

Research Article

Comparative Antioxidant Capacity of the Spices of Some Traditional Soups in Nigeria

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Abstract: Oxidative stress has been reported as causative agent in certain chronic diseases. However this effect can be delayed or prevented by dietary antioxidants. Vegetables and spices are the major dietary antioxidant contributors in soups. The objective of the present study compares the antioxidant capacities of vegetable and spices used in the preparation of 13 traditional soups drawn from different regions in Nigeria. The antioxidant capacity of the soups was evaluated by measuring the Ferric reducing antioxidant power (FRAP), total phenolic content (TPC), total flavonoid content (TFC) and radical scavenging activity of vegetable and spices used in the preparation of each soup. From the results obtained it was observed that based on the individual spices antioxidant, Miyan kuka and Miyan karkashi had the highest TPC and FRAP while banga soup had the highest TFC. On the other hand, Ewedu from the Southern Region of Nigeria had the least TPC followed by Ofe Achi, while Oha had the least TFC followed by Ewedu. The results provide the necessary information for a healthy feeding habit.

Keywords: Antioxidant, total phenolic content, flavonoid content, ferric reducing antioxidant power, vegetable and spices, soups.

INTRODUCTION

Reactive oxygen species (ROS) are known to play a central role in the pathogenesis of degenerative diseases which can be delayed or prevented by dietary antioxidants. [1] Thus, dietary antioxidant plays an important role in health care. Major dietary antioxidant contributors include fruits, vegetables, spices and beverages. [2-4]

Spices are food adjuncts used as flavoring, coloring and seasoning agents. Spices consist of a collection of leaves and / or branches of plants, ripened fruits or seeds or root/bulbs of certain plants that are usually dried and used to season foods because of their distinctive flavor and aroma. Herbs and spices are added to traditional dishes and snacks to beneficially improve the health status of the consumer. [5] According to the American Spice Trade Association, per capita spice consumption in the United States was ~ 4 g/person per day in 1998, and hot spices such as black and white pepper, red pepper, and mustard seeds account for 41 % of US spice usage. [6] These herbs and spices have been identified as potential source of various phytochemicals, many of which have important antioxidant activity with many health benefits such as stimulation of digestive action, anti-inflammatory, hypolipidemic, antimutagenic and anticarcinogenic. [3,

7-10] As antioxidants, spices have been reported to be powerful scavengers of free radicals [3, 9, 11, 12] and act as chain breakers in oxidative reactions and therefore can play a significant role in the quenching of oxidative stress. [13-15]

Indigenous Nigerian spices consist of part of trees, shrubs and grasses which abound in the tropical rain forest and savannah grassland zone. These are readily available, inexpensive and form the major ingredients in soup preparation a meal item regularly consume in Nigeria. In Nigeria, there are as many varieties of traditional soups as there are tribes. The difference between the taste and quality of one soup from another and depends on the type of spices used in their preparation. In our earlier study we evaluated the antioxidant capacity of vegetable and spices consume in the Eastern region of Nigeria. [4] In the present study we compare the antioxidant capacities of the different constituent spices of thirteen traditional soups drawn from the different regions in Nigeria.

MATERIALS AND METHODS

Reagents:

Folin-Ciocalteu (Sigma), DPPH (Sigma), TPTZ (Sigma), Catechin (sigma), Ferric Chloride

(BDH), HCl (BDH), Acetic acid (BDH), Sodium Acetate (BDH). All reagents were of Analytical grade.

Spices:

The spices used to prepare the following soups “Miyan kubewa, Miyan kuka, Miyan Karkashi, Miyan taushe, Ofe aku, Banga soup, Efo riro, Ofe achi, Ofe nsala, Ewedu, Oha, Ogbono and Egussi soups” were bought from the Elele environ, Rivers State, Nigeria.

Sample preparation

The samples spices were cleaned and air dried at room temperature for 3 days (leafy vegetables) while others (fleshy vegetables) were dried in an oven at low temperature (40 °C). Samples were then blended to powder and 0.1 g of each sample was then dissolved in 10 ml of distilled H₂O and boiled for 90 minutes with intermittent shaking after every 30 minutes. This was allowed to cool and the volume adjusted to 10 ml by addition of distilled water. The prepared extracts were then stored at -20 °C until analyzed.

