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Evaluation of Rice (*Oryza sativa* L.) Genotypes for Yield and Yield Component Parameters[•]

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ABSTRACT

This research was conducted to study yield and yield component of 20 rice genotypes. The genetic material of the genotypes was used to measure days to 50% flowering, days to maturity, panicle number/plant, panicle length (cm), number of mature seeds/panicle, number of empty seeds/panicle, grain yield/plant, 1000 seed wt. (gm) and grain yield (t/ha). The results revealed highly significant differences in 2016 for most parameters, significant difference in plant height after 30 and 60 days, leaf area and panicle length but not significant for plant dry weight. The results of 2017 showed similar trend with significant differences in plant height at 30 days, tillers of 90 days and not significant for plant dry weight. The significant yielding genotypes were NERICA 14 (12.30 t/ha) and NERICA4 (7.30 t/ha) in 2016. In 2017, SR 14 (10.42 t/ha) and NERICA 14 (7.00 t/ha) gave the best significant yield. However, for combine analysis SR 14 (8.01 t/ha) and NERICA 14 (9.60 t/ha) were the best.

Keywords: *Evaluation; Genotypes; Rice; Parameters; Yield.*

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1. INTRODUCTION

Rice, *Oryza sativa* L., is the world's second most important cereal crop grain production of rice being exceeded only by that of wheat. Rice is the major caloric source, with nearly 2.5 billion people depending on it as their main food (FAO, 2011). Rice is cultivated in at least 114, mostly developing countries and is the primary source of income and employment for more than 100 million households in Asia and Africa (FAO, 2011). About 80% of the world's rice is produced on small farms, primarily to meet family needs, (FAO, 2011). Less than 7% of the world's rice production is traded internationally (MacLean *et al.*, 2002). Rice in Sudan is grown on 7.60 thousand hectares producing 30 thousand tones. However, Sudan produced an average of 3947 kg/ha (AOAD, 2008).Swamp and upland varieties were first tried at the Gezira research farm in 1951. Later, extensive rice trials were carried out at Malakal. Since 1974 up to 1979 rice research at Gezira research station has identified many of the major constraints to high yields. Despite of this, the agricultural policies did not encourage its production (Ghobrial, 1981). The share of rice in cereals consumed as food has risen from 15% to 26% within the same period and is still increasing (Akpokedge *et al.*, 2001). FAO (2000) projection of the West African-sub region rice consumption growth rate of 4.5% through the year 2000, the regional consumption of the staple in the first decade of the 21st century is likely to increase by about 70%. Varieties in a series of environments have stable average yield are known to have vast adaptability. However, varieties which show high yielding genetic potential only in desirable conditions but poor yielding potential in un-desirable conditions known as varieties with finite adaptability (Lin and Bins, 1991).Recently, different genotypes from West African Rice Development Association (WARDA) and International Rice Research Institute (IRRI) are being evaluated for yield and earliness although, 82 aerobic rice varieties and lines were introduced in an attempt to save irrigation water and to reduce human diseases risks in the irrigated schemes. Also, FAO (2000) is planning to rehabilitate the White Nile research farm to improve rice production. Morphology variation does not reliably reflect the real genetic variation because of genotype-environment interactions and the largely unknown genetic control of polygenically inherited morphological and agronomic traits (Smith and Smith, 1992). The main objectives of this study were to assess the agronomical performance (growth and yield) of twenty rice varieties, to select the best varieties with resistance to lodging, shattering and early maturity, under Shambat environment (semi-arid).

2. MATERIALS AND METHODS

Genetic materials used in the study

The genetic materials used in this study were 20 rice genotypes including one Oryza glaberrima, five O. sativa, and 14 interspecific cultivars between O. sativa and O. glaberrima developed by the Africa Rice Center (Africa Rice) under the name of NEW RICE for Africa (NERICA) (Table 1).

Field experiments

The experiments were carried out, at the Demonstration Farm, College of the Agricultural Studies, Shambat, Sudan University of Science and Technology (15^0 40N, 32^0 32E and altitude 386m above sea level) over two consecutive summer seasons of 2016 and 2017.

