PHYTOCHEMICAL AND ANTIOXIDANT ANALYSIS OF AQUEOUS EXTRACTS OF UNRIPE PAWPAW (*Carica papaya* Linn.) FRUIT'S PEEL AND SEED

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ABSTRACT

In Nigeria, unripe papaya peel and seed are usually discarded during the preparation of papaya fruit. Unripe papaya, apart from being an edible fruit, also has a long history and proof of being an effective medicinal fruit used in the management of some human ailments. This study sought to examine the aqueous extracts of unripe papaya peel and seed for possible antioxidants and phytochemicals potencies. The phytochemicals screening showed that saponin and steroids were present while cardiac glycosides and anthraquinones only were absent in the extracts of both unripe papaya peel and seed. Furthermore, flavonoid and sterol were present only in unripe papaya peel extract but absent in unripe papaya seed extract. Furthermore, tannin and terpenoid were only present in the extract of unripe papaya seed but absent in unripe papaya peel extract. The antioxidant results showed that the extract of unripe papaya seed is richer in total phenol (131.00 mg GAE/100 g) and total flavonoid (191.06mg QAE/100g) than that of papaya peel [Total phenol = 126.75 mg GAE/100 g; Total flavonoid = 166.11mg QAE/100 g]. Meanwhile, the antioxidant results revealed that the extract of unripe pawpaw peel had higher ferric reducing antioxidant property (112.35 mg AAE/100 g) compared to the unripe papaya seed extract (102.78mg AAE/100g). Therefore, use of unripe papaya peel and seed as herbal materials could be of therapeutic use in the management/treatment of some oxidative stress induced human ailments due to their antioxidant and phytochemical potencies.

Keywords: *Antioxidants, phytochemicals, unripe papaya peel and seed, therapeutic potencies.*

1. INTRODUCTION.

Carica papaya Linn. (Family, *Caricaceae*), is a widely grown perennial tropical tree, grows up to about 10 m in height with an erect trunk. Its leaves are large, measuring about 50-70 cm in diameter, deeply palmately lobed with seven lobes (Duke, 1984). Its fruit (*papaya*) is known by different parts of the world such as *fruta bomba* in cuba and *lechoza* in Venezuela. In Nigeria, it is also known by different local names depending on the tribe. For example, Yorubas in the south west Nigeria, they call it "Ibepe", Hausas in the northern part of Nigeria call it "Gwanda", while the Igbos in the southern part of Nigeria call it "Okwere". The ripe fruit is edible and is usually eaten raw, without the peel and seed. The unripe green fruit (which is a rich source of vitamin A) can be eaten cooked, usually in curries, salads and stews (Lohiya, 2002).

Papaya is a major fruit crop in many tropical countries, and its ranked first amongst 38 common fruits based on its accordance to the united states recommended daily allowance for many vitamins, and consumption of papaya has been recommended for preventing vitamin A deficiency which causes childhood blindness in many tropical and subtropical countries. (Guoado et al., 2007)[6]. The fruits, leaves, seeds and latex are used in folklore for several ailments (Beckstrom et al., 1994)[2].

Unripe papaya is one of the common plant materials used in treatment of sickle cell disease in Nigeria; it is also found out that its water extract has no harmful effect on kidney functions (Sade, 2010)[21].

2. MATERIALS AND METHODS

Source of plant materials

Unripe papaya was plucked at the Federal Polytechnic Ede farm land and was washed thoroughly under a running water to remove any contaminant. The peels and seeds were removed using table knife, and the peels were diced into small pieces. Both samples were air dried separately at room temperature for $2^{1/2}$ weeks in the laboratory to dry.

The dried peel and seed were ground into fine powder using electric blender. The blended samples were oven dried 60ºC for 3 h.

Extract preparation

1g of each dried powdered samples was soaked with 20 ml of distilled water in the sample bottle which was placed in HY-BII speed governing multi-purpose oscillator/shaker for 24 h. The extracts were then filtered with No 1 Whatman filter paper. The filterate were centrifuged at 5000 rpm for 10 min to obtain a clear supernatant which was kept in a clean analysis bottle and stored in the refrigerator for further analysis.

Phytochemical screening

Phytochemical screening was carried out on the aqueous extracts of unripe papaya peel and seed using standard procedures as described by AOAC (1980)[1] and Sofowara (1993)[24].

Antioxidant analysis

The total phenol content was determined according to the method of Singleton et al. (1999) [23].
The total flavonoid content was determined using a slightly modified method reported by Meda et al. (2005) [9].
The reducing property of the aqueous extract from unripe papaya peel and seed was determined by assessing the ability of the extract to reduce $FeCl_3$ solution as described by Oyaizu (1986) [14].

