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Study some physiological characters, yield and yield component for five new rice varieties under different sowing dates

Ali A. A. Abou Khalifa and I. M. El-Rewainy

Rice Research and Training Center, Filed Crops, Research Institute, ARC, Egypt

ABSTRACT

Field research was conducted for 2 year 2009 and 2010 to evaluation in between rice varieties (Oryza sativa L.) under different sowing dates. at Rice research and training center (RRTC) – Sakha, Kafr- El sheikh, governorate, Egypt. To study five new rice varieties, Sakha 106, Sakha 105, G.Z 7576, G.Z. 9057 and G.Z. 9362 under five sowing dates April 1st , April 10th April 20th , may 1st and may 10th . Seedling age at transplanting was 26 days from sowing and planting spacing 20X20 cm in between hills. All agricultural practices were applied as recommended for each cultivar. As split plot design and four replication were used, five sowing dates allocated in the main plots, and five rice varieties were allocated in sup-plots. Main results induced that sowing date at April 1st gave the highest value on number of days from sowing up to maximum tillering , panicle initiation and flowering dates. And also Rote length(cm), leaf area index , No. of tillers/hill at PI, Chlorophyll content at H.D, Number of tillers/M^2 t maturity stage , Panicle length (cm), Number of grains/panicle ,1000- grains weight(g). and Grains yield /ha except light penetration it was the lowest value. While may 10th gave the lowest value for all Preview attributes. As Sakha surpassed other varieties under study to all previous attributes whoever G.Z. 9362 gave the lowest value.

INTRODUCTION

Rice is an important crop in Egypt. The variation in rice production could be attributable to different climates when other conditions are suitable. The optimal growing season of already growing cultivars has been determined by changing sowing dates of rice. Singh and Parsed (1999), Hari et al., (1999), Pirdashfy et al., (2000). found that delaying sowing decreased the grain, straw yield, harvest index, tiller number, panicle length, number of grain/panicle and fertility percentage. Sherief et al., (2000) studied the effect of sowing dates (April 25th . May 10th , May 25th and June 10th) on yield and yield components of rice. They found that early sowing dates (May 10) had marked effect on number of panicles /m^2 , number of filled grains / panicle, 1000-grain weight, grain and straw yields/fed. As compared with the planting in April 25th, however, late planting in May 25th or June 10 significantly reduced the above mentioned characteristics. (Song et al 1990), and larger leaf area index (LAI) during the grain-filling period, but the physiological basis for heterosis remains unknown. El-Hity et al. (1987) found that the number of days from sowing up to panicle initiation (P.I), Maximum tillering (M.T.), heading dates (H.D.) and grain yield (T/ha) were drastically reduced with delay of sowing time.

(Hoshikawa, 1967; Egli, 1998). From previous studies, however, it is doubtful that assimilate supply to the grain during the early grain filling period alone defines potential grain growth and determines final grain weight. If assimilate supply to rice is restricted by shading or unfavorable cultivated conditions in the first 10 d of the grain filling period, the grain may be profoundly affected, as grain growth rate is generally highest within the 2 wk after heading (Yoshida, 1981). The larger part of the active phase of grain dry matter increase may thus encounter restricted assimilate supply. Assimilate shortfall during the rest of the grain filling period could also cause reduction of final grain weight. Past experiments (Tanaka and Matsushima, 1963; Nagato and Chaudhry, 1970; Nagato et al., 1971; Tsukaguchi et al., 1996; Horie et al., 1997). demonstrated that rice plants that suffered from severe deficiency of assimilate supply due to short-term soil desiccation during the early and middle grain filling periods exhibited grain dry matter increases as large as no stressed plants did when the water deficit was redressed. It can thus be hypothesized that potential grain dry matter increase is not inevitably determined by shortage of assimilate supply during the early grain filling period when plants are grown under unfavorable environmental conditions .

Our objective was to test the hypothesis that shortage of assimilate supply to grain by shading during the early grain filling period of the first 10 days after heading does not reduce the rice grain weight at harvest if assimilate supply during the rest of the grain filling period is improved by thinning. Larger leaf area index (LAI) during the grain-filling period, but the physiological basis for heterosis remains unknown Peng (1998). El-Khoby (2004) showed that delaying sowing date sharply decreased the leaf area index, dry matter production and chlorophyll content. In addition, delaying sowing date up to June 15th significantly reduced the period from sowing to heading. Abou Khalifa (2005) found that number of days from sowing up to maximum tillering, panicle initiation and heading date was significant affected by different sowing dates. The number of days was higher under early sowing (April 20th) and gradually decreased with delayed sowing up to May 20th .