Lay out of the Experiments

The experiments were laid out in a randomized complete block design (RCBD) with three replications during two seasons (2016-2017). The field was disc ploughed, disc harrowed leveled. The land was divided into 2 x 3m plots, seeds were sown on the first of July 2016 and 15th of July 2017 because of some problems relating to late preparation of land. Seed rate applied at (3.5 kg /fed). The seeds were sown in holes five seeds per hole 2.5cm spacing between holes 2.5cm between lines. Nitrogen fertilizer (urea 46% N) 120Kg/F was applied in three doses two weeks, five weeks and seven weeks after planting, Hand weeding was done when needed, irrigation was conducted weekly.

Table 1. Rice Genotypes, their Institute and Origin

Nu	Genotypes	Institute	Origin	Nu	Genotypes	Institute	Origin
1	NERICA 3	WARDA	Cote d'Ivoire	11	NERICA15	WARDA	Cote d'Ivoire
2	NERICA4	WARDA	Cote d'Ivoire	12	NERICA16	WARDA	Cote d'Ivoire
3	NERICA 5	WARDA	Cote d'Ivoire	13	NERICA17	WARDA	Cote d'Ivoire
4	NERICA 7	WARDA	Cote d'Ivoire	14	NERICA18	WARDA	Cote d'Ivoire
5	NERICA 9	WARDA	Cote d'Ivoire	15	SR 1	ARC	ARC
6	NERICA 10	WARDA	Cote d'Ivoire	16	SR2	ARC	ARC
7	NERICA 11	WARDA	Cote d'Ivoire	17	SR 14	ARC	ARC
8	NERICA 12	WARDA	Cote d'Ivoire	18	CG14	IRRI	Philippines
9	NERICA 13	WARDA	Cote d'Ivoire	19	WAB	IRRI	Philippines
10	NERICA 14	WARDA	Cote d'Ivoire	20	WAB 181-18	IRRI	Philippines

Data Collection

At each of the two seasons, when the plants reached physiological maturity, five plants from the two inner lines at each plots were randomly selected and tagged and from them data was recorded for yield characters. Plant height, number of tillers were taken monthly (30, 60 and 90 days) and days to 50%flowering and days to maturity were recorded.

Yield Characters

Panicle Number/Plant: It was calculated as average for the panicle number of the five tagged plants.

Panicle Length (cm): It was measured from the base of the panicle to its tip using the meter tape.

Days to 50% Flowering: The days of 50% flowering were recorded from sowing date up to the day when 50%of the plants at each plot had fully exerted panicles

Days to Maturity: They were taken as the number of days from sowing date to the day when all the heads at each plot had reached physiological maturity.

Plant Dry Weight (gm): It was calculated as average for the dry weight of the five tagged plans after drying in oven at 80^0 C.

Number of Filled Seeds/Panicle: Number of filled seeds was taken by counting the filled seeds number for five panicle divided by five.

Number of Empty Seeds/Panicle: Number of empty seeds was taken by counting the empty seeds number for five panicle divided by five.

Grain Yield/Plant (g): After harvesting the panicles of the five selected tagged plants stored at room temperature for four weeks to minimize change in weight due to moisture content, then they were threshed manually and the grain yield/plant was determined using sensitive balance.

1000 Grain Weight (g): The weight of 1000 grains was determined by weighting 1000 grain obtained randomly from the five selected panicles using sensitive balance.

Grain Yield (ton /ha): After harvesting all the covered heads from an area of one m^2 in the middle of the plot each plot were cut and stored for four weeks to minimize change in weight due to moisture content manually threshed, cleaned weighted by using the sensitive balance and the grain yield ton/ /ha was determined as the following formula:

$$\text{Grain yield (ton/ha)} = \frac{\text{(grain weight/plot)} \times 10000}{\text{Plot area}}$$

Data Statistical Analysis

The collected data for growth and yield characters was subjected to analysis of variance used for a randomized complete block design (RCBD) using Statistic (8) software program.

Coefficient of Variation (C. V)

Coefficient of variation (C.V.) for each character was determined according to the following formula calculated by the program.

$$C.V\,(\%) = \frac{\sqrt{(\mathrm{MSE})}}{(G)} \times 100$$

Where: MSE = mean square of Error, G= Grand mean

Comparison between Seasons

The means were separated using the least significant difference (LSD) at 5% level of significance according to the formula:

$$L.S.D = \sqrt{\frac{\mathbf{2 \times Error\ Mean\ square}}{\mathbf{r}}} \times t\mathbf{0.5}$$

Where: r= number of replications t =level of significance for t-value at 0.05.

