EFFECT OF IRRIGATION MANAGEMENT AND SEEDLING AGE ON THE PRODUCTIVITY AND QUALITY OF TWO RICE VARIETIES USING SYSTEM OF RICE INTENSIFICATION (SRI).

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ABSTRACT

A two -year field experiment was conducted at the Experimental Farm of Agricultural Research Station and lab. of seed technology Dept. Sakha, Kafr El-Sheikh, Egypt, during 2013 and 2014 seasons. A split split plot design with three replications was conducted to study the effect of irrigation system, seedling age and variety on rice yield and its components, grain quality and viability. The two irrigation treatments i.e. continues flooding and continues saturation were allocated to the main plots, three ages of seedlings i.e. 15, 20 and 25 days old were assigned to the sub-plots and two rice varieties i.e., Sakha105 as inbred and Egyptian hybrid1 rice were distributed in sub-sub plots. The obtained results could be summarized as follows:

The grain yield, straw yield, hectolitre weight, protein content, hulling % and milling % responded positively to flooding treatment. Transplanting of younger seedlings provided more effective tillers m^{-1}, filled grains $panicle^{-1}$, thousand grain weight, hectolitre weight, straw yield, germination, protein content and amylose content, hulling %, milling % and grain yield than those of the older one. Egyptian Hybrid 1 rice produced the highest values of number of productive tillers hill, number of primary branches/panicle, grain yield, straw yield, radical length, E.C and 1000-grain weight. The interactions among irrigation, age of seedling and rice variety had a significant effect on number of productive tillers/m^2, number of primary branches/panicle, filled grains, panicle weight, straw yield, germination %, E.C and 1000-grain weight.

The present study indicated that sowing of Egyptian Hybrid 1 rice variety with 15 days seedlings old under flooding treatment can improve yield and its components as well as grain quality of economic values.

Key words: Rice, irrigation treatments, seedling age, cultivars, viability and quality.

INTRODUCTION

Rice is the most water-consuming crop grown in Egypt, occupying around 0.6 million hectares of land under continuous flooding during the growing season. Water availability is becoming progressively more limited as an increasing population creates competing demands for this precious resource. The challenge for agricultural researchers is to find ways to reduce water used in rice production while continuing to increase yields. There is also a need to understand the impacts of

growing rice with less water on labor requirements, weed control, fertilizer management, cultural practices, and rice grain quality. An additional issue for Egypt is that farmers sometimes use irrigation water containing elevated levels of heavy metals, which could degrade the quality of rice and other crops**.**

Rice production in Egypt, occupies 22% of cultivated area in the summer season, and consumes 13% of total water. Egypt presently has the highest average national rice yield in the world; however, the country's rice output must increase by 20% over the next decade just to maintain current levels of consumption. This will be difficult because the yield level is already high, and because of increasing competition for water with growing water shortages that affect all sectors. SRI methods for growing more rice with less water thus warrant evaluation under Egyptian conditions.

Rice cultivars performed differently when transplanted in field at varying seedling ages depending upon their genetic makeup and adoptability to certain environmental conditions. Seedling age plays an important role in yield contributing parameters like number of productive tillers, panicle length, filled grains panicle^{-1} and 1000-kernel weight leading to higher paddy yield in different rice cultivars and hybrids.

The System of Rice Intensification (SRI) is one of the best alternatives to minimize the water consumption for the cultivation of rice and at the same time increasing the productivity. System of Rice Intensification (SRI), a recently method in rice to increase its productivity was developed in Madagascar in the 1980,s, due to its less consumption of water, nearly 50% as compared to the other conventional methods. The cultivation under SRI is rapidly increasing. SRI is a set of ideas and insights that emphasize the use of younger seedlings (less than15 days) planted singly and intermittent irrigation, together with the adoption of at wider spacing, organic fertilization, and active soil aeration to the extent possible (Uphoff, 2007; Stoop et al., 2002). With this backdrop, an experiment was taken up to identify the correct irrigation system, age of the seedlings and rice cultivars for realizing good quality seed under SRI system of cultivation.

Transplanting rice seedlings from a nursery into the paddy field when the plants are relatively mature, 3 to 4 weeks old, as is common practice around the world, with SRI seedlings are transplanted before they are 15 days old, even 8 or 10 days old. This preserves the plants' potential for massive tillering if the other practices are followed. Transplanting seedlings in clumps of 3 or 4, as is almost universally done, with SRI seedlings are transplanted singly, so that there is no competition among plant roots to inhibit growth. Keeping paddy fields continually flooded, with SRI soils are kept wellaerated during the vegetative growth phase. the increase in the yield with SRI was

attributed to the increase in number of ear bearing tillers /hill, total number of spikelet /panicle and total length, Rafaralahy (2002).

