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ASSESSMENT OF THE NUTRITIONAL VALUES AND PROXIMATE ANALYSIS OF THE AFRICAN BLACK OLIVE *(Canarium schweinfurthii* linn) (ATILI) OIL SOLD AT DANTSE, GANAWURI MARKET OF RIYOM LOCAL GOVERNMENT AREA, PLATEAU STATE, NIGERIA

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ABSTRACT

The olive tree has global significance and high economic value because of its oil, which has a centuries-long history in the Mediterranean diet and is widely consumed worldwide. Alongside the economic value to the national economy of many countries, olive oil also serves as an important food in terms of its nutritional value. Olive oil extracted from the ripe fruit (*Canarium schweinfurthii*) is a liquid fat obtained from Olives. It is commonly used in cooking particularly, frying food or as a salad dressing. Despite the wide consumption of black olive fruits and their oil in the study area, the nutritional values have not been sufficiently investigated. Therefore, the study was to determine the nutritional and proximate values of the black Olive oil sold in Ganawuri market in Riyom Local Government Area of Plateau State using standard laboratory methods. The result of nutritional analysis indicated that olive oil had crude fat of 65.77%, protein of 8.09% crude fibre of 0%, and carbohydrate of 6.12%. The proximate analysis indicated that the olive oil had no calcium and phosphorus as it was negative (-) or 0%. The consumption of black olive oil due to its nutritional benefits is therefore justified and should be encouraged.

Keywords: Olive oil, proximate, Analysis, Nutrients

INTRODUCTION

The African olive (*Canarium schweinfurthii* L.) is an indigenous African tree species belonging to the olive family *Oleaceae*. The African olive tree has a geographical distribution throughout the African continent and native species are found in Nigeria, Cameroon, Ghana, Angola, Ethiopia, Guinea-Bissau, Liberia, Mali, Senegal, Sierra-Leone, Sudan, Tanzania, Togo, Uganda and Zambia (Nyam *et al*., 2018, Damián *et al*, 2019).

In recent times there has been an incredible increase in the production and consumption of olive fruit and oil in particular due to perceived gastronomic and health-related as well as economic benefits (Nyam, *et al.,* 2014).

Olive oil is produced from the matured harvested olive fruit after undergoing a process of pressing and subsequent separation of the oil from the pulp. Foscolou, *et al*. (2018) and Massaro *et al*. (2020) asserted that olive oil consists of large fats, predominantly monounsaturated fatty acids, and a high percentage of carbohydrates, vitamins, and minerals as the main nutrients. Al-Bachir and Sahloul (2017) and Guo *et al*. (2018) posited that there is growing evidence from scientific investigations suggesting that the health benefits of olive oil include lower incidences of chronic degenerative diseases, atherosclerosis, cardiovascular disease, neurodegenerative diseases, certain types of cancer and higher life expectancy among others. Consequently, such health benefits have been attributed to the dietary consumption of olive oil. Furthermore, empirical evidence suggests that phenolic components and other antioxidants in olive oil account for some of these health benefits (Yao *et al*., 2019, Gavahian *et al*., 2019).

Investigations by some authors (Yao *et al*., 2019, Medeiros *et al*., 2019, Díaz-Curiel *et al*., 2020) suggest that there are numerous health benefits of cooking with olive oil which include a low risk of osteoporosis (a condition of bones becoming brittle or weak) among several others. Olive oil contains oleic acid in small quantities, palmitoleic, stearic, linoleic, and alfa linolenic acids squalene which is essential in maintaining human health (Kelebek *et al*., 2015, Yao *et al*., 2019).

Similarly, Denis and Hampton (2019) recommend the frequent consumption of diets with olive oil due to the presence of saturated fatty acids, polyunsaturated fatty acids and linoleate among others which has immense health benefits. Massaro *et al*. (2020) and Centrone *et al*. (2021) noted that olive oil contains high number of antioxidants, soluble fats, vitamins, and carotene in comparison to other vegetable oils and has a zero-cholesterol level. Therefore, frequent consumption of a diet rich in black olive oil could neutralise the effect of gastric acid and prevent gastritis and duodenal ulcer. It can also reduce the occurrence of cholecystitis and gallstones due to the accumulation of bile (Yao *et al*., 2019, Massaro *et al*., 2020).