3. RESULTS AND DISCUSSION

Panicle Numbers/Plant and Panicle Length (cm)

Both Panicle numbers/plant and Panicle length affected yield positively. While panicle number showed high value by CG14 (11.33, 11.87 and 11.60), (Table 2), NERICA14 scored high panicle length (24.00, 22.00 and 23.00 cm) Table (2). Yang *et al.* (2019) reported that, the spikelets number in the newly bred variety was higher than those of conventional varieties but the number of filled grains did not increase. These findings might also support the importance of source activity at large sink size. Kobata *et al.*, (2006) reported that fertilization of rice decreased panicles with an increase in spikelet number. Panicle number has been reported to be an essential trait for high grain yield in low as well as high soil fertile uplands in Asia (Atlin *et al.*, 2006; Saito *et al.*, 2007) and West Africa (Saito and Futakuchi, 2009).

Days to 50% Flowering and Days to maturity

Mean of 50% flowering recorded the lowest value (67.67 days), (64.00 days), and (65.83 days) by the genotype NERICA 14 in the first season, the second season and combined respectively (Table3). While the genotype SR14 recorded highest value (94.33 days), (91.33 days) and (92.83 days) by in the first season, the second season and combined respectively (Table 3). Days to maturity showed highest values (124.33 days), (121.33 days) and (122.83 days) regarded by the genotypes SR 14 for the two seasons and combined, while the lowest value (97.00 days), (93.33 days) and (95.17 days) were detected by the genotype NERICA

14 in the first season, the second season and combined respectively (Table 3). Sasakawa Global (2009) found that, NERICA4 spent 100–110 days to mature during summer and 130 days during winter, which was matched with the mean for this study with (108.86) days.

Table 2. Mean Number Of Panicles and Panicle Length for Twenty Rice Genotypes Evaluated During Two Seasons 2016and 2017as Well as The Means of Combined Analyses.

Genotypes	Number of panicles			Panicle length		
	2016	2017	2016×2017	2016	2017	2016×2017
NERICA3	5.00^{bcd}	4.80^{cdefg}	4.90^{de}	22.26^{abcd}	20.00^{a}	21.13^{bcd}
NERICA4	5.60^{bcd}	4.60^{defg}	5.10^{cde}	20.96^{abcdef}	20.47^{a}	20.72^{cde}
NERICA5	4.13^{d}	4.07^{efg}	4.10^{e}	16.10^{g}	19.50^{a}	17.80^{f}
NERICA7	3.87^{d}	4.53^{defg}	4.20^{e}	23.66^{ab}	22.67^{a}	23.17^{a}
NERICA9	4.40^{d}	5.13^{cde}	4.77^{de}	20.73^{abcdef}	20.10^{a}	20.42^{cde}
NERICA10	5.20^{bcd}	4.93^{cdefg}	5.07^{cde}	20.06^{cdef}	20.93^{a}	20.50^{cde}
NERICA11	4.73^{cd}	5.67^{cd}	5.20^{cde}	19.10^{defg}	20.57^{a}	19.83^{de}
NERICA12	4.27^{d}	3.87^{fg}	4.07^{e}	21.96^{abcde}	21.20^{a}	21.58^{abcd}
NERICA13	4.73^{cd}	4.53^{defg}	4.63^{de}	18.43^{fg}	19.73^{a}	19.08^{ef}
NERICA14	6.40^{bc}	6.00^{c}	6.20^{c}	24.00^{a}	22.00^{a}	23.00^{ab}
NERICA15	4.33^{d}	4.67^{defg}	4.50^{de}	20.33^{bcdef}	22.67^{a}	21.50^{abcd}
NERICA16	4.47^{cd}	3.73^{g}	4.10^{e}	20.60^{abcdef}	20.50^{a}	20.55^{cde}
NERICA17	5.40^{bcd}	4.93^{cdefg}	5.17^{cde}	20.20^{bcdef}	19.53^{a}	19.87^{de}
NERICA18	4.27^{d}	4.87^{cdefg}	4.57^{de}	23.47^{abc}	21.20^{a}	22.33^{abc}
SR1	5.60^{bcd}	5.67^{cd}	5.63^{cd}	20.63^{abcdef}	20.97^{a}	20.80^{cde}
SR2	4.47^{cd}	4.53^{defg}	4.50^{de}	18.63^{efg}	21.23^{a}	19.93^{de}
SR14	6.80^{b}	9.00^{b}	7.90^{b}	21.27^{abcdef}	19.67^{a}	20.47^{cde}
CG14	11.33^{a}	11.87^{a}	11.60^{a}	21.87^{abcdef}	22.30^{a}	22.08^{abc}
WAB56-50	5.27^{bcd}	5.00^{cdef}	5.13^{cde}	21.40^{abcdef}	19.67^{a}	20.53^{cde}
WAB181-18	5.53^{bcd}	5.47^{cd}	5.50^{cd}	21.63^{abcdef}	20.87^{a}	21.25^{abcd}
Means	5.29	5.39	5.34	20.87	20.79	20.83
S.E	0.975	0.61	0.58	1.73	0.98	1.00
L.S.D	1.98	1.24	1.15	3.51	3.71	1.98

