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Chemical composition and antioxidant activities of some indigenous spices consumed in Nigeria

Henrietta Ene-Obong [a,*], NneOla Onuoha [b], Lilian Aburime [a], Obioma Mbah [b]

[a] Department of Biochemistry (Human Nutrition and Dietetics Unit), Faculty of Basic Medical Sciences, University of Calabar, Calabar, Cross River State, Nigeria
[b] Department of Home Science, Nutrition and Dietetics, University of Nigeria, Nsukka, Nigeria

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ABSTRACT

The chemical compositions and antioxidant capacities of seven spices consumed in Southern Nigeria were determined. They were purchased from majors markets in the study area. Edible portions of the spices were ground into fine powder and their nutrient and phytochemical compositions determined using standard methods. Antioxidant activity were determined on aqueous extract using standard assays, namely, 1,1-diphenyl-2picrylhydrazyl (DPPH) free radical ability and ferric reducing antioxidant potential (FRAP). The spices were rich in macro-and micro-nutrients. *Ricinodendron heudelotii* had the highest protein (30.6%) and fat (24.6%) contents. *Tetrapleura tetraptera* had the least fat content. The total phenol, flavonoid and vitamin C contents differed significantly ($p < 0.001$) from each other. *Aframomum citratum* had the highest amount of total phenol, flavonoid and DPPH scavenging ability, while *Afrostyrax lepidophyllus* had the best FRAP. The spices have good nutrient profile and antioxidant potentials. Their increased consumption is recommended and use as functional foods needs to be exploited.

1. Introduction

The double burden of disease in both developed and developing countries of the world has continued to pose serious health challenges. Apart from under nutrition, middle and low income countries have begun to experience an increase in the prevalence of non-communicable diseases (NCDs). These conditions impose a lot of healthcare cost on individuals, households and nations; hence majority of the population are driven to look to food as cheaper alternatives. Advances in food and nutritional sciences has shown that apart from nutrients, certain foods contain some bioactive substances which provide some health benefits; including reduction in cancer risk and modification of tumor behavior (Kaefer & Millne, 2008). Spices are typical examples of such foods.

Spices are said to be pungent or aromatic substances which are used as additives for the purpose of flavoring, colouring and preserving foods (Abishek, Panchal, Poudyal, & Brown, 2009). In Africa, especially in Nigeria most traditional and indigenous delicacies are prepared with traditional and indigenous spices. These spices are used as additives or cures for certain ailments and diseases or just to add taste or flavor to food. They are also used as preservatives to kills harmful bacteria or prevent their growth (Dalby, 2002). Spices could be obtained from any part of plant as fresh or dried seeds, kernels, bulbs, stalk, roots, barks, leaves, pods or buds. They have been used for thousands of centuries by many cultures to enhance the flavor and aroma of foods. Indigenous cultures recognized the value of spices mainly in preserving foods and for their medicinal value. Such knowledge has been handed down from one generation to another; thus not much attention is given to their nutritional value. Spices also improve appetite and increase the flow of gastric juice. They are said to be useful in the management of convulsion, leprosy, stomach ache, inflammation and rheumatoid pains, cough and loss of appetite (Valko et al., 2007).

Spices abound in Nigeria; some are specific to certain locations and usage is based on cultural food habits and preferences. Despite their wide use in traditional cuisine, most of these spices are missing in national and regional food composition databases/tables. This may be attributed to the fact that spices were regarded as non-nutritive components of food (Kaefer & Millne, 2008). Considerable amount of work has been done in Nigeria on spices, particularly *Monodora myristica* and *Piper guineense* (Akinwumi & Oyedepo, 2013; Bassey, Johnny, & Okoro, 2011; Dike, 2010; Ekeanyanwu, Oge, & Nwachukwu, 2010; Faleyimu & Oluwalana, 2008; Okonkwo & Ogu, 2014; Uhegbu, Iweala, & Kanu, 2011), however there are issues of proper identification, varying values and units of expression. There is need for more studies to validate existing work and to examine less researched spices for the

* Corresponding author.
E-mail addresses: nkeneobong@gmail.com, nkeneobong@yahoo.com (H. Ene-Obong).

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purpose of including them in the national Food Composition Table (FCT) and exploiting them for other uses in human nutrition.

This study was aimed at determining the nutrient and phytochemical compositions as well as the antioxidant capacities of the following spices commonly consumed in Southern Nigerian. The image of these samples is shown in Fig. 1.

Monodora myristica is a tropical tree of the family Annonaceae and popularly known as African/Calabash nutmeg. The local names include: ''*Inwun*'' in efik; ''ehuru'' (Igbo), ''ariwo'' Yoruba, ''gujiya-dan-miya'' in Hausa; while other names include ''ehiri'', ''airama'' (Okafor, 1987). The fruits are collected from the wild and the seeds dried and sold as whole or shelled seed, which are then ground for use in soups and other foods. The odour and taste mimic that of nutmeg and it is used as a popular spice in West African cuisine in stews, soups, and sauces. It is also used to flavor peanut butter used in eating kola nuts or garden eggs (common items of entertainment in parts of Southern Nigeria). Aqueous extract of the seed has been shown to contain pharmacological compounds such as, alkaloids, flavonoid, vitamin A and E (Eze-Steven, Ishiwu, Udedi, & Ogeneh, 2013), essential oils (Susheela, 2000), while ethanolic extract showed presence of tannins and saponnins (Erukainure et al., 2012). Onyenibe, Fowokemi, and Emmanuel (2015) also found that it contains cholesterol lowering ability. A close relation of *Monodora myristica* is ''ehu'' in Igbo. Its local name is used interchangeable with *Monodora myristica* (''ehuru''). It is used in flavouring soups and sauces but has not been sufficiently characterized.

Aframomum citratum is commonly known as ''mfong'' (efik), ''olima'' (Delta Ibo) and ''erighoje'' (Urobo). Its English name is grain of paradise. It belongs to the family Zingiberaceae (Ginger

Fig. 1. Pictorial presentation of the spices consumed in Nigeria.