone, chloroform, ethanol and petroleum ether. The result indicated that aqueous, acetone and ethanol extract were found to possess maximum number of phytochemicals followed by the ethanol and petroleum ether extracts. The total phenol content (2.67mg/Gallic acid g) and tannin content (2.77 mg/TAE) was found to be high in acetone extract while the total flavonoid content was high in ethanol extract (1.57mg Qe/g).

KEYWORDS: fruit peel, phytochemicals, therapeutic properties.

1. INTRODUCTION

Mango (*Mangifera indica* L.) is native to tropical regions of world and India ranks first in its production. Mango, being a seasonal fruit, is processed for various products such as puree, nectar, pickles, canned slices and pickles which have worldwide popularity.^[1] Several million tons of mango wastes are produced annually from factories. The main by-products of

processing mangos are the peel and the seed, which represent approximately 35% to 60% of the fruit.^[2]

Many researchers have established mangiferin as the possible active principle component of mango that imparts health benefits.^[3] Extracts obtained from mangopeel, leaves, bark and flowers exhibits a wide range of pharmacological effect such as antioxidant, anticancer, antimicrobial, anti-atherosclerotic, anti-allergenic, anti-inflammatory, analgesic and immunomodulatory action. Mango peel and seed have a great deal of antioxidant activity as they are rich in bioactive compounds such as phenolic compounds and sterols.^[4] In addition mango peel is said to be a good source of dietary fibre. Mango peels have also demonstrated higher values of anticancer properties and prevent the formation of fat cells by disrupting adipogenesis.^[5]

Therefore the present study was carried to screen the phytonutrients present in mango peel powder and to represent it as a valuable source of nutrients.

2. METHODOLOGY: The study was carried out in the following phases.

2.1 Collection and Authentication of Fruit

Fresh mangoes bright yellow in colour with no bruises were purchased from a local market. The fruits were washed under running water and wiped with clean cloth to dry before peeling. The peels were removed using a sterilized sharp knife. On an average around 200 g of peel was obtained from 1 Kg of mango.

2.2 Preparation of peel extract

Preparation of peel extracts were carried out by the method described by Janarthanam and Sumathi.^[6] One gram of dried mango peel powder were extracted with 20ml of aqueous, ethanol, acetone, and chloroform and petroleum ether and soaked overnight at room temperature. The samples were then filtered through Whatman.No.1 paper in a Buchner funnel. The filtered solution was evaporated under vacuum in a rota-vator at 40°C to a constant weight and then dissolved in respective solvents. The dissolving rate of the extracts was approximately 100%.

2.3 Qualitative analysis of phytochemical

The phytochemical tests were carried out using standard method to determine the presence of tannins, saponins, quinones, flavanoids, glycosides, cardiac-glycosides, terpenoids, phenols, coumarins, steroids, alkaloids, anthocyanin and betacyanin.^[7,8,9]

2.4 Quantitative analysis of phytochemical

Estimation of phenol content

The total phenolic content was estimated using the standard method described by (Lister and Wilson^[10] with slight modification. 100µl of the test sample was taken and mixed with 0.5 ml of Folin-Ciocalteu's reagent (1/10) dilution along with 1.5 ml Na₂CO₃ (2% w/v). The blend was incubated in a dark room for 15 minutes. The absorbance of blue coloured solution of all samples was measured at 765 nm using a UV spectrophotometer. The results were expressed in mg of gallic acid equivalent (GAE) per gram.

Estimation of total tannin content

Tannin content was estimated using the method as described by Fagbemi.^[11] The test samples (1 ml) were mixed with Folin-Ciocalteu's saturated in Na₂CO₃ solution (1ml) and distilled water (8 ml) which was allowed to stand for 30 minutes at room temperature. The supernatant was obtained by centrifugation and absorbance was recorded at 725 nm using UV – visible spectrophotometer. Tannin content was calculated as mg tannic acid equivalent obtained from a calibration curve.

$$\text{Abs 725 nm} = 7.061 \times (\text{TA})$$

Where (TA) mg is the concentration of tannic acid taken as standard.

