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YIELD OF SELECTED RICE (*ORYZA SATIVA* L.) VARIETIES AS INFLUENCED BY INTEGRATED WEED MANAGEMENT IN SUDAN SAVANNA OF NIGERIA

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ABSTRACT

Rice has become an important strategic and daily staple food crop in Nigeria. The trajectory of rice output in Nigeria has been increasing, but the yield is low (1.7 tha^{-1}) compared to other rice producing regions like Egypt (7.25 t ha^{-1}), China (6.5 t ha^{-1}) and the USA (7.5 t ha^{-1}). Disseminating improved varieties and other modern inputs would increase the production per unit area of farmers. It is based on the above that field trials were carried out during 2017/2018 dry season at the Teaching and Research Fadama farm of the Usmanu Danfodiyo University Sokoto located at Kwalkwalawa (Latitude 13^0 01'N, Longitude 5^0 09'E) and that of Kebbi State University of Science and Technology located at Jega (Latitude 12^0 21'N; Longitude 4^0 36'E) to study the response of rice and weed occurrence to integrated weed management (IWM) and variety. The two locations lie within the Sudan Savanna ecological zone of Nigeria. The experiment consisted of six weed management options (Solarization/Orizo-plus (at 3WAT)/Hoe-weeding (at 6WAT), Round-up/Orizo-plus (at 3WAT)/Hoe-weeding (at 6WAT), Solarization/Hoe-weeding (at 3WAT)/Hoe-weeding (at 6WAT), Round-up/Hoe-weeding(at 3WAT)/Hoe-weeding(at 6WAT), Weedy-check and Weed-free) and three rice varieties (Jamila, Faro 44 and Faro 57). The factorial combinations of the experiment were laid out in a randomized complete block design (RCBD) with split-plot arrangement and were replicated three times. The main plots were assigned weed management options while rice varieties formed the sub-plots. The result of the study indicated that each of the IWM gave a similar yield performance under each variety. The combination of solarization, orizo-plus and hoe-weeding achieved an effective weed control with weed dry matter of 33.56g/m^2 close to the weekly hoe-weeding (16.13g/m^2). The highest grain production was achieved with Faro 57 variety (4.6 t/ha) under good weed management practices. The results of this study therefore recommend Faro 57

ISSN: 2455-6939

Volume: 05, Issue: 06 "November-December 2019"

under combination of solarization, orizo-plus and hoe-weeding IWM option for an increased rice yield in the study area.

Keywords: Yield, Integrated weed management, Rice varieties, Sudan savanna

1. INTRODUCTION

Rice is grouped in the family *Gramineae*, tribe *Oryzeae and* genus *Oryza*. Twenty-five (25) species are recognized under the genus *Oryza*, among which twenty-three (23) are wild species and two (*O. sativa* and *O. glaberrima*) are cultivated [1]. *Oryza sativa* is more widely grown than *O. glaberrima*. Rice has become a convenient food for the growing world population and therefore, its consumption is growing faster than that of any other staple in Africa and the world at large. [2] reported that rice is cultivated on almost 11% of the earth's cultivated land area and some ecosystems. In Africa, paddy production in 2017 was predicted to reach 30.9 million tonnes [3]. West Africa accounts for 64.2% and 61.9% of total rice production and consumption in Sub-Saharan Africa, respectively [4]. [2] reported that Nigeria has a potential land area of between 4.6 to 4.9 million hectares suitable for rice production, but only about 1.7 million hectares are being cropped. Rice production in Nigeria has risen over the years with area expansion to surpass major rice producing countries like Cote d'Ivoire and Sierra Leone [5]. Population growth and urbanization are the principal factors driving increased rice production in Nigeria. In 2002, Nigeria accounted for nearly 44% of the total rice output and 57% of the total rice producing area in West Africa [6].