It has been asserted by Foscolou *et al*. (2018) that a tablespoon of olive oil could contain up to an estimated 119 kcal and 13.5 g of fat, 10 g of monounsaturated fat, 0 g of carbohydrates, fibres, and proteins, 1.9 mg of vitamin E and 8.1 µg of vitamin K. Gorzynik-Debicka *et al*. (2018) reported that an increasing trend in the incidence of chronic cardiovascular diseases such as hypertension, and coronary artery disease among others among people in the age bracket of 45-60 is attributed to unhealthy dietary patterns and recommend improve healthy eating habits including the regular consumption of olive oil as a protective measure to improve human morbidity (Foscolou, *et al*., 2018, Gorzynik-Debicka *et al*., 2018).

Therefore, Kelebek *et al*, (2015) submitted that olive oil is considered one of the most proper oils for human nutrition among the oils found so far. Furthermore, edible olive oil is rich in trace elements and many mineral elements. Hence, cooking with olive oil can help supplement the necessary nutrients in the body, regulate the body, maintain beauty, and effectively prevent cardiovascular diseases (Kelebek *et al*, (2015).

There is an increased consumption of black olive oil in recent times within the study area and beyond resulting in high demand for the product largely due to its perceived nutritional and health benefits as well as economic values. This study, therefore, was aimed at investigating the nutritional as well as proximate values of the black olive oil to justify such claims.

MATERIALS AND METHODS

Study Area

Samples of black olive oil were obtained from Dantse market in Ganawuri District of Riyom Local Government Area of Plateau State. Ganawuri environment is rocky and has a temperature that supports the growth of African Olive tree. The Ganawuri Wednesday market is popular for the sale of various farm produce including locally processed cooking oils such as groundnut, olive, castor, sunflower oils among others thereby attracting customers from far and near.

Sampling

The sample of pure black olive oil (a bottle of 500ml) was purchased from the local market of Ganawuri and placed in a polythene bag, the sample was transported to the Biochemistry Laboratory of National Veterinary Research Institute (NVRI) Vom for analysis.

Laboratory Analysis

All Laboratory analyses conducted in this work are according to the procedures detailed in the Association of Official Analytical Chemists (AOAC) (2016) protocol. All reagents used in this analysis are of analytical grade.

Determination of Moisture Content

Determination of moisture content was done by adding 2ml of olive oil into a 50mm diameter aluminium pre weighed dish then it was weighed. After which it was shaken to homogeneity and placed in an oven at a temperature of 105^0C for 18 hours. The dish was transferred into a desiccator to cool. The weight was calculated as loss in weight of the moisture content as detailed in AOAC (2016).

Determination of Ash Content

Determination of ash content was carried out as detailed in the AOAC (2016) protocol. Briefly, a previously ignited crucible with a lid was placed in a muffle furnace for 1 minute, afterwards placed in a desiccator to cool and the weight recorded. Thereafter, 2ml of the sample was pipetted into a porcelain crucible and weighed. The crucible was placed into a furnace for 2hours at a temperature of 600^0C. Subsequently, the crucible was placed in a desiccator after cooling, the weight was recorded and the crude ash expressed as percentage by weight of test sample.

Determination of Protein Content

In this method, a moisture-free sample of pure olive oil weighing 0.10g was transferred into a Kjeldahl digestion flask, followed by addition of few crystals of Kjeldahl digestion mixture and antibumping granule crystals. Digestion was done for 3 hours by adding 10ml of concentrated sulphuric acid (H_2S0_4) to ensure complete oxidation. After cooling, the sample was then diluted in a 100ml volumetric flask to the mark with distilled water. This was then followed by steam-distillation in a Markham distillation apparatus in the presence of 40% Sodium Hydroxide (NaOH). The change in colour observed from pink to pale green is due to the liberation of ammonia from the sample to form ammonium borate. After collecting about 100ml of the distillate in a conical flask it was titrated against 0.11 M $Na_2 CO_3$ until a pink colour was observed.

