

Evaluation of Some New Rice Genotypes under Irrigation Intervals at Different Two Locations

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Abstract

Four field experiments were conducted at the Experiment and Research Center, Fac. Agric., Moshtohor, Benha Univ., Kalubia Governorate and Rice Research and Training Center, Sakha, Kafrelsheikh Governorate, Egypt in the two successive seasons 2011 and 2012 to study the performance of five new genotypes of rice under three irrigation intervals on yield and yield attributes. The most important results obtained from this study can be summarized as follows:

The highest values were recorded under irrigation intervals of 3 days, followed by irrigation every 6 days, however, the extra of the studied traits increasing irrigation intervals to 9 days significantly reduced the obtained characters values for all of the studied characters in both seasons under the two locations. Results showed that irrigation every 3 days over the growing season gave reasonable production compared with irrigation every 6 and 9 days.

The GZ7576 genotype was of the earliest heading compared with the other rice genotypes in both seasons. While, Sakha106 genotype gave the highest values of root length, No. of panicles hill-1, No. of panicles m-2, panicle length, No. of grains panical-1, grain index and grain yield fed-1 in the both seasons at two locations.

Significant interaction effect for irrigation intervals and rice genotypes was obtained for No. of panicles m-2 in the first season and heading date, No. of panicles hill-1, panicle length, No. of grains panical-1 and grain index in the second season at Moshtohor location. While, No. of panicles hill-1 in the both seasons and No. of panicles m-2 and grain yield fed-1 in the first season were significantly affected by the interaction between irrigation intervals and rice genotypes at Kafrelsheikh location. Generally, irrigation every 3 days under Sakha 106 genotype treatment recorded the highest values for the studied traits in both seasons at two locations.

Keywords: Rice, Genotypes, Irrigation intervals, Yield and its components.

Introduction

Rice crop is a main crop among the different cultivated crops under Egyptian condition and all over the world. In Egypt, conventional irrigation method of rice consumes greater amounts of water, putting rice in the first demand among the grown summer crops, including sugar cane, maize and cotton. The highest water demand is more likely over to the highest water management of rice lines which was more than 6000 m³ fed-1, and the increased in its cultivated area which exceeded 2.0 million fed, during the last year few years. The total high water use by rice causes certain difficulties which negatively affect yields of summer thirsty crops. Egypt is completely depending on water from River Nile (55.5 Milliar m³, yearly). Rice alone consumes about 25% of such water. No doubt, the Government rightly intends to reduce rice growing areas by almost 50% of its current area, as a wise step to achieve better water management. The successful fit policy of water saving depends on some factors including lengthening irrigation interval, use of early rice cultivars.

Several researchers showed that increases the irrigations intervals, wherever, allowed the rice fields to dry for a few days in between irrigations

intervals for 6 to 8 or 9 up to 12 days. Similar information reported by Mosalem et al, (1998), El-Sharkawi et al, (2006), Okasha et al, (2009), Abu and Malgwi (2011) and Raumjit and Wichitparp (2014). The interval of 6 days gave reasonable production of rice grain and most of its components, as mentioned by El-Kalla et al, (2006), as well as El-Bably et al, (2007).

Several rice varieties of different ideal types are spreading all over the world. Thereafter, it could be expected that the rice varietal variation was detected in many studies such as Abou Khalifa, 2001, Khawshi et al, 2003, Abou El-Hassan et al, 2006, El-Kalla et al, 2006, El-Bably et al, 2007, Okasha et al, 2009, Abou Khalifa, 2012, Raumjit and Wichitparp, 2014.

The current study aims to investigate the effect of irrigation intervals on yield and its attributes of five newly rice genotypes at Moshtohor and Sakha locations.

Materials and methods

Four field experiments were conducted at the Experiment and Research Center, Fac. Agric., Moshtohor, Benha Univ., Kalubia Governorate and