Biochemical Analysis

The ability of the extracts to reduce the phosphomolybdic-tungstate chromogene in Folin Ciocalteu with maximum absorbance at 760 nm (Total phenolic content, TPC) was assessed as earlier described. [16] The total flavonoid content (TFC) was measured as earlier described. [17] The ferric reducing antioxidant power (FRAP) of the extracts measured the ability of the extract to reduce the ferric tripyridyltriazine to ferrous tripyridyltriazine yielding a blue coloration with maximum absorbance at 593 nm. [18] The ability of the extract to scavenge free radicals by converting DPPH (purple in color) into di-phenyl hydrazine (yellow in color), was measured at 517 nm as earlier described. [19]

Statistical Analysis

All analysis were carried out in triplicates and results presented as bar charts of mean ± Standard Deviation. The student t-test was applied for comparison between samples. Significant difference between samples was considered at P < 0.05.

RESULTS AND DISCUSSION

Vegetables and spices have long been reported to possess health benefits [2-4] related to their antioxidant capacity. In the present study we assessed some of the vegetable or spices used in the preparation of some of the popularly known traditional soups in Nigeria for their antioxidant capacity.

Table 1 presents the list of the spices studied, their vernacular, common, and botanical names and the type of soup they are used in preparing. Most often the difference between soups in a particular region may just be a single vegetable or spice and the soup is named after that vegetable or spice. An example is seen in the soups from the Northern Region where the difference

between Miyan Kuka and Miyan Kabewa is just that they contain baobab fruits (Kuka) and Melon spout (Kabewa) respectively.

Fig. 1 presents the antioxidant capacity of the spices used to prepare four soups commonly consumed in the northern region of Nigeria. Of all the spices analyzed, kuka (baobab fruit) had the highest TPC and FRAP followed by karkashi (roselle leaf) meanwhile albasa (onion) had the highest flavonoid content followed by kuka. The high TPC and FRAP of baobab fruit may have been contributed by its high ascorbic acid content earlier reported. [20] Onion is a spice consumed widely across the world and possesses a high content of flavonoid compounds and sulphur compounds which have a high level of antioxidant activity. [21] Onion has earlier been reported to have very high flavonoid content than the phenolic content. [22] Roselle is used as a folk remedy in the treatment of abscesses, bilious conditions, cancer, cough, debility, dyspepsia, fever, heart diseases, hypertension, and neurosis. [23, 24] Roselle petals have been reported to contain, anthocyanins, polyphenol and flavonoids which can contribute to its antioxidant capacity. [25] Kubewa (okro) and Kabewa (melon sprout) were generally low in TPC and FRAP. Maggi cube contributed the least TPC and FRAP though it presented false high flavonoid content. Within the four different soups the difference lies on a single spice which gives the soup its specific name meanwhile all the other spices remain same irrespective of the soup. Thus the antioxidant capacities of the different soups revolve around a single spice. Considering additional effect of the antioxidant capacity of the constituent spices then the different soups can be classified as follows: Miyan kuka>Miyan Karkashi>Miyan Taushe> Miyan kubewa for both TPC FRAP and Miyan kuka>Miyan taushe>Miyan karkashi>Miyan Kubewa for TFC.

Fig. 2 presents the antioxidant capacity of spices used in preparing seven soups commonly consumed in the eastern region of Nigeria. Uda had the highest TPC followed by ugu meanwhile black pepper and ugu had the highest FRAP followed by Ogbono. For the TFC it was igeriegojae that topped the table followed by onion. Black pepper is the berry of *Piper nigrum* and *Piper guineense* and are also known as peppercorns, African black pepper or Ashanti pepper. [11] Chemically, peppercorn contains lignans, alkaloids, flavonoids, aromatic compounds, and amides [26, 27] that are responsible for its radical (free, hydroxyl, and superoxide radicals) scavenging activity, phenolic content and ferric reducing antioxidant power. [3, 11, 12] Considering the additional effect of constituent spices, the soups can be classified as follows: Banga soup >Ogbono soup>Egussi soup>Ofe aku>Oha soup>Ofe nsala>Ofe achi for TPC; Ogbono>Ofe aku>Egussi soup>Oha soup>Banga soup>Ofe nsala>Ofe achi for FRAP; and Banga

soup>Ogbono soup>Ofe aku>Egussi soup>Ofe achi>Ofe nsala>Oha soup for TFC.

