GRADE QUALITY OF PARBOILED MILLED DOMESTIC AND IMPORTED RICE VARIETIES SOLD IN SOUTHEAST NIGERIA

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ABSTRACT

Objective: This study was carried out to ascertain the grade quality of Nigeria's domestic rice and assess them according to international standard for marketing rice.

Methods: 18 domestic rice varieties were collected from Enugu (4), Ebonyi (7), and Anambra State (7). Three imported rice varieties coded Ip1, Ip2, and Ip3 were purchased from Ogige market in Nsukka LGA of Enugu state, Nigeria and served as controls. The rice varieties were cleaned manually by winnowing. They were graded by separating the head rice from brokens and classified according to recommended model grading system for marketing rice in the International trade.

Results: Domestic rice varieties from Enugu state were of Grade 1 quality excluding Fortin 16 (old variety). Faro 40 (72.33) and Taraba rice (77.33) from Anambra state were of Grade 2 quality while R-Bus (81.33), Igboukwu rice (86.67), Aguleri rice (83.67), and B-G (84.67) were of Grade 1 quality. Geshua (68.33) from Ebonyi state was of Grade 2 quality while Afikpo-Mas (87.33), Abakiliki-Mas (84.33), R-8 (89.33), and 306 (82.67) were of Grade 1 quality. All the imported rice varieties (control samples) were of premium quality. Omor-Mas (95.33), Akpujie (95.67), Kpurukpuru (98.00), and Fortin 16 (old variety) (95.00) were of premium quality.

Conclusion: Large percentages (77.78%) of the domestic rice varieties from different states were low in their grade quality. Necessary measures should be taken to improve the grade quality of Nigeria's domestic rice for them to compete favorably in the International market.

Keywords: Rice, Head-rice, Brokens, International trade, Grading.

INTRODUCTION

Grading in rice processing is a unit operation in which the head rice is separated from broken rice using grain graders and improved technologies. Head rice normally includes broken kernels that are 75-80% of the whole kernel [1,2]. Broken rice is milled rice with length less than three-quarters of the length of whole kernel. High head rice yield is highly desirable and one of the most important criteria for measuring milled rice quality as rice is consumed as a whole grain. Broken grain has normally only half of the value of head rice [1-3]. Grading of milled rice is also conducted to obtain uniformity of the milled rice grain. The uniform grain length after grading renders a nice appearance to the finished product and adds to the presentation before and after cooking. Rice is graded also to prevent unfair trading practice, obtain rice in conformity to international standard, and able to compete in international market. Grading is carried out in many industrial rice mills with advanced technologies. These include in drum graders, plan sifters, and indented cylinders working at different stages [4]. Graded rice is described using four quality parameters, namely, Premium, Grades 1-3. Rice of premium quality should have 95% head rice, 3% big brokens, 1.90% small brokens, and 0.10% brewers. Rice of Grade 1 quality should have 80% head rice, 10% big brokens, 9.75% small brokens, and 0.25% brewers. Rice of Grade 2 quality should have 65% head rice, 10% big brokens, 24% small brokens, and 0.50% brewers. Rice of Grade 3 quality should have 50% head rice, 20% big brokens, 29% small brokens, and 1% brewers [5]. The domestic rice varieties grown in Nigeria have not been graded and thus, hinder it from competing with rice varieties from other countries in the International trade. The objective of this study was to determine the grade quality of parboiled milled domestic rice varieties sold in Nigeria using Southeast zone as case study.

18 varieties of parboiled milled domestic rice were collected from different markets and rice processing units in Enugu, Anambra, and Ebonyi State.

Fadama and FARO 44 were procured from Adani rice mill while Fortin 16 and Fortin (old variety) were procured from Ikpa market in Enugu state. Omor-Mas, R-Bus, and FARO 40 were procured from Omor rice processing unit while Igboukwu rice, Aguleri rice, Taraba rice, and B-G, were procured from Ogbojito Ekwulobia in Anambra state. Akpujie, Kpurukpuru, and Afikpo-Mas were procured from Afikpo while Abakiliki-Mas, R-8, 306, and Geshua were procured from Abakiliki rice mill in Ebonyi state, Nigeria. Three imported rice varieties were purchased from Ogige market in Nsukka LGA of Enugu state, Nigeria. The imported rice varieties were coded Ip1, Ip2, and Ip3 and served as controls. The samples collected were cleaned manually using plastic trays to remove husk, shrivelled kernels (defectives), stones, and seeds. The milled rice grain samples were graded by separating the rice grains into head rice and brokens.

10 g of the cleaned milled rice of each variety were selected and graded. The head rice was separated from the broken by laboratory hand-picking method. The weight of the broken and head rice grains obtained were determined using an electronic pocket scale (model EHA251). The percentage values for the head rice and broken rice were calculated using the expressions equations 1 and 2:

$$\% \text{Head rice} = \frac{\text{Weight of whole grains}}{\text{Weight of sample used}} \times 100 \tag{1}$$

$$\% \text{Brokens} = \frac{\text{Weight of brokens}}{\text{Weight of sample used}} \times 100 \tag{2}$$

The study adopted a completely randomized design. The data generated from the analysis were subjected to statistical analysis of variance using Crop Stat and SPSS version 20 to obtain the means. The means obtained were separated using the Duncan's multiple range test [6].

