



## Research Note

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### Quality Characteristics of Fifteen Rice Varieties Grown in the Ivory Coast

#### ABSTRACT

*Some chemical and physical characteristics of fifteen varieties of rice grown in the Ivory Coast were evaluated. The protein contents of these varieties ranged from 6.10% to 8.57% and that of carbohydrate from 67.7% to 75.5%. Moisture and ash levels varied from 9.0 to 12.5% and 0.56% to 1.80%, respectively. All rice varieties had long and slender grains. Yields of whole-kernel varied widely, depending on variety, grain type and milling conditions. These results were of importance for the eating and processing qualities of the rice varieties.*

#### INTRODUCTION

The Ivory Coast is not yet self-sufficient in its staple food, rice. Consequently, rice producers in the past have emphasized yield as their main producing objective, with grain quality being of secondary importance. Now, the recent increased rice production has changed the situation somewhat to a growing consumer demand for good grain quality, thus making quality more important than it has been in the past. Traditionally, rice varieties in the Ivory Coast are classed as long and medium-grain types. Varieties of each grain type are associated with specific cooking, eating and processing qualities. Thus, Ivorian long-grain varieties cook dry and the cooked grains tend to remain separate. Cooked kernels of typical medium varieties, on the other hand, are more moist than long-grain types. Ivorian consumers prefer long-grain type for its cooking qualities. An important proportion of the Ivorian rice crop is processed into several kinds of prepared products such as boiled

rice, cooking rice in refined palm oil and bolô. Recently, selected varieties have been released for cultivation by the Savannah Institut (IDESSA) in the Ivory Coast. In the present investigation the physico-chemical characteristics of fifteen rice varieties are reported.

## MATERIALS AND METHODS

### Grain samples

Fourteen rice varieties in hulls (*Oriza sativa* L.) were purchased from the Savannah Institut (IDESSA) and one local rice variety (widely spread in the Ivory Coast), from Abidjan market.

### Packaging

Small polyethylene bags of 500 g were used as packaging materials. Samples were wrapped in packaging material.

### Storage conditions and sampling

Rice was stored at 25–26°C (60% RH) in the laboratory. Whole rice grains were removed from plastic bags, dehulled and milled to fine powder (0.5 mm mesh particle size) with a universal type laboratory rice mill.

### Proximate composition

Five to ten gram samples (three samples  $\times$  15 rice varieties) were used for proximate analyses. Moisture, ash, crude protein ( $N \times 5.7$ ) and total carbohydrate were determined in triplicate by the AOAC (AOAC, 1970) methods.

### Physical measurements

One thousand rice grains were counted and weighed. The length and width of the kernels of each variety were estimated. Determination was carried out in triplicate. Milling yield was expressed as the ratio of the whole milled rice weight over the whole grain weight. Unbroken milled kernels were measured and, on the basis of average length, were classified into different categories following the scale of Khush *et al.* (1979). All determinations were carried out on at least ten samples for each variety except for the average grain weight.

### Statistical evaluation of data

The student's *t*-test, analysis of variance, was used to detect significant difference ( $p < 0.01$ ) in proximate composition, milling characteristics and grain size.

## RESULTS AND DISCUSSION

### Proximate analysis

Data on proximate composition of the fifteen rice varieties are presented in Table 1. Moisture content ranged from 9.0% for IRAT 170 to 12.5% for IRAT 136, IRAT 112, Bouaké 189, BG 90-2 and Morobe Rekan. The ash value (1.80%) of Jaya was significantly higher than those of other varieties. The protein content of milled rice was relatively low (about 7.5% at 11% moisture). IRAT 112 contained over 8% protein and the carbohydrate level varied from 67.7% (IRAT 112) to 75.5% (Bouaké 189 and IRAT 170).

### Physical measurements

Regarding physical values of different rice varieties shown in Table 1, the average grain length varied from 6.53 mm (Morobe Rekan) to 7.40 mm (IRAT 112 and IRAT 13). All rice varieties had the same grain width except for local rice (Goubô). The length-to-width ratio increased from 1.10 (Igliape Cateto) to 3.84 (gambiaka and IRAT 112). Table 1 also shows that the average kernel weight significantly decreased from 39 g (Morobe Rekan and IRAT 109) to 20 g for local rice.