MATERIALS AND METHODS

A two -year field experiment was conducted at the Experimental Farm of Sakha Agricultural Station and lab. of seed technology Dept. Sakha, Kafr El-Sheikh, Egypt, during 2013 and 2014 rice growing seasons. The experiments were conducted to investigate the response of two rice varieties, i.e., Sakha105 and Egyptian hybrid 1 to irrigation treatment and seedling age on yield and its components, grain quality and viability. The experimental design was split split plot with three replications. The main plot was randomly assigned to two irrigations system i.e. continues flooding and continues saturation. Three sub-plots were assigned to seedling age i.e. 15, 20 and 25 days old seedling with two sub-sub plots for rice varieties i.e. Sakha105 and Egyptian hybrid 1 rice. Seeds of rice Sakha105 and Egyptian Hybrid 1 rice cultivars at the rate of 40 and 10 kg/fed, respectively, were planted dry seed on dry soil and then irrigated on May 10^{th} in both seasons. Seedlings from the different aged nurseries were removed according to the assigned treatments and 3-5 seedlings per hill were transplanted in 20 x 20 cm spacing into 15 m^2 plot size. The nitrogen fertilizer in the form of urea from (46% N) was applied as assigned levels in two splits i.e. 2/3 as basal application and 1/3 as topdressing at panicle initiation stage. The recommended doses of the other fertilizers i.e. phosphorus as single super phosphate (15.5% P_2O_5) was added at the rate of 100kg /fed. and zn sulphate (22% Zn) at the rate of 20kg/fed. was added after pudding before planting.

Data collection

Important parameters like number of tillers/m^2, number of primary branches/panicle, filled grains/panicle, panicle weight (g), 1000-grain weight, grain yield (t/ha) and straw yield (t/ha) were recorded from ten randomly selected plants from each replication to assess treatment effects on crop growth and performance. The grains obtained from all the treatments were tested for laboratory germination which was conducted according to international rules (ISTA, 1993). Electrical conductivity (EC) was measured according to (AOSA, 1986). Hectolitre weight (g hL-1): it was determined for dockage-free grain sample using seedburo hectolitre mass device and electronic balance. The protein content was determined according to the procedures outlined in (A.O.A.C, 1990). The amylose content was determined according to the iodimetric technique (Blue Value), described by Gilbert & Spragg (1964). Hulling percentage: About 150g cleaned rough rice samples at moisture content 12.14 % were estimated using experimental huller machine (Stake) in Rice Research and Training Center, grain quality lab

Hulling % = Weight of brown rice/ weight of rough rice × 100.

Milling percentage: Brown rice was consequently milled using McGILL Millerno2. The sample was milled for 60sec. the milled rice sample was then collected and the weight was taken and percentage of total milled rice was computed.

Milled rice % =Weight of milled rice/weight of rough rice × 100

Data collected in the two seasons were statistically analyzed according to the technique of analysis of variance (ANOVA) for three factors in split split plot. For comparison between means, LSD at 0.05% of probability was used. All data were calculated according to Dunacn (1955). All statistical analyses were performed using analyses of variance technique by "MSTAT-C" computer software package (1990).

RESULTS AND DISSCUSSION

Pooled data in both seasons as shown in Tables 1, 2, 3,4,5 and 6 revealed significant differences in productivity and grain quality of the two rice varieties due to the irrigation treatment, age of seedlings, and their interactions.

Effect of irrigation treatments:

Irrigation treatment significantly affected number of productive tillers/m^2 and number of branches/panicle only in the first season as shown in Table (1). Saturation treatment gave the highest number of productive tillers/m^2 and number of branches/panicle in the first season, but the differences in the second season did not reach the 5% level of significant with flooding treatment. Saturation treatment trended to decrease number of filled grains/panicle, but the differences with flooding treatment did not reach the 5% level of significant in both seasons. Saturation as a system of irrigation recorded the highest panicle weight (3.49 gm) while, flooding irrigation showed posteriority regarding panicle weight in the second seasons of study in Table (2). Flooding system indicates considerable superiority in grain yield in the first season and straw yield in both seasons compared with saturation system. The present finding is in a good agreement with those reported by Singh et al (1998), Ginigaddara and Ranamukhaarachchi (2011), El-Feky (2012), Ali et al (2013) and Shantappa et al (2014)

Data in Tables (3 and 4) demonstrate there were no significant differences between irrigation systems in both studied seasons at germination %. The flooding irrigation gave the lowest conductivity in the first season. While, flooding gave the highest hectoliter weight (75.09 and 74.63 g) in both seasons. Flooding system had the highest values for protein content (7.99 and 7.94%), hulling % (85.40 and 84.70 %) and milling% (63.20 and 63.27 %) in both seasons,

respectively. The present findings are in complete agreement with those reported by El-Kady and Abdallah (2004).

