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CHEMICAL COMPOSITION OF INDIGENOUS (NUPE) RICE AND FOREIGN RICE VARIETIES IN BIDA, NIGER STATE, NIGERIA

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ABSTRACT

The objective of the study was to ascertain the differences in the nutrients composition of imported and locally grown rice in Bida. Four different rice varieties (two locally grown and two imported rice) were evaluated for proximate, some minerals and vitamins and anti-nutrient composition. The local rice varieties contained more moisture, crude fibre, and ash than the foreign varieties, but with no change in carbohydrate content. There were significant difference ($P<0.05$) in the levels of minerals- phosphorus, calcium, sodium, and minerals in foreign and local rice varieties. The rice varieties also contained anti-nutrients which restrict the complete utilization of the nutrients contained in rice but can easily be destroyed by heat. These results generated might be able to provide vital information on identifying superior quality of rice marketed in Bida, based on their nutrient composition.

Keywords: Rice Varieties, 'Ofada', 'Aroso', Nutrients, Sensory Properties, Nigeria.

INTRODUCTION

Rice is the seed of monocot plant of the genus *oryza sativa* and of the grass family poaecea (formally Graminea) which

includes twenty wide species and two cultivated ones, oryza sativa (Asian rice) and Oryza glabberima (African rice). Oryza sativa is the most commonly grown species throughout the world today (Oko and Ugwu, 2017). As a cereal grain, it is the most commonly consumed staple food for over 3 billion people, constituting over half of the world's population (Cantral and Reeves, 2002). Rice has become the second most important cereal in the world after wheat in terms of cultivation, due to a recent decline in maize production (Jones, 1995). Rice is grown in all the ecological and dietary zones of Nigeria, with different varieties possessing adaptation traits for each ecology (Sanni etal., 2005). The two commonly cultivated varieties of rice in Nigeria are oryza sativa and oryza glabberima (Abulude, 2004). Rice is an economical crop, which is important in household food security, ceremonies, nutritional diversification, income generation and employment (Osaretin and Abosede, 2006). it is utilized mostly at the household level, where it is consumed as boiled or fried or ground rice with stew or soup. Rice is cooked by washing and boiling in water which leads to loss of some nutrients (Ihekoronye and Ngoddy, 1985; Peres et al; 1987). The proximate composition of rice has been previously reported (Oyenuga, 1968; Temple and Bassa, 1991; Adeyeye and Ajewole, 1992; Bishnol and Khotarpaul, 1993; Abulude, 2004). Many varieties of rice are grown in Bida and its environs. These varieties (such as Biruwa, Nda Ikonko etc) exhibit on cooking marked difference in quality. Attempts to correlate quality of rice with its chemical composition have not so far been successful.

According to Sanjiva (1999), the differences in the quality of rice may be attributable to the difference in their colloidal

structure and despite the fact that different varieties of rice are widely cultivated in Nigeria, for example, ofada and Abakaliki rice, there is an upsurge in the influx of foreign or imported rice varieties with the level of importation approaching 80% of total rice consumption in Nigeria. A popular foreign and parboiled rice variety produced in Thailand, widely consumed and imported into Nigeria is "Aroso" rice. Majority of Nigerians prefer to consume foreign rice brands as compared to any of the local rice varieties produced in the country. It is therefore imperative to ascertain why this preference exists and to determine whether there are significant differences in the nutritive composition of these rice varieties. Therefore, the objective of this study is to determine the chemical composition of selected indigenous rice (Nupe rice) and foreign rice varieties.

MATERIALS AND METHODS

Materials

Two major and popular rice varieties, Biruwa and Nda-ikanko, a local and indigenous Nupe rice cultivated in Bida and environs in the North central of Nigeria, and Marvel and Eagle rice, a foreign and imported rice produced in Thailand, were used for this study.

Preparation of Sample

Both the indigenous and foreign rice were sorted to remove chaff and stones and then milled into flour before taken to National Cereals and Research Institute (NCRI) Baddegi, Niger State, for analysis.

