EVALUATION OF PURITY AND PERFORMANCE OF RICE SEEDS FROM SOME SELECTED SEED COMPANIES IN THE NORTH-WESTERN NIGERIA, USING THE GROW-OUT-TEST (GOT)

Ojo P. O.[1], IshiakO. K.[1], ManassehE. A.[2], ZidafamorE. J.[1] and UbandomaH. M.[2].
[1]*National Agricultural Seeds Council, KM 29, Abuja-Lokoja Express Way Sheda, Abuja*
[2]*National Agricultural Seeds Council, North-West Region, Samaru, Zaria*

ABSTRACT
The trial aimed at determining the purity and performance of rice seeds fromsome seed companies in the North-Western Region of Nigeria, using the Grow-Out-Test during the 2020 and 2021 dry seasons at the National Cereals Research Institute (NCRI), Kebbi station, located at Gwadangaji, Birnin Kebbi. Nine rice variety of Faro 44 certified seed samples were drawn from the submitted samples sent to the Regional laboratory in Zaria from the various seed companies and one sample of Faro 44 breeder seed from NCRI, Badeggi was used as control in the experiment. The experiment was laid out in a Randomized complete Block Design (RCBD) and replicated three times. Data on days to 50 % heading, plant height at harvest, tiller numbers, yield/ha and 1000 grain weight were evaluated and subjected to general linear model of SAS while total number of off-types counted was computed based on the minimum permissible level at 98 % purity for rice certified seed.The results revealed that there was no significant difference between the Faro 44 certified seeds from the selected companies with the control sample in terms of days to 50 % heading and plant height at harvest; while the control had the highest yield value in both 2020 and 2021. Based on the number of off-types counted, all samples were considered pass, since none exceeded the threshold value (24), though proper rouging of the seed fields should be encouraged to minimize the off-types count.

Keywords: *Grow-out-test; Seed; Rice; Variety*

INTRODUCTION
Rice is an important food crop that generates income for Nigerian farmers, especially small scale producers who sell a larger percentage of their total production and consume little and with the population of Nigeria been increasing, rice demand and consumption are also expected to increase (GAIN, 2016). The global trend in food and economic crises and continuous importation of rice from developed countries to developing countries, most especially Nigeria has negative effect on the domestic production and general economic development of such countries (Abbas *et al.,* 2018). In 2016, national rice demand was estimated at 6.3 million metric tons while domestic supply was put at 2.3 million metric ton (FMARD, 2016). The balance of 4 million metric tons was expected to be filled by import, which is very detrimental to Nigeria`s economy because it portends a serious danger in terms of foreign exchange.While in 2021, local production of rice was increased drastically; this made the country now ready to export the commodity according to Aminu Goronyo, the National President of Rice Farmers Association of Nigeria (www.gazettengr.com). Quality and improved seed may have contributed to these great achievements, being the primary input in any crop production.Most seed companies were predominantly within the North western region of the country, covering the seven states that includes: Kaduna, Kano, Katsina, Jigawa, Zamfara, Sokoto and Kebbi; this may be due to favorable weather conditions for both production and processing including a large expanse of farm land that can either be cultivated under rainfed, irrigation or both throughout the season, with rice being among the major seed produced in these areas due to its high potential for sales and availability of rice mills Grow-out-Test (GOT) is a broad term that comprises of both pre-control and post control test. Pre control is the term applied to variety verification of early generation seeds (breeder and

foundation seeds), when they are being multiplied to produce a further generation of seed, the information provided by a control plot provides data on identity and quality that are available before a major widespread problem (OECD, 2019). While post control test is a term normally applied to variety verification of certifieds seed which are not further multiplied. The information deduced from this test gives in sights on how efficient the seed production process has been in maintaining varietal purity and identifies ways in which the system might be improved (OECD, 2019).Therefore, the objective of this trial was to determine the purity and performance of Faro 44 certifieds seed from some selected seed companies in the North-Western region of Nigeria.

MATERIALS AND METHODSThe Study Area

Field experiments (two) were conducted during the 2020 and 2021 dry season at the Research Farm of the National Cereals Research Institute (NCRI) Gwadangaji, Birnin Kebbi, Kebbi State. Kebbi is located onlatitude N12^{0}29.395`` and longitude E4$^0$15.672``. The area has a Sudan Savannah vegetation type, which is marked by two distinct seasons; rainy and dry seasons. The rainy season ranges from May to early October with peak in August and Septemberwhile the dry season starts from November and ends into April. The mean annual temperature is 23^{0}C, but can be as high as 42^0 C between April and and as low as 18^{0}C in January.Kebbi State lies within two ecological zones: the Northern part of the state is in the Sudan Savannah while the Southern part is in the Northern Guinea Savannah. This climate peculiarity of the state supports the production of a wide range of arable crops, roots and tubers, agro forestry, fisheries and livestock (Kebbi State Government, 2017a).