Effect of seedlings age:

Data presented in Tables (1 and 2) show clearly that seedling age caused a highly significant effect on number of productive tiller/m^2, number of filled grains/panicle, grain yield and straw yield, but failed to excrete any significant effect on number of branches/panicle and panicle weight in the two seasons of study. 15 days age of seedling resulted in the highest number of productive tillers/ m^2, number of filled grains/panicle, grain yield (11.73 and 12.76 t/ha) and straw yield (16.06 and 15.39 t/ha) without significant differences with 20 days age of seedling in most cases in both seasons. Overall younger seedlings produced higher number of tillers than older seedling, which might be due to less root damage and minimal transplanting shock, as younger seedlings can more easily establish themselves after transplanting in the main field and conscuntly produced more grains/panicle. These results are in accord with those reported by El-Rewainy et al (2007), Krishna et al (2008), Wong et al (2008), Naeem et al (2011), Salem et al (2011), El-Fky (2012), El-Hefnawy (2012), Leila et al (2013), Aggarwal et al (2014), Rajendran and Gameasa (2014), Duraga et al (2015) and Akhilesh et al (2016).

Table (1): Number of productive tillers/m^2, number of branches/ panicle and number of filled grains/ panicle of the two rice varieties as affected by irrigation treatments and seedling age and varieties in 2013 and 2014 seasons.

Characters / Treatment	No of productive tillers/m^2		No. of primary branches/ panicle		No. of filled grains/ panicle	
	2013	2014	2013	2014	2013	2014
Irrigation (I):						
Flooding	418.67b	408.56	8.97b	9.41	140.33	141.57
Saturation	453.06a	425.67	9.20a	9.53	134.52	137.62
F. test	**	NS	*	NS	NS	NS
Seedling age (S):						
15 days	447.17a	446.33a	9.33	9.46	144.18a	145.74a
20 days	422.50b	439.00a	9.27	9.55	140.18a	140.06ab
25 days	397.92b	401.00b	8.66	9.40	127.83b	133.00b
F. test	**	**	NS	NS	**	**
Rice variety (V):						
Sakha105	400.28b	404.44b	9.05	9.28b	137.29	137.37
Hybrid 1	423.44a	429.78a	9.12	9.66a	137.57	141.83
F. test	**	**	NS	**	NS	NS
A x B	**	**	NS	NS	NS	**
A x C	**	**	*	**	**	**
B x C	**	NS	NS	**	NS	**
A x B x C	**	**	**	NS	**	**

*, ** and NS indicated P<0.05%, P<0.01% and not significant, respectively. Means followed by the same letter are not significantly different at the 5% level, using Duncan's multiple range test.

Table (2): Panicle weight (g), grain yield (t/ha) and straw yield (t/ha) of the two rice varieties as affected by irrigation treatment and seedling age in 2013 and 2014 seasons.

Characters / Treatment	Panicle weight (g)		Grain yield (t/ha)		Straw yield (t/ha)	
	2013	2014	2013	2014	2013	2014
Irrigation (I):						
Flooding	3.39	3.33b	10.97a	11.54	13.27a	14.67a
Saturation	3.50	3.49a	10.43b	11.14	12.71b	13.69b
F. test	NS	**	**	NS	**	**
Seedling age (S):						
15 days	3.47	3.63	11.73a	12.76a	16.06a	15.39a
20 days	3.47	3.38	10.91a	11.33b	15.73a	15.28a
25 days	3.39	3.21	9.47b	9.93c	11.70b	11.88b
F. test	NS	NS	**	**	**	**
Rice varieties (V):						
Sakha105	3.42	3.37	10.45	11.22b	13.81b	13.04b
Hybrid 1	3.47	3.46	12.95	12.46a	15.18a	15.33a
F. test	NS	NS	NS	**	**	**
A x B	NS	**	*	NS	**	**
A x C	NS	NS	*	NS	**	**
B x C	NS	NS	NS	**	**	**
A x B x C	NS	**	NS	NS	**	**

*, ** and NS indicated P<0.05%, P<0.01% and not significant, respectively. Means followed by the same letter are not significantly different at the 5% level, using Duncan's multiple range test.

Data in Tables (3 and 4) show that there were significant difference among seedling age regarding germination %, 1000-grain weight, hectolitre weight, protein %, amylose %, hulling % and milling %. Fifteen days old seedling gave the highest values than other treatments. However EC values were decreased with the same treatments. These results are in line with those reported by Singh et al (2004), Krishna et al (2008), Wong et al (2008), El-Hefnawy (2012), Ali et al (2013), Naidu et al (2013) and Pramanik and Bera (2013).