Weeds are plants that does more harm than good and generally hamper with crop production. They are unwanted plants, which succeed in the struggle for existence with crops [7]. Weeds deprive crops of the limited environmental resources such as nutrients, light, water and space. Weeds can further serve as alternate hosts to pests and pathogens which damage crops in the field and during storage [8]. [9] reported that unchecked weed growth are responsible for great losses of many cereal crops. In rice cultivation system, the longer the presence of weeds in rice cropping paddy, the greater the reduction of grain yield [10, 11]. Timely weed control therefore is one of the important parts of cultivation that can affect the production of rice plants.

[12] suggested that for increased rice production, selection of good variety is inevitable. One of the most economical approaches to attain optimal crop yield is planting high yielding crop varieties that are competitive against weeds in combination with other methods of weed control [13]. The work of Africa Rice Center (AfricaRice) and National Agricultural Research Institutions (NARIs) in breeding improved rice varieties has led to the release of FAROs 38 to FARO 57 [14]. This study was therefore carried out to investigate the effect of integrated weed management and variety on weed occurrence and yield of rice in the study area.

ISSN: 2455-6939

Volume: 05, Issue: 06 "November-December 2019"

2. MATERIALS AND METHODS

The experiments were carried out during 2017/2018 dry season at the Teaching and Research Fadama farm of the Usmanu Danfodiyo University Sokoto located at Kwalkwalawa (Latitude 13^0 01'N, Longitude 5^0 09'E) and that of Kebbi State University of Science and Technology located at Jega (Latitude 12^0 21'N; Longitude 4^0 36'E). The two locations are within the Sudan Savanna ecological zone of Nigeria. Prior to sowing, composite samples were taken randomly from seven (7) different spots at 0-15cm and 15-30cm using soil auger. The samples were composited into two samples, air-dried, grounded and sieved through 2mm sieve and subjected to tests on their physical and chemical properties.

The experiment consisted of six weed management options (Solarization/Orizo-plus(at 3WAT)/Hoe-weeding(at 6WAT), Round-up/Orizo-plus(at 3WAT)/Hoe-weeding(at 6WAT), Solarization/Hoe-weeding(at 3WAT)/Hoe-weeding(at 6WAT), Round-up/Hoe-weeding(at 3WAT)/Hoe-weeding(at 6WAT), Weedy-check and Weed-free) and three rice varieties (Jamila, Faro 44 and Faro 57). The factorial combinations of the experiment were arranged in a randomized complete block design (RCBD) with split-plot arrangement and were replicated three times. The main plots were assigned weed management options while rice varieties formed the sub-plots.

Weeds from $1m^2$ quadrat (weed density) of each plot was collected from the net plot at 3, 6 and 9WAT. The weeds were oven-dried at 75°C to a constant weight. The dry weight of the weed were measured with an electronic weighing balance and expressed as g per m^2. Panicles with tillers were counted per square meter within each net plot as the productive tillers before harvesting the crop and the values obtained were used to express the percent productive tillers. Grain yield of each net plot was taken after harvesting while harvest index (HI) was determined as the ratio of grain yield to total biomass.

3. RESULTS AND DISCUSSION

3.1 Effects of Integrated Weed Management

One of the most important and suggestive practices for potential rice production is weed control [15]. Fourteen weed species were identified (Table 2) in the experimental fields, which include: grasses, broad-leaved and sedges. The grass *Echinochloa colona* (Linn.) Link was found to have the highest occurrence among the identified weed species at both locations. Its dominance could be attributed to the fact that it is a common weed of rice and grows in a wide range of soil moisture conditions, from swampy soils to dry land [16].

ISSN: 2455-6939

Volume: 05, Issue: 06 "November-December 2019"

Jega location recorded more weeds infestation than Sokoto location (Table 3). This could be as a result of relatively higher clay content at Sokoto compared to Jega (Table 1). [17] affirmed that irrigated rice prefers heavy soils with low water losses through percolation. This could be an advantage that the rice plant has over some weeds that would not do well in heavier soils. The higher weed dry matter recorded among the weedy-check treatments and the lower weed dry matter among weed-free treatment and combination of solarization, orizo-plus and hoe-weeding (Table 3) indicated that weed thrives when left uncontrolled in rice and they respond to measures aimed at controlling them.