Determination of Crude Fat

The extraction flask was weighed and placed in a wrapped sample in an extraction thimble containing 2ml of the oil sample and was fixed in a soxhlet extractor with 150ml of solvent in a flask, then extracted for about 4 hours at a condensation rate of 5 drops per second or 16 hours at 2 drops per second.

The thimble with the sample was removed leaving the extracted fat with 10ml of solvent in the flask. The solvent in an oven was gently evaporated and then transferred into a desiccator to cool and thereafter weighed.

Determination of Crude Fibre

In this procedure, 1ml of the sample was weighed into 250ml conical flask, and 50ml digestion mixture was added, the flask was placed into a source of heat in a fume cupboard, and allowed to boil for 45 minutes while shaking occasionally to keep solids from adhering to the sides. The flask and filter were removed through a previously weighed ashless filter paper. The conical flask was rinsed with 75ml of boiled distilled water and washed through filter paper. The process was repeated with three 50ml portions of water until the sample was free from acid. The residue was rinsed again with 50ml of acetone. The residue was removed with filter paper and dried at 105^0C in a hot air oven for 2hrs, and was transferred into the previously weighed crucible and ignited for 3 hours at 600^0C in a muffle furnace, allowed cool and weighed.

Determination of Carbohydrate

The carbohydrate content of the sample was determined using the procedure described by AOAC (2016) by subtracting the total ash content, crude fat plus crude protein and crude fibre from the total dried matter.

Determination of Phosphorus

In this method, 2ml of the sample was weighed and ashed in a furnace at 600^0C for 3hrs. It was allowed to cool and moistened residue with a little distilled water in a beaker. 8.5ml of 25% of HCL was added. The reaction was accelerated by adding 2 drops of concentrated HNO_3 and was heated to boiling. After boiling, it was allowed to cool and filtered into a 100ml volumetric flask to make the mark of distilled water. 1ml of the sample was taken and also 5ml of molybdovanadate reagent was added and allowed to stand for 10 minutes to make up 25ml of distilled water, absorbance was read at 470nm in the Spectophotmeter.

For standard, 0.2ml of 1mg/ml phosphorus solution was taken, 19.8ml of distilled water was added and also 5ml of molybdovanadate reagent was added then absorbance was read at 470nm.

Determination of Calcium

Ashing and Extraction: 2 ml of the sample was weighed and ashed in a muffle furnace to carbon-free at 600°C for 3hrs, it was allowed to cool, and the moistened residue with a little distilled water was transferred into a beaker. 8.5 ml of 25% HCl and 3 drops of nitric acid were added, and then the mixture was heated to boil. After cooling, the solution was diluted with distilled water and made up to the required volume mark of 10 ml.

RESULTS AND DISCUSSION

The results obtained from this analysis show the percentage level of proximate composition of the African black olive oil as follows- moisture content (20.01%), ash content (0.01%) crude fat (65.77%), crude fiber (-), protein (8.09%) and carbohydrate (6.12%) as presented in Table 1 below.

Table 1: Proximate Composition of the Olive Oil (*Canarium schweinfurthii*)

Parameters	Proximate Composition (%)
Moisture content	20.01
Ash content	0.01
Crude protein	8.09
Crude fat	65.77
Crude fiber	-
Carbohydrate	6.12

Table 2: Elemental Composition of the Olive Oil (*Canarium schweinfurthii*)

Element	Concentration (mg/100g)
Calcium	-
Phosphorus	-

Discussion

The result of the proximate analysis from this investigation on black olive oil obtained from Dantse Market in Ganawuri of Riyom Local Government Area of Plateau state is presented in Table 1. The parameters examined were Moisture content, ash content, crude fat, crude fibre, protein content and carbohydrate. The ash content had the lowest value of 0.01% out of all parameters examined. This is in agreement with a similar result obtained by Nyam (2014). The moisture content of olive oil (20.01%) was high compared with the value of moisture content of palm oil (5%) as reported by Itelima (2014). The result of proximate analysis also indicated that the Olive oil is rich in crude fat or fat (65.77%) as seen in Table 1. This was however slightly lower than that reported by Nyam (2014) who obtained a value of 68.3%.