Treatments and Experimental Design

The treatment evaluated consisted of nine (9) certified seeds of Faro 44 from selected seed companies within the North-Western Region and one breeder seed of Faro 44 from NCRI, as control (Table 1).The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications while each plot size was 4 × 4m. Prior to land preparation, the entire field was wetted and sprayed with glyphosate at the rate of 2.0 Kg a i ha^{-1}for weed eradication. A separate nursery was established for all the seeds around the edge of the field, on 01/02/2020 and 08/02/2021, respectively. Thereafter, the entire land was ploughed, puddled and leveled after fourteen days. The bonds of beds were raised (4 ×4m) manually with local. Seedlings were transplanted 28 days after sowing (on 28/02/2020 and 02/03/2021, respectively). Transplanting rob was used during the seedlings transplanting at an inter and intra row spacing of 20 × 20cm using one seedling per stand, giving a total plant population of 400 stands per 16m^2 and a net plot of 3 × 3m was used during the performance evaluation. After transplanting, the entire plot was flooded with water for three days and sprayed with pendimethalin at the rate of 1.2 Kg a i ha^{-1}. One week after the transplanting, basal application of NPK 15 15 15 was applied at the rate of 40 Kgha^{-1}, thereafter, nitrogen fertilizer (Urea) was applied in two split doses at 4 and 8 weeks after transplanting (WAT) at the rate of 30 Kgha^{-1}each. Both NPK fertilizer and urea were applied by broadcasting method. Weeding was done at 4 and 8 WAT, followed by hand pulling of grasses in the field.

Data collected include:

Days to 50% heading:

The days to 50% heading were recorded when 50% of the panicles were visible.

Height (cm)/plant: The height of five randomly tagged plants within the net plots were measured and recorded prior to harvest. This was obtained during the harvest by measuring the plant from ground level to the tip of the tallest panicle using a plastic ruler and the average value was computed and recorded.

Number of tillers per plant: The number of tillers of the five tagged plants was counted prior to harvesting and the mean recorded.

Number of off-types: All plants that differed in conformity from the original variety planted in each plot were counted and recorded as off-types. This counting was based on the differences in plant

height, leaf colour and arrangement and the panicle colour and length.

Grain yield (kgha^{-1}): The harvested panicles from each net plot were threshed and the paddy winnowed and weighed using a sensitive electronic weighing balance and the yield expressed in kgha^{-1}.

00 grain weight (g):

A randomly selected 1000 seeds were counted from the harvest of each net plot and weighed using a sensitive electronic weighing balance.

Data Analysis

Data on the number of off types were computed using the minimum number of off-types permissible according to National Agricultural Seed Council(NASC) and OECD standard while data on growth characteristics, yield and yield components were subjected to Analysis of Variance (ANOVA) using SAS (Statistical Analysis System) software version 9.3 (SAS, 2011). Treatment means werecompared using Duncan Multiple Range Test (DMRT)(Gomez and Gomez, 1984).

ResultsDistribution of Selected Seed Companies

Table 1 showed the distribution of the seed companies whose samples were used for this experiment for a period of two seasons. Kano and Zamfara were represented by one Seed Company each, followed by Kaduna and Kebbi state which has a representation of two seed companies while Katsina has the highest number (3) of seed companies represented in this study (Table 1). The breeder seed was sourced from National Cereals Research Institute (NCRI) Badeggi, Niger state, which has the mandate for the genetic improvement of rice in Nigeria.

Table 1:Shows the experimental materials, class and the location of seed companies

S/NO.	CROP	VARIETY	CLASS	COMPANY	LOCATION
1	RICE	FARO 44	C.S	Maina Seed	Kano
2	RICE	FARO 44	C.S	Premier Seed	Zaria, Kaduna
3	RICE	FARO 44	C.S	Alhusahura Seed	Kaduna
4	RICE	FARO 44	C.S	A. A. Albasu Seed	Katsina
5	RICE	FARO 44	C.S	Jamy- Nagari S	Katsina
6	RICE	FARO 44	C.S	M.M Bello Seed	Katsina
7	RICE	FARO 44	C.S	Gawal Seed	Kebbi
8	RICE	FARO 44	C.S	Goro Seed	Kebbi
9	RICE	FARO 44	C.S	Maslaha Seed	Zamfara
10	RICE	FARO 44	B.S	N.C.R.I	Niger

Growth Performances and Yield of Rice Seeds of Faro 44 from Selected Seed Companies Growth performance and yield of FARO 44 seeds from selected seeds companies is shown in Table 2. The growth characteristics of the rice seeds from the selected seed companies in comparism with the control seed were fairly the same (P>0.05). Considering the days to 50% heading, there was no significant difference between the control (82.00) and even the highest value (84.00) for A.A Albasu and Alhusahura; so also of the values for plant height at harvest whose values were not significant while the least value of the tiller numbers is M.M Bello (Table 2)

Grain yield and one thousand grain weight for the control (5572.40kgha^{-1} and 27.47 g) were significantly different from the others (Table 2).