at Rice Research and Training Center Farm, Sakha, Kafrelsheikh Governorate, Egypt in the two successive seasons 2011 and 2012 to study the performance of new five genotypes of rice under three irrigation intervals on yield and yield attributes. Agricultural Practices: In both seasons, preceded crop was wheat. Seedbed of the nursery, area of 350 m² for 1 fed was well prepared and fertilized with calcium super phosphate (15.5% P₂ O₅) at 100 kg fed-1 before ploughing. Rice grains of the genotypes were soaked in running water for 48 hr., then incubated for another 48 hr. before seeding and 10 kg fed-1 of zinc sulphate was added. Seeds were manually broadcasted in the nursery on April 20th, at 60 kg fed-1 nursery. Two weeks after sowing, 40 kg N fed-1 was added at once as urea (46% N). Before transplanting, permanent field was well prepared, calcium super phosphate (15.5% P₂ O₅) at rate 100 kg fed-1 was added to the dry soil before ploughing. Flushing irrigation was done. Nitrogen in the form of urea (46% N) at the rate 70 Kg N was added (according to the recommendation) three equal splits, 1/3 as basal and incorporated in to dry soil immediately before flooding, 1/3 was applied 30 days after transplanting, and 1/3 was applied as top dressing 7 days before panicle initiation. Transplanting of seedlings from nursery to the permanent field was done 30 days after sowing, which transplanted in hills spaced 20X20 cm for all rice genotypes, as three plants hill-1. Irrigation was withheld 15 days before harvest. Harvest was carried out according to each genotypes duration. All remainder agricultural practices were carried out as usual.

Experimental design: A split plot design with four replicates was used. The main plots were randomly devoted to irrigation intervals (3, 6 and 9 days), while rice genotypes were distributed at the sub plots. Randomization was considered in all cases. Plot area was 10.5 m² (3x3.5m).

Studied attributes:

After 55 days from sowing, samples were taken from the sub plot at random during the growing season to study days to 50 % heading, number of days from sowing to 50% panicle emergence on the whole plot basis. At harvest, No. of panicles hill-1, No. of panicles m-2, panicle length (cm) and No. of grains panical-1 were measured. Grain yield (t fed-1) was calculated on the base of yield plot-1 then fed-1. Air dried plants were mechanically threshed and grain yield was estimated and adjusted to 14 % moisture content. Grain samples from each sub plot were taken to determine 1000 grain weight.

Statistical analysis

Analysis of variance was done for the obtained data of each season separately according to Snedecor and Cochran (1980), the means and interaction

compared according to the least significant difference (L.S.D) at 5%. The data were analyzed statistically following sub plot design by MSTAT-C computer package developed by Russell (1986).

Results and Discussion

-Irrigation intervals effect:

Results in Table (1) showed that heading date, No. of panicles m-2, panicle length, No. of grains panical-1, grain index and grain yield fed-1 were significantly affected by the irrigation intervals in both seasons at Moshtohor location. The highest values were recorded under continuous flooding irrigation interval of 3 days, followed by irrigation interval of 6 days, but no significant difference for No. of panicles m-2 and grain index in both seasons and No. of grains panical-1 in the first season only. While, increasing irrigation intervals up to 9 days significantly reduced the values of all the studied attributes and grain yield fed-1 in the first and second seasons at Moshtohor location. Also, Kafrelsheikh location (Table 2), showed the same trend as was observed for irrigation each 3 days followed by irrigation each 6 days which recorded the highest values for all of the studied grain yield fed-1 and its attributes, but no significant difference for No. of panicles m-2, No. of grains panical-1 and grain index in the first season only. Irrigation interval of 3 and 6 days in the first season significantly increased No. of panicles m-2, panicle length, No. of grains panical-1, grain index and grain yield fed-1 by 22.71 and 20.77, 15.75 and 11.44, 4.87 and 4.14, 13.94 and 9.89, 14.10 and 11.70%, respectively compared with irrigation interval of 9 days. In the second season, the corresponding increases in rice root length, No. of panicles hill-1, No. of panicles m-2, panicle length, No. of grains panical-1, grain index and grain yield fed-1 were 23.26 and 18.88, 13.92 and 10.25, 4.02 and 3.18, 18.18 and 13.54, 15.78 and 13.23%, respectively at Moshtohor location. At Kafrelsheikh location, the same trend was observed. This may be due to the decrease moisture content in root zone of rice plants for a long period, which adversely affected cell division, elongation and vegetative growth. These results revealed that the reduction in yield components can be expected as plants are exposed to water deficit. Besides, available water enhanced the production and transporting of dry matter content to the panicle resulting in more grain weight. These data are in agreement with those reported by Mosalem et al, (1998), El-Sharkawy et al, (2006), Okasha et al, (2009), Abu and Malgwi (2011) and Raumjit and Wichitparp (2014).