Fig. 3 presents the antioxidant capacity of spices used in preparing two soups (Efo riro and Ewedu) commonly consumed in the southern region of Nigeria. Tomato had the highest TPC while vegetable jute had the highest FRAP and TFC. Considering the additional effect of individual spices antioxidant capacity, the Efo riro is a better soup than Ewedu in all the methods applied. Tomato the major spice in Efo riro, is one of the most consumed economically vegetable in the world and provides beta carotene, provitamin A (carotenoids) and ascorbic acid which are important in human health. Antioxidant molecules already identified in tomato fruit include lycopene, and quercetin-3-O-rutinoside associated with reduced cancer

risk. [28] Vegetable jute the major spice in Ewedu, has nutritional value, and act as thickeners in soups, stews, and sauces. An earlier antioxidant study of vegetable jute reported higher DPPH radical-scavenging ability, reducing power and trolox equivalent antioxidant capacity for the hydrophilic extract, while lipophilic extract showed a higher OH scavenging ability. [29] Overall, the antioxidant capacity of Efo riro was better than that of Ewedu since Efo rifo contained other spices which were lacking in Ewedu.

Fig. 4 presents the additional effect of the different spices in the soups. Considering an additional effect of all the individual antioxidant capacities of the different spices, it was Miyan kuka that stands out with the highest TPC, FRAP and second in TFC making it an antioxidant rich soup.

Table 1: Native, common and scientific names of selected herbs and spices consume in Nigeria

Native name	Common name	Scientific name	Type of soup
Chitta (Housa)	Ginger	<i>Zingiber officinale</i>	Karkashi, Kuka, Kabewa, Taushe, etc
Tafarnuwa (House)	Garlic	<i>Allium sativum</i>	Karkashi, Kuka, Kabewa, Taushe, etc
Ose ndu (Ibo), Borkono (Housa)	Red pepper	<i>Capsicum frutescens</i>	Karkashi, Kuka, Kabewa, Taushe, Ofe nsala, Ofe achi, Ewedu, Ogbono, Egussi, etc
Albasa, iyabas, Alubosa (Housa)	Onion	<i>Allium cepa</i>	Karkashi, Kuka, Kabewa, Taushe, Banga soup, Ofe aku, Ofe achi, Efo riro, Ogbono, Egussi, etc
Udah, Unienie (Ibo)	Udah	<i>Xylopiya athiopic</i>	Ofe nsala, Banga soup, etc
Tumatir (Housa)	Tomatoes	<i>Lycopersicum esculentum</i>	Taushe, Efo riro, etc
Aleyaho (Housa)	Spinach	<i>Amaranthus hybridus</i>	Taushe, Efo riro, etc
Dawadawa (Housa)	Locust beans	<i>Cerantonia siliqua</i>	Kuka, Taushe, Karkahi, Kabewa, etc
Uri ede	Cocoyam	<i>Colocasia esculenta</i>	Oha, Ofe nsala, etc
Uzuwo, Uziza (Ibo)	Black pepper	<i>Piper nigrum</i>	Oha, Ofe nsala, Banga soup, Ofe aku, Ofe achi, etc
Ehuru, Imilo	Ehuru, Calabash nut meg	<i>Monodora myristica</i>	Ofe nsala, Banga soup, Ofe aku, etc
Olima (ubulu-uku) (Ibo)		<i>Aframomum danielli</i>	Ofe aku, Ofe achi, etc
Ugu (Ibo)	Pumpkin leaf	<i>Telferia occidentalis</i>	Ogbono, egussi, etc
Ogbono (Ibo)	Bush mango	<i>Ivingia gabonensis</i>	Ogbono, etc
Egusi (Ibo)	Melon	<i>Cucumeropsis manni</i>	Egusi, etc
Nkpulu olulu (Ibo)	Cashew nut	<i>Anacardium occidentale</i>	Ofe aku, etc
Oha (Ibo)	Ora	<i>Pterocarpus soyauxil</i>	Oha, etc
Ogiri (Ibo)	Ogiri	<i>Ricinus communis</i>	Oha, etc
Karkashi (House)	Red sorell leaf	<i>Hibiscus sabdariffa</i>	Karkashi, etc
KuKa (Housa)	Baobab fruit	<i>Adansonia digitata</i>	Kuka, etc
Kabewa (Housa)	Okro	<i>Hibiscus esculenta</i>	Kabewa, Taushe, etc
Utazi (Ibo)	Utazi	<i>Gongronnema latifolium</i>	Ofe achi, etc
Beletete, Onugbu (Ibo)	Bitter leaf	<i>Vernonia amygdalina</i>	Banga soup, Egussi, Ogbono, etc
Iru (Yoruba)	Locust beans	<i>Cerantonia siliqua</i>	Efo riro, Ewedu, etc
Ewedu (Yoruba)	Vegetable jute	<i>Corchurus olitorious</i>	Ewedu, etc
Soko (Yoruba)	Feather cockscomb	<i>Celosia argentea L.</i>	Efo riro, etc
Ata rodo (Yoruba)	Sweet pepper	<i>Capsicum annum</i>	Efo riro, etc
Sombo (Yoruba)	Cayenne pepper	<i>Capsicum frutescens</i>	Efo riro, etc