Combination of solarization, orizo-plus and hoe-weeding treatment was only les effective to the weed-free treatment in terms of weed control effectiveness. At 3WAT, combination of solarization, hoe-weeding and hoe-weeding treatment was statistically the same with combination of solarization, orizo-plus and hoe-weeding treatment. This implies that solarization effectively controlled weeds at the early stage of rice plant. At 9WAT, combination of round-up, orizo-plus and hoe-weeding treatment were statistically at par with combination of solarization, orizo-plus and hoe-weeding treatment. The result therefore suggests that combination of orizo-plus and hoe-weeding at the later stage of rice plant controls weed better than resorting to only hoe-weeding twice. This agrees with the findings of [18] where combination of herbicides and manual weed control gave a significant weed control effect in rice field.

IWM significantly influenced yield character such as percent productive tillers, grain yield and harvest index (Table 6, 8 and 10). The results revealed that the IWM treatments performance was superior to weedy-check and inferior to weed-free in terms of yield characters. This could be attributed to the effect of weed control which resulted in maximum nutrient utilization and then to high production and assimilation of photosynthates causing increase in grain yield. The results agrees with the findings of [19], who observed that crops are known to perform better under good weed management.

3.2 Effect of Variety

The varieties showed significant difference in weed dry matter at both location during 3WAT while at 6WAT, it was noted only at Sokoto location (Table 3). The observation was consistent with Faro 44 and Faro 57 recording the highest weed dry matter while Jamila was lowest. These results indicated that weed suppression occurs among the rice varieties during the early growth stage, with Jamila (a local variety) competing better with weeds than the other two improved varieties. These results is in agreement with [20], where they reported that the choice of rice cultivar by farmers is often influenced by the cultivar's ability to suppress or compete with weeds.

ISSN: 2455-6939

Volume: 05, Issue: 06 "November-December 2019"

Yield character such as percent productive tillers and grain yield were influenced by variety (Table 6, 8 and 10). The results revealed that Faro 57 variety had a superior performance in each of the yield character that showed significant effect. This agrees with the findings of [4], where Faro 57 had heavier weight of panicle than Faro 44 and other varieties experimented.

Jamila variety had statistically similar grain yield with Faro 57 at Sokoto location while at Jega, it had similar grain yield with Faro 44 variety. The greater performance of Faro 57 in terms of yield characters could be attributed to its improved genetic ability and its longer growing cycle among the other varieties.

3.3 Interaction

There was significant interaction of IWM and variety on weed dry matter during 3WAT at both locations and the combine (Table 4) while at 9WAT, only Jega recorded significant interaction (Table 5). During the growing season, Jega location recorded more weed infestation (Table 3), which could be suspected as the cause for the more significant interaction effect noted in Jega location. Lowest weed occurrence was recorded when the three varieties were treated with weed-free. The three varieties treated with a combination of solarization, orizo-plus and hoe-weeding and Jamila variety treated with a combination of solarization, hoe-weeding and hoe-weeding were only less effective in weed dry matter as compared to the varieties treated with weed-free during 3WAT at both locations and the combined. This result could be linked to the effective weed control noted with solarization at the early stage of rice plant (Table 3). Jega location observation at 9WAT showed that when Faro 57 variety was treated with combination of solarization, orizo-plus and hoe-weeding and combination of round-up, orizo-plus and hoe-weeding, it had no significant difference with the varieties treated with weed-free. This results showed that Faro 57 maximized the selective nature of orizo-plus applied during the 6WAT to subdue weed growth. This findings recommend Faro 57 to farmers for selection as [20] affirmed that choice of rice cultivar by farmers is often influenced by the cultivar's ability to suppress or compete with weeds.