3. RESULTS AND DISCUSSION

The results of the phytochemical screening are presented in Table 1, the phytochemical analysis were carried out on the extracts of unripe papaya peel and seed to ascertain the presence of different phytochemical components present in peel as compared to the seed. and the results revealed that saponin and steroids were present in both unripe pawpaw peel and seed extracts while Cardiac glycosides and Anthraquinones were absent in the extracts of both unripe pawpaw peel and seed. Flavonoid and Sterol were present in unripe pawpaw peel extract but absent in unripe pawpaw seed extract, while Tannin and Terpenoid were only present in the extract of unripe pawpaw seed but absent in unripe pawpaw peel extract. The analysis gave positive results for saponins, steroids, sterols and flavonoid in the extracts of unripe papaya peel, also in the extracts of unripe papaya seed, saponins, tannins, steroids and terpenoids seemed to be positive. This demonstrated the presence of bioactive components in extracts of unripe pawpaw peel and seed. Saponin has relationship with sex hormones like oxytocin. Oxytocin is a sex hormone involved in controlling the onset of labor in women and the subsequent release of milk (Okwu and Okwu, 2004) [11]. According to David (1983) [3], saponins has expectorant action through the stimulation of a reflex of the upper digestive tract. Also, saponins cause a reduction of blood cholesterol by preventing its re-absorption. They also have antitumor and antimutagenic activities and can lower the risk of human cancers by preventing cancer cells from growing (Esan, 2014) [5]. Presence of tannin also showed that both extract is rich in polyphenolic compounds and antioxidants which could prevent cellular damage. Terpenoids has been found to be potent antimicrobial, antifungal, anti-hyperglycemic, antispasmodic and anti-allergic properties in the prevention of several diseases, including cancer. (Roslin J, 2011) [19]. Cardiac glycosides and Anthraquinones were significantly absent in the extracts of unripe papaya peel and seed. This indicated that the difference in activity could be due to the differences in the phytochemical composition of the extracts.

Table 1: Phytochemical Screening of unripe papaya peel and seed

TEST	**AQUEOUS EXTRACT**	
	Pawpaw peel	Pawpaw seed
Saponins	+	+
Tannins	-	+
Caridiac glycosides	-	-
Steroids	+	+
Sterol	+	-
Terpenoid	-	+
Anthraqulnenes	-	-
Flavonoid	+	-

All experiments were performed in triplicate.
+ Present
_ Absent

Table 2: Antioxidant analysis of total phenol, total flavonoid, and ferric reducing antioxidant property (FRAP) on aqueous extracts of unripe papaya seed and peel.

Samples	Total Phenol (mg GAE/100 g)	Total flavonoid (mg QE/100 g)	FRAP (mg AAE/100 g)
Papaya Seed	131.00±0.01	191.06±0.26	102.78±0.21
Papaya Peel	126.75±0.20	166.11±0.01	112.35±0.20

All the experiments were performed in triplicate and data presented as mean ±.
GAE= Gallic Acid Equivalent
QE= Quercetin Equivalent
AAE= Ascorbic Acid Equivalent

Table 2 represents the results of the total phenol, total flavonoid and ferric reducing antioxidant property (FRAP) of the aqueous extracts of unripe pawpaw peel and seed. Antioxidants have been hypothesized to play an important role in preventing chronic disease, due to their ability to prevent oxidative damage caused by reactive species to vital biomolecules like lipids and proteins. (Peter C.H, 2001) [16]. The results demonstrated that extract of unripe pawpaw seed was richer in total phenol (131.00 mg GAE/100 g) than that of pawpaw peel (126.75 mg GAE/100 g) also the extract of unripe pawpaw seed seemed to be richer in total flavonoid (191.06 mg QE/100 g) than that of unripe of pawpaw peel extract (166.11 mg QE/100 g). Meanwhile, the antioxidant results revealed that the extract of unripe pawpaw peel had higher ferric reducing antioxidant property (112.35 mg AAE/100 g) when it is compared with the unripe pawpaw seed extract (102.78 mg AAE/100 g). The results of the analysis revealed higher total phenolic content in the extract of unripe papaya seed than that of the unripe papaya peel, which indicated that the extract of unripe papaya seed is likely to provide good sources of dietary antioxidant. Plants based food rich in phenols have the ability to retard lipid oxidation in oil and fatty foods, thereby reducing the incidence of cardiovascular diseases (Rumbaoa et al., 2009) [20]. Plants rich in flavonoids have the potency to reduce inflammation in the arteries. It also protects the body's cells from harmful free radicals from smoke and other environmental contaminants. (Monagas, et al., 2009) [8]. Ferric reducing antioxidant power (FRAP) was conducted on the extracts of unripe papaya peel and seed to confirm its antioxidant potential. The results revealed that the extract of unripe papaya peel had higher ferric reducing antioxidant property (112.35 mg AAE/100 g) compared to unripe pawpaw seed extract (102.78 mg AAE/100 g).

4. CONCLUSION.

This study has revealed the significant phytochemical properties, antioxidative potentials of unripe papaya peel and seed extracts. Hence, the use of unripe papaya peel and seed could be of beneficial in the management/treatment of some oxidative stress induced human ailments.

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