Effect of varieties:

Data illustrated in Tables (1 and 2) confirmed that there were highly significant differences between the two tested rice varieties on number of productive tillers/ m^2 and straw yield in both seasons

Table (3): Laboratory germination, electrical conductivity (µhos/g), 1000-grain weight (g) and hectolitre weight (hl^{-1}) of the two rice varieties as affected by irrigation treatment and seedling age in 2013 and 2014 seasons.

Characters / Treatment	Lab. Germination %		EC(µhos/g)		1000-Grain weight (g)		Hectolitre weight (hl-1)	
	2013	2014	2013	2014	2013	2014	2013	2014
Irrigation (I):								
Flooding	**83.56**	**85.11**	**7.18b**	**6.76**	**25.45**	**25.45**	**75.09a**	**74.63a**
Saturation	**77.11**	**77.56**	**7.76a**	**7.04**	**25.30**	**25.27**	**73.87b**	**73.41b**
F. test	**NS**	**NS**	**	**NS**	**NS**	**NS**	**	**
Seedling age (S):								
15 days	**86.33a**	**86.67a**	**7.19b**	**6.68b**	**26.24a**	**25.71a**	**75.14a**	**74.68a**
20 days	**84.00a**	**81.67ab**	**7.38b**	**6.83b**	**24.97b**	**25.46ab**	**74.48b**	**74.02b**
25 days	**70.67b**	**76.00b**	**7.85a**	**7.19a**	**24.92b**	**24.91b**	**73.83c**	**73.37c**
F. test	**	**	**	**	**	**	**	**
Rice varieties (V):								
Sakha105	**68.44**	**80.22**	**7.81a**	**7.18a**	**24.87b**	**25.25**	**74.20b**	**73.74b**
Hybrid 1	**82.22**	**82.44**	**7.14b**	**6.62b**	**25.88a**	**25.46**	**74.76a**	**74.30a**
F. test	**NS**	**NS**	**	**	**	**NS**	**	
I xS	**	**	**	*	**NS**	**	**	**
Ix V	**NS**	**NS**	**	**	**	**NS**	**NS**	*
S x V	**	**	**	**	**	**	**	*
I x Sx V	*	**	**	**	**	**NS**	**	**

*, ** and NS indicated P<0.05%, P<0.01% and not significant, respectively. Means followed by the same letter are not significantly different at the 5% level, using Duncan's multiple range test.

Table (4): Protein content %, amylose content %, hulling %and milling % of the two rice varieties as affected by irrigation treatment and seedling age in 2013 and 2014 seasons.

Characters / Treatment	Protein content %		Amylose content %		Hulling %		Milling %	
	2013	2014	2013	2013	2013	2014	2013	2014
Irrigation (I):								
Flooding	7.99a	7.94a	18.67	18.67	85.40a	84.70a	63.20a	63.27a
Saturation	7.60b	7.58b	18.72	18.66	75.96b	75.73b	62.89b	62.95b
F. test	**	**	NS	NS	**	**	**	**
Seedling age (S):								
15 days	8.42a	8.10a	19.37a	19.33a	85.67a	85.03a	63.65a	63.74a
20 days	8.02b	7.97b	18.55b	18.51b	84.12b	83.61b	63.34b	63.40b
25 days	7.45c	6.91c	18.17c	18.14c	78.25c	78.00c	62.16c	62.19c
F. test	**	**	**	**	**	**	**	**
Rice varieties (V):								
Sakha105	7.65b	7.60b	18.51b	18.47b	79.85b	79.18b	62.62b	62.71b
Hybrid 1	7.95a	7.88a	18.89a	18.85a	85.51a	85.25a	63.47a	63.52a
F. test	**	**	**	**	**	**	**	**
A x B	**	**	**	**	**	**	**	**
A x C	**	**	**	**	**	**	**	**
B x C	**	**	**	**	**	**	**	**
A x B x C	**	**	**	**	**	**	**	**

*, ** and NS indicated P<0.05%, P<0.01% and not significant, respectively.

Means followed by the same letter are not significantly different at the 5% level, using Duncan's multiple range tests.

and number of branches/panicle and grain yield in only the second season, but there were no significant differences between the two varieties on filled grains/panicle and panicle weight in the two seasons. The Egyptian Hybrid1 showed superiority in these characters compared with Sakha 105 inbred rice variety. These results might be attributed to the differences among these cultivars in their genetic constitutions as well as their response to the prevailing environmental conditions. These results are in line with those reported by El-Rewainy et al (2007), Salem (2011), El-Fky (2012) and El-Hefnawy (2012).