Singh and Parsed (1999), Hari et al., (1999), Pirdashfy et al., (2000). found that delaying sowing decreased the grain, straw yield, harvest index, tiller number, panicle length, number of grain/panicle and fertility percentage. Sherief et al., (2000) studied the effect of sowing dates (April 25th . May 10th , May 25th and June 10th) on yield and yield components of rice. They found that early sowing dates (May 10) had marked effect on number of panicles /m^2, number of filled grains / panicle, 1000-grain weight, grain and straw yields/fed. As compared with the planting in April 25th, however, late planting in May 25th or June 10 significantly reduced the above mentioned characteristics. (Song et al 1990), and larger leaf area index (LAI) during the grain-filling period, but the physiological basis for heterosis remains unknown. Ryo Matsuda[1], et al (2004) found that In rice plants grown under red light supplemented with blue light (red/blue-light PPFD ratio was 4/1), photosynthetic rates per unit leaf area measured under white light at 1,600 and 250 µmol m^{-2} s^{-1} were higher than those in the plants grown under red light alone. The higher photosynthetic rates were associated with higher total N content of leaves, which was accompanied by larger amounts of key components of photosynthesis-limiting processes, including Rubisco, Cyt *f*, Chl and LHCII. These results suggested that the increase in total N content of leaves induced by supplemental blue light enhanced both light-saturated and light-limited photosynthesis.

MATERIALS AND METHODS

A field experiment was conducted at Rice Research and training center (Sakha—Kafr El sheikh – Egypt). In 2009 and 2010 rice growth seasons to Study some physiological characters, yield and yield component on five new rice varieties under different sowing dates. five rice varieties were namely, five new rice varieties, Sakha 106, Sakha 105, G.Z *7576*, *G.Z. 9057* and *G.Z. 9362* under five sowing dates April 1st , April 10th April 20th , may 1st and may 10th Seedling age at transplanting was 26 days from sowing by 20X20 cm planting spacing. for all rice varieties in 3X5 M plots.

All cultural practices were applied as recommended for each rice varieties. Split-split plot design with four replications was used. Sowing dates were allocated in the main plots, rice varieties occurred in sub plot. Soupier phosphate 15% was added by p2o5 form before land preparation by rate (45% p2 o5). Nitrogen fertilizer was used in the urea form (46.5%N) for two splits (2/3 dose was applied mixed in the dry soil before flooding. 1/3 dose was added at panicle initiation stage of each rice variety). Maximum tillering, Panicle Initiation and heading dates were recorded for each variety considering the number of days from sowing up to maximum tillering, Panicle Initiation and 50% heading respectively. After complete heading, leaf area index and total chlorophyll content in the leaves of plants were recorded using chlorophyll meter 5 SPAD-502 Minolta Camera Co. Ltd., Japan. (Futuhara et al., 1979). Ten panicles were taken every three days to recorded grains filling in each plot. Before harvest. Number of tillers /hill was counted. Average number of tillers for five hills. Calculated roots length (cm): it was determined for each sample in cm was measured as the distance between soil surfaces up to the top of roots. Grain yield was measured from 12 m^2 (3 X 4 m) in the center of sub-plot. Grain yield was adjusted to 14 % moisture content determined according to Yoshida (1981) harvest index = (Economic yield/ Biological yield) (RRTC 2002), B.V.P= basic vegetative phase: = (the highest date to heading – 35 days).PSP= photoperiod sensitive phase; = (the highest date of heading – the lowest date to heading RRTC (2002).Sink capacity = number of spikelets per m^2 (Yoshida and Parao 1976), Spikelets-leaf area ratio = number of spikelets/ unit leaf area. RRTC(2002).ten panicles were randomly elected from each sup plot to determine 1000-grain weight and number of grain per panicle. Data collected were subjected to statistical analysis of variance according to Gomez and Gomez (1984) using GENSTAT computer program.

RESULTS AND DISCUSSION

Number of days from sowing up to Maximum tillers, panicle initiation and flowering dates. Light penetration, leaf area index, chlorophyll content, number of panicles / m^2, 1000-grain weight, panicle length (cm), number of grains/ panicle, grain yield, As affected by some rice varieties under different dates of sowing.