Olive oil provides dietary requirements for energy and also provides a feeling of satiety. Olive oil is a source of lipid-soluble vitamins and poly-unsaturated fatty acids, implying that the consumers of Olive oil are nutritionally well-fed. The analysis also revealed a low protein content of 8.09% implying that the Olive oil is not so rich in protein. Davies *et al*. (2015) asserted that Protein is necessary for the biosynthesis of new cells, enzymes, hormones, antibodies and other substances required for healthy functioning and the development of the body cells as well as for protection. Proximate analysis in this investigation recorded a negative crude fibre indicating that Olive oil does not contain any level of crude fibre. On the contrary, Nyam (2014) recorded 11% of crude fibre and further reported a higher value of crude fibre in Olive oil of 20.0g/100g as reported by Tous and Ferguson (1996). The carbohydrate content (6.12%) of this study was high compared to that of Nyam, (2014) who reported a value of 2.85%.

The result of the elemental analysis of the African black olive oil indicates the fruit does not contain calcium and phosphorus as indicated in Table 2.

Empirical evidence by Foscolou *et al.* (2018) has shown that a table spoon of olive oil contains some vital compounds of nutritive benefit such as monounsaturated fat (10 g), fat (11913.5 g), vitamin E (1.9 mg) and vitamin K (8.1 μg). Furthermore, black olive oil is rich in some basic polyphenols and antioxidants including flavonoids and several essential minerals such as iron and copper, it is also rich in vitamin C. The inclusion of diet rich in olive oil could reduce the risk of coronary heart diseases such as hypertension, and cancer, particularly breast cancer (Nyam *et al*., 2018, Garcia-Martinez *et al*., 2018, Denis and Hampton 2019).

Therefore, Yao *et al*. (2019) and Massaro *et al*. (2020) recommend the consumption of olive oil for hypertensive patients in addition to their antihypertensive medications as this has been proven to favourably lower blood pressure and are now recommended as integrative tools in hypertension management.

Many studies (Gorzynik-Debicka *et al*., 2018, Ilak and Težak, 2021) on olive leaf extract showed that it can lower blood pressure in animals as well as increase blood flow through the coronary arteries, slow down the heart rate and normalize intestinal muscle contractions.

Chemopreventive activity of olive oil has been attributed to its unique phenolic compounds represented by phenolic alcohols like hydroxytyrosol (3, 4-dihydroxyphenylethanol: 3, 4-DHPEA) beside others (Gorzynik-Debicka *et al*., 2018**).** In addition, Gorzynik-Debicka *et al*. (2018**)** and Yao *et al.* (2019) are of the view that anticancer properties of olive oil seem to correlate with the antioxidant activity of phenolic and polyphenolic compounds present therein that is capable of scavenging free radicals and reactive Oxygen species.

Gavahian, *et al*. (2019) reported that research has shown that some natural plant-derived polyphenols can directly or indirectly prevent cells from the initiation of neoplastic transformation due to xenobiotics and carcinogenic factors, and thus contribute to a lower risk of developing cancer.

CONCLUSION

This study revealed that black African olive oil from Ganawuri, Plateau State, is rich in fat and contains measurable levels of protein, moisture, ash, and carbohydrates, although crude fibre was not detected. The oil also lacks appreciable amounts of phosphorus and calcium. These findings suggest that black African olive oil is rich in unsaturated fat and could provide significant nutritional benefits. Its inclusion in the human diet may help address health challenges such as cancer, stomach ache, heart disease, ulcer, and weakened immunity, thereby justifying its traditional use in folk medicine.

RECOMMENDATIONS

In light of these results, the following recommendations are made:

i. The consumption of black African olive oil should be encouraged, particularly among hypertensive patients.
ii. Further scientific research into its chemical, nutritional, and medicinal properties should be pursued to deepen understanding and validate its health benefits.
iii. Large-scale planting of olive trees should be promoted to ensure sustainable utilization, support ongoing research, and enhance food security through economic development.

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