Integrated weed management and variety were noted to interact in percent productive tillers (Table 7) and grain yield (Table 9). Across the IWM, Jamila had higher percent productive tillers with weed-free and all the IWM treatments than with weedy-check. Faro 44 recorded higher percent productive tillers with solarization/orizo-plus/hoe-weeding, round-up/orizo-plus/hoe-weeding, solarization/hoe-weeding/hoe-weeding and weed-free while weedy-check and round-up/hoe-weeding/hoe weeding were least. Faro 57 had higher percent productive tillers with solarization/orizo-plus/hoe-weeding, round-up/orizo-plus/hoe-weeding, solarization/hoe-weeding/hoe-weeding and weed-free while weedy-check was least. The higher percent productive tillers among varieties treated with IWM and weed-free could be attributed to the

ISSN: 2455-6939

Volume: 05, Issue: 06 "November-December 2019"

effective weed control in their plots. Varieties under the weedy-check plots recorded consistent least percent productive tillers as a result of intense weed competition.

Factor interaction with respect to grain yield revealed that the highest grain yield was produced by Faro 57 under weed-free treatment. Furthermore for all the IWM treatments, Faro 57 maintained a higher grain yield than the other two varieties. The least grain yield was observed under weedy-check treatments for all varieties. The more grain yield produced by Faro 57 under weed free could be ascribed to its being an improved variety and having a longer growing cycle to make use of available growth resources for grain production in a weed free condition.

Table 1: Soil physical and chemical properties at Jega and Sokoto locations during 2017/2018 dry season.

	Locations			
	Jega		**Sokoto**	
	0-15cm	**15-30cm**	**0-15cm**	**15-30cm**
Physical properties				
Sand %	51.400	57.300	49.400	51.400
Silt %	33.300	27.400	34.100	32.100
Clay %	15.300	15.300	16.500	16.500
Textural class	Loam	Sandy loam	Loam	Loam
Chemical properties				
pH	6.500	6.600	6.800	6.900
Organic Carbon %	1.160	0.980	0.420	0.360
Organic Matter %	2.000	1.690	0.720	0.620
Total N %	0.091	0.084	0.074	0.067
P mg/kg	1.000	0.960	0.700	0.680
Exchangeable bases				
Ca Cmol/kg	0.600	0.500	1.250	1.050
Na Cmol/kg	0.650	0.430	0.350	0.380
Mg Cmol/kg	1.000	0.900	0.150	0.250
K Cmol/kg	2.510	2.210	0.970	0.900
CEC Cmol/kg	7.280	6.840	5.160	4.540

ISSN: 2455-6939

Volume: 05, Issue: 06 "November-December 2019"

Table 2: Weed species identified and their level of occurrence in rice fields at Jega and Sokoto during 2017/2018 dry season.

Weed species	Location	
	Jega	Sokoto
	Level of occurrence	
Grasses		
Chloris pilosa Schumach	***	***
Digitaria horizontalis Wild.	**	**
Echinochloa colona (Linn.) Link	*****	*****
Oryza bathii A. Chev.	**	**
Paspalum scrobiculatum Linn.	**	**
Sorghum arundinaceum (Desv.) Stapf.	***	-
Broad leaves		
Amaranthus viridis Linn.	-	*
Indigofera spicata Forskk	**	*
Mimosa pigra Linn.	*	*
Vernonia cinerea (Cass.) Less.	**	*
Vernonia galamensis (Cass.) Less.	*	*
Sedges		
Cyperus rotundus Linn.	*	**
Kyllinga pumila Michx.	*	**
Pycreus lanceolatus (Poir.) C. B. Cl.	**	**

*** = Very low occurrence, ** = Low occurrence, *** = Moderate occurrence, **** = High occurrence, *****===Very high occurrence, - = Absent**

ISSN: 2455-6939

Volume: 05, Issue: 06 "November-December 2019"

Table 3: Weed dry matter of rice as influenced by integrated weed management and variety at Jega, Sokoto locations and the combined during 2017/2018 dry season.