Table 2: Growth Performances and Yield of Faro 44 Seed from SelectedSeed Companies in 2020

Seed Companies	Days to 50 % heaading	Plant height @ harvest	Tiller number	Yield/ha (Kg/ha)	Thousand grain weight (g)
A.A Albasu	84.00a	103.20a	50.00ab	5099.80ab	23.57b
Alhusahura	84.00a	103.48a	50.00ab	5092.70ab	23.13b
GAWAL	83.00a	103.60a	52.00a	5453.80ab	24.73b
Goro	83.00a	103.43a	51.00a	5447.10ab	24.77b
Jamy-Nagari	83.00a	104.07a	51.00a	5177.10ab	23.27b
M.M Bello	83.00a	103.80a	48.00b	5138.50ab	23.47b
Maina	83.00a	104.00a	50.00ab	5027.40b	23.50b
Maslaha	83.00a	103.38a	50.00ab	5109.80ab	24.03b
Premier	83.00a	103.50a	51.00a	5526.40ab	24.23b
NCRI(Control)	82.00a	103.70a	52.00a	5572.40a	27.47a
SE±	0.829	1.952	0.870	149.890	0.523

Means followed by the same letter(s) within the column are statistically the same @ 5% level of significance; SE±= Standard Error.

The results on growth performance and yield of FARO 44 seeds from selected seed companies in 2020 showed almost the same trend as that of 2021, (Table 3).There was no significant difference between the control (83.00) and even the highest value (84.00) for A.A Albasu, Alhusahura, Goro and M.M Bello in Days to 50% heading; Premier has the highest value in plant height (102.8cm) while A.A Albasu has the least (101.7cm) which were all not significant ($P>0.05$). Tiller numbers per plant was significantly different, where the Control (50.00) had the highest number, followed by Gawal, Goro and Premier then other seed companies were at par, except M.M Bello having the least (46.00) as shown in Table 3

Grain yield and one thousand grain weight for the Control (5284.100kgha^{-1} and 26.50 g) were significantly different from the others (Table 3)

Table 3: Growth Performances and Yield of Faro 44 Seed from SelectedSeed Companies in2021 Dry Season

Seed Companies	Days to 50 % heaading	Plant height @ harvest	Tiller number	Yield/ha	Thousand grain weight (g)
A.A Albasu	84.00a	101.70a	48.00ab	4822.50ab	22.60b
Alhusahura	84.00a	102.50a	48.00ab	4812.20ab	22.17b
GAWAL	83.00a	102.77a	49.00a	5170.20ab	23.93b
Goro	84.00a	102.27a	49.00a	5204.90ab	23.77b

Jamy-Nagari	83.00a	102.53a	48.00ab	4889.90ab	22.30b
M.M Bello	84.00a	102.72a	46.00b	4851.20ab	22.50b
Maina	83.00a	102.53a	48.00ab	4793.60b	22.60b
Maslaha	83.00a	102.73a	48.00ab	4822.20ab	23.07b
Premier	83.00a	102.80a	49.00a	5236.60ab	23.30b
NCRI(Control)	83.00a	102.30a	50.00a	5284.10a	26.50a
SE±	0.763	1.802	0.756	142.850	0.520

Means followed by the same letter(s) within the column are statistically the same @ 5% level of significance; SE±= Standard Error.

Off-types Count Table 4 showed total number of off-types for rice seeds from each of the seed companies using the OECD and NASC minimum standard of permissible level of 98 % purity for CS.

From the table, a minimum threshold value of 24 off-types was the limit, where the output of the evaluation in both 2020 and 2021 showed that none of the counted off-types from the selected seed companies exceeded the minimum threshold of 24. Though M.M Bello in 2020 had the highest value of off-types (21) while Gawal had the least value (5.0); for 2021, A.A Albasu had the highest off-types value (14.0), followed by Alhusahura (11.0) whileGawal (4.0) is still the least (Table 4)

Table 4: Total off -types count, minimum permissible level and remark on the purity of seed in 2020 and 2021 dry season

	2020			2021		
Seed Companies	**Total off - types**	**Minimum permissible number**	**Remark**	**Total off - types**	**Minimum permissible number**	**Remark**
A.A Albasu	13.00	24.00	Pass	14.00	24.00	Pass
Alhusahura	11.00	24.00	Pass	11.00	24.00	Pass
GAWAL	5.00	24.00	Pass	4.00	24.00	Pass
Goro	6.00	24.00	Pass	6.00	24.00	Pass
Jamy-Nagari	11.00	24.00	Pass	6.00	24.00	Pass
M.M Bello	21.00	24.00	Pass	12.00	24.00	Pass
Maina	11.00	24.00	Pass	7.00	24.00	Pass
Maslaha	10.00	24.00	Pass	7.00	24.00	Pass
Premier	8.00	24.00	Pass	5.00	24.00	Pass
NCRI(Control)	0.00			0.00		