Means followed by the same letter for each column are not significantly different at 5% level of LSD.

Number of Filled Seeds/Plant

Number of filled seeds per plant between genotypes was highly significant (P ≤0.01). In this study the genotype HERICA14 recorded high value in the 1th season (86.20) while NERICA7, NERICA15 and NERICA16 gave lowest combined values (43.83, 22.83 and 21.33) respectively. This result was due to genotypic deference Table (4). Yoshida *et al.*, (1972) reported that, depending on the rice cultivar, 20–40% of preanthesis assimilate contribution is needed to attain high grain yields

Table 3. Mean Number of Days to 50% Flowering and Days to Maturity for Twenty Rice GenotypesEvaluated during two Seasons 2016and 2017 as Well As the Means of Combined Analyses.

Genotypes	Days to 50% flowering			Days to maturity		
	2016	2017	2016×2017	2016	2017	2016×2017
NERICA3	78.67^{fghi}	72.33^{cde}	75.50^{fghi}	111.67^{defg}	105.33^{cd}	108.50^{cdef}
NERICA4	82.00^{defg}	71.33^{cde}	76.67^{fg}	115.00^{bcdef}	104.33^{cd}	109.67^{bcde}
NERICA5	73.33^{j}	70.00^{de}	71.67^{k}	104.33^{h}	101.00^{de}	102.67^{g}
NERICA7	85.67^{bcde}	75.33^{bcd}	80.50^{de}	117.33^{bcd}	107.00^{cd}	112.17^{bcd}
NERICA9	77.33^{ghij}	70.67^{de}	74.00^{ghijk}	109.67^{efgh}	103.00^{cd}	106.34^{efg}
NERICA10	78.67^{fghi}	70.67^{de}	74.67^{ghij}	110.00^{efgh}	102.00^{cde}	106.00^{efg}
NERICA11	78.33^{ghi}	68.00^{ef}	73.17^{ijk}	112.67^{cdefg}	102.33^{cd}	107.50^{defg}
NERICA12	83.33^{cdef}	78.33^{b}	80.83^{d}	115.33^{bcde}	110.33^{bc}	112.83^{bc}
NERICA13	76.00^{ij}	71.33^{cde}	73.67^{hijk}	108.33^{fgh}	103.67^{cd}	106.00^{efg}
NERICA14	67.67^{k}	64.00^{f}	65.83^{l}	97.00^{i}	93.33^{e}	95.17^{h}
NERICA15	81.33^{efgh}	74.33^{bcd}	77.83^{ef}	110.00^{efgh}	103.00^{cd}	106.50^{efg}
NERICA16	79.00^{fghi}	73.33^{bcde}	76.17^{fgh}	106.67^{gh}	101.00^{de}	103.84^{fg}
NERICA17	76.00^{ij}	75.00^{bcd}	75.50^{fghi}	108.00^{gh}	107.00^{cd}	107.50^{defg}
NERICA18	80.00^{fghi}	73.00^{bcde}	76.50^{fg}	111.67^{defg}	104.67^{cd}	108.17^{cdef}
SR1	87.67^{bc}	88.00^{a}	87.83^{b}	118.67^{abc}	119.00^{ab}	118.84^{a}
SR2	90.33^{ab}	77.00^{bc}	83.67^{c}	120.33^{ab}	107.00^{cd}	113.67^{b}
SR14	94.33^{a}	91.33^{a}	92.83^{a}	124.33^{a}	121.33^{a}	122.83^{a}
CG14	86.67^{bcd}	72.67^{bcde}	79.67^{de}	118.67^{abc}	104.67^{cd}	111.67^{bcd}
WAB56-50	76.67^{hij}	67.67^{ef}	72.17^{jk}	109.00^{efgh}	100.00^{de}	104.50^{fg}
WAB181-18	86.67^{bcd}	77.00^{bc}	81.83^{cd}	117.67^{abcd}	108.00^{cd}	112.84^{bc}
Means	80.98	74.07	77.53	112.32	105.40	108.86
S.E	2.41	1.58	1.44	3.35	2.35	2.04
L.S.D	4.88	5.99	2.87	6.78	8.91	4.07