Nutrient Determination

The proximate composition-moisture, Ash, Crude protein, fat, crude fibre and carbohydrate of the rice varieties were determined according to the method of AOAC(2005). The level of potassium, sodium and calcium of the rice varieties were analyzed using Jenway digital flame photometer. Phosphorus was determined by Vanado-molybdate colorimetric method while magnesium was analyzed using Atomic Absorption spectrophotometer (AAS model 200B). The vitamins and anti-nutrients contents of the rice varieties were determined using standard procedure AOAC (2005). The caloric values of whole grain, and of fat, protein and carbohydrate in the grains were computed (Davidson *et al.*, 1979).

Statistical Analysis

All the analysis were performed in duplicates and presented as mean $\pm$ standard deviation. Statistical significance of the data obtained was analyzed by one way analysis of variance (ANOVA) followed by Duncan multiple range test by using SPPS window version 20. The level of significance was considered at $p< 0.05$.

RESULTS

The proximate compositions of the rice varieties are shown in table 1. Analysis of variance shows that there are significant differences ($p < 0.05$) in the proximate compositions of the rice varieties studied. The mineral and vitamin contents of the rice varieties are shown in table 2 and 3. There is significant differences in the mineral and vitamin contents of the varieties of rice studied while the anti-nutrient contents of the rice varieties were shown in table 4.

TABLE 1: PERCENTAGE PROXIMATE COMPOSITION

Rice Varieties	Moisture (%)	Fat (%)	Cr. Protein (%)	Cr. Fibre (%)	Ash (%)	Carbohydrate (%)	Energy
Marvel Rice	6.31 ± 0.02^{c}	0.52 ±0.02^{a}	7.32 ± 0.03^{b}	1.67± 0.03^{d}	0.36±0.05^{c}	83.84 ± 0.02 ^{a}	369. ± 0.18 ^{a}
Eagle Rice	6.89±0.03^{b}	1.16±0.01^{b}	9.35±0.02^{a}	1.76±0.01^{c}	0.54±0.01^{b}	80.32 ± 0.07 ^{c}	369.08 ± 0.11 ^{a}
Biruwa Rice	7.33±0.01^{a}	1.30±0.01^{a}	6.54±0.03^{d}	2.18 ± 0.01^{b}	0.78±0.03^{a}	81.88 ± 0.55 ^{b}	365.36 ± 0.15 ^{b}
Nda – Ikanlo	7.36±0.01^{a}	0.78±0.02^{c}	7.06±0.05^{c}	2.24±0.01^{a}	0.59±0.02^{b}	81.98 ± 0.04 ^{b}	363.16 ± 0.16 ^{c}

Values are expressed as mean ± S.D of two determinations

TABLE 2: PERCENTAGE MINERAL COMPOSITION

Rice Varieties	Phosphorus (%)	Potassium (%)	Sodium (%)	Calcium (%)	Magnesium (%)
Marvel Rice	0.21 ± 0.01^{a}	0.28 ± 0.01^{b}	0.31 ± 0.01^{a}	0.59 ± 0.01^{a}	0.15±0.01^{d}
Eagle Rice	0.22 ± 0.01^{a}	0.33±0.01^{a}	0.31±0.01^{a}	0.40±0.01^{b}	0.37±0.01^{a}
Biruwa Rice	0.16±0.01^{b}	0.26±0.01^{b}	0.20±0.01^{c}	0.25±0.01^{d}	0.23±0.01^{c}
Nda – Ikanlo Rice	0.11±0.01^{c}	0.32±0.01^{a}	0.22±0.01^{b}	0.29±0.01^{c}	0.83±0.03^{a}