Table .1. Maximum tillering, panicle initiation and flowering dates as affected by some rice varieties and sowing dates

Characters / Treatments	April 1st	April 10th	April 20th	May 1st	May 10th	B.V.P	P.S.P
			maximum tillering stage				
Rice variety							
Sakha 106	64	63	62	61	60		
Sakha 105	65	64	63	62	61		
G.Z. 7576	65	64	64	63	62		
G.Z. 9057	66	65	64	63	63		
G.Z. 9362	67	65	65	64	63		
L.S.D at 5%			**2.01**				
			panicle initiation stage				
Rice variety							
Sakha 106	64	63	62	61	60		
Sakha 105	65	64	63	62	61		
G.Z. 7576	65	64	64	63	62		
G.Z. 9057	66	65	64	63	63		
G.Z. 9362	67	65	65	64	63		
L.S.D at 5%			**1.59**				
			Flowering stage				
Rice variety							
Sakha 106	103	102	101	100	99	68	4
Sakha 105	104	103	103	101	100	69	4
G.Z. 7576	104	103	103	102	101	69	3
G.Z. 9057	104	104	103	102	102	69	3
G.Z. 9362	105	104	104	103	102	70	3
L.S.D at 5%			**1.66**				

M.T. maximum tillering, P.I. panicle initiation, F.S. flowering stage. B.V.P= basic vegetative phase: = (the highest date to heading – 35 days)PSP= photoperiod sensitive phase; = (the highest date of heading – the lowest date to heading (RRTC 2002).

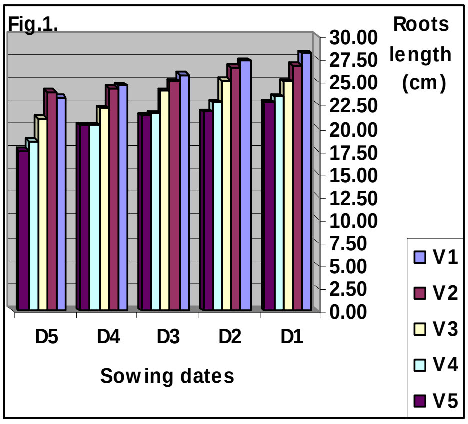
Data in table (1): found that maximum tillering, Panicle Initiation, flowering stage were gradually decreased by delaying of sowing dates up to May 10th . also Sakha 106 gave the lowest value of maximum, panicle initiation , flowering stage and B.V.P. While G.Z. 9362 gave the highest value M.T., P.I. , F.S. and B.V.P. but no significant effect therefore all the varieties under study early maturity stage and not sensitive for day length and photoperiod phase. Also, a agricultural period for rice varieties very long without decrease of grains yield in both seasons These data are in agreement with those reported by El-Hity et al. (1987), Singh and Parsed (1999), Hari et al., (1999), Pirdashfy et al., (2000).

Date in table .2. Showed that April 1st date of sowing gave the highest value of roots length (cm), leaf area index, No. of tillers/hill at PI, except Light penetration at heading dates it was the lowest value. But May 10th gave the lowest value for the previous attributes except Light penetration it was highest value compared with other date of sowing. While no significant in between April 1st and April 10th in roots length (cm) in 2009 season. Sakha 106 surpassed other varieties for all the previous attributes but Sakha 106 gave the lowest value in light penetration. While G.Z. 9362 gave the lowest value for all previous attributes while G.Z. 9362 surpassed other varieties in light penetration. These data are in agreement with those reported by, Peng (1998). Song et al 1990, El-Khoby (2004) Ryo Matsuda[1], et al (2004). Abou Khalifa (2005).

Table .2. Effect of sowing dates and some rice varieties on roots length (cm), L.A.I., No. of tillers/hill at (P.I.), leaf area index at (P.I.) and Light penetration at heading dates.

Characters Treatments	roots length(cm)		L.A.I.		No. of tillers/hill at PI		L.P at H.D	
	2009	2010	2009	2010	2009	2010	2009	2010
Sowing dates								
April 1st	25.43	24.99	5.27	5.04	26	25	1628	1710
April 10th	24.72	24.72	5.11	4.86	24	23	1802	1803
April 20th	23.50	23.50	4.90	4.73	23	22	2255	2256
May 1st	22.53	22.52	4.70	4.53	22	20	2445	2446
May 10th	20.83	20.83	4.39	4.20	20	19	2855	2856
L.S.D at 5%	*0.71*	*0.68*	*0.11*	*0.15*	*0.49*	*0.67*	*182*	*183*
Varieties								
Sakha 106	25.91	25.78	5.69	5.36	26	24	1540	1555
Sakha 105	25.35	25.26	5.27	5.08	24	23	1839	1853
G.Z. 7576	23.71	23.65	4.84	4.70	23	22	2330	2356
G.Z. 9057	21.30	21.26	4.32	4.19	22	21	2520	2551
G.Z. 9362	20.78	20.62	4.24	4.04	19	19	2755	2756
L.S.D at 5%	*0.59*	*0.60*	*0.22*	*0.19*	*1.19*	*1.12*	*137*	*137*

Fig.1. and Fig.2. Effect of the interaction between sowing dates and some rice varieties on Roots length and leaf area index (L.A.I.).



