J. Agric. Sci. Mansoura Univ., 31 (6): 3325 - 3333, 2006

EVALUATION OF SOME RICE MUTANTS UNDER WATER STRESS CONDITIONS.

Sobieh, S. El-S.S.[(1)] and S.M. Shehata [(2)]

(1) Plant Research Department, Nuclear Research Center, Atomic Energy Authority, Abu Zaabal 13759, Egypt.

(2) Rice Research and Training Center, Sakha, Kafr El-Sheikh, 33717 Egypt.

ABSTRACT

Two field experiments were carried out during two successive growing seasons (2004 and 2005) in a farm located at Sahafa village. Sharkia Governorate, to evaluate some new rice mutants comparing with the local variety Giza 177 (sensitive)and exotic rice variety IET 1444 (tolerant) for drought tolerance and efficient use of irrigation water under three irrigation intervals, i.e., irrigation after 4 (control), 6 and 8 days for water stress treatments.

The results showed that :

1- Maximum grain yield and its components were obtained when rice plants were irrigated every 4 days intervals, while increasing irrigation intervals up to 8 days significantly decreased grain yield and its components.

2- Mutants MG 16 and MS 6 were superior in plant height, panicle length, number of grains per panicle, panicle weight and 1000 grain weight, while the maximum values of number of panicle / m^2 and straw yield were obtained by IET 1444 variety.

3- The ranking for grain yield (t/fed.) was as follows: MG 16 > IFT 444 > MS 6 > Giza177.

4- The interaction between irrigation intervals and rice genotypes had no significant effect on yield or any of its attributes.

5- According to stress susceptibility index for different rice genotypes Mut. MG16 was tolerant to drought comparing with the other genotypes.

6- The highest water use efficiency (WUE) was obtained by Mut. MG 16 under sever water stress comparing to the other genotypes.

7- Irrigation of rice plant every 6 days interval saved 2140.74 m^3 / fed. (24.9 %) comparing with the control treatment.

8- Mut. MG 16 with its highest yield, water use efficiency and lowest values of stress susceptibility index under drought conditions, So, it was consider the most tolerant comparing with the rest of genotypes.

INTRODUCTION

Rice is one of the major staple food crops in Egypt, in addition to its importance for export. During the past seventy years, world wide , more than 2250 varieties have been released , either as direct mutants or from their progenies. Induction of mutation with radiation has been the most frequently method used for directly developed mutant varieties, Ahloowalia *et al.*, (2004).

Rice plant is known to consume much water of about (9000 m^3/fed) . Early maturing trait is considered as the main component to drought escape, where drought escape was described as a systematic approach to varietal selection based on the relationship between grain yield and days to heading, Fukai, and Cooper (1995).

Drought causes a reduction in biomass and consequently, in yield. Yield losses are more severe when drought accurse the reproductive phase, Sarkarung *et al.*, (1995). According to Dey, and. Upadhyaya (1996), where the three critical stages of growth, seedling, vegetative and anthesis; drought during anthesis is the most serious and devastating to yield because of its adverse effects on pollination and the flowers become sterile. The decreased in sugar delivery to reproductive tissues upon inhibition of photosynthesis male gametophyte development Saini, (1997).

The grain yield and its components were highest at 4-days interval and decreased as irrigation interval increased up to 8 days Abdel-Rahman, *et al.*, (2004).

The aim of this study was to evaluate some new rice mutants for drought tolerance and efficient use of irrigated water under three irrigation intervals.

MATERIALS AND METHODS

A mutation breeding program was carried out at the Experimental Station belonging to the Nuclear Research Center to improve yield potential of two rice commercial varieties, Sakha102 and Giza178 . As a result two high yielding mutant lines were developed. These mutants were evaluated under drought conditions (various irrigation intervals) during the summer seasons of 2004 and 2005 in a farm located at Sahafa village, Sharkia Governorate. The soil was loam in texture with pH 7.59 and Ec 2.9 dsm^{-1} Some physical properties of the experimental soil are presented in table (1).

Table (1): Soil properties of the used experimental field over the owo seasons 2004 – 2005 .