Treatment	Weed dry matter (g)								
	Jega			Sokoto			Combined		
	3 WAT	6 WAT	9 WAT	3 WAT	6 WAT	9 WAT	3 WAT	6 WAT	9 WAT
Integrated weed management									
Solarization/orizo-plus/hoe-weeding	22.37c	24.24d	21.38c	19.99d	20.31c	19.10c	21.18c	22.28d	20.24c
Round-up/orizo-plus/hoe weeding	99.91b	43.09c	19.38c	85.20b	24.70c	16.27c	92.56b	33.89c	17.82c
Solarization/hoe-weeding/hoe weeding	28.57c	66.62b	38.61b	23.24d	36.28b	32.60b	25.19c	51.45b	35.61b
Round-up/hoe-weeding/hoe weeding	92.39b	65.23b	42.60b	76.79c	41.67b	37.54b	84.59b	53.45b	40.07b
Weedy-check	207.68a	247.74a	272.70a	168.68a	224.65a	244.91a	188.18a	236.20a	258.81a
Weed-free	7.40d	6.49e	6.27d	6.74e	6.30d	6.30d	7.07d	6.39e	6.28d
SE±	**3.193**	**2.004**	**2.193**	**1.237**	**2.718**	**2.564**	**2.953**	**3.248**	**2.315**
Variety									
Jamila	69.05b	77.62	69.01	57.36b	53.46b	56.75	63.20b	65.54	62.88
Faro 44	77.10a	72.27	65.24	65.38a	61.17a	59.91	71.24a	68.22	62.58
Faro 57	83.01a	73.83	66.22	67.59a	62.32a	61.70	75.30a	68.08	63.96
SE±	**2.258**	**1.417**	**1.550**	**0.875**	**1.922**	**1.868**	**2.088**	**2.297**	**1.627**
Interaction									
Integrated weed management x Variety	*	NS	*	*	NS	NS	*	NS	NS

Within a treatment group, means in a column followed by the same letter(s) are not significantly different using DMRT at 5% level of probability. NS = not significant, * = significant, WAT = Weeks after transplanting.

ISSN: 2455-6939

Volume: 05, Issue: 06 "November-December 2019"

Table 4: Interaction of integrated weed management and variety of weed dry matter at 3 WAT for Jega, Sokoto locations and the combined during 2017/2018 dry season.

Integrated weed management	Variety		
	Jamila	**Faro 44**	**Faro 57**
Jega			
Solarization/orizo-plus/hoe-weeding	20.77h	24.13h	22.20h
Round-up/orizo-plus/hoe weeding	93.70e	100.63d	105.40d
Solarization/hoe-weeding/hoe weeding	20.77h	31.67g	33.27g
Round-up/hoe-weeding/hoe weeding	86.93f	94.63e	95.60de
Weedy-check	185.63c	202.97b	234.43a
Weed-free	6.50i	8.57i	7.13i
SE±		**5.523**	
Sokoto			
Solarization/orizo-plus/hoe-weeding	19.43i	20.57i	19.97i
Round-up/orizo-plus/hoe weeding	84.57d	81.87e	89.17d
Solarization/hoe-weeding/hoe weeding	19.33i	24.07h	26.33g
Round-up/hoe-weeding/hoe weeding	68.17f	81.73e	80.47e
Weedy-check	146.13c	177.07b	182.83a
Weed-free	6.50j	6.97j	6.77j
SE±		**2.143**	
Combined			
Solarization/orizo-plus/hoe-weeding	20.10h	22.35h	21.08h
Round-up/orizo-plus/hoe weeding	89.13e	91.25e	97.28d
Solarization/hoe-weeding/hoe weeding	20.05h	27.87g	29.80g
Round-up/hoe-weeding/hoe weeding	77.55f	88.18e	88.03e
Weedy-check	165.88c	190.02b	208.63a
Weed-free	6.50i	7.77i	6.95i
SE±		**5.116**	

Means followed by the same letter(s) are not significantly different using DMRT at 5% level of probability. WAT = Weeks after transplanting.

ISSN: 2455-6939

Volume: 05, Issue: 06 "November-December 2019"

Table 5: Interaction of integrated weed management and variety of weed dry matter at 9 WAT for Jega location during 2017/2018 dry season.