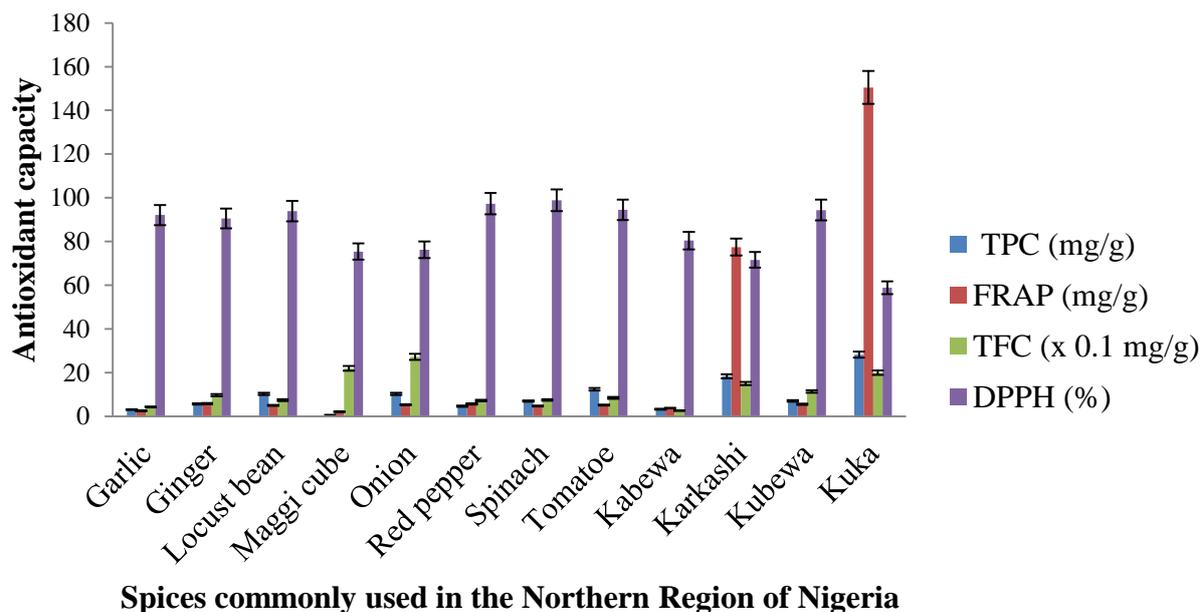


Fig-1: Antioxidant capacity of spices used in preparing traditional soup of the northern region of Nigeria