Soil analys	Particle size distribution			Texture	PH	EC dS/m
	Sand	Silt	Clay			
	46	40	14	Loam	7.59	2.9

The experiment was conducted in a split plot design with three replications. The main plots were devoted to irrigation intervals and the sub-plot to rice genotypes.

Three irrigation intervals, namely 4 days (Control), 6 days (Mild water stress) and 8 days (sever water stress) with flood water depth of 10 cm were used. The application of water intervals started 15 days after transplanting. The surface irrigation water added and calculated according to Israelsen, and Hansen (1962).

V-notc equation : $Q = 0.0138\ H^{2.5}$

Where :

Q = water quantity, Liter/sec.

H = water head, cm.

The material consisted of four rice genotypes, Mutant (MS 6) that selected from irradiated Sakha 102 with 200 Gy of gamma rays, Mutant (MG 16) that selected from irradiated Giza 178 with 300 Gy of gamma rays, Sobieh *et al.*, (2001).

local variety Giza 177 (Sensitive to drought) and exotic rice variety IET 1444 (Resistant to drought).

Table (2) : Averages of irrigated water (m^3 / fed)* for different rice genotypes as affected by different irrigation treatments in 2004 and 2005 seasons.

Irrigation treatments	2004	2005	Average	Total amount of water consumed
Amount of irrigated water in nursery.	796	796	796	-
Amount of irrigated water in permanent field for 15 days before applying irrigation treatments.	1223	1223	1223	-
Irrigation every 4 - days.	6728.04	6422.22	6575.13	8594.13
Irrigation every 6 – days	4587.30	4281.48	4434.39	6453.39
Irrigation every 8 – days	3364.02	3058.20	3211.11	5230.11

*ha = 2.4 fed.

Rice seeds were broadcasted in separate nursery beds in May 15th in both seasons. Thirty day-seedlings were transplanted in hills at rate of 5 seedling per hill at 20 × 15 cm spacing apart between rows and hill, respectively. Phosphatic fertilizer as calcium super-phosphate (15.5% P_2O_5) was added at the rate of 100 kg/fed. during soil preparation to the nursery and to the permanent soil, whereas nitrogen fertilizer was applied as ammonium sulphate (20.5 % N) at the rate of 250 kg/fed. where ⅔ of the amount was incorporated in dry soil before transplanting and the rest was added one week before panicle initiation.

At harvest, plant height and number of panicles/m^2 were measured. Ten main panicles were chosen at random from each plot for estimating panicle length, panicle weight, number of grains/panicle and 1000-grain weight. A 2 m^2 from each sub-plots was harvested and threshed for grain yield and straw yield estimation.

Drought susceptibility index (s) was calculated for grain yield (kg/fed.) using the formula of Fisher. and Maurer (1978).

:

$S = (1 - Yd/Y\partial) / (1 - Xd/X\partial)$

Where :

Yd = The yield of an individual genotypes under dry conditions.

Y∂ = The yield of the same genotypes in the adequate moisture conditions.

Xd and **X∂** = The average yield of all genotypes under dry and adequate moisture conditions, respectively.

Water use efficiency : ratio of grain yield to water used.Data of he two seasons were subjected to analysis of variance according to Gomez and Gomez (1984). and treatment means were compared by LSD test.

RESULTS AND DISCUSSION

1- Effect of irrigation intervals :

Concerning the effect of irrigation intervals on yield and its attributes of rice genotypes data presented in Table 3 and 4 clearly showed that irrigation intervals had no significant effect on 1000-grain weight in both seasons. Irrigation intervals exhibited highly significant effect on plant height in the two growing seasons. Sever water stress significantly decreased plant height from 7.40 to 10.77 % in the two growing seasons as compared to the control. Reduction in plant height reported by McCauley, (1990). from 9.0 to 29.0 %. From Table (3) it could be observed that irrigation treatment had significant effect on panicle length in both seasons. Sever water stress decreased significantly panicle length from 10.38 to 8.52 % in the two seasons as compared with the control(4 day interval). Also, irrigation intervals caused highly significant effect on number of grains per panicle in the two growing seasons.

