THE STUDY OF PHYTOCHEMICALS, PROXIMATE AND MINERAL CONTENTS OF SWEET ORANGE SEEDS AND PEELS.

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ABSTRACT

The study of phytochemicals, proximate and mineral contents of sweet orange seeds and peels was carried out. Standard methods were adopted in carrying out the phytochemical and proximate analyses. Atomic Absorption Spectrophotometer was employed for the mineral composition. The phytochemical analysis revealed the presence of alkaloids, saponins, flavonoids, terpenoids, tannins, phenols, glycosides, volatile oils and steroids in both the seeds and peels of the sweet orange .The proximate analysis revealed that the seeds contain moisture(10.92%), ash(4.31%), crude fat(6.37%), crude fibre(1.67%), crude protein(2.36%), and carbohydrate(74.37%) while the peels contains moisture(10.43%), ash(3.66%),crude fat(4.83%),crude fibre (2.35%),crude protein(2.17%) and carbohydrate(76.56%)..The mineral analysis revealed that the seeds contain Mn (0.13mg/100g), Cu(0.27mg/100g), Ni(0.03mg/100g), Cd(0.04mg/100g), Cr(0.15mg/100g), Zn(0.63mg/100g), Ca(31.00mg/100g), Mg(1.02mg/100g), Na(55.56mg/100g) and K(57.50mg/100g) while the peels contain Mn(0.13mg/100g), Cu(0.10mg/100g), Ni(0.01mg/100g), Cd(0.04mg/100g), Cr(0.60mg/100g), Zn(0.27mg/100g), Ca(133.73mg/100g), Mg(0.13mg/100g), Na(55.56mg/100g), and K(60.00mg/100g).The seeds and peels of sweet orange can serve as potential source of nutrients and drugs, with the seeds being better preferred than the peels.

Keynotes: Sweet Orange, Atomic Absorption Spectrophotometer, Flavonoids, Mineral Composition, Proximate Analysis.

INTRODUCTION

Sweet orange is a fruit of citrus species in the family of *Ruttaceae*[1]. The Orange tree is an evergreen, flowering tree, with an average height of 9 to 10m, although some very old specimens can reach 15m[2]. The sweet orange has different sizes and shapes varying from spherical to oblong. It has ten segments inside and contains up to six seeds and porous white tissues. When unripe, the fruit is green but bright orange to yellow when ripe. The fruit retains green patches but under warm climate conditions, remains entirely green. There are other citrus groups which are also known as orange, these are:

bitter orange, bergamot orange, trifoliate orange and mandarin orange[3].

Orange is found in almost every part of the world like Nigeria, America, India, Spain, Vietnam, Morocco, Florida, South Africa, Brazil, Japan, Italy, Portugal, China, Texas, Israel, Lebanon, Pakistan, California, Mexico, Turkey, Algeria, France and Egypt[4]. Orange is used for juice; oil is produced by pressing the peels. It is also used for solvent, fragrance and flavouring of food and drinks. The sweet orange oil consists of approximately 90% D-Limonene. Limonene is considered a natural chemopreventive agent in humans. D-Limonene may affect human cancer on a level equivalent to that for caffeic acid via dietary coffee intake[5]. The orange peels is also used to remove water stains on metal fixtures, polish dull-looking wood furniture, repelants, flies and mosquitoes, soften brown sugar and for tea. Ethanolic crude extract, volatile oil and the peel powder of sweet orange were evaluated for their efficiency against the weevil[6]. This study was aimed at comparing the medicinal nutritional and mineral content of the seeds ands of sweet orange in Nigeria.

MATERIALS AND METHODS

Collection of Plant Materials

The Orange seeds and peels were removed from fresh sweet orange which were purchased from Gwagwalada international market, Abuja, Nigeria. The orange seeds and peels were dried for two weeks. They were ground separately with mortar and pestle and sieved with a mesh of size 0. 5mm.The powdered samples obtained were stored in clean airtight container at ambient temperature until when needed for use.

Preparation of Extracts

The powdered orange seeds were extracted using ethanol. 200g of the powder was packed in a muslin cloth and inserted into the soxhlet extractor and ethanol was used as the extraction solvent for a period of eight hours. At the end extracts were collected. The extraction was also carried out for powdered orange peels, adopting the same procedure.

Proximate Analysis

The proximate analysis was carried out by adopting standard methods[7]. The analysis was carried out in triplicate with the results being presented as mean values.

Phytochemical Screening

The phytochemical analysis was carried out using standard methods[8].

Mineral Analysis

Acid digestion of the powdered sample was carried out. 2g of the powdered sample was treated with 10ml of a mixture of nitric acid and perchloric acid (2:1v/v) until a clear solution was obtained. The digest was allowed to cool and then transferred into a 100ml volumetric flask and made up to mark with de-ionized water. The mineral elements were determined with atomic absorption spectrophotometer equipped with air-acetylene flame. Sodium and potassium were determined using a flame photometer.

Statistical Analysis

The results were expressed as the mean (±) standard deviation.