*@ 98% purity for CS

Discussion

The general performance of the rice seeds of Faro 44 from various seed companies has not deviated from the standard control sample from NCRI. Considering the days to 50 % heading and plant height at harvest for both 2020 and 2021 dry season, the least value for days to 50 % heading was 82 days while the highest value was 84 days; and for plant height at harvest, the least value is 101.70cm and the highest is 104.07cm which were both not significantly different from the Control.Ojo*et al*., (2018) and Manasseh *et al*., (2018) reported similar findings on the value of days to 50 % heading and plant height at harvest on Faro 44 rice variety along the flood plain of Jega, in Kebbi state.

Tiller numbers, seed yield and 1000 grain weight followed a consistent trend both in 2020 and 2021. The Control had the highest value of 5572.40kgha^{-1} and 5284.10kgha^{-1} in both 2020 and 2021, respectively while the least value for yield in 2020 and 2021 was from Maina seed with5027.40kgha^{-1} and 4793.60kgha^{-1}. Under good management, Faro 44 will yield between 4-6 kgha^{-1}(Nwilene*et al*., 2016). Therefore, the trend of the seed yield for both the breeder and certified seeds for the two consecutive years of this study was in linewith the findings of other authors.

There was generally a decreased in the number of off-types as observed from the data in 2021 compared to 2020 for all the seed companies. This implies that the seed companies are improving in maintaining purity of their seeds through proper rouging of their seed fields. Since the entirecertified seeds did not exceeded the minimum threshold of off-types according to (NASC, 2007; OECD, 2019), all seeds were considered pass.

Conclusion and Recommendation

The outcome of the performance and purity trials of some certified seeds selected from some seed companies in the North-Western Nigeria revealed that all the seeds of Faro 44 from the different companies did not deviate from the Control in relation to Days to 50 % heading and Plant height at harvest while none of the seed companies certified seeds exceeded the total number ofpermissible off-types, as such were considered pass. Thus proper monitoring of the seed fields should be encouraged in order to completely rogue all off-types in the whole fields

REFERENCES

Abbas, M.A, Agada, G.I. and Kolade, O. (2018). Impact of rice importation on Nigeria`s economy. *Journal of Scientific Agriculture*, **2**:71-75.

Aminu Goronyo. (2021). Nigeria and Rice Export. (www.gazettengr.com, dated 24th June, 2021)

Federal Ministry of Agriculture and Rural Development. (2016). The Agriculture Promotion Policy (2016-2010). FMARD, Abuja, Nigeria. 2016; pp 1-59.

Global Agricultural Information Network. (2016) Nigeria`s grain and feed annual report. https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Grain%20and%20Fee%20Annual_Lagos_Nigeria. Accessed 14.08.2020.

Gomez, K.A. and Gomez, A.A. (1984) *Statistical Procedures for Agricultural Research,* Wiley Inter-science, New York, NY. 704 ppKebbi State Government (2017a). *About Kebbi State.* Retrieved from http://kebbistate.ng

Manasseh, E.A., Abimiku, S.E., Zidafamor, E.J. and Ishiak, O.K. (2018). Evaluation of four rice (*Oryza Sativa* L.) varieties under dry season production in Jega, Kebbi State Nigeria. *Journal of Agriculture and Environment*, **14**:(2):187-191. ISSN 1595-465

National Agricultural Seed Council. (2007). Seed Certification Manual, Retrieved from Standard Operating Procedure for issuance of Seed Importation Permit, 2018: https:// seedcouncil.
gov.ng/

Nwilene, F.E., A.A. Shaibu, O.E. Oyetunji, O.B. Oladejo and A. Shittu. (2016). Rice Seed Quality Maintenance and Varietal Recognition. Africa Rice Centre (AfricaRice) Handbook, Ibadan, 2016

Ojo. P.O., Manasseh, E.A., Abimiku, S.E., Zidafamor, E.J., Ubandoma, H.M., Ishiak, O.K. and Yakub, M.A. (2018). Influence of maxicrop on agronomical attributes and yield of four rice varieties in Kebbi, North-Western Nigeria. Journal of Biology, *Agriculture and Healthcare*, **8**(18):1-9.

Organization of Economic Co-operation and Development. (2019).Guideliness for Control Plots Tests and Field Inspection of Seed Crops, July, 2019.

SAS Software Version 9.3. (2011). Statistical Analysis System Institute Incorporation, Cary, NC, USA.