

Comparative Studies of Phytochemical and Vitamin Constituents of *Citrus Sinensis* and *Vitis Vinifera* Peels

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Abstract

The phytochemical and vitamin analysis of the crude peel extracts of *Citrus sinensis* and *Vitis vinifera* was determined. The phytochemical and vitamin contents were determined using standard biochemical methods. The results of phytochemical studies showed *C. sinensis* peels had high levels of Saponins, alkaloids and tannins with low levels of oxalate and phenol while *V. vinifera* had high levels of alkaloids, phenol, tannins and oxalate with saponin low. Analysis vitamins showed that the *C. sinensis* has highest level of vitamin C (136.67 ± 4.16) and B₉ (26.67 ± 0.58), moderate level of vitamin A (4.10 ± 0.06) with low contents of vitamin B₂ (0.11 ± 0.01) while *V. vinifera* had highest amounts of Vitamin A (210.12 ± 0.01) and B₉ (63.25 ± 0.21), moderate amounts of C (4.16 ± 0.00) and E (1.16 ± 0.00) with trace amounts of B₁, B₂ and B₅ (0.07 ± 0.00). The findings therefore, suggest that there is an indication that *C. sinensis* and *V. vinifera* peels contains important phytochemicals and vitamin compounds that may be linked to its beneficial effects on health.

Keywords: Phytochemical; Vitamin composition; *Citrus sinensis* and *Vitis vinifera* peels

Introduction

Although, man has colossal vigor to consume and adapt to a variety of eating stuff, there are certain things like fruits and vegetables that are insensible in human diet. Fruits and their important components have a crucial role in providing invaluable nutrients to maintain human health. Interestingly, the seed and rind of some fruits contained high amount of vitamins, fibers, minerals and other essential nutrients activity than the pulp fractions. To this effect, it is therefore necessary to evaluate the nutritional and anti-nutrient contents of these fruits and their waste materials so that the knowledge derived can be used to encourage adequate consumption of fruits and re-utilization of the seeds and rind in possible value added applications in addition to medicinal significance.

Peel, also known as rind or skin, is the outer protective layer of a fruit or vegetable which can be peeled off. The rind is usually the botanical exocarp, but the term exocarp does also include the hard cases of nuts, which are not named peels since they are not peeled off by hand or peeler, but rather shells because of their hardness. A fruit with a thick peel, such as a citrus fruit, is called a hesperidium. In hesperidiums, the inner layer (*albedo* or *pith* by non-botanists) is peeled off together with the outer layer (*flavedo*) and together they are called the peel. The flavedo and albed are known as exocarp and mesocarp respectively while the juicy layer inside the peel (containing the seeds) is the endocarp.

Depending on the thickness and taste, fruit peel is sometimes eaten as part of the fruit, such as with guava, garden egg, tomato fruits and apples etc. In some cases, the peel is unpleasant or inedible and it is removed and discarded. Among these are watermelon, pineapple, bananas and citrus fruits. Peel of some fruits like pomegranates has been reported to contained high levels of tannins and other polyphenols and is employed in the production of dyes. The peel of citrus fruits is bitter and generally not eaten raw, but may be used in cooking, e.g., chenpi. In gastronomy, the outermost, colored part of the peel is called the zest, which can be scraped off and used for its tangy flavor.

The fleshy white part of the peel, bitter when raw in most species, is used as succade or is prepared with sugar to make marmalade or fruit soup.

Phytochemicals are diverse range of biologically active compounds found in plants, which provide color, flavor and natural protection against pests to the plants along with reduction of the risk of developing many forms of cancer (lung, prostate, pancreas, bladder and breast) and risk of cardiovascular diseases [1]. The majority of these beneficial effects are at least in part due to the presence of phytochemicals in vegetables and fruits. Carbohydrates, proteins, antioxidants, proteases, tannin, phytic acid etc., are some of the important bioactive components present in fruit peels. Each of them has their own significance and biological roles.

The aim of this study was to analyses the extract of *citrus sinensis* and *vitis vinifera* peels for phytochemical and vitamin constituents.