Jega			
	Variety		
Integrated weed management	**Jamila**	**Faro 44**	**Faro 57**
Solarization/orizo-plus/hoe-weeding	26.27de	20.57e	17.30ef
Round-up/orizo-plus/hoe weeding	22.30e	18.87e	16.97ef
Solarization/hoe-weeding/hoe weeding	51.60c	30.67de	33.57d
Round-up/hoe-weeding/hoe weeding	39.57d	43.40cd	44.83cd
Weedy-check	267.80b	271.10ab	279.20a
Weed-free	6.50f	6.87f	5.43f
SE±		**3.798**	

Means followed by the same letter(s) are not significantly different using DMRT at 5% level of probability. WAT = Weeks after transplanting.

Table 6: Percent productive tillers of rice as influenced by integrated weed management and variety at Jega, Sokoto locations and the combined during 2017/2018 dry season.

Treatment	**Percent productive tillers**		
	Jega	**Sokoto**	**Combined**
Integrated weed management			
Solarization/orizo-plus/hoe-weeding	46.75a	55.53a	52.62a
Round-up/orizo-plus/hoe weeding	49.89a	49.28b	50.16a
Solarization/hoe-weeding/hoe weeding	44.50b	43.66c	44.07b
Round-up/hoe-weeding/hoe weeding	36.79c	41.68cd	39.21c
Weedy-check	28.53d	30.69e	29.58d
Weed-free	47.04a	46.09b	46.54b
SE±	**6.844**	**11.162**	**7.443**
Variety			
Jamila	50.58a	61.27a	55.80a
Faro 44	38.82c	41.26b	40.07b
Faro 57	41.97b	39.96c	40.94b
SE±	**4.839**	**7.893**	**5.263**
Interaction			
Integrated weed management x Variety	*	NS	NS

Within a treatment group, means in a column followed by the same letter(s) are not significantly different using DMRT at 5% level of probability. NS = not significant, * = significant.

ISSN: 2455-6939

Volume: 05, Issue: 06 "November-December 2019"

Table 7: Interaction of integrated weed management and variety on percent productive tillers at Jega location during 2017/2018 dry season.

Jega			
	Variety		
Integrated weed management	**Jamila**	**Faro 44**	**Faro 57**
Solarization/orizo-plus/hoe-weeding	48.63a	43.7ab	48.31a
Round-up/orizo-plus/hoe weeding	57.64a	48.07a	50.08a
Solarization/hoe-weeding/hoe weeding	54.88a	42.85ab	40.25ab
Round-up/hoe-weeding/hoe weeding	45.4ab	31.9bc	35.59b
Weedy-check	36.13b	26.44bc	25.27bc
Weed-free	56.9a	38.29ab	49.23a
SE±		**11.855**	

Means followed by the same letter(s) are not significantly different using DMRT at 5% level of probability.

Table 8: Grain yield of rice as influenced by integrated weed management and variety at Jega, Sokoto locations and the combined during 2017/2018 dry season.

Treatment	**Grain yield (t ha^{-1})**		
	Jega	**Sokoto**	**Combined**
Integrated weed management			
Solarization/orizo-plus/hoe-weeding	2.71b	3.18b	2.94b
Round-up/orizo-plus/hoe weeding	2.61b	3.14b	2.87b
Solarization/hoe-weeding/hoe weeding	2.59b	3.19b	2.89b
Round-up/hoe-weeding/hoe weeding	2.58b	3.08b	2.83b
Weedy-check	0.71c	0.92c	0.82c
Weed-free	4.17a	4.77a	4.47a
SE±	**0.084**	**0.224**	**0.138**
Variety			
Jamila	2.28b	3.12a	2.70b
Faro 44	2.29b	3.62b	2.46b
Faro 57	3.11a	3.41a	3.26a
SE±	**0.060**	**0.159**	**0.097**
Interaction			
Integrated weed management x Variety	*	NS	NS

Within a treatment group, means in a column followed by the same letter(s) are not significantly different using DMRT at 5% level of probability. NS = not significant, * = significant.