-Genotypes Effect:

Results reported in Table (1) clearly indicated that, there were significant differences between the different rice genotypes in all the of the studied traits in both seasons. The GZ7576 genotype was earliest

heading compared with the other rice genotypes in both seasons at Moshtohor location. Sakha 106 genotype gave the highest values of No. of panicles m⁻² which were (652.08 and 680.83 panicle), panicle length (23.25 and 25.29 cm), No. of grains panical-1 (127.08 and 126.75 grain), grain index (24.92 and 25.00 g) and grain yield fed-1 (4.60 and 5.26 tons) in the subsequent first and second seasons, respectively. While, GZ7576 genotype gave the lowest values of No. of panicles m⁻² (524.17 and 569.58 panicle), panicle length (18.58 and 19.29 cm), No. of grains panical-1 (119.08 and 119.25 grain), grain index (18.83 and 19.00 g) and grain yield fed-1 (3.50 and 4.22 tons) subsequent in the first and second seasons, respectively at Moshtohor location. At Kafrelshiekh

location, Table (2) illustrated the similar trend. It could be concluded that genotypes differences among rice genotypes may be due to genetical make up. The superiority of Sakha 106 genotype in grain yield (kg fed-1) over the other the genotypes might be due to the increase in the growth and yield components, namely, root length, No. of panicles hill-1, No. of panicles m⁻², panicle length, No. of grains panical-1 and grain index. (Abou Khalifa, (2001), Khawshi et al, (2003), Abou El-Hassan et al, (2006), El-Kalla et al, (2006), El-Bably et al, (2007), Okasha et al, (2009), Abou Khalifa, (2012), Raumjit and Wichitparp, (2014) calcified marked differences among rice varieties and genotypes in yield and yield components of rice.

Table 1. Yield and its attributes of rice as affected by irrigation intervals and genotypes in 2011 and 2012 seasons at Moshtohor Location

Treatments	Heading date (day)	No. of Panicles m ⁻²	Panicle length (cm)	No. of grains panical-1	Grain index (g)	Grain yield (t fed-1)
2011 season						
Intervals						
3 days	105.40	633.50	22.05	125.43	23.05	4.29
6 days	103.05	623.50	21.23	124.55	22.23	4.20
9 days	102.10	516.25	19.05	119.60	20.23	3.76
LSD at 5%	0.78	36.42	0.52	2.23	1.14	0.03
Genotypes						
Sakha106	105.58	652.08	23.25	127.08	24.92	4.60
Sakha105	104.92	628.33	22.13	124.92	23.88	4.44
GZ9362	103.75	588.33	20.50	123.54	22.04	4.07
GZ9057	102.25	562.50	19.42	121.33	19.50	3.79
GZ7576	101.08	524.17	18.58	119.08	18.83	3.50
LSD at 5%	1.04	12.67	0.79	0.79	0.76	0.13
IxG	NS	*	NS	NS	NS	NS
2012 season						
Intervals						
3 days	105.95	682.25	23.33	125.45	23.40	4.99
6 days	103.85	658.00	22.58	124.43	22.48	4.88
9 days	102.60	553.50	20.48	120.60	19.80	4.305
LSD at 5%	1.02	27.18	0.67	0.66	1.06	0.21
Genotypes						
Sakha106	108.00	680.83	25.29	126.75	25.00	5.26
Sakha105	105.50	659.17	23.63	125.58	23.54	5.01
GZ9362	103.67	640.83	22.13	124.04	21.92	4.70
GZ9057	102.25	605.83	20.29	121.83	20.00	4.43
GZ7576	101.25	569.58	19.29	119.25	19.00	4.22
LSD at 5%	0.67	17.76	0.59	0.69	0.51	0.14
IxG	*	NS	*	**	*	NS

Table 2. Yield and its attributes of rice as affected by irrigation intervals and genotypes in 2011 and 2012 seasons at Kafrelshaikh Location