Data in Tables (3 and 4) show that there were significant differences between rice varieties on 1000-grain weight in the first season and on hectoliter weight, protein content, amylase content, hulling % and milling % in both seasons. The tested Egyptian Hybrid 1 showed superiority in these characters compared with Sakha 105 inbred rice varity. However, conductivity value decreased with Egyptian Hybrid 1. These results were parallel with those reported by El-Maksoud (2008) and El-Hefnawy (2012).

Effect of interaction:

As shown in Table (5) the interaction among the three factors under study had a significant effect on number of productive tillers/ m^2, number of filled grains/panicle and straw yield in both seasons as well as on number of primary branches/panicle in the second season and panicle weight in the first season. Egyptian Hybrid 1 recorded the highest number of productive tillers/m^2 with saturation system under 15 days old seedling (718.33 and 504.00) in both seasons, respectively,

while Sakha 105 with 15 days under saturation system gave the highest number of branches/panicle (10.68) in the first season. Egyptian Hybrid 1 rice varity recorded the highest number of filled grains/panicle with 20 days old seedling under saturation system (168.88 and 165.47) in the two seasons, respectively. Sakha 105 rice varity with twenty days old seedling under flooding system gave the highest panicle weight (4.31 g) in the second season.

Table (5): Effect of interaction among irrigation treatment, seedling age and two rice varieties on number of productive tillers/m^2, number of branches/ panicle, number of filled grains/ panicle, panicle weight and straw yield in 2013 and 2014 seasons.

Characters / Treatments	No of productive tillers/m^2	No.of branches/ panicle	No.of filled grains/panicle	Panicle weight
I1S1V1	608.33c	8.27b	146.33ab	3.90a
I1S1V2	322.00f	9.58ab	120.67cde	3.23a
I1S2V1	526.67d	8.67b	150.33ab	3.60a
I1S2V2	218.33h	9.67ab	114.00de	3.91a
I1S3V1	541.67d	9.15ab	140.00bc	3.16a
I1S3V2	300.00fg	8.50b	105.80e	3.19a
I2S1V1	170.00h	10.68a	136.73bcd	3.90a
I2S1V2	718.33a	8.77b	153.00ab	3.23a
I2S2V1	268.33g	9.60ab	107.47e	3.60a
I2S2V2	676.67b	9.13ab	168.88a	3.91a
I2S3V1	291.67fg	7.93b	112.87de	3.16a
I2S3V2	458.33e	9.07ab	133.00bcd	3.19a
F-test	**	**	**	NS
I1S1V1	380.67d	9.03a	152.07abc	2.91bc
I1S1V2	415.33bcd	9.20a	161.13ab	3.78ab
I1S2V1	379.67d	10.20a	94.47e	4.31a
I1S2V2	518.00a	9.33a	134.83bcd	3.53ab
I1S3V1	360.33d	9.27a	119.43de	3.43a-c
I1S3V2	397.33cd	9.40a	133.83cd	2.99bc
I2S1V1	485.33ab	8.93a	103.90e	2.91bc
I2S1V2	504.00a	10.67a	145.87a-d	3.78ab
I2S2V1	463.00abc	9.07a	145.47a-d	4.31a
I2S2V2	395.33cd	9.60a	165.47a	3.53ab
I2S3V1	357.67d	9.20a	158.90a-c	3.43a-c
I2S3V2	348.67d	9.73a	993.83e	2.99bc
F-test	**	NS	**	**

Means followed by the same letter within columns are not significantly different at the 5% level, using Duncan's multiple range test.

I- irrigation (I1-flooding , I2- saturation) S- seedling age (S1-15 days, S2-20days S3-25 days) V- varieties (V1-Sakha 105, V2- Hybrid1)

Data in Table (6) show that the interaction among the three factors under study significantly affected germination %, conductivity, hectoliter weight, protein content, amylase content, hulling % and milling % in both seasons as well as 1000- grain weight was significant in the first season only. Flooding system and 15 days old seedling with Egyptian Hybrid 1 gave the highest germination percentage (96.67 %) in the first season, while flooding and 20 days old seedling with Egyptian Hybrid 1 varity gave the highest one (96.71 %) in the second season. Flooding irrigation treatments with first age and Egyptian Hybrid 1 produced significantly the highest numerical values of 1000-

grain weight (28.50 g) in the first season, hectoliter weight (76.51 and 76.06 g), protein content (8.68 and 8.61 %), amylase content (20.43 and 20.44 %) and milling % (64.34 and 64.44 %) in both seasons, respectively. While, flooding system with 15 days old seedling and Sakha 105 rice varity gave the highest hulling % (92.75 and 91.70 %) in 2013 and 2014 seasons, respectively. Electrical conductivity was decreased under flooding with 25 days and Hybrid 1 (6.57) in the first season and under flooding with 20 days and Hybrid 1 (5.69) in the second season.

