



COMPARATIVE STUDIES OF PADDY RICE GRAIN ENGINEERING QUALITY PARAMETERS FOR THREE VARIETIES OF UPLAND PADDY RICE GROWN IN MUBI, ADAMAWA STATE NIGERIA

ABSTRACT

The three varieties of upland paddy rice cultivated and harvested, the engineering quality parameters that aimed at evaluating highest quality paddy rice were determined. The parameters evaluated were 1000g weight, paddy shape, percentage broken grains, percentage immature grains and percentage dockage paddy for Narica A-f2,

*HUSSAINI, M. S.; **ABUBAKAR, Y.;
***ABDULHAMID, Y.; & GABI, M. N.

*Department of Agricultural and Bio-Environmental Engineering Technology,
Federal Polytechnic, P.M.B. 35 Mubi, Adamawa State, Nigeria. **Department of Agriculture and Natural Resources, Potiskum, Yobe State. ***Department of Plant Resources, Agricultural Research Council of Nigeria, Mabushi, Abuja

Introduction

Rice quality mostly depend on the consumer and the intended end use of the milled grain. Generally the consumer want the best quality for feeding and industrialization. The quality demand has increased with increase in rice production of a particular country. Recently the trend has changed to incorporate preferred quality characteristics that increase the total economic value of rice, but all the same grain quality is not just depend on the variety of rice, but also depend on the crop production environment, harvesting, processing and method of milling. Rice is the only cereal crop cooked and consumed mainly as whole grains, and quality



Faro 59 and Champa Chines paddy. The results obtained for the three varieties were 30g weight for Narica A-f2, 20g for Faro 59 and 30g weight for Champa paddy respectively. Other parameters were percentage broken grains of (0.35%, 0.28% and 0.26%), percentage immature grains (0.28%, 0.16% and 0.14%), and percentage dockage paddy of (2.5%, 3.2% and 3.0%) for Narica A-f2, Faro 59 and Champa Chines Paddy respectively. The data obtained were subjected to Microsoft word excel 2010 vision for data analysis. Statistical table's charts was used for presentations, from which observations, conclusion and recommendation were made for further studies.

Keywords; Comparative studies, Paddy rice grain, Quality, Variety

considerations are much more important than for any other food crop (Hossain *et al.*, 2009). Although production, harvesting and postharvest operations affect overall quality of milled rice, variety remains the most important determinant of Market and end-use qualities. Quality desired in rice vary from one geographical region to another and consumer demand certain varieties and favors specific quality traits of milled rice for home cooking (Juliano *et al.*, 1964). The paddy rice under this study was justified for its quality under total yield at harvest, paddy weight of the same quantity, broken/crack grain and grain dimension which results to the highest quality of milled rice grain in terms of economic value, physical characteristics and consumer attraction.

Materials and Methods

Materials

Seeds sample varieties of Narica A-F2, Faro 59 obtained from Grain Research Institutes Zaria and Chines Champa rice of early ripening which was obtained locally from Modern Grain Market Mubi Adamawa State, experimental plots of the department of Agricultural Engineering Federal Polytechnic Mubi, Rice herbicides, Water, Harvesting Sickles, Graduated bags, Electronic Weighing balance YP10 Model and Vanier Caliper for Measurement.



Methods

Cultural Practice

A total plot of 25ft×75ft was cleared, ploughed and harrowed for the experiment in the department of Agricultural and Bio-environmental Engineering Federal Polytechnic Mubi, Adamawa State. The plot was divided in to three equal parts of 25ft×25ft for each variety to be planted. The three seeds samples were cleaned, sorted and planted on the same date of 8th of July, 2020 with a total of 15kg for each variety. The varieties were given equal considerations of Agronomic activities and treatments, no effects recorded from the above factors. Germination was between (80-90%) for all the three varieties. Since the study emphasized on the harvested paddy quality, the details of agronomic descriptions were less considered.



Plate 1; Field Establishment of the three varieties

Paddy Quality Determination

The parameters considered for the paddy quality were; paddy at harvest, paddy weight, broken grain, grain dimension, immature grains, dockage in paddy and 1000 kernel weight among others. The samples of approximately 500grams of fresh paddy was weighed and the above parameters were determined as method describe by (ISO Standard 1979) Philippines.