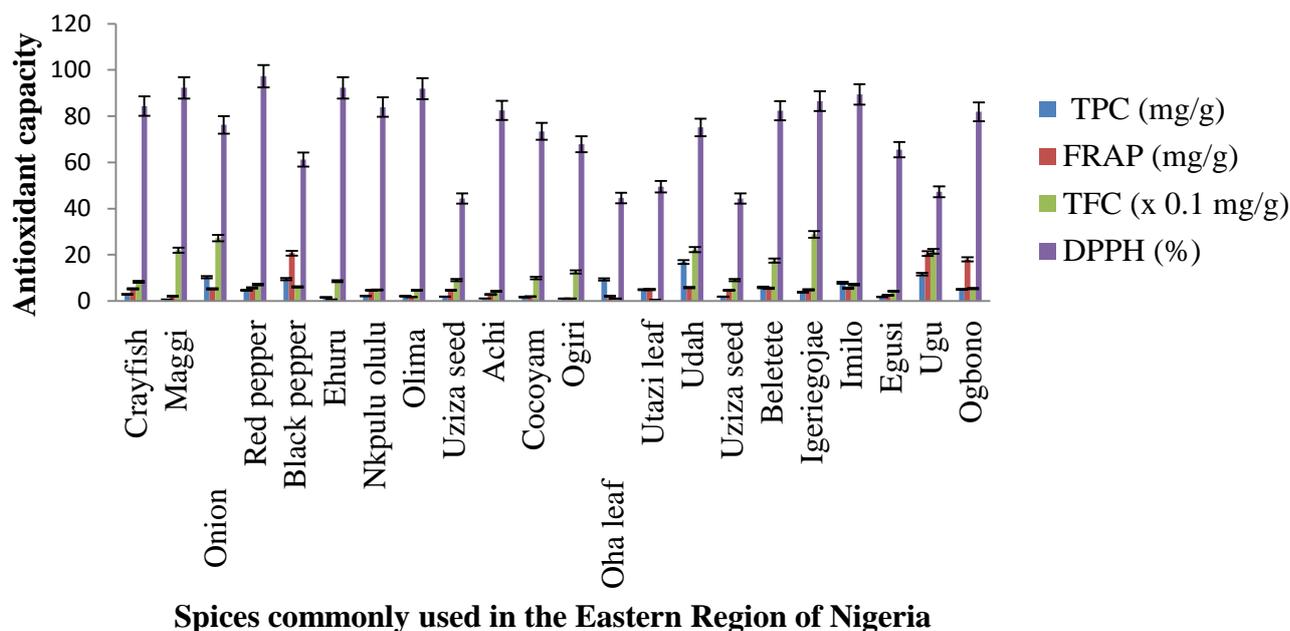
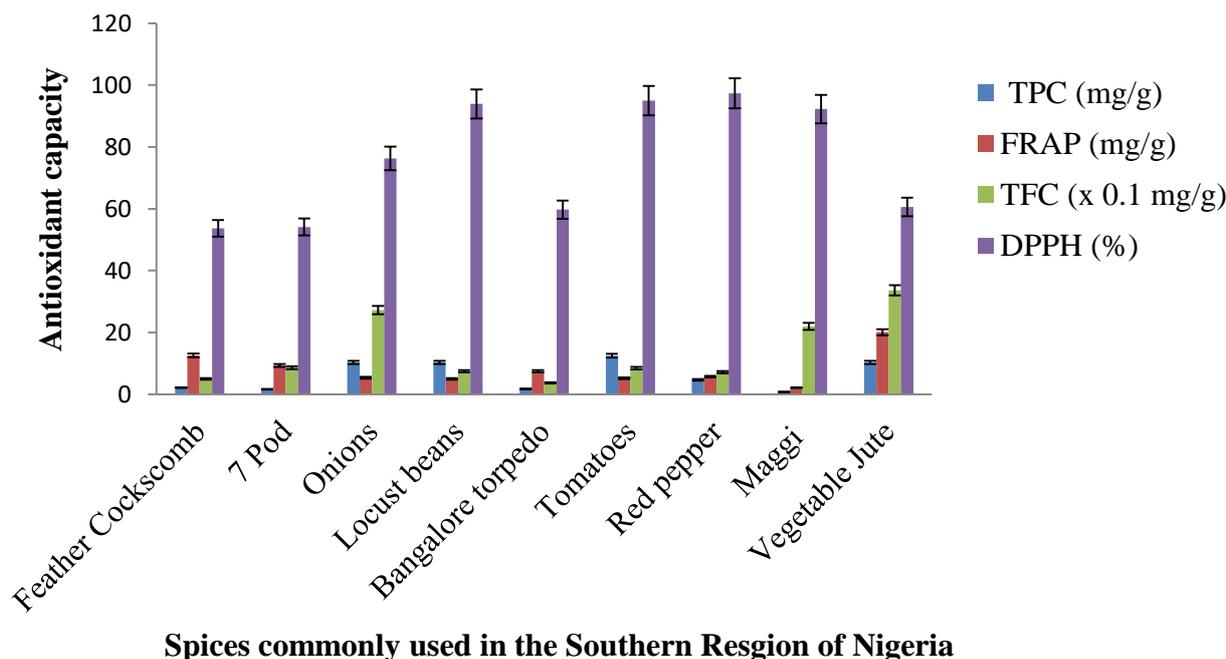