### Milling characteristics

The milling characteristics of rice grain are listed in Table 2. The per cent of hull varied from 17.9 (Igliape Cateto and Bouaké 189) to 22.4 (Gambiaka) whereas the variety BG 90-2 contained the lower value of unripe grain. The varieties (Jaya, gambiaka and Bouaké 189) had the lower per cent of green grain and the level of perfect grain ranged from 62.2% (IRAT 104 and local rice) to 75.3% (Igliape Cateto and Jaya). The per cent of total milled rice varied from 76.7 (gambiaka and IR5) to 82.1 (Igliape Cateto, IRAT 112 and BG 90-2). In addition most rice varieties had long, and slender grains.

Table 1 shows that these rice varieties had relatively low protein contents but were rich in carbohydrate. These results were in agreement with those

**TABLE 1**  
Grain Size and Proximate Composition of Rice Varieties

Variety	Grain size (mm)		L/W	1 000 Kernel wt/g		Chemical composition			
	Length (L)	Width (W)		Moisture (%)	Ash (%)	Protein (%)	Carbohydrate (%)		
Local rice (Goubô)	7.33	1.67	4.39	20	10.5	0.57	7.10	73.3	
IRAT 170	7.0	2.0	3.50	32.0	9.0	0.56	7.27	75.5	
GAMBIAKA	7.67	2.0	3.83	24.0	12.0	0.66	6.10	68.4	
IRAT 13	7.53	2.0	3.76	30	10.0	0.85	6.30	74.0	
MOROB REKAN	6.53	2.0	3.26	39.0	12.5	0.81	8.0	68.5	
B.G. 90-2	6.87	2.0	3.43	27.0	12.5	0.93	6.31	71.6	
BOUAKE 189	7.33	2.0	3.66	23.0	12.5	1.06	7.10	75.6	
Jaya	6.67	2.0	3.33	26.0	11.0	1.80	6.82	71.5	
Igiape Cateto	6.67	6.0	1.10	30	12.0	1.00	6.69	69.8	
IRAT 104	7.20	2.08	3.46	31.0	11.5	0.86	6.73	69.5	
IR 5	6.70	1.90	3.53	24.0	12.0	0.86	6.91	72.1	
IRAT 136	6.93	2.0	3.46	30	12.5	0.92	7.20	70.1	
IM 16	7.40	2.0	3.70	25.0	9.50	0.57	7.20	73.1	
IRAT 112	7.67	2.0	3.84	30	12.5	0.68	8.57	67.7	
IRAT 109	6.73	2.0	3.37	38.0	11.5	0.77	6.86	69.7	
MEAN	7.08	2.24	3.44	29.0	11.4	0.86	7.01	71.4	

**TABLE 2**  
Milling Characteristics of Rice Varieties

Variety	Hulls (%)	Total rice milled (%)	Immature grains (%)	Green grain (%)	Perfect grain (%)	Grain size/shape
Igliape Cateto	17.9	82.1	5.33	1.78	75.0 long	bold
Jaya	20.2	79.6	3.29	1.08	75.3 long	slender
IRAT 170	20.3	79.1	5.99	8.08	65.0 long	slender
IRAT 109	21.4	78.2	9.41	2.05	66.7 long	slender
IRAT 104	19.7	80.1	15.4	2.66	62.1 long	slender
IRAT 13	19.5	80.3	9.54	6.05	64.7 extra long	slender
GAMBIAKA	22.4	76.7	3.91	0.75	72.0 extra long	slender
IRAT 112	18.5	81.5	6.98	5.29	69.0 extra long	slender
IRAT 136	19.8	79.2	3.09	5.22	70.9 long	slender
IM 16	20.4	79.8	7.34	3.92	68.5 medium	slender
Morobe Rekan	20.0	79.8	1.13	7.31	73.0 long	slender
BG 90-2	17.9	80.1	4.63	0.87	74.6 long	slender
BOUAKE 189	21.0	71.5	2.09	1.67	73.7 long	slender
IR 5	20.7	79.3	11.6	5.20	62.2 long	slender
Local rice	21.7	78.3	11.2	5.3	12.5 long	slender
Mean	19.9	79.6	6.43	3.71	74.9 long	slender

found in the literature (Onâte *et al.*, 1964; Webb *et al.*, 1972; Juliano, 1972; Nanda *et al.*, 1976; Nanda & Coffman, 1979). There was little measurable difference in the amounts of ash and moisture between the rice varieties studied. Table 2 also shows that all varieties, except Morobe Rekan, had long and slender grains. As Ivorian consumers prefer long grain types for their cooking qualities, all varieties studied were suitable for cooking, eating and processing.

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(Received 3 January 1990; revised version received and accepted 23 April 1990)