Determination of paddy weight;

1000 number of counted paddy grains was weighted using electronic balance YP10KN Model and replicated three times and mean product weight was recorded for each paddy experimental sample.



Determination of broken grain;

Manual detection of cracked/broken was done and 100 broken grains was used to compute the percentage (%) broken grain using the equation;

$$\% \text{ Broken grains} = \text{Number of broken grains} / 100\text{grains} \times 100.$$

Determination of grains dimension;

Digital caliper was used to measure of 10 samples from each replicates and mean average was recorded for length and width of the paddy grains. The paddy shape was obtained from the equation;

$$\text{Length to Width ratio (L/W)} = \text{Average paddy length, (mm)} / \text{Average paddy width (mm)}$$

The dimension data will be classified based on the International organization for standardization (ISO) for paddy. Table 1.

Scale	Shape	L/W Ratio
1	Slender	Over 3.0
3	Medium	2.1- 3.0
5	Bold	1.1 - 2.0
9	Round	1.0 or less

Source; (Quality Standard of Rice in Philippines National Food Agency 1979).

Determination of Immature grains;

A sample of 25grams grains was selected, segregated and weight the immature in the sample. The percentage immature grains in the samples were calculated from the equation;

$$\% \text{ Immature grains} = \text{weight of immature grains} / \text{total weight of the sample} \times 100.$$

Determination of dockage in paddy;

100 grams of paddy was weight from the samples, all foreign materials was removed and weight separately, then the dockage percentage was obtained from the equation;



$\% \text{ dockage} = \text{weight of dockage} / \text{total weight of the sample} \times 100.$



Plate 2; Harvested yield samples for analysis

Data Analysis

The data obtained was subjected to Microsoft Word Excel 2010 Vision for data analysis, statistical tables and graphs were used for comparison and presentations.



Results and Discussions

Results

The products were harvested differently due to rainfall effects and maturity dates; Table 2.

Variety	Harvesting date	Seeds planted in (kg) & plot size	Yield at harvest in (kg) per plot	Difference in harvesting time (days)
Narica-F2	17:10:20	15kg (25ft×75ft)	100kg	101days
Faro 59	19:10:20	15kg (25ft×75ft)	120kg	103days
Champa-china	30:10:20	15kg (25ft×75ft)	260kg	114days

Source: (Field Survey)

The paddy grains dimensional parameters Table 3.

Variety	Replicates	Lengths (mm)	Widths (mm)
Narica-F2	1	8.82	2.69
	2	9.24	2.80
	3	9.75	2.72
	4	7.89	2.80
	5	8.81	2.71
	6	8.92	2.75
	7	9.03	2.69
	8	8.65	2.54
	9	7.91	2.43
	10	8.44	2.76
	Mean	8.75	2.69
Faro 59	1	8.72	2.62
	2	7.89	2.53
	3	9.82	2.68
	4	8.82	2.58
	5	8.90	2.88



	6	9.62	2.71
	7	8.64	2.49
	8	7.94	2.51
	9	8.32	2.55
	10	8.92	2.74
	Mean	8.76	2.63
Champa-china	1	10.49	2.50
	2	10.75	2.53
	3	11.07	2.58
	4	11.06	2.41
	5	10.31	2.45
	6	11.07	2.60
	7	11.02	2.49
	8	10.08	2.38
	9	10.51	2.52
	10	11.36	2.51
	Mean	10.77	2.50

Source: (Field Survey)

Determined Grades for Quality Standard Table 4.

S/N	Variety Samples	Grading Scale	Shape	L/W	Point recorded
1	Narica A-F2	1	Slender	8.75/2.69	3.3
2	Faro 59	1	Slender	8.76/2.63	3.3
3	Champa-Chines	1	Slender	10.77/2.50	4.3

Source: (Field Survey)

Determined Quality Parameters Table 5.