Table (3) : Average plant height, panicle length,number grains per panicle and Panicle weight as affected by irrigation interval and rice genotypes during 2004 and 2005 seasons.

Treatments	Plant height (cm)		Panicle length (cm)		No. Grains per panicle		Panicle weight (g)	
	2004	2005	2004	2005	2004	2005	2004	2005
Irrigation interval								
4 days	102.92	103.90	25.22	25.00	169.15	170.90	4.84	4.82
6 days	98.72	98.80	24.1	24.20	156.9	160.15	4.63	4.49
8 days	95.30	93.22	22.87	22.87	139.5	145.07	4.01	4.10
F-test	**	**	**	*	**	**	**	*
LSD $_{(0.05)}$	5.46	5.01	1.58	2.38	23.50	15.89	0.765	0.829
Rice genotypes								
Giza 177	76.56	76.10	18.70	19.00	94.53	97.40	2.69	2.84
Mut. MS 6	103.20	104.06	27.33	26.96	182.66	194.33	5.43	5.49
Mut. MG 16	129.43	128.96	28.10	27.56	196.66	201.33	6.62	6.37
IET 1444	86.73	85.43	22.53	22.56	146.86	146.76	3.23	3.18
F-test	**	**	**	**	**	**	**	**
LSD $_{(0.05)}$	7.16	6.03	1.53	1.59	13.60	13.75	0.500	0.664

Sever water stress significantly decreased the number of grains per panicle from 17.52 to 15.11 % in two seasons as compared to the control. These results agreed with those obtained by Lilley and Fukai, (1994).

They reported that in reproductive severe stress treatment, grain number per panicle was significantly reduced by water deficit for all cultivars, indicating that damage to the panicle occurred when spikelets were forming, during either the water deficit period or the recovery period when crop growth rate, and therefore assimilate supply were small. From Table (3) it could be noticed that irrigation intervals had a significant effect on panicle weight in the two growing seasons. Also high water stress significantly decreased the panicle weight from 17.1 to 14.93 % in the two seasons as compared to the control.

With respect to number of panicles/m2 results in Table (4) showed that irrigation intervals had a significant effect on number of panicles/m2 in the two growing seasons. At sever water stress significantly decreased the number of panicles/m2 from 16.24 to ١٨,٧٢ % in the two seasons. Similar results were obtained by Castillo *et al.*, (1992).

Table (4) : Average 1000-grain weight, no. of panicles /m^2, Grain yield and straw yield (t/fed.) as affected by irrigation interval and rice genotypes during 2004 and 2005 seasons.

Treatments	1000-grain weight (g)		No. of panicles / m^2		Grain yield (t / fed).		Straw yield (t / fed).	
	2004	2005	2004	2005	2004	2005	2004	2005
Irrigation interval								
4 days	29.15	29.12	519.33	533.9٩	4.99	4.99	5.29	5.20
6 days	28.65	28.62	479.22	486.99	4.46	4.56	4.97	4.86
8 days	27.57	27.62	434.99	433.99	3.94	4.04	4.47	4.48
F-test	NS	NS	**	**	*	*	**	NS
LSD $_{(0.05)}$			51.74	83.70	0.926	1.32	0.676	
Rice genotypes								
Giza 177	27.10	26.63	484.66	494.88	2.15	2.32	2.93	2.97
Mut. MS 6	30.66	31.17	469.33	368.66	4.96	5.06	4.58	4.59
Mut . MG 16	35.53	35.30	369.77	373.55	5.42	5.39	5.59	5.38
IET 1444	20.53	20.73	688.44	702.88	5.32	5.34	6.54	6.46
F-test	**	**	**	**	**	**	**	**
LSD $_{(0.05)}$	1.84	1.75	63.73	٤٤,٢١	0.804	0.743	0.873	0.771

who stated that reduction in panicles/m^2 or plant caused by water deficit.