Means followed by the same letter for each column are not significantly different at 5% level of LSD.

Number of Empty Seeds/Plant

Highly significant differences (P ≤0.01) among genotypes showed by analysis of variance and high values were recorded by the genotypes NERICA7, NERICA15 and NERICA16 (66.27, 83.80 and 84.20) respectively. The lowest value recorded by the genotype NERICA14 (27.27). The abortion might be due to the differences in growth habit or environmental factors Table (4). Abbasi and Sepaskhah (2011) included unfilled grain percentage together with harvest index as the most suitable traits for selection of rice varieties with high yield potential under water saving irrigations. Kobata *et al.,* (2006) indicated that, two types of factors responsible for the lower grain filling those are inferior assimilate supply and lower fertilization.

1000 Seeds Weight (gm)

Analyses of variance showed that, thousand grain weight had highly significant difference (P ≤0.01) between genotypes. Mean separation for thousand seeds weight recorded highest value by deferent genotypes in the two seasons. The genotype NERICA 12 in the first season scored (29.36 gm), while the genotype NERICA 10 scored (36.81 gm), as well as in the combined NERICA 10 record the highest value (31.16 gm) (Table 5). The lowest value for all means during both seasons and combined for this parameter was recorded by the genotype SR 14 it was (18.74 gm, 19.28 gm and 19.01 gm) consecutively (Table 5). The differences between seasons may be due to environment. Yoshida, (1981), reported that thousand grain weight (TGW) increases with high radiation during filling stage which probably affected the yield component, which is least affected by environmental duration, because grain size is limited by the size of hull.

Table 4. Mean Number of Filled Seeds/Plans and Empty Seeds/Plantfor Twenty Rice Genotypes Evaluated during Two Seasons 2016and 2017as Well As the Means of Combined Analyses.