S/N	Variety Sample	1000grains weight	Percentage broken grains (%)	Percentage Immature grains (%)	Percentage Dockage in paddy (%)
1	Narica A-F2	30gramms	0.35	0.28	2.5



2	Faro 59	20gramms	0.28	0.16	3.2
3	Champa-Chines	30gramms	0.26	0.14	3.0

Source: (Field Survey)

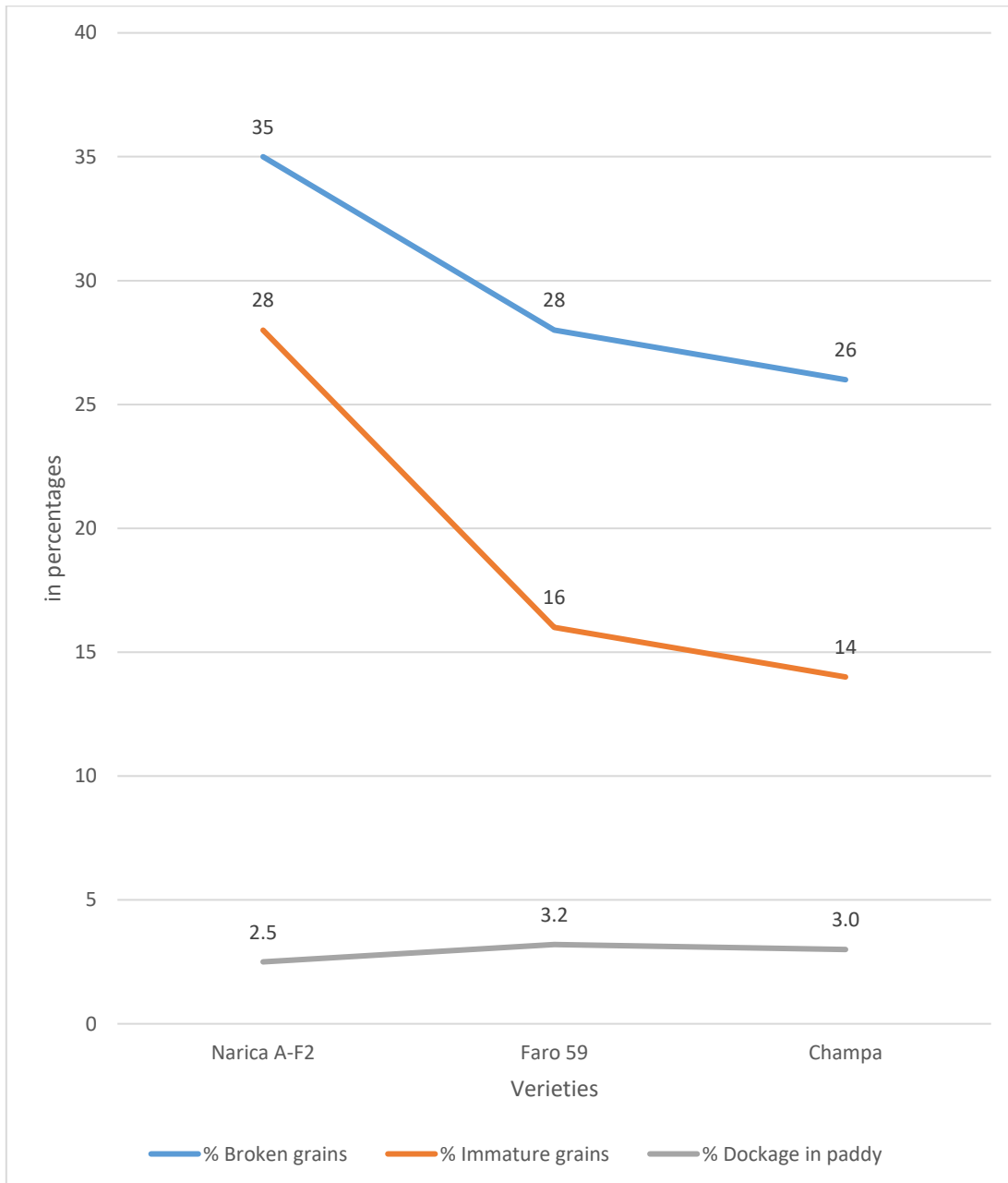


Figure 1: Weight of paddy at 1000g

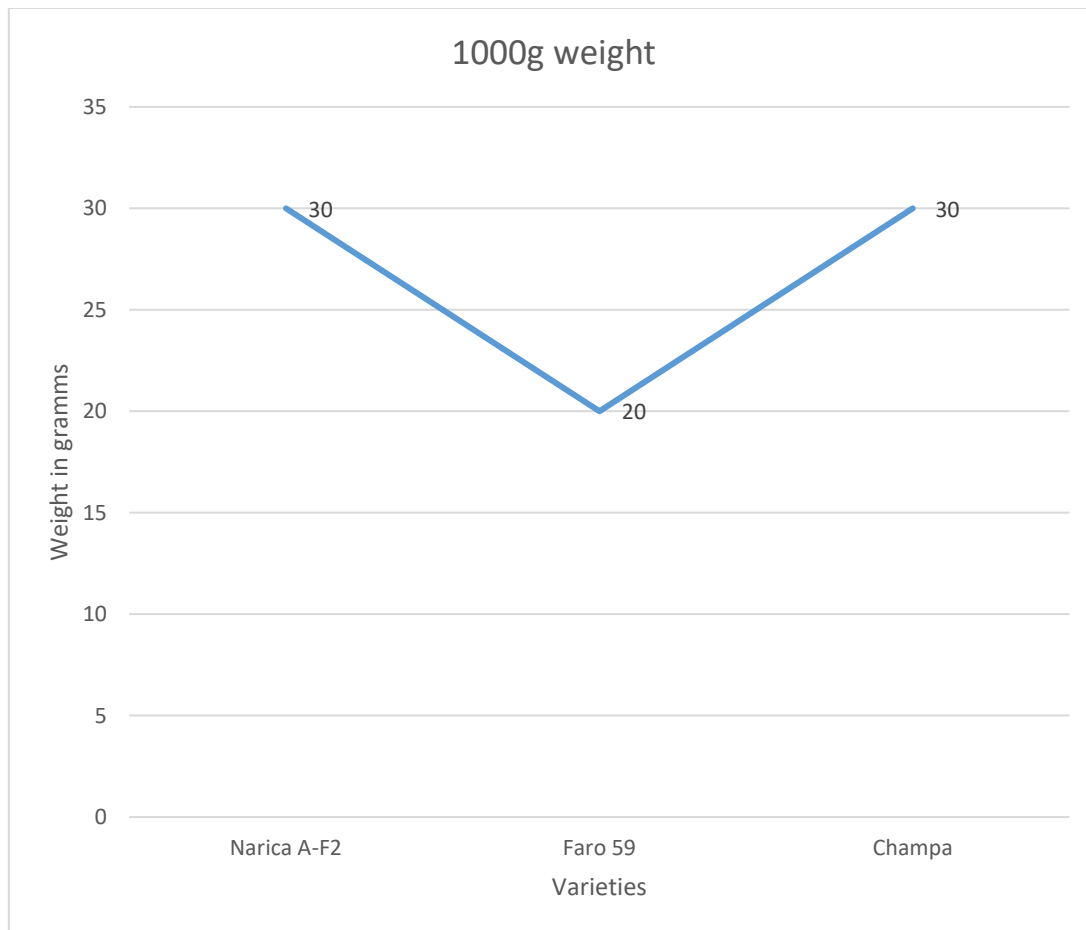


Figure 2: Percentages determined quality parameters

Discussion

The results of the determined quality parameters of paddy rice were discussed in the following sectors:

The paddy shape which was determined from the ratio of its length to width, and categorized into slender, medium, bold and round. The three varieties investigated were found to have slender shape in terms of quality, and this is in agreement with quality standard of paddy rice in Philippines National Food Agency (1979), that reveals length to width ratio over 3.0 classified as slender rice with high quality, but also contrary to the research conducted by Danbaba, *et. al.*, (2011), in that shape should not be considered as quality parameter for rice quality characteristics. The percentage broken grains for Narica A-F2, Faro