As shown in Table (4) water deficit by prolonging irrigation intervals significantly reduced grain yield in the two seasons. Reduction in yield was greater under sever water stress (irrigation every 8-days) from 21.04 to 19.03 % in the two seasons than under mild water stress treatment (irrigation every 6-days) from 10.62 to 8.61 %). As a significant reduction in yield by increasing irrigation interval from 4 to 8 days while, no significant differences between irrigation every 4-days and 6 days. Similar results were obtained by Sorur, *et al.*, (1998).

who found significant reduction in yield by increasing irrigation interval from 3 to 12 days and no significant differences between continues flooding and irrigation every 6 days were recorded .

The amount of irrigation water delivered to each irrigation interval showed that water stress treatments may be saved about 24.90 % (2140.74 m3/fed.) and 39.14 % (3364.02 m3/fed.) of irrigated water, over the control, respectively.Results presented for grain yield (t/fed.) showed that no significant difference between irrigation every 4 days and 6 days. Accordingly, it could be saved about 24.9 % (2140.74 m3/fed.) using irrigation every 6 days. Similar results obtained by Aidy, et al (2003,who used alternate irrigation during rice growth season. They reported that the amount of water saved using prolonged irrigation regime ranged from 19 to 39 %.

Also, irrigation intervals caused a highly significant effect on straw yield (t/fed.) in the first season. While, they had no significant effect on the second season it could be stated that watering rice plants each 4 day interval record the maximum grain yield and could be recommended .

2- Genotypes differences :

Highly significant differences were detected between the tested rice genotypes regarding plant height, panicle length, grains per panicle, panicle weight, 1000-grain weight, number of panicles/m^2 as well as grain and straw yields. Data in table 3 and 4 showed that Mut. MG 16 and Mut. MS 6 were superior in plant height, panicle length, grain per panicle, panicle weight, 1000-grain weight. However, IET 1444 was superior regarding number of panicles/m^2 and straw yield (t/fed.).

As shown in Table (4) results presented for grain yield (t/fed.) showed that no significant differences between rice genotype Mut. MG 16, IET 1444 and MS6 as compared to Giza 177. Mut. MG 16 recorded a highly significant grain yield (t/fed.) followed by IET 1444,and then Mut. MS 6 . While, Giza 177 had the lowest grain yield. Similar data were obtained by Shehata,. (1995). and Ali, (2000).

Mut.MG16 posse the most increase in grain yield if compared with the rest genotype.

3- Interaction effect :

Data presented in Table (5) showed that the interaction between irrigation intervals and rice genotypes had no significant effect on yield or any of its attributes in the two seasons , indicating that each of the two factors acts independently.

Table (5) :The Interaction between irrigation interval and rice genotypes for yield and its attributes during 2004 seasons.

Traits	2004 season												F-test
	4 days				6 days				8 days				
	Giza 177	MS 6	MG 16	IET 1444	Giza 177	MS 6	MG 16	IET 1444	Giza 177	MS 6	MG 16	IET 1444	
Plant height (cm)	80.8	107.6	132.0	91.3	77.3	102.0	129.3	86.3	71.6	100.0	127.0	82.6	NS
Panicle length (cm)	20.5	28.8	29.8	23.0	18.3	27.6	27.5	23.0	17.3	25.6	27.0	21.6	NS
Grains per panicle	108.0	199.0	216.0	153.6	97.6	185.0	198.0	147.0	78.0	164.0	176.0	140.0	NS
Panicle weight (g)	3.20	5.74	7.10	3.35	2.80	5.45	6.87	3.40	2.09	5.12	5.90	2.95	NS
1000-grain weight (g)	28.0	31.0	36.3	21.3	28.3	31.0	35.0	20.3	25.0	30.0	35.3	20.0	NS
No. of panicles / m^2	535.3	395.3	386.0	762.7	498.0	370.0	369.3	680.0	420.7	342.7	354.0	622.7	NS
Grain yield (t / fed).	2.64	5.49	5.90	5.94	2.05	5.03	5.40	5.36	1.76	4.37	4.98	4.68	NS
Straw yield (t / fed)	3.28	4.91	5.91	7.04	2.88	4.64	5.60	6.78	2.64	4.21	5.26	5.78	NS

Table (5) : The Interaction between irrigation interval and rice genotypes for yield and its attributes during 2005 season.