Estimation of flavonoid content

The Aluminium Chloride calorimeter method described by Woisky and Salantino^[12] was used to determine the flavonoid content. Quercetin was used to make the calibration curve. 10 mg of quercetin was dissolved in 80% ethanol and then diluted to 25, 50, and 100 µg ml. The diluted standard solutions (0.5 ml) were separately mixed with 1.5 ml of 95 % ethanol, 0.1 ml of 10% aluminium chloride, 0.1 ml of 1 M potassium acetate, and 2.8 ml of distilled water. After incubating at room temperature for 30 minutes, the absorbance of the reaction mixtures were measured at 415 nm with a spectrophotometer. The amount of 10% aluminium chloride was substituted by the same amount of distilled water in blank.

3. RESULTS AND DISCUSSION

The result of proximate phytochemical analysis of mango peel powder is presented in table 1. Five extracts namely aqueous, acetone, chloroform, ethanol and petroleum ether were used for qualitative analysis of phytochemicals. Table 1 clearly indicates that aqueous, acetone and ethanol extracts were found to possess maximum number of phytochemicals than chloroform and petroleum ether extract. The phytochemicals which were present in these extracts were tannin, saponin, quinones, flavonoids, cardiac glycosides, terpenoids, phenols, coumarins, steroids, alkaloids and betacyanin respectively.

Table 1: Qualitative phytochemical analysis of mango peel powder (*Mangifera indica* L.)

Solvent	Aqueous	Acetone	Ethanol	Petroleum Ether	Chloroform
Tannin	++	++	++	-	-
Saponin	++	-	-	-	+
Quinones	-	++	++	-	-
Flavonoids	++	++	++	-	-
Glycosides	-	-	-	-	-
Cardiac glycosides	++	++	++	++	+
Terpenoids	-	+	-	-	-
Phenols	++	++	++	-	-
Coumarins	++	++	++	-	-
Steroids	-	+	++	-	-
Alkaloids	+	+	+	-	-
Anthocyanin	-	-	-	-	-
Betacyanin	+	+	+	-	-

Since prehistoric times, plants have been used as a source of treatment for diseases due to the presence of bioactive non-nutrient plant compounds known as phytochemicals.^[13] Phytochemicals are biologically active, naturally occurring chemical compounds found in plants, which provide health benefits such as antioxidant activity, antimicrobial effect, modulation of detoxification enzymes, stimulation of the immune system, decrease of platelet aggregation and modulation of hormone metabolism and anticancer property.^[14]

Alkaloid exhibits antibacterial, antifungal, antihypertensive, anti-arrhythmic and anticancer actions.^[15] Saponins act as an immunostimulant, hypocholesterolaemic and anti-carcinogenic agent. These have also been observed to kill protozoans, functions as antioxidants and acts as antifungal and antiviral agents.^[16] Terpenoids have been found to be useful in the prevention and therapy of several diseases, including cancer, and show significant pharmacological activities, such as antimicrobial, antifungal, antiparasitic, antiviral, anti-allergenic,

antispasmodic, antihyperglycemic, anti-inflammatory, and immune modulatory properties.^[17] Glycoside is used as an anticancer agent, cardiac glycosides is used in treatment of heart related illnesses and anthracene glycosides is used in treating skin diseases and as a purgative.^[18]

Estimation of phenol content

The phenol content of mango peel powder is presented in table 2. Table 2 clearly indicates that mango peel is a good source of phenol. Among the extract analysed it is evident that acetone extract was found to have the highest phenol content (2.67mg Gallic acid/g) followed by aqueous extract (2.48 mg Gallic acid/g) and ethanol extract (2.18mg Gallic acid/g) respectively.

Table 2: Phenol content of mango peel powder (*Mangifera indica* L.)