Values are expressed as mean ± S.D of two determinations

TABLE 3: PERCENTAGE VITAMIN COMPOSITIONS

Rice Varieties	Vitamin A (%)	Vitamin C (%)	Vitamin D (%)	Vitamin E (%)	Vitamin B_1 (%)	Vitamin B_2 (%)
Marvel Rice	4.25±0.05^{c}	16.65±0.01^{b}	9.1±0.1^{a}	0.00047±5.0^{c}	0.69±0.01^{d}	34.29±0.02^{b}
Eagle Rice	7.85±0.05^{a}	11.28±0.02^{a}	6.3±0.1^{b}	0.00039±0.00^{d}	0.87±0.01^{c}	16.47±0.01^{c}
Biruwa Rice	4.55±0.05^{b}	17.15±0.01^{a}	6.4±0.01^{b}	0.00052±5.0^{b}	1.04±0.02^{b}	147.57±0.01^{a}
Nda - Ikanlo Rice	0.68±0.03^{d}	16.05±0.05^{d}	5.55±0.05^{c}	0.00068±5.0^{a}	1.15±0.01^{a}	9.98±0.03^{d}

Values are expressed as mean ± S.D of two determinations

TABLE 4: PERCENTAGE ANTI-NUTRIENT COMPOSITIONS

RICE VARIETIES	PHYTATE	CYANIDE	OXALATE	TANNIN
Marvel Rice	0.483 ± 0.01^{c}	126.07 ± 0.02^{a}	1.805 ± 0.001^{a}	3.126 ± 0.001^{a}
Eagle Rice	0.454 ± 0.001^{d}	112.72 ± 0.02^{b}	1.451 ± 0.001^{b}	3.126 ± 0.001^{a}
Biruwa Rice	0.691 ± 0.001^{b}	106.91 ± 0.01^{c}	0.703 ± 0.001^{d}	2.374 ± 0.002^{b}
Nda – Ikanko Rice	0.707 ± 0.002^{a}	106.12 ± 0.01^{d}	0.87 ± 0.01^{c}	3.124 ± 0.001^{a}

DISCUSSION

The rice samples contained high quantities of carbohydrates ranging from 81.88% to 83.84%. The high percentage carbohydrate contents of the rice varieties shows that rice is a good source of energy since it is rich in carbohydrate. The amount of ash present in a food sample plays an important role while determining the levels of essential minerals present in the food samples (Bhat and Sridhar, 2008). Moisture content which plays a significant role in determining the shelf life (Webb, 1985) was recorded to vary between7.36% to 6.31%. Nda-ikanko rice has the highest % moisture content (7.36%). The high % moisture content may be attributed to low drying temperature (xhen and Lan, 2006). It follows that Eagle rice variety may have a longer shelf life compared to other rice varieties due to the lower moisture content. The fibre content among the four rice samples were in the range of 2.24% to 1.67%. Milling of rice generally decreases the fibre content of rice. The two locally grown rice varieties (Biruwa and Nda-ikanko) contained more fibre than the foreign varieties (Eagle and Marvel rice). The differences in the fibre content may be attributed to post-harvest processing techniques. Dietary fibre results in reduction of bowel disorders and fights constipation (Champe and Harvey, 1994). The % crude protein contents are in the range of 9.35% to 6.54%. Prolonged parboiling lowers the protein

content of rice and some other environmental and edaphic factors. However, the range is comparable to the range obtained by Ebuehi and Oyewole (2007). The % fat content of the rice samples is within the range 0.52% to 1.30%. The results of this study are in agreement with an earlier results reported by Willis *et al.* (1982) and Juliano (1985) who also gave the fat range 0.9% to 1.97% in different milling fractions. This may be attributed to the degree of milling. Milling of rice removes the outer layer of the grain where most of the fats are concentrated (Frei and Becker, 2003). Fertilizer application, rate of parboiling and the amount of soil contents all affects the mineral and vitamin contents of rice. Rivero *et al.* (2006) reported that as greater amount of rice bran are removed from grain during milling and polishing, more vitamins and minerals are lost. Anti- nutrients in the rice samples are higher in foreign rice varieties than the local varieties (Biruwa and Nda-ikanko) except for phytates. Anti-nutritional factors are undesirable constituents which retards the availability of nutrients in the body. (Ihekoronye and Ngoddy, 1985). They are easily destroyed by heat.

CONCLUSION

There are significant differences in the nutrient composition of the local and foreign rice varieties in Bida and its environs, and are affected by- the soil type, the ecological zone and the processing techniques and the results of this study can be exploited by rice consumers in their choices regarding nutrient composition.

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