Traits	2005 season												F-test
	4 days				6 days				8 days				
	Giza 177	MS 6	MG 16	IET 1444	Giza 177	MS 6	MG 16	IET 1444	Giza 177	MS 6	MG 16	IET 1444	
Plant height (cm)	82.0	110.3	134.3	89.0	77.0	102.6	130.6	85.0	69.3	99.3	122.0	82.3	NS
Panicle length (cm)	20.1	27.8	28.3	23.8	19.1	27.3	27.8	22.6	17.8	25.8	26.6	21.3	NS
Grains per panicle	110.6	205.0	214.0	154.0	99.6	190.0	205.0	146.0	82.0	173.0	185.0	140.3	NS
Panicle weight (g)	3.31	5.95	6.74	3.29	2.84	5.46	6.31	3.38	2.38	5.06	6.07	2.89	NS
1000-grain weight (g)	27.3	31.3	36.6	21.3	27.3	31.6	35.0	20.6	75.3	30.6	34.3	20.3	NS
No. of panicles / m^2	573.3	413.3	395.3	754.0	496.7	368.7	377.3	705.3	414.7	324.0	348.0	649.3	NS
Grain yield (t / fed) .	2.62	5.60	5.82	5.93	2.45	5.08	5.41	5.30	1.90	4.52	4.95	4.79	NS
Straw yield (t / fed)	3.32	4.97	5.64	6.89	2.89	4.56	5.34	6.67	2.70	4.25	5.17	5.83	NS

4- Drought susceptibility index (s) :

The genotypes which showed drought index (s) value < 1 could be considered as drought tolerant compared with these of (s) value > 1. As shown in Table (6) drought index ranged from 0.739 for mut. MG 16 to 1.58 for Giza 177 in the first season. Meanwhile, these values reached 0.784 and 1.44 for mut. MG 16 and Giza 177, respectively, in the second season. Stress susceptibility indices in the first season were 0.738, 0.971, 1.00 and 1.58 for mut. MG 16, MS 6, IET 1444 and Giza 177, respectively, vs 0.784, 1.01, 1.01 and 1.44, respectively in the second season. So, Mut. MG 16 is considered more tolerant to drought than the other rice genotypes.

Table (6) : Drought susceptibility index (s) of some rice genotypes for grain yield (t/fed) . during 2004 and 2005 seasons.

Genotypes	2004			2005		
	High level of water stress	Low level of water stress	Drought susceptibility index (s)	High level of water stress	Low level of water stress	Drought susceptibility index (s)
Giza 177	1.76	2.64	1.58	1.90	2.62	1.440
Mut. MS 6	4.37	5.49	0.971	4.52	5.60	1.010
Mut. MG 16	4.98	5.90	0.738	4.95	5.82	0.784
IET 1444	4.68	5.94	1.00	4.79	5.93	1.010
Mean	3.94	4.99	-	4.04	4.99	-

5- Water use efficiency (W.U.E) :

Table (7) shows the values of water use efficiency as a function of three irrigation intervals and rice genotypes for grain yield.

Table (7) : Number of irrigations, irrigation quantity and water use efficiency (WUE) of grain yield (kg/fed.) of rice genotypes as affected by irrigation intervals in 2004 and 2005 seasons.

Irrigation intervals	Number of irrigations	irrigation quantity m^3/fed.	(WUE) of grain yield (kg/fed.)			
			Giza 177	Mut. MS 6	Mut. MG 16	IET 1444
2004						
4 days	22	7951.32	0.332	0.690	0.742	0.747
6 days	15	5810.58	0.352	0.865	0.929	0.922
8 days	11	4587.30	0.383	0.952	1.080	1.020
2005						
4 days	21	7645.50	0.342	0.732	0.761	0.775
6 days	14	5504.76	0.445	0.922	0.982	0.962
8 days	10	4281.48	0.443	1.050	1.150	1.110

Under 4-days (Control) which received 7951.32 , 7645.50 m^3 water/fed. in the first and second seasons respectively, we can arrange WUE for the different rice genotypes in the following order : IET 1444 > Mut. MG 16 > MS 6 > Giza 177. While, under 6-days (mid stress) which received 5810.58 , 5504.76 m^3 water/fed. in the first and second seasons respectively, we can arrange WUE for the different rice genotypes in the following order : Mut. MG 16 > IET 1444 > MS 6 > Giza 177.