Fig. 2: Antioxidant capacity of spices used in preparing traditional soup of the Eastern region of Nigeria



Spices commonly used in the Southern Resgion of Nigeria

Fig-3: Antioxidant capacity of spices used in preparing traditional soup of the Southern region of Nigeria

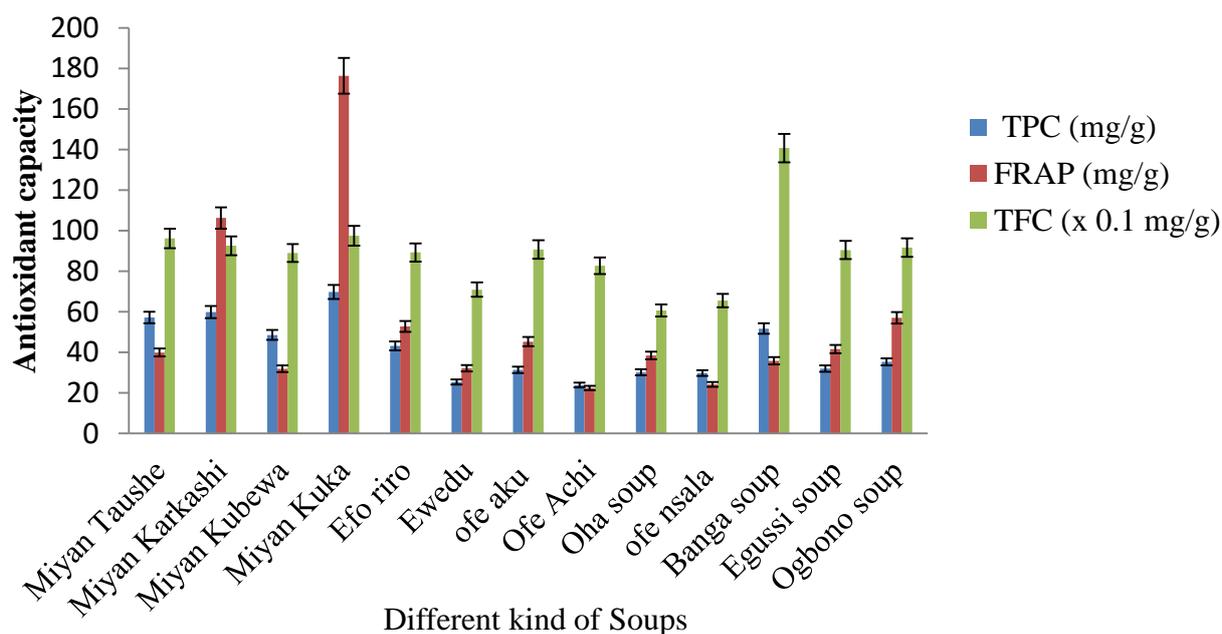


Fig-4: Addition effect on the Antioxidant capacity of spices in different traditional soup preparation in Nigeria

CONCLUSIONS

Today with modernization the recipes of the different traditional soups may no longer be the same. However, the main spices remain the same. Hence the knowledge of their antioxidant capacity may be informative of the antioxidant capacity of the soup or food in which they are used. From the results obtained spices used in preparing the soup from the northern region provided the highest antioxidant capacity and

this may enrich whatever food or soup they are used in. For this reason Miyan kuka, Miyan karkashi and Miyan Tausha were the best antioxidant rich soups in this study.

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