ISSN: 2455-6939

Volume: 05, Issue: 06 "November-December 2019"

Table 9: Interaction of integrated weed management and variety of grain yield at Jega location during 2017/2018 dry season.

Jega			
	Variety		
Integrated weed management	**Jamila**	**Faro 44**	**Faro 57**
Solarization/orizo-plus/hoe-weeding	2.40de	2.50de	3.23c
Round-up/orizo-plus/hoe weeding	2.10e	2.13e	3.60bc
Solarization/hoe-weeding/hoe weeding	2.20de	2.40de	3.17c
Round-up/hoe-weeding/hoe weeding	2.30de	2.10e	3.33c
Weedy-check	0.67f	0.73f	0.73f
Weed-free	4.00b	3.90b	4.60a
SE±		**0.140**	

Means followed by the same letter(s) are not significantly different using DMRT at 5% level of probability.

Table 10: Harvest index of rice as influenced by integrated weed management and variety at Jega, Sokoto locations and the combined during 2017/2018 dry season.

Treatment	**Harvest index**		
	Jega	**Sokoto**	**Combined**
Integrated weed management			
Solarization/orizo-plus/hoe-weeding	0.332b	0.353b	0.343b
Round-up/orizo-plus/hoe weeding	0.326b	0.362ab	0.344b
Solarization/hoe-weeding/hoe weeding	0.326b	0.364ab	0.345b
Round-up/hoe-weeding/hoe weeding	0.366ab	0.367ab	0.367ab
Weedy-check	0.277c	0.284c	0.281c
Weed-free	0.378a	0.416a	0.397a
SE±	**0.0132**	**0.0194**	**0.0124**
Variety			
Jamila	0.323	0.396a	0.360a
Faro 44	0.331	0.323b	0.327b
Faro 57	0.349	0.353b	0.351ab
SE±	**0.0093**	**0.0137**	**0.0088**
Interaction			
Integrated weed management x Variety	NS	NS	NS

Within a treatment group, means in a column followed by the same letter(s) are not significantly different using DMRT at 5% level of probability. NS = not significant, * = significant.

ISSN: 2455-6939

Volume: 05, Issue: 06 "November-December 2019"

4. CONCLUSION

The result of the study indicated that Faro 57 variety has a potential to increase grain production under good weed management practices. Solarization effectively control weed for the first three weeks after its application. Weeds are more effectively controlled with the combination of orizo-plus and hoe-weeding than resorting to only hoe-weeding twice. Faro 57 under combination of solarization, orizo-plus and hoe-weeding IWM option can be adopted for effective weed control and increased rice yield in the study area.

REFERENCES

[1]. Brar, D. S. and Khush, G. S. (2003). Utilization of wild species of genus Oryza in rice improvement. In: Nanda, J.S. and Sharma, S. D. (eds.), Monograph on Genus Oryza, pp. 283-309.

[2]. Abiwon, B. O., Dambaba, N. and Salihu, B. Z. (2016). Genetic Improvement of Rice in Nigeria for Enhanced Yeild and Grain Quality - A Review. *Asian Research Journal of Agriculture,* 1(3): 1-18.

[3]. FAO (Food and Agriculture Organization) (2017). Rice Market Monitor. Retrieved from http://fao.org/fileadmin/templates/est/COMM_n MARKETS.../RMM-Jul17.pdf.

[4]. Vange, T., Ojo G. O. S. and Ayuba S. (2016). Effect of sowing method on the productivity of rice in Makurdi, Southern Guinea Savanna ecology of Nigeria. *European Journal of Physical and Agricultural Sciences*, 4(2): 57-67.

[5]. Ayanwale, A. B. and Amusan, C. A. (2012). Gender Analysis of Rice Production Efficiency in Osun State: Implication for the Agricultural Transformation Agenda. Paper presented at the 13th National Conference of the Nigerian Association of Agricultural Economists, Obafemi Owolowo University, Ile – Ife, Nigeria, September 25th – 27th.