Table 1: Head rice and broken rice values of domestic and imported rice varieties sold in the Southeast zone of Nigeria

Rice variety	Head rice (%)	Brokens (large and small brokens %)	Grade
Imported rice variety			
Control 1	100^a±0.00	0.00^g±0.00	Premium
Control 2	97.67^a±0.58	2.33^g±0.58	Premium
Control 3	99.00^a±1.00	1.00^g±1.00	Premium
Enugu state			
Faro 44	87.00^{bc}±1.00	13.00^{ef}±1.00	Grade 1
Fadama	82.67^{cd}±6.11	17.33^{cde}±6.11	Grade 1
Fortin 16	89.00^b±0.00	11.00^f±0.00	Grade 1
Fortin 16 (old variety)	95.00^a±0.00	5.00^g±0.00	Premium
Anambra state			
Omor-Mas	95.33^a±0.58	4.67^g±0.58	Premium
R-Bus	81.33^{de}±3.06	18.67^{bcd}±3.06	Grade 1
Faro 40	72.33^f±3.21	27.67^a±3.21	Grade 2
Igboukwu rice	86.67^{bc}±2.08	13.33^{ef}±2.08	Grade 1
Aguleri rice	83.67^{cd}±1.53	16.33^{cde}±1.53	Grade 1
Taraba rice	77.33^e±3.06	22.67^b±3.06	Grade 2
B-G	84.67^{bcd}±3.06	15.33^{def}±3.06	Grade 1
Ebonyi state			
Akpujie	95.67^a±1.53	4.33^g±1.53	Premium
kpurukpuru	98.00^a±1.00	2.00^g±1.00	Premium
Afikpo-Mas	87.33^{bc}±2.08	12.67^{ef}±2.08	Grade 1
Abakiliki Mas	84.33^{bcd}±1.53	15.67^{cdef}±1.53	Grade 1
R-8	89.33^b±1.53	10.67^f±1.53	Grade 1
306	82.67^{cd}±3.51	20.67^{bc}±3.51	Grade 1
Geshua	68.33^f±7.51	31.67^a±7.51	Grade 2
Mean	87.49±8.86	12.67±8.97	
SE	1.55	1.60	
LSD$_{0.05}$	4.44	4.57	
CV (%)	3.1	21.9	

Values are means±standard deviation of triplicate determination. Means in the same column carrying similar script are not significantly (p>0.05) different, a-g

Table 1 shows the grade quality of domestic rice varieties sold in Southeast Nigeria. There was no significant (p>0.05) difference in the broken and head rice of the imported rice varieties. Significant (p<0.05) differences existed in the head rice and brokens of imported rice varieties and a large percentage (77.78%) of the domestic rice varieties. The imported rice varieties were of premium quality grade. A large percentage (77.78%) of the domestic rice varieties did not measure up to the premium quality grade. Only Omor-Mas (95.33%) from Anambra state; Akpujie (95.67%) and Kpurukpuru (98.00%) from Ebonyi state and Fortin 16 (old variety) (95.00%) from Enugu state met the criteria for premium quality and thus, had no significant (p>0.05) difference with the imported rice varieties.

Large percentages (77.78%) of the domestic rice varieties from different states were low in their grade quality (68.33-89.33%). The low-grade quality could be as a result of non-grading of the milled rice varieties in the mills. In rice processing, it is required that after milling, rice should be graded both in thickness and length [4], through this process broken rice is separated from the head rice to a very high percentage of accuracy and thus, uniformity is achieved [4]. Rice milled in Southeast Nigeria is not graded. Non-grading of milled rice is as a result of absence of grain graders in all the rice mill industries in Southeast Nigeria. The low-grade quality could also be as a result of the nature of machine used in milling the rice. The steel Engelberg machine is the only equipment used in milling the rice, which when not set correctly, produces large number of brokens. The steel huller subjects the rice to excessive pressure and friction resulting in heating, low milling recovery, and a high grain breakage. Milling recovery of steel huller is 60-63% compared with 68-70% in conventional modern rice mills [4]. Even when large brokens are obtained, grading separates the broken rice from the head rice and prepares the rice lot for international trade.

Large percentage (88.89%) of the domestic rice varieties excluding Akpujie and Kpurukpuru had significant (p<0.05) high brokens. The high broken in the rice lot could also have been as a result of production

factors which include, harvesting, drying, and milling process. It may also be as a result of low moisture content during milling causing brittleness and subsequently breakage. High brokens in milled rice lot reduces the quality of the milled rice lot. This is seen in most of the domestic rice varieties which had high brokens being of Grade 1 quality and some of them of Grade 2 quality. For high price value in the International Market, broken rice should be minimal.

In conclusion, it is vital that grading machine is provided in all Nigerian rice mills for domestic rice to be able to compete in the International market. Grading is essential to obtain rice of different grades used for cooking and other industrial purposes and prevent unfair trading practice.

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