Under 8-days (High stress) which had 4587.30 , 4281.48 m^3 water/fed. in the first and second seasons, respectively. The WUE for different rice genotypes can be ranked in the following order :
Mut. MG 16 > IET 1444 > MS 6 > Giza1777.

It could be concluded that 8-days (High stress) achieved the highest water utilization efficiency value. While the lowest value was obtained after 4-days (control). Regarding to rice genotypes it is evident that Mut. MG 16 is superior in water utilization efficiency than the other rice genotypes under mid and high stress. Similar results were obtained by El-Sabbagh *et al.*, (1997).

REFERENCES

Abdel-Rahman, A.A.M.; A.A. Leilah; M.A. Badawi and B.A. Zayed (2004). Effect of irrigation inervale and methods of nitrogen application on yield of some rice cultivars under saline soil conditions . Egypt. J. Agric. Res., 82 (1) 197 - 207.

Ahloowalia, B.S.; M. Maluszynski and K. Nichterlein (2004).Global impact of mutation derived varieties Euphytica, 135: 2, 187-204.

Aidy, I.R.; S.M. Hassan; M.R. Sehly; M.R. Sherif; S.A. Ghanem and A.A. El-Hissewy (2003). Regional workshop, In: integrated production and protection management of rice in some Near east Countries. July, 27-29, Alexandria, Egypt.

Ali, H.I. (2000). Evaluation of some induced rice mutants under stress condition . M.Sc. Thesis, Dept. Agron., Fac. of Agric., Ain ShaMS Univ.

Castillo, E.C.; R.J. Buresh and K.T. Ingram (1992). Lowland rice yield as affected by timing of water deficit and nitrogen fertilization . Agron. J. 84: 152-158.

Dey, M.M. and H.K. Upadhyaya (1996). Yield loss due to drought , cold and submergence in Asia . in :- Rice Research in Asia: Progress and Priorities. R.E. Evenson; R.W. Herdt and M. Hossain, (eds), CAB International, pp. 291-303.

El-Sabbagh, A.A.; S.A. Abd El-Hafez and El-Sh.I. Abou Ahmed (1997). Infuence of irrigation schedule on the productivity of some rice cultivars and water utilization efficiency . Menofiya J. Agric. Res., 22 (3): 781-788.

Fisher, R.A. and R. Maurer (1978). Drought resistance in spring wheat cultivar: 1 Grain yield response . Aust. J. Agric., 29: 897-912.

Fukai, S. and M. Cooper (1995). Development of drought resistance cultivars using physio-morphological traits in rice . Field Crops Res., 40: 67-86.

Gomez, K.A. and A.A. Gomez (1984). Statistical Procedure for Agriculture Research, 2nd ed. John Wiley and Sons. Inc, New York.

Israelsen, O.W. and V.E. Hansen (1962). Irrigation Principles and Practices, 2nd ed. John Wiley and Sons. Inc, New York.

Lilley, J.M. and S. Fukai (1994). Effect of timing and severity of water deficit on four diverse rice cultivars . 111 phenological development crop growth and grain yield . Field Crops Res. 37: 225-234.

McCauley, G.N. (1990). Sprinkler vs. flood irrigation in traditional rice production regions of southeast texas . Agron. J. 82: 677-682.

Saini, H.S. (1997). Effect of water stress on male gametophyte development in plants . Sex Plant Reported. 10: 67-73.

Sarkarung, S.; O.N. Sing; J.K. Roy; A. Vanavichit and P. Bhetasut (1995). Breeding strategies for rainfed lowland ecosystem in fragil lives in Fragile EcosysteMS . Proc. Intl. Rice Research Conf. 13-17 February, 1995, IRRI, LosBanos, Laguna, Philippine, pp. 709-720.