Treatments	Heading date (day)	No. of panicles m-2	Panicle length (cm)	No. of grains panical-1	Grain index (g)	Grain yield (kg fed-1)
Intervals		2011 season				
3 days	105.55	637.50	22.13	120.90	25.45	4.29
6 days	102.60	612.50	20.56	119.50	24.45	4.13
9 days	101.40	475.00	19.49	114.05	23.01	3.60
LSD at 5%	1.02	32.24	1.06	4.47	1.51	0.11
Genotypes						
Sakha106	104.92	639.58	21.92	122.17	26.89	4.53
Sakha105	103.42	606.25	21.31	120.33	25.29	4.17
GZ9362	103.42	579.17	20.49	117.67	23.86	3.98
GZ9057	102.25	545.83	20.58	115.25	22.90	3.79
GZ7576	101.92	504.17	19.32	115.33	22.58	3.57
LSD at 5%	1.94	24.72	1.01	4.72	1.56	0.14
IxG	NS	*	NS	NS	NS	**
Intervals		2012 season				
3 days	106.55	656.25	22.99	124.60	25.95	4.44
6 days	104.05	612.50	21.34	120.70	24.86	4.24
9 days	102.55	496.25	19.92	115.70	24.06	3.41
LSD at 5%	0.43	26.07	0.67	1.97	0.66	0.09
Genotypes						
Sakha106	106.42	672.92	22.80	124.58	27.78	4.64
Sakha105	104.83	614.58	22.40	123.08	25.93	4.21
GZ9362	104.42	587.50	21.39	120.67	24.60	3.91
GZ9057	103.58	556.25	20.72	118.58	23.68	3.79
GZ7576	102.67	510.42	19.75	114.75	22.79	3.56
LSD at 5%	0.99	25.15	0.67	1.88	0.81	0.15
IxG	NS	NS	NS	NS	NS	NS

-Interaction effect:

The effect of the interaction showed significant or highly significant effect for No. of panicles m-2 in the first season and heading date, panicle length, No. of grains panical-1 and grain index in the second season at Moshtohor location, but the other traits didn't show any significant effects in the both seasons (Table 1). Concerning the interaction between irrigation intervals and rice genotypes, results in Table (3) indicated that continuous flooding (3 days) under Sakha106 genotype treatment recorded the highest values of No. of panicles m-2 (706.25 and 750.00 panicle), panicle length (25.25 and 26.50 cm), No. of grains panical-1 (129.50 and 128.75 grain) and grain index (26.50 and 27.00 g) in the first and second seasons respectively. While, irrigation interval 9 days under GZ7576 genotype was of earlier heading (100.25 and 100.75 day) in the first and second seasons respectively. On the other hand, irrigation every 9 days under GZ7576 genotype treatment gave the lowest values of No. of panicles m-2 (462.5 and 500.0 panicle), panicle length (17.75 and 18.63 cm),

No. of grains panical-1 (115.75 and 117.00 grain) and grain index (17.75 and 17.25 g) in the first and second seasons respectively at Moshtohor location.

The of the interaction showed significant effect or highly significant for No. of panicles m-2 and grain yield fed-1 in the first season at Kafrelshiekh location, but the other traits didn't show any significant effects in the both seasons Table (2). The interaction between irrigation intervals and rice genotypes, (Table 4) indicated that continuous flooding (3 days) under Sakha106 genotype treatment recorded the highest values of No. of panicles m-2 (700.00 and 737.50 panicle) and grain yield fed-1 (4.88 and 4.95 t) in the first and second seasons respectively. On the other hand, irrigation interval 9 days under GZ7576 genotype treatment gave the lowest values of No. of panicles m-2 (443.75 and 443.75 panicle) and grain yield fed-1 (3.28 and 3.03 t) in the first and second seasons respectively at Kafrelshiekh location.

Table 3. Effect the interaction between irrigation intervals and genotypes on some attributes of rice in 2011 and 2012 seasons at Moshtohor Location

Treatments	(First season)			(Second season)		
	Irrigation intervals			Irrigation intervals		
	3 days	6 days	9 days	3 days	6 days	9 days
Genotypes	Heading date (day)					
Sakha106	108.75	104.50	103.50	110.00	108.00	106.00
Sakha105	107.25	105.00	102.50	107.75	105.25	103.50
GZ9362	105.25	103.25	102.75	105.75	103.50	101.75
GZ9057	103.50	101.75	101.50	104.25	101.50	101.00
GZ7576	102.25	100.75	100.25	102.00	101.00	100.75
L.S.D at 5%	NS			1.16		
Genotypes	No. of panicles m-2					
Sakha106	706.25	668.75	581.25	750.00	688.75	603.75
Sakha105	675.00	672.50	537.50	718.75	676.25	582.50
GZ9362	625.00	627.50	512.50	686.25	686.25	550.00
GZ9057	598.75	601.25	487.50	650.00	636.25	531.25
GZ7576	562.50	547.50	462.50	606.25	602.50	500.00
L.S.D at 5%	21.94			NS		
Genotypes	Panicle length (cm)					
Sakha106	25.25	23.75	20.75	26.50	25.88	23.50
Sakha105	23.75	22.63	20.00	25.00	24.38	21.50
GZ9362	21.50	21.25	18.75	23.63	22.75	20.00
GZ9057	20.50	19.75	18.00	21.50	20.38	19.00
GZ7576	19.25	18.75	17.75	20.00	19.50	18.63
L.S.D at 5%	NS			1.03		
Genotypes	No. of grains panical-1					
Sakha106	129.50	128.25	123.50	128.75	127.00	124.50
Sakha105	127.50	126.25	121.00	128.00	126.75	122.00
GZ9362	125.62	125.00	120.00	125.75	125.88	120.50
GZ9057	123.75	122.50	117.75	123.75	122.75	119.00
GZ7576	120.75	120.75	115.75	121.00	119.75	117.00
L.S.D at 5%	NS			0.99		
Genotypes	Grain index (g)					
Sakha106	26.50	25.25	23.00	27.00	25.50	22.50
Sakha105	25.00	24.63	22.00	25.50	24.25	20.88
GZ9362	23.25	22.63	20.25	23.25	22.63	19.88
GZ9057	20.75	19.62	18.13	21.00	20.50	18.50
GZ7576	19.75	19.00	17.75	20.25	19.50	17.25
L.S.D at 5%	NS			0.88		

