

CHANGES IN PROXIMATE AND PHYTOCHEMICAL COMPOSITIONS OF PERSEA AMERICANA MILL. (AVOCADO PEAR) SEEDS ASSOCIATED WITH RIPENING

Chidube A. Alagbaoso*, Ome S. Osakwe, and Iranlowo I. Tokunbo

ABSTRACT

Persea americana (avocado pear leaves, fruits, and seeds) is one of the medicinal herbs that has been widely utilized in treating/managing disease conditions. In this study, we investigated the changes in proximate and phytochemical compositions of avocado seeds associated with ripening using standard methods. Proximate analysis showed that the ripe and unripe seeds contain appreciable quantities of moisture, ash, fibre, fat, and protein. The crude fat content was however higher in the ripe ($20.1 \pm 0.1\%$) relative to unripe ($10.2 \pm 0.1\%$). Phytochemical analyses showed the presence of saponins, phenols, tannins, flavonoids, alkaloids, steroids, and glycosides in both seeds, but the levels of alkaloids ($4.8 \pm 0.115\%$) and saponins ($1.739 \pm 0.24\%$) were higher in the ripe. Our results suggest that ripening significantly increased the fat, alkaloids, and saponins contents, but lowered the carbohydrate content of the seeds. Our findings also indicate that the ripe may be a better source of antioxidant compounds owing to its higher phytochemical content.

INTRODUCTION

Medicinal plants have been in the forefront in the search for effective drugs in the treatment of diseases, and they have been widely utilized in the treatment/management of devastating disease conditions. Different parts of the plants such as; seeds, stem, roots, leaves, and bark, are used for this purpose (Alhassan et al.)¹. Many useful drugs have already been isolated from plants, and are clinically used to treat and manage diseases such as asthma, allergy, bacterial infections, catarrh, liver disease, kidney infection, cardiovascular diseases, etc (Chinedu et al.)². Extracts from medicinal plants are widely reported to possess antioxidant, ant-diabetic, anti-bacterial, anti-

viral, hepatoprotective, anti-hypertensive, cholesterol-lowering, and anti-cancer properties (Iroka et al.)³. The health benefits conferred by the use of these plants are attributed to the presence of bioactive compounds such as; alkaloids, steroids, tannins, flavonoids, etc, which are classified as secondary metabolites produced by plants (Fagbohun et al.)⁴.

Avocado pear, also called alligator pear or butter pear, is produced by avocado trees which originated from Mexico and Central America, and it belongs to the Lauraceae family and genus *Persea*. It is rich in protein, vitamins, and essential minerals required for maintaining good health. The fruits are used in traditional medicine for the management of hypertension and other related diseases (Weschenfelder et al.)⁵. Apart from the fruits, the seeds which are usually discarded during consumption, have been reported to be rich in essential minerals such as potassium and possess

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Chidube A. Alagbaoso*, Ome S. Osakwe, and Iranlowo I. Tokunbo
Department of Biochemistry, Faculty of Life Sciences, University of Benin, P.M.B 1154, Benin City, Nigeria.

*Correspondence

Author's email: chidube.alagbaoso@uniben.edu

*Corresponding author's phone number: + 2347035836711.

antioxidant activities, and may be effective in managing hypertension and other free radical-induced health challenges (Alagbaoso et al.)⁶. With the current reports of the potential health benefits of the seeds, it becomes imperative to establish the changes in biochemical constituents of the seeds associated with ripening.

The aim of this work therefore, was to evaluate the changes in the proximate and phytochemical compositions of avocado pear seeds associated with ripening.

MATERIALS AND METHODS

Sample Collection/Preparation

Unripe fruits of *Persea americana* was purchased from New Benin market and was authenticated in the Department of plant biology and biotechnology in the University of Benin. A part of the seeds were immediately separated from the pulp and sliced into small pieces, and was air dried. The remaining fruits were kept for four (4) days to undergo ripening (i.e become soft). After ripening, the seeds were again separated from the pulp and sliced into small pieces, and was air dried. The dried seeds were pulverized, and 500g of each of the powdery samples was extracted in 2.5 liters of methanol for 48hr with occasional stirring. It was then filtered using Whatmann filter paper (Number 1). The filtrate was lyophilized to obtain the dried extract used for analyses.

Chemicals/Reagents

All chemicals and reagents used were of standard analytical grade, distilled water was used in the preparation of solutions.

Proximate Analysis

The proximate composition of the ripe and unripe avocado seeds was carried out according to the method of A.O.A.C⁷. The powdery samples were used to carry out this study. Proximate composition constitute the different class of nutrients present in the sample such as carbohydrates, protein, fat, fiber, ash, and moisture content.

Qualitative phytochemical analysis

The extracts from the powdery samples of ripe and unripe seeds were subjected to phytochemical analyses according to the method of Trease and Evans⁸, and Sofowora⁹. The presence of the following phytochemicals: alkaloids, saponins, flavonoids, phenols, steroids, glycosides, and tannins were analyzed.