Materials and Methods

Materials

Fresh fruits of *citrus sinensis* and *vitis vinifera* were purchased at meat market in Abakiliki, Ebonyi State Nigeria in the month of August, 2014. The plant samples were identified and authenticated by Taxonomist in the Department of Applied Biology, Ebonyi State University, Abakiliki, Ebonyi State, Nigeria. All chemicals and reagents were of analytical standard.

Preparation of Plant Material

The peels of *citrus sinensis* and *vitis vinifera* were obtained from the fruits and shade dried at room temperature ($28 \pm 3^\circ\text{C}$). The dried peels were pulverized into fine powder using manual grinder.

Methods

Quantitative Phytochemical Analysis

The method of Akubugwo., *et al.* (2007) [1] was adopted to assay for the quantitative phytochemical analysis to determine the concentrations of alkaloids, saponins, tannins, oxalate and phenols in the peels of *citrus sinensis* and *vitis vinifera*.

Measurement of Selected Vitamins

Selected Vitamins: Thiamin, riboflavin, niacin, ascorbic acid, tocopherol, retinol and folic acid were determined using atomic absorption spectrophotometer (AAS) based on association of official Analytical chemist A.O.A.C [2].

Statistical Analysis

The data was analyzed by ANOVA and results expressed as means and standard deviation.

Results and Discussion

Phytochemical analysis conducted on the *C. sinensis* and *V. vinifera* peel extracts revealed that the peels contained numerous phytochemicals in variable amounts and these are known to exhibit medicinal as well as physiological activities. Analysis of the *C. sinensis* peels had higher levels of Saponins, alkaloids and tannins with low levels of oxalate and phenol while *V. vinifera* had high levels of alkaloids, phenol, tannins and oxalate with saponin low (Table 1). The results of alkaloids, saponins and phenol except tanins obtained from *C. sinensis* peel is in conformity with the report of Adewole., *et al.* [3] reported on *C. sinensis*. The values observed in tannin in both peels disagree with concentration found in Apple and Pomegranate ($42.46 \mu\text{g/ml}$), Grapes ($35.72 \mu\text{g/ml}$) as reported by Archana., *et al.* [4] and *Sclerocarya birrea* peels [5]. Saponins have the property of precipitating and coagulating red blood cells. Some of the characteristics of saponins include formation of foams in aqueous solutions, hemolytic activity, cholesterol binding properties and bitterness [6]. Alkaloids have been associated with medicinal uses for centuries and one of their common biological properties is their cytotoxicity [7]. Several workers have reported the analgesic [8], antispasmodic and antibacterial properties of alkaloids. The results obtained in this study thus

suggest the identified phytochemical compounds may be the bioactive constituents and this leaf is proving to be an increasingly valuable reservoir of bioactive compounds of substantial medicinal merit.

Phytochemicals	<i>Citrus Sinensis</i>	<i>Vitis Vinifera</i>
Alkaloids	0.55 ± 0.01	1.58 ± 0.01
Saponins	1.60 ± 0.02	0.31 ± 0.00
Tannins	0.54 ± 0.01	0.64 ± 0.00
Oxalate	0.04 ± 0.01	0.56 ± 0.04
Phenol	0.07 ± 0.00	0.71 ± 0.00

Values are mean ± standard deviation of triplicate determination.

Table 1: Results of Phytochemical Composition of *C. Sinensis* and *V. Vinifera* Peels (G/100g) Dry Weight.

Vitamins	<i>Citrus Sinensis</i>	<i>Vitis Vinifera</i>
A	4.10 ± 0.06	210.12 ± 0.01
B ₁	0.11 ± 0.01	0.07 ± 0.00
B ₂	0.08 ± 0.00	0.31 ± 0.00
B ₃	0.87 ± 0.01	0.07 ± 0.01
B ₅	0.48 ± 0.00	0.07 ± 0.00
B ₉	26.67 ± 0.58	63.25 ± 0.21
C	136.67 ± 4.16	4.60 ± 0.00
E	0.21 ± 0.01	1.16 ± 0.00

Values are mean ± standard deviation of triplicate determination.