Table 4. The interaction effect the interval of between irrigation intervals and genotypes on some attributes of rice in 2011 and 2012 seasons at Kafrelshaiikh Location

Treatments	First season			Second season		
	Irrigation intervals			Irrigation intervals		
	3 days	6 days	9 days	3 days	6 days	9 days
Genotypes	No. of panicles m-2					
Sakha106	700.00	700.00	518.75	737.50	700.00	581.25
Sakha105	681.25	650.00	487.50	681.25	650.00	512.50
GZ9362	643.75	618.75	475.00	662.50	618.75	481.25
GZ9057	612.50	575.00	450.00	631.25	575.00	462.50
GZ7576	550.00	518.75	443.75	568.75	518.75	443.75
L.S.D at 5%	42.82			NS		
Genotypes	Grain yield (kg fed-1)					
Sakha106	4.88	4.75	3.95	4.95	4.88	4.10
Sakha105	4.60	4.33	3.58	4.70	4.50	3.43
GZ9362	4.15	4.03	3.75	4.33	4.08	3.33
GZ9057	4.00	3.95	3.43	4.20	4.03	3.15
GZ7576	3.83	3.60	3.28	3.95	3.70	3.03
L.S.D at 5%	0.24			NS		

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تقييم بعض التركيب الوراثية الجديدة للأرز لفترات الري في موقعين مختلفين
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أجريت أربع تجارب حقلية ، اثنتان بمركز البحوث والتجارب الزراعية بكلية زراعة مشتهر-جامعة بنها -محافظة القليوبية ، واثنتان بمزرعة مركز البحوث والتدريب في الأرز سخا- كفر الشيخ خلال عامي 2011، 2012م لتقييم كفاءة خمس تراكيب وراثية من الأرز تحت ثلاث فترات ري علي المحصول ومكوناته. وكانت أهم النتائج المتحصل عليها كمايلي:-
أظهرت معاملة الري كل ثلاثة ايام أعلى القيم لكل من المحصول ومكوناته وتلتها معاملة الري كل ستة ايام. بينما أدت معاملة الري كل تسعة ايام الي نقص في المحصول ومكوناته في كل من موسمي وموقعي الزراعة.
سجل التركيب الوراثي سخا 106 أعلى القيم لصفات عدد الداليات للمتر المربع ، طول الدالية (سم) ، عدد حبوب الدالية ، وزن الالف حبة (جم) ، محصول الحبوب للقدان (طن). بينما كان التركيب الوراثي GZ7576 الأفضل في صفة التبيكر لطراد الداليات في كل من موسمي وموقعي الزراعة.
تأثر معنويا كل من صفات عدد الداليات للمتر المربع في الموسم الاول وتاريخ التزهير ، طول الدالية (سم) ، عدد حبوب الدالية ، وزن الالف حبة (جم) في الموسم الثاني لموقع مشتهر. بينما تأثرت معنويا كل من صفات عدد داليات الجورة في كل من موسمي الزراعة وعدد الداليات للمتر المربع ، محصول الحبوب للقدان (طن) في الموسم الاول فقط لموقع سخا بالتفاعل بين فترات الري والتراكيب الوراثية للأرز. وعموما كانت أفضل معاملة للتفاعل هي الري كل ثلاثة أيام مع زراعة التركيب الوراثي سخا 106 حيث أعطت أعلى القيم للصفات السابقة في كل من موقعي الزراعة.