[6]. Onu, D. O., Obike, K. C., Ebe, F. E. and Okpara, B. O. (2015). Empirical assessment of the trend in rice production and imports in Nigeria (1980 – 2013). *International Research Journal of Agricultural Science and Soil Science*, 5(6):150-158.

[7]. Gwandu, H. A. (2006). Effects of irrigation interval, weeding regimes and clove size on the growth and yield of garlic (Alium cepa L.) in Sokoto, Nigeria. Ph. D Thesis submitted to the Postgraduate School, Usmanu Danfodiyo University, Sokoto. Pp 1-136.

[8]. Akobundu, I. O. (1993). Integrated weed management techniques that can reduce soil degradation. International Agricultural Development, Sambau, Orissa India, 7(3):5-12.

[9]. Adigun, J. A. (2000). The strategies of weed control in vegetable crops. *Noma*, 10:18-20.

[10]. Merry, A. Ida, N. I., Yuyun, Y. and Tualar, S. (2015). Effect of difference weed control methods to yield of lowland rice in the sobari. *Procedia Food Science*, 3: 323 – 329.

[11]. Ajala, A. A., Muhammad, A., Yakubu, A. I., Adamu, M. and Busari, Y. A. (2019). Correlation study on growth and yield components of rice (Oryza sativa L.) varieties to integrated weed management in Sudan savanna of Nigeria. *Journal of Agriculture and Ecology Research International*, 19(1): 1-6.

[12]. Murshida, S., Uddin, M. R., Anwar, M. P., Sarker, U. K., Islam, M. M. and Haque, M. M. (2017). Effect of variety and water management on the growth and yield of Boro rice. *Progressive Agriculture*, 28 (1): 26-35.

[13]. Adusumilli, N. R. (2012). Integrated Weed Management in Rice in India. Rice Knowledge Management Portal (RKMP), Retrieved from http://www.rkmp.co.in.

[14]. Maji, A. T., Ukwungwu, M. N., Danbaba, N., Abo, M. E. and Bakare, S. O. (2007). Rice: History, Research and Development in Nigeria. In: Rice in Nigeria, Traditional Recipes & Research Needs. Danbaba N., I. Nkama, A.T Maji & M.N Ukwungwu (Eds.). Pp1-10.

[15]. Parthipan, T., Ravi, V., Subramanian, E. and Ramesh, T. (2013). Integrated Weed Management on Growth and Yield of Transplanted Rice and its Residual Effect on Succeeding Black gram. *Journal of Agronomy*, 12: 99-103.

[16]. Akobundu, I. O., Ekeleme, F., Agyakwa, C. W. and Ogazie, C. A. (2016). A hand book of West African weeds (Third edition). International Institute of Tropical Agriculture, PMB 5320, Ibadan, Nigeria, 276 pp.

[17]. Schalbroeck, J.J., (2001). Rice crop production in tropical Africa. Pp. 60-77.

[18]. Singh, V. P., Singh, G., Singh, S. P., Kumar, A. and Singh, Y. (2005). Effect of rice–wheat establishment methods and wheat management in the irrigated rice–wheat production system. In: G.B. Pant, Workshop on Direct Seeded Rice in the Rice–Wheat System of the IndoGangetic Plains. Pantnagar, Uttaranchal, India. University of Agriculture and Technology, 12 pp.

[19]. Adekpe, D. I., Shinggu, C. P., Adesanya A. A. and Bitrus, C. T. (2005). Effect of pre emergence herbicides on the performance of roselle (Hibiscus sabdariffa) at Samaru Zaria. A paper presented at the 22ndAnnual Conference of the Horticultural Society of Nigeria (HORTSON) held at Daula Hotel, Kano 4th-9th July 2004.

[20]. Jonne, R. and David, E. J. (2013). Managing Weeds of Rice in Africa. Africa Rice Center (AfricaRice), Dar es Salaam, Tanzania; International Rice Research Institute (IRRI), Los Baños, Philippines. Pp 204-212.

