Physicochemical Analysis of *Daucus carota* (Carrot)

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ABSTRACT
The experimental data of this current research work shows the Physico- chemical and Antioxidant Parameters of Carrot (TABLE 1.1). The experiments were carried out using standard procedures from other literatures. All chemicals used were of analytical standard. It was observed that the fresh carrot sample contained 8.33 ± 0.58 (%) of Total Soluble Solids, 0.06 ± 0.03 (g/100g) of titrable Acidity, 16.667 ± 1.332 (mg/100ml) of Ascorbic Acid, 124.28 (mg/100 kg) of B carotene with a pH of 6.233 ± 0.058. β-carotene has the value of 124.28 (mg/100 kg), the high concentration of this in carrot make them to inhibit cancers, also serves as anti mutagenic, free radical scavengers and immune enhancers. Carrot is traditionally recommended to every human being especially the weak, sickly, or rickety children; it's good for pregnant women, this is good news as many children and adults have poor intakes of this nutrient.

Keywords: *Daucud Carota*, carotenoids, phytosterols, glucosinolates,

1.0 INTRODUCTION

1.1. Background of study

The World Health Organization (WHO) estimates that 80 percent of the world population presently use herbal medicine for some aspect of primary health care (Alasalvar *et al*, 2001). Plant showed nutritional and therapeutic benefits including antimicrobial, antioxidant, anticancer, hypolipidemic, cardiovascular, central nervous, respiratory, immunological, anti-inflammatory, analgesic antipyretic and many other pharmacological effects. The protective action of fruits and vegetables has been attributed to the presence of bioactive compounds with health benefits. These compounds include carotenoids, phytosterols, glucosinolates and others. Some carotenoids are widely known as provitamin A, while there is an increasing interest in their role as antioxidants (Berger *et al*. 2008). In addition to the anti-cancer activity, other health benefits provided by β-carotene include protection against cardiovascular diseases, cataract prevention (Dietmar and Bamedi, 2001) and others.

Carrot (*Daucuscarota L.*) contains many carotenoids, such as tetraterpenes of the isoprenoid group. It is a root vegetable, which are usually orange in color but sometimes appears purple, red, black, white and yellow in colour. Carrot is a vegetable that is not only nutritive but they are important food to mankind for the maintenance of health (Wong *et al.*, 2003). Carrots can provide a significant amount of vitamin A, food matrices greatly affect the bio-availability of

plant carotenoids, their efficiency of conversion to vitamin A, or both (Tang *et al*. 2005). Carrot gives essential mineral and vitamin and also in adding colour flavor and variety of diet (Ragaert *et al*. 2004). Carotene also carotin from the latin *carota* carrot is used for many related unsaturated hydrocarbon substances having the fomula C4Hx which are synthesized by plants, they are also photosynthetic pigments important for photosynthesis. Carotene contains no oxygen atoms, and is responsible for the orange colour of the carrot. The root contains high quantities of alpha and beta carotene and they are good source of vitamin k and vitamin B6. About 60% of the total carotene content in carrot is (3-carotene (Gabelman 1974).

2.0 METHODS

2.1 Sample Preparation

100g of the sample was used for the analysis. The plant Material originally identified and authenticated by botanist from Chukwuemeka Odumegwu Ojukwu University Uli Anambra State. The carrot was washed in running tap water to remove impurities. Trashes were removed with a plane stainless steel knife and then trimmed with the same knife. It was chopped into smaller pieces and blend with a blender. The juice was extracted using a sieve cloth. It was then poured in a well rinsed bottle and kept in a refrigerator for further analysis.

2.2.2. Physico-chemical analysis

2.2.2.1. Total Soluble Solids

Brix is used to express the level of soluble solids in a solution. Brix values primarily represent estimates of sugar content in fruits and vegetables. Brix values of a solution are measured using a device called a refractometer. Refractometers measure the refractive index of a solution to calculate a soluble solid concentration. Functionally, the refractive index quantifies dissolved solids based on changes in the direction of a light beam that passes through a liquid containing invisible dissolved or suspended solids. In general, the greater the amount of these "solids" in the liquid, the more light is bent when passing through it. All things being equal, the extent of this refraction also hinges on the temperature of the solution. Therefore, some refractometers adjust the values they report to account for the solution temperature.

In this current project, Total soluble solids (TSS) were assayed using the refractometric method, total soluble solid (TSS) was determined using hard refractometer (ATAGO-ATCI, Atago Co. Ltd., Tokyo, Japan).