59 and Champa Chines varieties were found to be 0.35%, 0.28% and 0.26% respectively. The champa chines variety of (0.26%) considered the highest quality paddy which is in agreement with the International Standard for paddy rice in Philippines (1979), and also in agreement with that of Japan International Cooperation Agency (JICA), that paddy rice with lowest broken grains should be considered as high quality grade as far as grading system is concerned. The percentage of immature grains for Narica A-F2, Faro 59 and Champa Chines varieties was found to be 0.28%, 0.16% and 0.14% respectively. This is also in agreement with Japan International Cooperation Agency specific requirement for grading system that stated rice with 1.0-1.5% immature grains should be considered as grade 1, and others should follow based on the percentages of the immature grains. The percentage dockage for Narica A-F2, Faro 59 and Champa Chines Varieties were found to be 2.5%, 3.2% and 3.0% respectively. The three varieties investigated falls within the acceptable range of quality as reported in both Federal Ministry of Agriculture and Rural Development of Nigeria and Japan international cooperation agency manual on simple paddy grading checking in field and storages of famers (2016), that rice with dockage percentages between 1-5% should be accepted for quality grade 1., 2-3% as 2 and 3-5% as grade 3 respectively.

Conclusion and Recommendation

Conclusion

Based on the results obtained from this study, champa chines paddy was observed to high quality parameters of good rice characteristics with 1000grains weighted to 30gramms, slender shape of 4.3mm, percentage broken grains of 0.26%, percentage immature grains of 0.14% and percentage dockage in paddy of 3.0% respectively, in comparison to Narica A-F2 and Faro 59 with 1000grains weight to 30g and 20g, percentage broken grains of 0.35% and 0.28%, percentage immature grains of 0.28% and 0.16% and percentage dockage in paddy of 2.5% and 3.2% respectively. Therefore, the champa chines paddy rice obtained the highest quality parameters in terms of economic value, physical characteristics and consumer attraction.



Recommendation

From the study conducted on the three varieties of paddy rice (Narica A-F2, Faro 59 and Champa Chines paddy) on quality characteristics, the champa chines paddy recorded the highest quality, therefore it is recommended for famers and industries around the study area, and Adamawa State at large.

Acknowledgment

The research plot provided by the department of Agricultural and Bio-Environmental Engineering Technology (ABEET), Federal Polytechnic Mubi in promoting researches, Suppliers of Seeds from Research Institute Zaria, other referenced research publishers, Technical Staff of ABEET Department assisted in the course of this study are highly acknowledged and appreciated.

References

- Danbaba, N., Anounye, J.C., Gana A.S., Abo, M.E. and Ukwungwu, M.N. 2011. Grain quality characteristics of ofada rice cooking and eating quality. International food research Journal vol. 18: 629-634.
- Hossain, M. S., Singh, A.K. and Fasih-uz-Zaman. 2009. Cooking and eating characteristics of some newly identified inter sub-specific (indica/japonica) rice hybrids. Science Asia 35: 320-325.
- Juliano, B.O., Perez, C.M., Blakeney, A.B., Breckenridge, C., Castilo, D.T., Kongseree, N., Laignelet, B., Lapis, E.T., Murty, V.V.S., Paule, C.M. and Webb, D. 1981. International cooperative testing on amylose content of milled rice. Satarke 33: 157-162
- Fadesere, T. J. (2012); Post-harvest of rice paddy and effects on paddy quality; A case Study of OLAM Nigeria Outgrains in Pategi L.G.A. of Kwara State, Nigeria. Unpublished Master's degree research Project in development specialization in rural development and food security. Submitted to Van Hall Larenstein University of Applied Sciences. Pp; 30-102.
- Khush, G.S., Paule, M. and Delacruz, N.M. 1979. Grain Quality Evaluation and Improvement at IRRI, In, Proceeding of Workshop on chemical aspect of rice grain quality. International Rice Research Institute Philippines, pp.21-31.
- IRRI International) Rice Research Institute (1981); Annual Report for 1980 Los Banos, Laguna, Philippines. Pp. 25-38.



TIMBOU-AFRICA ACADEMIC PUBLICATIONS
NOV., 2022 EDITIONS, INTERNATIONAL JOURNAL OF:
AGRICULTURAL RES. & BIOTECHNOLOGY VOL. 11

Japan International Cooperation Agency (JICA) (2016); Manual on simple paddy grading checking in the field/ storages of famers. Vol. 2, March 2016.

United State Development Agency, Rice Inspection Handbook (USDA), 2014. Pp. 3-7.