Genotypes	Number of filled seeds/plans			empty seeds/plant		
	2016	2017	2016×2017	2016	2017	2016×2017
NERICA3	32.33^{ijk}	28.87^{ef}	30.60^{hi}	81.80^{b}	61.67^{ab}	71.74^{ab}
NERICA4	62.27^{cd}	58.27^{abc}	60.27^{bc}	40.67^{fg}	25.87^{cd}	33.27^{ij}
NERICA5	13.60^{l}	16.20^{g}	14.90^{efgh}	82.00^{b}	27.93^{cd}	54.97^{cde}
NERICA7	38.87^{hij}	48.80^{abcde}	43.83^{ef}	104.93^{a}	27.60^{cd}	66.27^{bc}
NERICA9	43.00^{fghi}	29.27^{ef}	36.13^{fgh}	73.73^{bc}	37.80^{bcd}	55.77^{cde}
NERICA10	49.27^{defgh}	62.80^{f}	56.03^{gh}	66.53^{bcd}	41.87^{bcd}	54.20^{cdef}
NERICA11	37.13^{hij}	46.60^{bcde}	41.87^{efg}	50.67^{def}	32.33^{bcd}	41.50^{fghi}
NERICA12	67.33^{bc}	47.07^{bcde}	57.20^{bc}	44.00^{efg}	36.33^{bcd}	40.17^{ghij}
NERICA13	19.40^{kl}	40.27^{bcdef}	29.83^{h}	77.53^{bc}	42.40^{bcd}	59.97^{bcd}
NERICA14	86.20^{a}	55.67^{abcd}	70.93^{a}	29.07^{g}	25.47^{cd}	27.27^{j}
NERICA15	15.67^{l}	30.00^{def}	22.83i	82.27^{b}	85.33^{a}	83.80^{a}
NERICA16	26.27^{jkl}	16.40^{f}	21.33^{j}	83.20^{b}	85.20^{a}	84.20^{a}
NERICA17	40.87^{fghi}	44.13^{bcde}	42.50^{ef}	44.60^{efg}	22.80^{d}	33.70^{ij}
NERICA18	79.00^{ab}	51.07^{abcde}	65.03^{ab}	51.47^{def}	42.67^{bcd}	47.07^{defgh}
SR1	54.67^{cdef}	59.93^{abc}	57.30^{bc}	75.60^{bc}	32.20^{bcd}	53.90^{cdef}
SR2	39.73^{ghij}	33.80^{cdef}	36.77^{efgh}	47.20^{ef}	56.53^{abc}	51.87^{defg}
SR14	57.93^{cde}	75.00^{a}	66.47^{ab}	71.80^{bc}	39.13^{bcd}	55.47^{cde}
CG14	46.20^{efghi}	46.20^{bcde}	46.20^{de}	34.20^{fg}	34.20^{bcd}	34.20^{hij}
WAB56-50	53.93^{cdefg}	63.73^{ab}	58.83^{bc}	60.20^{cde}	32.13^{bcd}	46.17^{efghi}
WAB181-18	51.40^{defgh}	58.73^{abc}	55.07^{cd}	106.2^{a}	57.00^{abc}	81.60^{a}
Means	45.75	45.64	45.70	65.38	42.32	45.70
S.E	7.13	6.94	4.97	8.65	8.81	6.17
L.S.D	14.42	26.36	9.90	17.50	33.48	12.30

Means followed by the same letter for each column are not significantly different at 5% level of LSD

Grain Yield ton/ha

The genotype NERICA14 and SR14 recorded high grain yield (9.68 and 8.17) ton per hectare for both seasons with highly significant deference between genotypes (P ≤0.01). The genotype NERICA14 in 1th season recorded high value for yield (12.30 ton/ha) (Table 5). This result was matched with Namba, (2003) who obtained 15 ton/ ha rough grain yield and 30 ton/ ha biomass on the Nile delta in Egypt, using an inbred variety. Dass and Chandra (2013) concluded that water saving irrigation regimes may necessitate changes in genotypes and crop geometry that contribute to yield forming processes and yield. In conclusion highly significant differences were recorded for most parameters in both seasons. NERICA 4 ,NERICA 14 and SR14 were the best yielding genotypes.

Table 5. Mean 1000 Seeds Weight and Yield (Ton/ha) for Twenty Rice Genotypes Evaluated during Two Seasons 2016 and 2017as Well As the Means of Combined Analyses.