S.no	Extract	Total Phenol content (mg Gallic acid/ g)
1	Acetone	2.67
2	Aqueous	2.48
3	Ethanol	2.18

Mango peels and leaves contain significant content of polyphenols, including xanthonenes, mangiferin and gallic acid.^[19] Mango peel extracts are used as nutraceutical and functional foods as they are a good source of polyphenols, anthocyanins and carotenoids. The polyphenolic and flavonoid contents ranges from 8.1 to 29.5 and 0.101 to 0.392 mg/g, and the phenolic acids are gallic, protocatechuic and syringic acids, and kaempferol and quercetin.^[20] Among the phenolic acids, Gallic acid is the major compound (6.9 mg/kg) present in mango peel.^[21] The amount of gallic acid in mango peel extracts ranges from 23 to 838 mg/100 g depending on the method of extraction.^[22]

Estimation of tannin content

The tannin content present in mango peel powder is depicted graphically in figure 1. Figure 1 clearly portrays that the tannin content was high in acetone extract (2.77 mg/TAE) followed by ethanol extract (2.43 mg/TAE) and the least in aqueous extract (0.86 mg/TAE).

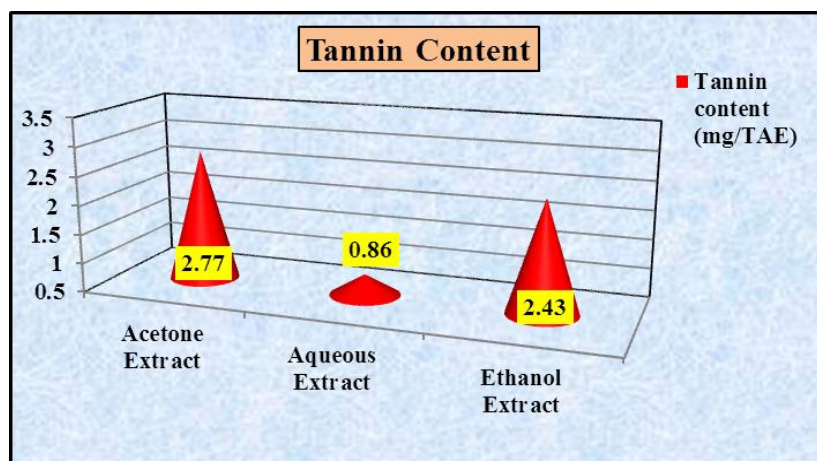


Fig.1. Total tannin content of mango peel powder (*Mangifera indica* L.)

Mango peel and pulp contains phytonutrients, pigment antioxidants - carotenoids and polyphenols, omega-3 and -6 polyunsaturated fatty acids. The edible mango peel has considerable value as a source of dietary fiber and antioxidant pigments. The tannin content of mango seed was found to be $1.03 \pm 0.01 \text{ mg/100g}$.^[23] Tannins, in general, are water soluble phenolic secondary metabolites. Gallo tannins are the predominant class of tannins identified from mango.^[24]

Estimation of flavonoid content

The flavonoid content of mango peel powder is presented in table 3. Among the extract analysed it is evident that ethanol extract was found to have the highest phenol content (1.57mg Qe/g) followed by acetone extract (1.39 mg Qe/g) and aqueous extract (1.04mg Qe/g) respectively.

Table 3: Total flavonoid content of mango peel powder (*Mangifera indica* L.)

S.no	Extract	Total flavonoid content (mg Qe/ g)
1	Acetone	1.39
2	Aqueous	1.04
3	Ethanol	1.57

The flavonoids present in mango include catechin, epicatechin, quercetin, isoquercetin (quercetin-3-glucoside), fisetin, and astragalin (kaempferol-3-glucoside). Quercetin has been reported to possess anticancer property against benzopyrene induced lung carcinogenesis in mice, an effect attributed to its free radical scavenging activity.^[25]

4. CONCLUSION

The study clearly highlights the use of mango by-products (peels) in food, pharmaceutical and nutraceutical industries as it contains various potential health enhancing components which have predominant and promising health benefits such as antioxidant and antibacterial activities.

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