Shehata, S.M. (1995). Genetic studies on salt and drought tolerance in rice . Ph.D. Thesis, Dept. Agric. Bot., Fac. of Agric., Zagazig Univ.

Sobieh, El-S.S.S.; R.A.K. Moustafa and A.M.A. Shahen (2001). Selection for high yielding rice mutants following gamma irradiation . Egypt. J. Appl. Sci., 16 (4): 108-123.

Sorur, F.A.; M.E. Mosalem; F.N. Mahrous and I.S. El-Refaee (1998). Effect of irrigation interval and potassium fertilization level on growth , yield and quality of rice . 7th Conf. Agric. Dev. Res., Fac. Agric., Ain ShaMS Univ., Cairo, December 15-17. Ann. Agric. Sci., Sp., (3): 663-678.

تقييم بعض طفرات الأرز تحت ظروف الإجهاد الرطوبى

صبيح السيد سليمان صبيح [١] ، سعيد محمد شحاته [٢]

(١) قسم البحوث النباتية – مركز البحوث النووية – هيئة الطاقة الذرية – ص ب ١٣٧٥٩ – أبى زعبل – مصر.

(٢) مركز البحوث والتدريب فى الأرز – سخا – كفر الشيخ ٣٣٧١٧ – مصر

أجريت تجربتان حقليتان خلال موسمى الزراعة ٢٠٠٤ ، ٢٠٠٥ بقرية الصحافة – محافظة الشرقية وذلك بهدف تقييم بعض طفرات الأرز الجديدة مقارنة بالصنف المحلى جيزة ١٧٧ (الحساس) والصنف المستورد IET 1444 (المتحمل) تحت ظروف الإجهاد الرطوبى لترشيد كميات المياه المستخدمة فى رى الأرز وذلك باستخدام ثلاث فترات من الري هي الري كل ٤ أيام (معاملة الكنترول) ، ٦ ، ٨ أيام لمعاملتي الإجهاد الرطوبي.

ويمكن إيجاز أهم النتائج المتحصل عليها فيما يلى :

١-أعطت الفترة بين الريات كل ٤ أيام أعلى قيم للمحصول ومساهماتة ثم انخفض المحصول و مساهماتة بزيادة فترة الري إلي ٨ أيام.

٢-أظهرت كل من الطفرات MG 16 ، MS 6 معنويا أعلى قيم لطول النبات والدالية وعدد حبوب الدالية ووزنها و وزن الـ ١٠٠٠ حبة. كما أعطى الصنف IET 1444 أعلى قيم لعدد الداليات فى المتر المربع ومحصول القش. وعلى الجانب الأخر فقد أعطت الطفرة MG 16 أعلى محصول حبوب تحت ظروف الإجهاد الرطوبي يليها الصنف IET 1444 ثم الطفرة MS6. بينما أعطى الصنف جيزة ١٧٧ أقل محصول.

٣-لم يظهر التفاعل بين فترات الري والتراكيب الوراثية تأثيرا معنويا لجميع الصفات المدروسة في الموسمين.

٤-اختلفت التراكيب الوراثية للأرز فى قدرتها على تحمل الجفاف باستخدام مقياس معامل الحساسية للجفاف لمحصول الحبوب حيث تميزت الطفرة MG 16 بتحملها للإجهاد الرطوبى عن باقى التراكيب الوراثية الأخرى.

٥- أظهرت الطفرة MG 16 أعلى كفاءة في استخدام ماء الري (WUE) تحت ظروف الإجهاد الرطوبى مقارنة بباقي التراكيب الوراثية.

٦-كانت كمية المياه المتوفرة باستخدام معاملة الري كل ٦ أيام مقارنة بمعاملة الري كل ٤ أيام 2140.74 m^3/fed. بنسبة ٢٤,٩ %.

٧-وجد أن الطفرة MG 16 كانت أفضل التراكيب الوراثية في تحمل الجفاف لارتفاع محصولها وزيادة كفائتها في استخدام ماء الري تحت ظروف الإجهاد الرطوبي كما أنها أعطت أقل قيمة لمعامل الحساسية للجفاف.