Table 2: Results of Vitamin Composition of *C. sinensis* and *V. vinifera* peels (g/100g) Dry Weight.

Tannin values in the peels were less than 1 mg/100 ml and the values were not significantly different from each other. Tannin imparts an astringent taste that affects palatability, reduce food intake and consequently body growth. Tannins are known to inhibit the activities of digestive enzymes and nutritional effects of tannin are mainly related to their interaction with protein. Tannin protein complexes are insoluble and the protein digestibility is decreased [9]. Although, the values reported were low to be of any nutritional importance. The value was however low when compared to 13.3, 19.1 and 99.2g/kg tannin reported for cashewnut, fluted pumpkin and raw breadnut, respectively [10]. Studies on rats, chicks and livestock revealed that high tannin in diet adversely affects digestibility of proteins and carbohydrates, thereby reducing growth, feeding efficiency, metabolizable energy and bioavailability of amino acids [11]. From medicinal point of view, polyphenol to which tannin belongs has been reported to act as antioxidant by preventing oxidative stress that causes diseases such as coronary heart disease, some types of cancer and inflammation [12]. Oxalate is a concern because of its negative effect on mineral availability. High oxalate diet can increase the risk of renal calcium absorption and has been implicated as a source of kidney stones [13]. Oxalate ranged between 0.04 mg/100g for *C. citratus* peel and 0.56 mg/100g for *V. vinifera* peel. The levels of oxalate in the different peels is similar to 0.33g/100g oxalate in orange pulp, 0.28g/100g in okro, 0.99g/100g in red pepper and 1.31g/100g in tangerine pulp [14]. The levels of oxalate in the studied peels might not play important role in their nutritive values. Munro and Bassir [14] have revealed that the possibility of oxalate poisoning in Nigeria from consumption of local fruits and vegetables is as remote as it is in other parts of the world. Spinach that recorded 19.72g/100g oxalate can only be hazardous if there is calcium oxalate interaction in the body. Phenol values obtained are 0.07 and 0.71 mg/100g for *C. citratus* and *V. vinifera* peels respectively. Phenol is an antioxidant that is involves in protection of the human system against cancer and other degeneratives diseases by scavenging free radicals.

The peels of *C. citratus* has highest content of vitamin C at a contraction of 136.67 ± 4.16 mg/100g while vitamin B₉ and A occurred at contraction of 26.67 ± 0.58 and 4.10 ± 0.06 mg/100g. However, vitamin B₁, B₂, B₅ and E were less than 1 mg/100g. Similarly, the peel of *V. vinifera* has highest amounts of vitamin A at a level of 210.12 ± 0.01 mg/100g while B₉, C and E were at levels of 63.25 ± 0.21 , 4.60 ± 0.00 and 1.16 ± 0.00 mg/100g with the rest less than 1 mg/100g (Table 2). Vitamins play very important roles in maintaining the proper function of the system, even in very minute quantity. The value of vitamin C obtained in this work is close agreement with the research done by Thomas and Oke's [15] peel of mangoes contained and also on the *C. millenii* mesocarp according to Bello., *et al.* [16]. Vitamin A and C have strong antioxidant activity while vitamin B₉ could help in red blood cells development. It could also regulate nerve cells at embryonic and foetal stages of development, helping to prevent abnormalities of the brain, spinal cord and neural tube defects [17]. This study therefore point to the fact that both juice and the peels of citrus fruit can be use for both as medicinal and nutritious.

Conclusion

From the research, it has been established through the phytochemical and vitamin analysis that *Citrus sinensis* and *Vitis vinifera* peels can be used as a good source of phytochemicals and vitamins. Vitamin plays important roles in metabolic activities in the body. The traditional medicine practice is recommended strongly for the use of these peels in treatment and to individuals as food. Further study is however needed to determine the digestibility and bioavailability of these citrus peels. Similarly, studies on the identification, isolation, characterization and elucidation of structure of the bioactive compounds can help in utilizing the valuable nutrients in fruit peels instead of wasting them.

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