Quantitative phytochemical analysis

The phytochemicals present in the two extracts were quantified following standard methods. Alkaloids was estimated according to the method of Harborne¹⁰. Total phenols was quantified according to the method described by Obadoni and Ochuko¹¹, while saponin, tannin, flavonoid, and cardiac glycosides content were estimated according to the methods of A.O.A.C⁷, Van-Burden and Robinson¹², Boham and Kocipai-Abyazan¹³, and El-Olemy et al¹⁴ respectively.

Statistical Analysis

All the data obtained were subjected to statistical analyses using the statistical package for social sciences (SPSS, Version 17.0), and values are represented as mean \pm SEM. Values with $p < 0.05$ were considered significant.

RESULTS

Proximate Composition

The figure below (Figure 1) shows the result of the proximate composition of the ripe and unripe avocado seeds. The fat content in the ripe seeds is significantly higher than the unripe, while the other components analyzed showed no significant differences in both seeds except for carbohydrate which is higher in the unripe.

Qualitative phytochemical analysis

The table below (Table 1) shows the result of the qualitative phytochemical analysis

indicating the presence of the various phytochemicals in the two extracts. Both samples tested positive for the various phytochemicals, but there was no significant difference in the two samples except for saponins and steroids which are higher in the ripe seeds.

Quantitative phytochemical composition Below (Figure 2) is the result of the phytochemical composition of the ripe and unripe seeds of avocado pear. It was observed that the ripe seeds contain higher alkaloids and saponins relative to the unripe, but no significant difference was observed in the other components.

FIGURE 1

Figure 1: PROXIMATE COMPOSITION OF RIPE AND UNRIPE AVOCADO SEEDS

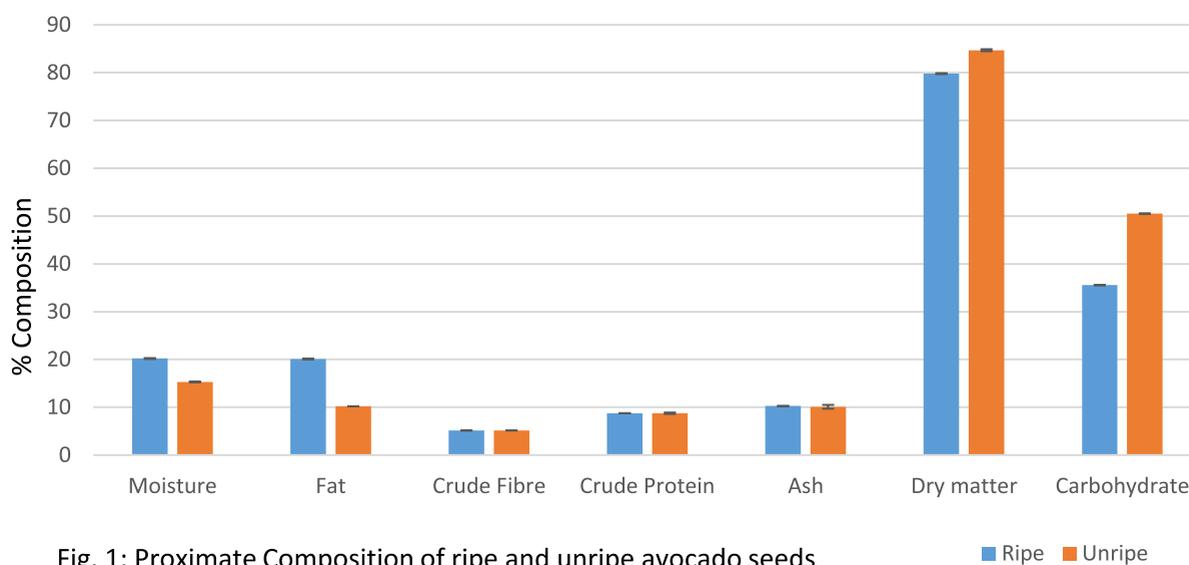


Fig. 1: Proximate Composition of ripe and unripe avocado seeds

TABLE 1

Table 1: QUALITATIVE PHYTOCHEMICAL COMPOSITION OF RIPE AND UNRIPE AVOCADO SEEDS

Parameters	Saponins	Phenols	Tannins	Flavonoids	Alkaloids	Steroids	Cardiac glycosides
Ripe seeds	++	+	+	++	++	++	+
Unripe seeds	+	+	+	++	+	+	+