Table (6): Effect of interaction among irrigation treatment, seedling age and two rice varieties on germination %, EC, 100-grain weight, hectoliter weight, protein %, amylase %, hulling % and milling % in 2013 and 2014 seasons.

Characters / Treatment	Germination %	EC (µhos/gm)	1000-Grain weight (g)	Hectolitre weight	Protein content	Amylose content	Hulling %	Milling %
	2013							
I1S1V1	94.00ab	8.15b	23.40c	75.53a-c	8.55ab	18.72de	92.75a	63.54c
I1S1V2	96.67a	6.74de	28.50a	76.51a	8.68a	20.43a	89.71c	64.34a
I1S2V1	90.67ab	6.99de	27.23ab	73.92de	bc	17.78h	90.86b	63.35d
I1S2V2	78.67b-d	7.79bc	21.97c	74.57b-d	5.44b	19.16c	88.75e	64.18b
I1S3V1	54.67e	6.83de	27.83ab	74.52b-d	6.94ef	17.75h	87.71g	61.06i
I1S3V2	78.67b-d	6.57e	21.97c	75.48a-c	6.95ef	18.20g	86.62h	62.73f
I2S1V1	682.67bc	7.41cd	23.40c	74.44cd	7.89d	19.71b	70.77i	63.06e
I2S1V2	64.00c-e	7.44cd	23.67c	74.06de	8.56ab	18.63def	89.43d	63.64c
I2S2V1	84.00ab	7.75bc	22.37c	73.79de	7.16e	18.74d	68.71k	62.43h
I2S2V2	82.67bc	6.97de	27.50ab	75.65ab	8.15c	18.51def	88.16f	63.39d
I2S3V1	62.67de	9.69a	23.17c	73.00ef	6.901f	18.33fg	68.30l	62.30i
I2S3V2	86.67ab	8.32b	25.70b	72.30f	6.95ef	18.40efg	70.37j	62.54g
F-test	*	**	**	**	**	**	**	**
	2014							
I1S1V1	81.38ab	7.01b-d	25.77a	75.07a-c	8.57ab	18.69d	91.70a	63.66c
I1S1V2	80.00c	6.20de	26.20a	76.06a	8.61a	20.44a	89.07b	64.44a
I1S2V1	57.33d	8.37a	23.93a	73.46de	8.28d	17.70h	89.28b	63.44d
I1S2V2	96.71a	5.69e	25.16a	74.12b-d	8.39c	19.19c	88.61c	64.21b
I1S3V1	86.00ab	6.46de	25.69a	74.06b-d	6.86i	17.77h	87.15e	61.14i
I1S3V2	78.67c	6.81cd	24.93a	75.02a-c	6.94h	18.20g	86.41f	62.75f
I2S1V1	80.00c	6.95b-d	23.89a	73.98cd	7.91f	19.71b	70.30g	63.15e
I2S1V2	76.67bc	6.56de	25.96a	73.61de	8.51b	18.49e	89.06b	63.70c
I2S2V1	79.67c	6.56de	26.97a	73.33de	7.09g	18.69d	68.43h	62.54g
I2S2V2	80.89c	6.68d	25.77a	75.20ab	8.12e	18.46e	88.11d	63.43d
I2S3V1	65.33d	7.70a-c	25.26a	72.55ef	6.89hi	18.27fg	68.22h	62.31h
I2S3V2	64.00d	7.79ab	23.76a	71.84f	6.95h	18.33f	70.24g	62.58g
F-test	**	**	NS	**	**	**	**	**

Means followed by the same letter within columns are not significantly different at the 5% level, using Duncan's multiple range test.

I- irrigation (I1-flooding , I2- saturation) S- seedling age (S1-15 days, S2-20days S3-25 days) V-varieties (V1-Sakha 105, V2- Hybrid1)

CONCLUSION

From the obtained results of both growing seasons field's study, it was concluded that yield, its components, grain composition, quality and viability of rice crop were increased with utilization of Egyptian Hybrid 1 variety with youngest seedling age (15 day old) and

flooding treatment under the system of rice intensification (SRI), under the environmental conditions of this research.

REFERENCE

A. O. A. C. 1990. Official methods of analysis. The Association of Official Analytical Chemists 15th (Edition, Published by Association of Official Analytical Chemists, Arrington, Virginia, USA.)