2.2. Total Acidity

Titrable acidity which is also called total acidity measures the total acid concentration in a food. This quantity is determined by exhaustive titration of intrinsic acids with a standard base. Titrable acidity is a better predictor of acid's impact on flavor than pH.

Total acidity (as % citric acid) was determined by titrimetric method (Rangmana, 1986). Acidity was measured by titrating samples with 0.1 moL^{-1} of NaOH solution up to pH 8.2 and was expressed as citric acid per 100ml of juices(AOAC, 1990). The values for pH were measured by pH meter

2.3. Vitamin C determination

Determination of vitamin C concentration is based on redox titration method by using iodine. When the iodine is dropped into the Erlenmeyer flask containing ground extract, HCl and starch solution, the ascorbic acid (vitamin C) is oxidized to dehydroascorbic acid while the iodine is reduced to iodide ions.

2.3.1. Procedure The ascorbic acid was determined by iodine titration method (FAO, 2011). The 10ml of juice sample were taken in 250mL conical flask, and the 75 mL of distilled water and 0.5mL of starch indicator were added. The sample was titrated with 0.1mlL^{-1} iodine solution. The endpoint of the titration was identified as the first permanent trace of a dark blue-black color due to the starch-iodine complex. The amount of ascorbic acid was expressed in mg/100mL of juice.

2.4. Beta carotene content determination

2.4.1. Principle

The β-carotene bleaching assay for evaluating antioxidant activity is one of the common methods used in the field of food chemistry. The principle of the method is based on the discoloration of yellowish color of a β-carotene solution due to the breaking of π-conjugation by addition reaction of lipid or lipid peroxyl radical (or) to a C=C double bond of β-carotene.

2.4.2. Procedure

The beta-carotene content was estimated following the procedure of (Sharma *et al.*, 2009). The 25mg of beta-carotene was weighed and dissolved in 2.5 mL of chloroform and diluted to 250 mL with petroleum ether. The final solution was diluted with petroleum ether. The final concentrations of standards were 10, 20, 30, 40 and 50mgL^{-1}. The absorbance was measured at 452nm, using 3% of acetone in petroleum ether as blank. The beta-caronete content in the juice sample was calculated using the standard curve.

3.0. RESULTS

TABLE 1.1: Physico- Chemical & Antioxidant Parameters of Carrot

Parameters	Values
Total Soluble Solids	8.33 ± 0.58 (%)
Titrable Acidity	0.06 ± 0.03 (g/100g)
Vitamin C	16.667 ± 1.332 (mg/100ml)
β. carotene	124.28 (mg/100 kg)
pH	6.233 ± 0.058

Values are mean ± Standard Error (SE)

3.1. DISCUSSION

Physicochemical properties

The above experimental data show the physico-chemical and antioxidant parameters of Carrot (TABLE 1.1).

Total Soluble Solids

The fresh carrot sample in this study contained 8.33 ± 0.58 % of Total Soluble Solids. The outcome of the TSS is in agreement with the findings of Moza (2010) who reported in their work that fresh carrot juice had 7.4% of total soluble solids.

Titrable Acidity and pH values

The mean value of titrable acidity observed in the fresh carrot sample used for this work is 0.06 ± 0.03 g/100g, while the pH were found to be 0.06%. The mean values of titrable acidity obtained is in agreement with the findings of Zadernowski *et al*. (2010) who reported 0.19 g/100 g acidity in fresh red carrot. Similarly, Jothi *et al*. (2014) recorded pH as 5.00 and mean titrable acidity to be 0.05 g/100g, in carrot juice.

Ascorbic acid value

The measured amount of Ascorbic Acid is 16.667 ± 1.332 (mg/100ml). The value indicates that carrot a good source of vitamin C for body normal metabolism, and can also be used in prevention of scurvy and in wound healing and tissues repair. Our findings are in agreement with the result published by Arora *et al*. (2009).

β-carotene

β-carotene has the value of 124.28 (mg/100 kg), the high concentration of this in carrot make them to inhibit cancers, also serves as anti mutagenic, free radical scavengers and immune enhancers.

4.1. CONCLUSION

Conclusively, carrot is very good for the body and need to be added to our daily especially when in season. It cannot be disputable as the percentage rates of vitamin are very high enough, therefore, it will be nutritionally and medicinally helpful for carrot to be utilized as supplement with other fruits and products in the diet in order to meet up with the body requirements for healthy nutrition.

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