Key: +++ =Highly present, ++ = moderately present, + = present in trace amount

Table 1: Qualitative phytochemical composition of ripe and unripe avocado seeds

FIGURE 2

Figure 2: PHYTOCHEMICAL COMPOSITION OF RIPE AND UNRIPE AVOCADO SEEDS

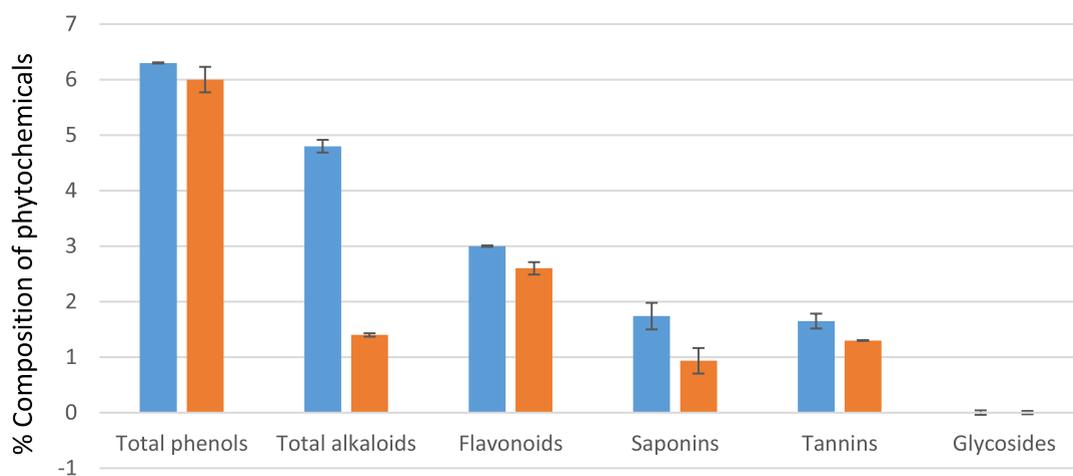


Fig. 2: Phytochemical composition of ripe and unripe avocado seeds ■ Ripe ■ Unripe

DISCUSSION

The present study investigated the proximate and phytochemical compositions of ripe and unripe avocado pear seeds. The result obtained in the proximate analysis showed that the unripe seeds contain significantly higher value of carbohydrate and a lower value of fat relative to the ripe. The other proximate parameters analyzed namely; moisture, ash, fibre, and protein content did not show any significant difference (Fig. 1). Carbohydrate is a good source of energy for cells to carry out useful work. The higher value of carbohydrate recorded in the unripe seeds indicates that ripening reduced the level of carbohydrate probably because of a higher expression of carbohydrate degrading enzymes during ripening (Chin et al.)¹⁵. Fat is another good source of energy for man and animals, but the type of fat consumed is an important factor in controlling body weight and a healthy heart. Fat is required for hormone synthesis, insulate body organs, and for the digestion of fat soluble vitamins. Current researches show that high intake of fat leads to hyperlipidemia and hypercholesterolemia, both of which predisposes to cardiovascular and metabolic diseases such as myocardial infarction, arteriosclerosis, stroke, hypertension, diabetes, obesity, etc (Coelho et al.)¹⁶. It is therefore imperative to apply caution in the use of ripe avocado seeds as medicine. Protein perform many different function in living cells, ranging from catalytic activities to structural functions. They also perform hormonal functions in regulating cellular processes (Murray et al.)¹⁷. The two seeds samples contain significant amount of proteins which was not so different from each other. The ash content indicates the level of minerals present in the samples analyzed. Mineral is important to body

functions, as they play essential roles in metabolic processes. They act as cofactors to many important cellular enzymes, and other essential body functions. Fibre is essential in food digestion as it aids peristaltic movement of food particles in the digestive tract. It also slows down the absorption of carbohydrate and cholesterol in the gastrointestinal tract thereby reducing the incidence of diabetes and hypercholesterolemia (Lattimer and Haub)¹⁸.

The result of the phytochemical analyses shows the presence of the various phytochemicals reported, namely; saponins, phenols, tannins, flavonoids, alkaloids, steroids, and cardiac glycosides (Table 1). The ripe seeds contain higher values of saponins, alkaloids, and steroids than the unripe, but shows no significant difference in the other phytochemicals (Fig. 2). Phytochemicals are bioactive secondary metabolites synthesized by plants which play essential roles in their defense against microorganisms. Bioactive compounds in plants have been reported to play important biological roles in living cells, and are widely utilized because of their medicinal properties. They possess antioxidant, antimicrobial, and antidiabetic roles among others (Wintola and Afolayan)¹⁹. The presence of these phytochemicals may account for the antioxidant activities recorded by Alagbaoso et al.⁶.

CONCLUSION

It is evident from our findings, that even though ripening increases the level of phytochemicals present in the seeds and decreases the amount of carbohydrate, it also increases the fat content of the seeds. In view of this, caution should therefore be exercised in applying ripe avocado seeds to medicinal use in order to avoid the deleterious consequences of lipid overload.

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AUTHORS CONTRIBUTION

Chidube Alagbaoso designed the work, and the three authors executed it, and also interpreted the results. The manuscript was written and typed by Chidube Alagbaoso.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interests.

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