A. O. S. A., 1986. Association of Official Seed Analysis Seed Vigor Testing Hand Book, No., 32, p. 1.

Aggarwal. N, S. Avtar and Sh. Savita. 2014. Chemical composition, milling and cooking quality of mechanically transplanted rice in relation to seedling age and plant population. Oryza-An International Journal on Rice. Vol.51, Iss:4. P (309-314).

Akhilesh. V, J. K. Singh, A. V. Sen, J. S. Bohra and S. Singh. 2016. Effect of transplanting date and age of seedlings on growth, yield and quality of hybrids under system of rice (Oryza sativa) intensification and their effect on soil fertility. The Indian Journal of Agriculture Sciences. Vol 86, No 5.

Ali, M. S., Hasan., S. Sikder., M. R. Islam and M. H. R. Hafiz. 2013. Effect of Seedling Age and Water management on the performance of Boro rice (Oryza sativa L.) variety BRRI Dhan28. The Agriculturists 11(2): 28-37.

Duncan, D. B. (1955). Multiple range and multiple F test. Biometrics, 11:1-42.

Duraga. K. K. ., P. S. Rao and K. Raju. 2015. Effect of seedling age and spacing schedule on the productivity and quality traits of rice under system of rice intensification (SRI). Journal of Cereal and Oilseeds vol. 6 (3).15-19.

El-Fky. K. A. 2012. Evaluation of some SRI (system of rice intensification) treatments and its effect on rice productivity in North Delta . Ph D. Thesis, Kafrelsheikh Univ., Egypt.

El-Hefnawy., T. M. 2012. The effect of system of rice intensification (SRI) on productivity of rice. M.S. Thesis, Mansoura University, Egypt.

El-Kady, A. A. and A. A. Abdallah. 2004. A study on the effect of planting methods and water management on some grain quality characters of rice. Egyptian J. of Agric. Res. 139-147.

El-Maksoud, M. F. A. 2008. Effect of levels and splitting of N-fertilization on growth, yield components, yield and grain quality of some rice cultivars. Res. J. of Agric. and Bio. Sci. 392-398.

El-Rewainy. I.M . S.A. Hamoud, T.F.Metwaly and S.E. Sedeek. 2007. Response of two rice cultivars to different seedling ages and nitrogen levels. African Crop Science Conference Proceedings Vol. 8. pp. 1937-19410.

Ginigaddara. G. A. S and S.L. Ranamukhaarachchi. 2011. Study of age of seedling at transplanting on growth dynamics and yield of rice under alternating flooding and suspension of irrigation of water

management. Recent Research in Science and Technology. 3(3): 76-88.

Gilbert, G.A and Spragg, S.P. 1964. Iodine Sorption: "Blue Value". In: WHISTLER, R.L. Methods in carbohydrate chemistry: volume IV - starch. London: Academic. p.168-169.

I.S.T.A, 1993. International Rules for Seed Testing. Seed Sci. and Technol., 21: 24-46.

Krishna. A, N. K. Biradarpatil, K. Manjappa and B. B. Channappagoudar. 2008. Evaluation of System of Rice Intensification Cultivation, Seedling Age and Spacing on Seed Yield and Quality in Samba Masuhri (BPT-5204) Rice. Karnataka J. Agric. Sci., 21 (1) (20-25)

Leila R., M. S. Daliri and A. A. Mousavi. 2013. Effect of seedling age on yield and yield component of rice cultivars (Oryza sativa L.). Annals of Biological Research, 4 (2):72-76.

MSTATC, (1990). Microcomputer Program for Design Experiment and Analysis of Agronomic Research Experiments Michigan State Univ.

Naeem.S. M. Maqsood., S. A. Wajid. And M. A. U. Haq. 2011. Impact of nursery seedling density, nitrogen and seedling age on yield and yield attributes of fine rice. Chilean journal of Agricultural Research 71 (3) July- September.

Naidu. G. J., K. T. Rao., A.U. Rao and D. S. Reddy. 2013. Age of seedlings and planting pattern on grain yield, protein content, NPK uptake and post-harvest nutrient status of rice under SRI. Journal of Academia and Industrial Research Vol 2, Is 6.

Pramanik. K and A. K. Bera. 2013. Effect of seedling age and nitrogen fertilizer on growth, chlorophyll content, yield and economics of hybrid rice (Oryza sativa L.). International Journal of Agronomy and Plant Production. Vol., 4 (S), 3489-3499.

Rafaralahy, S. (2002). An NGO perspective on SRI and its origin in Madagascar. In: Assessments of the System of Rice Intensification (SRI): Pro. of the I. Conf., Sanya, China, 17-22.

Rajendran.K, and R. V. Gameasa. 2014. Effect of age of seedling on growth and yield of rice. India Journal of Advances in Plant Research, vol.1 (5):62-66.

