CHEMICAL COMPOSITIONS OF FIVE INDIGENOUS SPICES

N. E. Abu and H. I. Okwuosa
Department of Botany, University of Nigeria, Nsukka

Corresponding author: Abu, N. E. Department of Botany, University of Nigeria, Nsukka

Abstract

Five aromatic plant species viz Piper nigrum, Ocimum gratissimum, Monodora myristica, Xylopia aethiopica and Tetrapleura tetraptera were used in this work. The chemical analysis revealed variations in proximate, mineral composition and vitamin content of the spices. The percent carbohydrate, protein and fat varied from 45.5 – 65.1%, 3.6 – 18.4% and 4.3 – 14.5 respectively. The folic acid and B – carotene content of the spices ranged from 0.3 – 17.6 mg/100g and 0.2 – 102.3 mg/100g in Monodora myristica and Ocimum gratissimum. A high iodine content of 2.6 mg/100g and 23.7mg/100g, exceeding the RDA for iodine were observed in Tetrapleura tetraptera and Ocimum gratissimum

Introduction

A spice is a vegetable substance of indigenous or exotic origin which is aromatic or has a hot piquant tastes, used to enhance the favour of foods or to add to them the stimulant ingredients contained in them (Borget 1993). The unique flavour in our diet takes us to an array of aromatic plant species. All vegetable products contain proteins, lipids, carbohydrates including starch and cellulose and various mineral compounds (Borget 1993, Bosland and Votava 2000). Spices being vegetable products contain all these categories of substances but also contain fractions which are not present in all vegetable products, this fractions give them their specific characteristics as spices. Many of these compounds are included under the general term essential oils, they give the spices their flavour, aroma and smell (Borget 1993, Cobley 1963).

Wall *et al* (2001) reported a wide variation in B –carotene content of pepper fruits in both fresh and dry state while Uguru (2000) in a two locational experiment has shown that aroma, colour, ascorbic acid and mineral composition of pepper fruits (a common spice) where not significantly affected by agro-ecological zones.

Flavour is undoubtedly a basic characteristics stimulating the desirability of food and forms the corner stone of contemporary food industries throughout the world. Blenford (1997) and Hoch 1997 reported that due to adverse health implications associated with most artificial flavourings, there is an increasing demand by consumers on natural flavorings. Bosland and Votava (2000) also observed an increase in breeding and physiological research as consumers look to fruits and vegetable as insurance against illness.

The aim of this work therefore is to show the nutritive value of some common spices by determining their chemical composition and also relate same to their recommended daily allowances.

Materials and Methods

The spice plant parts used in this work were all collected from Nsukka in Enugu state. Table 1 shows the list of spices, the plant names (common and botanical names) family and the parts used as spice. The samples were sorted to remove the damaged, discoloured, wrinkled and infected ones. The seedy spices were dried in the incubator at a temperature of 45^{0}C and ground using manual hand grinder. *Monodora myristia* seeds were dehusked and the edible portion used for analysis. The chemical analysis were determined using the Wendy method as outlined in Pearson (1976). The fat was determined by the Soxhlet extraction method, the crude protein was determined using Kjeldahl method. Soluble carbohydrate was extracted from sample with water and the concentration of carbohydrate in the extract was spectrophotometrically determined as the blue – green complex which is formed when carbohydrate in heated with anthrone in teltraoxosulpahte (vi) acid. Phosphorus was determined by Vanado-molybdate colorimetric method and the optical density was measured using a spectrophotometer. All the other mineral elements and vitamins except for sulphur that was determined by simple titration, were determined by measuring the optical density with a spectrophotometer after preparation. The above chemical analyses were conducted in the Crop Science analytical laboratory. The values recorded are average of three samples.

Results and Discussion

Table 2 shows the proximate analysis of the spices. The carbohydrate content of the fruits of *P. nigrum*, *M. myristica*, *X. aethiopica* and *T. tetraptera* varied from 49.8 to 65.1% while the leaves of *O. gratissimum* contained 45.5%. *O. gratissimum* had a protein content as high as 18.4% almost five times the protein content of 3.6% found in *M. myristica*. Cellulose and other fibrous materials account for 12.3% in *T. tetraptera* and only 3.4% in the leaves of *O. gratissimum*.