RESULTS AND DISCUSSION

Proximate Analysis

The result of the proximate analysis of the sweet orange seeds and peels powdered sample is given in Table.1. The result shows that the seeds contain more ash content (4.31%) than the peels (3.66%). This indicated that the seeds contain more mineral than the peels. The crude fat of the seeds (6.37%) was also more than that of the peels (4.83%), which indicated that the seeds can be a source of energy more than the peels. The crude fat of the sweet orange was also more than that of the *securinega virosa* leaves (4.70%). This can be used in animal feeds. The carbohydrate content of the seeds (74.37%) was less than that of the peels (76.56%) but was more than that of the *securinega virosa* (64.25%), This also can serve as source of energy in animal feeds. The crude protein content of the seeds was (2.36%). This was also more than that of the *securinaga virosa* leaves (1.98%). The seeds can serve as source of protein. The moisture content of the peels (10.43%) was lower than that of the seeds(10.92%).The lower the moisture content of the peels would hinder the growth of micro-organism and storage life would be high[9].The moisture content of both the seeds and the peels were lower than those of acalypha huspida(11.02%) and *acalyha recemosa* (11.91%).The crude fibre of the seeds(1.67%) was lower than that of the peels(2.35%).The dietary fibre can lower cholesterol level, risk of coronary heart disease, hypertension, constipation, diabetes, and breast cancer.

Table1. Proximate analysis of sweet Orange Peels and Seeds.

Composition	Values (%) (N=3)	
	Seeds	Peels
Ash	4.31±0.1	3.66±0.2
Crude fat	6.37 ±0.3	4.83± 0.1
Crude protein	2.36±0.2	2.17±0.1
Crude fibre	1.67±0.4	2.35±0.1
Moisture	10.92±0.2	10.43±0.3
Carbohydrate	74.37±0.2	76.56±0.5

Phytochemical Analysis

The phytochemical analysis result is shown in table 2. The result revealed the presence of alkaloids, saponins, flavonoids, terpenoids, tannins, phenols, glycosides, volatile oils, and steroids in both the seeds and peels of the sweet orange. There is the presence of balsam in the peels which was not in the seeds. The quantitative determination of the phytochemicals in the seeds and peels (Table 3) revealed more of the alkaloids, phenols and tannins in the seeds than in the peels but more of the saponins and flavonoids in the peels than in the seeds. The presence of this secondary metabolite has contributed to the medicinal values of the sweet orange seeds and peels[8]. Saponins exhibit cytotoxic effect and growth inhibitions against a variety of cells, making them to posses' anti-inflammatory and anti-cancer properties. The peels of the sweet orange exhibit more of the anti-cancer and anti-inflammatory properties than the seeds of the sweet orange.

Table 2. Phytochemical Analysis of the Seeds and peels of sweet Orange

Phytochemical Constituent	Orange Seeds	Orange Peels
Alkaloids	+	+
Saponins	+	+
Flavonoids	+	+
Cardia glycoside	-	-
Resin	-	-
Balsam	-	+
Volatile oils	+	+
Phlobatannins	-	-
Carbohydrate	-	-
Anthraquinone	-	-
Candenalides	-	-
Steroids	+	+

Table.3. Quantitative determination of phytochemicals in the seeds and peels of sweet orange.

Phytochemicals	%Content	
	Seeds	Peels
Alkaloids	8.0	6.8
Phenols	11.4	11.0
Tannins	5.6	4.2
Saponins	7.8	8.4
Flavonoids	12.0	13.0

Mineral Analysis

The result of mineral analysis is shown in table 4. The sodium content of the orange seeds (55.56mg/100g) and orange peels (55.56mg/100g) is the same? The sodium could serve in lowering blood pressure. The

potassium content of the orange peels (60.00mg/100g) is more than that of the orange seeds (57.50mg/100g).The Magnesium content of the sweet orange seeds (1.02mg/100g is higher than that of the peels (0.13mg/100g) but lower than magnesium content of *Amaranthus hybridus* leaves (23.18mg/100g)[10]. The copper content of orange seeds (0.27mg/100g) which is higher than the copper content of the orange peels (0.10mg/100g).This also is higher than the copper of *indigofera astragelina* (0.0.2mg/100g).Copper serve as a catalyst for the oxidation of unsaturated fat and oils. It is also a very powerful pro-oxidation. Zinc is useful in the synthesis and degradation of carbohydrate, lipids, proteins and nucleic acids. The Zinc content of the sweet orange seeds as(0.63mg/100g) which is higher than the Zinc content of the orange peels (0.27mg/100g). This is also higher than the Zinc content of *Mucuna sloani* *(*0.25mg/100g)[11].

The calcium content of the sweet orange peels (133.73mg/100g) is higher than that of the seeds (31.00mg/100g). This is also higher than that of the *securinega virosa* (2.90mg/100g). Calcium is good for maintenance of bones, teeth and muscles. It is also good for growth[12]. The manganese content of sweet orange seeds (0.13mg/100g) is same as that of the peels (0.13mg/100g). Manganese acts as an activator for many enzymes. It is essential for human nutrition.

Table 4: Mineral composition of Sweet Orange peels and seeds

Minerals	concentration (mg/100g)	
	Peels	Seeds
Sodium	55.56	55.56
Potassium	60.00	57.50
Manganese	00.13	00.13
Copper	00.10	00.27
Nickel	00.01	00.27
Cadmium	00.04	00.04

Chromium	00.60	00.15
Zinc	00.27	00.63
Calcium	133.73	31.00
Magnesium	00.13	01.02

CONCLUSION

The seeds and peels of sweet orange can serve as potential source of minerals and Phyto drugs for man and animals.

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