Salem. A.K.M., W.M. ElKhoby, A.B. Abou-Khalifa and M. Ceesay. 2011. Effect of nitrogen fertilizer and seedling age on inbred and hybrid rice varieties. American-Eurasian J. Agric. & Environ. Sci., 11 (5): 640-646.

Shantappa. D, K. Tirupataiah, K. R. Yella, K. Sandhyrami, R. K. Mahenndra and K. Malamasuri. 2014. Yield and water productivity of rice under different cultivation practices and irrigation regimes. Integrated water Resources Management (IWRM). February 19-21. p 938-943.

Singh, K. K.; S. K. Yadav; B. S. Tomar; J. N. Singh and P. K. Singh. 2004. Effect of seedling age on seed yield and seed quality attributes in rice (Oryza sativa L).cv. Pusa Basmati-1. Seed Res. 5-8.

Singh, R.S. and Singh, S.B. 1998. Response of rice (*Oryza sativa*) to age of seedlings and levels and time of nitrogen under irrigated condition. *Indian J. Agron*., 43(4):632-635.

Stoop WA, N. Uphoff and A. Kassam . 2002. A review of agricultural research issues raised by the System of Rice Intensification (SRI) from Madagascar. Opportunities for improving farming systems for resource-poor farmers. Agric. Syst. 71:249-274.

Uphoff, N. 2007. The system of rice intensification: using alternative cultural practices to increase rice production and profitability from existing yield potentials. International Rice Commission Newsletter, Number 55, UN Food and Agriculture Organization, Rome.

Won, Jong-Gun, A. Duok-Jong, K. Se-Jong, C. Chung-Don and L. Sang-Chul. 2008 . Yield and Grain Quality as Affected by Seedling Age in Late Transplanted Rice. Korean Journal of Crop Science. Vol 53, pp.19-23.

الملخص العربي

تأثير نظام الري و عمر الشتلات علي انتاجيه و جوده صنفان من الأرز باستخدام نظام التكثيف.

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***قسم بحوث الأرز -معهد بحوث المحاصيل الحقلية – مركز البحوث الزراعية. ****قسم بحوث تكنولوجيا البذور– معهد بحوث المحاصيل الحقلية – مركز البحوث الزراعية**

اقيم هذا البحث في المزرعه البحثية بمحطه بحوث سخا و معمل تكنولوجيا البذور بمحطة البحوث الزراعية بسخا- بكفر الشيخ - جمهورية مصر العربية و ذلك لدراسه تقييم بعض معاملات نظام التكثيف علي زراعة محصول الأرز و مكوناته و صفات جوده و حيويه الحبوب و ذلك خلال موسمي الزراعة 2013و 2014 علي التوالي. و كان التصميم الأحصائي المستخدم القطع المنشقه مرتين في أربع مكررات حيث وزعت معاملات الري 1- الري بالغمر المستمر 2- الري بالتشبع المستمر في القطع الرئيسيه بينما وضعت أعمار الشتلات حيث يتم نقل الشتلات و شتلها بعد 15 يوم، 20 يوم، 25 يوم في القطع الشقيه الأولي بينما وزعت الأصناف و هي سخا 105 ، هجين 1 في القطع الشقيه الثانيه.

أظهرت النتائج المتحصل عليها زياده كلا من محصول حبوب و محصول قش و وزن الهكتوليتر و تصافي التقشير و التبيض و محتوي البروتين عند استخدام نظام الري بالغمر. و قد اوضحت النتائج ايضا أن نقل الشتلات في عمر صغير و هو 15 يوم تفوق علي باقي الأعمار في عدد الفروع /م2و عدد الحبوب الممتلئة بالسنبلة و محصول الحبوب و محصول القش و نسبه الأنبات المعملي و طول الريشه و الوزن الجاف للبادره و وزن 1000 حبه و وزن الهكتوليتر و تصافي التقشير و التبيض و محتوي البروتين و محتوي الأميلوز في الحبه و انخفاض التوصيل الكهربي للبذرة. و أعطي الهجين 1 اعلي الصفات المحصوليه و صفات الجوده. و قد كان التفاعل بين نظامي الري و اعمار الشتلات و الأصناف معنويا في بعض الصفات. و قد كان للتفاعل بين نظامي الري و أعمار الشتلات و الأصناف تأثير معنويا علي العديد من الصفات المدروسه

من النتائج المتحصل عليها و تحت ظروف هذة الدراسه يمكن ان نستخلص انة بزراعه صنف الأرز هجين 1 بشتلات عمرها 15 يوما و الري بنظام الغمر يمكن ان نحصل علي زيادة في المحصول و مكوناته و تحسين صفات الجودة و الحيوية للحبوب.