Wide variation was observed among the species for vitamins C and E (Table 3). Spices are primarily taken for their flavours, aroma and taste enhancement, however they contribute greatly in supplementing major sources of vitamins and minerals. A vitamin C content of 27.1 mg/100g was observed in *T. tetraptera* indicating that 200g of sample would approach the recommended daily

Table 1: List of spices used

Common name	Botanical name	Family	Part used as spice
Black pepper	Piper nigrum	Piperaceae	Fruits
African nutmeg	*Monodora myristica*	Annonaceae	Fruits
Fever plant	*Ocimum gratissimum*	Lamiaceae	Leaves & tender stems
Ethiopian pepper	*Xylopia aethiopica*	Annonaceae	Fruits
***	*Tetrapleura tetraptera*	Mimosaeae	Fruits

Table 2: Proximate analysis of five indigenous spices

Spices	Proximate analysis %					
	Carbohydrate	Protein	Fat	Fibre	Ash	Moisture
Piper nigrum	49.8	9.6	7.6	8.6	3.1	21.3
Monodora myristica	45.5	18.4	4.3	3.4	1.6	26.8
Ocimum gratissimum	65.1	3.6	4.5	6.9	3.2	16.7
Xylopia aethiopica	50.3	6.3	12.4	9.8	4.3	16.9
Tetrapleura tretraptera	50.4	6.8	14.5	12.3	3.4	12.6

Table 3: Vitamin composition of five indigenous spices (mg/100g) and their respective recommended daily allowances (RDA) (mg/day)

Samples	Vitamins (mg/100g)			
	C	E	Folic acid	B-carotene
Piper nigrum	18.7	0.02	9.6	12.9
Ocimum gratissimum	2.9	10.6	17.6	102.3
Monodora myristica	1.3	0.2	0.3	0.2
Xylopia aethipica	7.9	0.03	5.1	9.9
Tetraplewa tetraptera	27.1	0.9	10.8	27.6
RDA (mg/day)	60	10	0.18	1.0

Table 4: Mineral composition of five indigenous spices (mg/100g) and their respective RDA (mg/day)

Samples	Minerals (mg/100g)				
	Phosphorus	Iron	Iodine	Sulphure	Calcium
Piper nigrum	4.1	5.7	0.11	0.26	7.9
Ocimum gratissimum	2.15	3.0	2.6	16.4	18.9
Monodora myristica	0.03	0.04	0.02	0.03	1.0
Xylopia aethipica	4.6	7.2	0.26	226.1	9.8
Tetraplewa tetraptera	6.81	5.3	23.7	244.6	36.3
Recommended daily allowances (RDA)	1200	15.0	0.15	*	1200

allowance (RDA) for vitamin C. On the other hand a vitamin E content of 106 mg/100g exceeding the RDA of 10mg/day was found in *O. gratissimum.* However, *P. nigrum, M. myristica* and *X. aethipica* had low values of vitamin E. The values for folic acid in all the spices used in this work were higher than the RDA for folic acid. While B-carotene contents of the spices per 100g were higher than the RDA for B-carotene except in *M. myristica.* The mineral compositions of the spices were compared with the recommended daily allowances in Table 4. The variations are very great, it is however important to note the high iodine content in *O. gratissimum* and *T. tetraptera* which are both higher than the RDA of 0.15 for normal health and an extra 0.25 to 0.5 needed in pregnancy and lactating mothers.

References

Borget, M. (1993). Spice Plants. The Macmillan Press Ltd. London 114pp.

Blendford D.E. (1997) Adding to flavour. FSTA 30(8) 262-263

Bosland, P.W. and Votava E.J. (2000). Peppers: Vegetable and Spice *Capsicums.* Cabi publishing, New York. 204 pp.

Cobley L.S. (1963). An Introduction to the Botany of Tropical Crops. Longmans, Green and Co. Ltd. London.

Hoch G.J. 1997. The great flavour debate: artificial Vs natural. Food processing, U.S.A 58 (7) 41.

Pearson, D. (1979). The Chemical analysis of Foods. 7th edition. Churchill Livingstone, Edinburgh. 575pp.

Wall, M.M.; Waddell C.A, and Bosland P.W. (2001). Variation in B-carotene and total carotenoid content in fruits of *Capsium.* Hort. Science 30 (4): 746-749.