Genotypes	Thousand seeds weight			Yield/ (ton/ha)		
	2016	2017	2016×2017	2016	2017	2016×2017
NERICA3	18.83^{j}	21.95^{ab}	20.39^{gh}	2.60^{hij}	2.45^{ij}	2.52^{hi}
NERICA4	26.05^{bcde}	25.21^{ab}	25.63^{abcde}	7.32^{bc}	5.38^{cdef}	6.35^{c}
NERICA5	22.40^{fghi}	25.51^{ab}	23.96^{a}	1.01^{j}	5.24^{def}	3.12^{ghi}
NERICA7	25.98^{bcde}	29.67^{ab}	27.83^{abc}	3.01^{fghi}	5.14^{def}	4.07^{defg}
NERICA9	21.86^{ghij}	26.04^{ab}	23.95^{cdefg}	$3.44^{defghij}$	3.05^{ghi}	3.25^{fghi}
NERICA10	25.51^{cdef}	36.81^{a}	31.16^{abcde}	5.54^{cdefgh}	1.98^{ij}	3.76^{efgh}
NERICA11	22.91^{efgh}	25.78^{ab}	24.35^{cdefg}	3.25^{efghij}	5.40^{cdef}	4.33^{defg}
NERICA12	29.36^{a}	27.98^{ab}	28.67^{ab}	6.74^{bcd}	4.08^{fgh}	5.41^{cde}
NERICA13	27.75^{abc}	29.41^{ab}	28.58^{ab}	2.12^{ij}	4.27^{fgh}	3.19^{ghi}
NERICA14	27.06^{abcd}	26.81^{ab}	26.94^{abc}	12.30^{a}	7.06^{b}	9.68^{a}
NERICA15	20.39^{hij}	24.41^{ab}	22.40^{defgh}	1.07^{j}	2.70^{hij}	1.89^{i}
NERICA16	24.06^{defg}	25.34^{ab}	24.70^{bcdef}	2.26^{hij}	1.28^{j}	1.77^{i}
NERICA17	28.80^{ab}	28.66^{ab}	28.73^{ab}	$5.06^{cdefghi}$	5.02^{ef}	5.04^{cdef}
NERICA18	26.66^{abcd}	27.66^{ab}	27.16^{abc}	7.16^{bc}	5.45^{cdef}	6.30^{c}
SR1	25.82^{bcde}	25.41^{ab}	25.62^{abcde}	6.44^{bcde}	6.88^{bc}	6.66^{bc}
SR2	19.36^{ij}	24.19^{ab}	21.78^{efgh}	2.66^{ghij}	2.94^{ghi}	2.80^{ghi}
SR14	18.74^{j}	19.28^{b}	19.01^{h}	5.93^{bcdefg}	10.42^{a}	8.17^{ab}
CG14	21.19^{ghij}	21.19^{b}	21.19^{fgh}	8.94^{b}	4.47^{fg}	6.71^{bc}
WAB56-50	23.26^{efgh}	25.39^{ab}	24.33^{cdefg}	$5.31^{cdefghi}$	6.29^{bcde}	5.80^{cd}
WAB181-18	26.96^{abcd}	25.77^{ab}	26.37^{abcd}	6.17^{bcdef}	6.73^{bcd}	6.45^{bc}
Means	24.15	26.12	25.13	4.92	4.81	4.86
S.E	1.61	3.93	2.12	1.63	0.79	0.90
L.S.D	3.26	14.91	4.23	3.30	1.60	1.80

Means followed by the same letter for each column are not significantly different at 5% level of LSD

4. CONCLUSION

It concluded that, Nerica 14 and SR14 recorded the best yield in both seasons, respectively and in the combine analysis as well.

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Evaluation of Rice (*Oryza sativa* L.) Genotypes for Yield and Yield Component Parameters•

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المستخلص

أُجريت التجربة لدراسة الإنتاج ومكوناته فى عشرين صنف من الارز. وقد استخدمت المادة الوراثية للاصناف العشرون لدراسة 50% للازهار، عدد الايام للنضج، عدد السنابل فى النبات، طول السنبلة بالسنتمتر، عدد البذور الممتلئة، عدد البذور الفارغة، إنتاج البذرة للنبات بالجرام، وزن المائة حبة بالجرام والإنتاجية بالطن لكل هيكتار. أوضحت النتائج فروقات معنوية عالية فى العام 2016م لمعظم العوامل وفروقات معنوية بسيطة فى طول النبات بعد 30 و60 يوم من الزراعة ولمساحة الورقة وطول السنبلة، كما لم توجد فروقات معنوية فى الوزن الجاف. فى العام 2017م أوضحت النتائج الارقام مماثلة مع وجود فرق معنوى بسيط فى طول النبات بعد 30 يوم من الزراعة والخلف عند 90 يوم من الزراعة. كانت أكثر الأصناف إنتاجاً (12.3t/ha) NERICA14 و(7.3 t/ha) NERICA4 في العام 2016. أما فى 2017م فقد كانت

•جزء من أطروحة تقدم بها المؤلف الأول لنيل درجة الدكتوراة لجامعة السودان للعلوم والتكنولوجيا.

الأصناف (10.42 t/ha) SR14 و(7.00 t/ha) NERICA14 ، أما فى متوسط الموسمين فقد كانت الأصناف الأجود هى(8.01 t/ha) SR14 و(9.60 t/ha) NERICA14.

كلمات فتاحية: *إنتاج؛ أرز ؛ تقييم؛ صفات؛ طرز وراثية.*