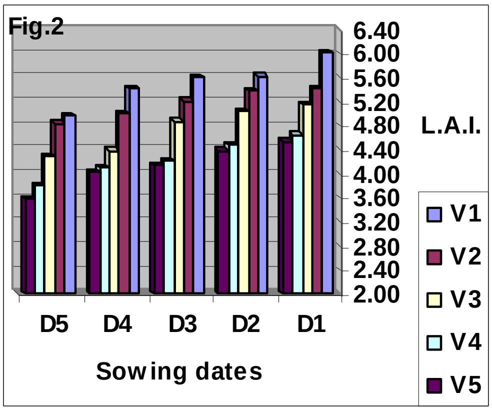


Table .3. Chlorophyll content at H.D, number of days up to panicle initiation, flowering dates and Number of tillers/M2 at maturity stage as affected by sowing dates and some rice varieties.

Characters Treatments	Chlorophyll content at H.D.		Number of days up to Panicle initiation		Number of days up to flowering dates		Number of tillers/M^2 at maturity stage	
	2009	2010	2009	2010	2009	2010	2009	2010
Sowing dates								
April 1st	44.15	43.58	66	64	105	103	655	620
April 10th	43.64	43.01	65	63	104	102	619	586
April 20th	42.75	42.23	64	62	104	102	587	555
May 1st	42.10	41.39	64	62	102	101	554	519
May 10th	41.35	40.79	62	61	101	101	515	490
L.S.D at 5%	*0.12*	*0.32*	*1.51*	*1.00*	*0.35*	*0.54*	*22.38*	*18.22*
Varieties								
Sakha 106	45.36	44.75	63	61	102	101	649	615
Sakha 105	43.71	43.27	64	62	103	102	624	582
G.Z. 7576	43.14	42.54	65	63	104	102	585	557
G.Z. 9057	42.12	41.51	65	63	104	102	569	531
G.Z. 9362	39.67	38.94	66	64	104	103	504	484
L.S.D at 5%	*0.70*	*0.71*	*0.72*	*0.65*	*0.76*	*0.57*	*26.63*	*23.64*

Data in Fig.1. and Fig.2.found that roots length and L.A.I. were gradually decreased by delaying of sowing dates from April 10th up to May 10th**.** So April 1st gave the highest value for Roots length and L.A.I. But may 10th was the lowest value of Roots length and L.A.I with all rice varieties under study. In both seasons.

Data in table .3. showed that Chlorophyll content at H.D,. number of days up to panicle initiation, flowering dates and Number of tillers/M2 at maturity stage as affected by sowing dates and some rice varieties. So April 1st gave the highest value Chlorophyll content at H.D,. number of days up to panicle initiation, flowering dates and Number of tillers/M2 at maturity stage. While May 10th gave the lowest value for the same characters. Sakha 106 high significant than other varieties under study on all previous attributes but G.Z. 9362 was the lowest value. These data are in agreement with those reported by Song et al 1990, Peng (1998). El-Khoby (2004), Abou Khalifa (2005).

Fig.3. chlorophyll contact as affected by some rice varieties under different sowing dates.

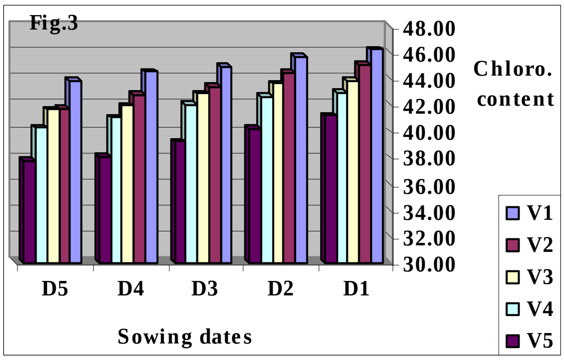


Fig.3. found that April 1st gave the highest value of chlorophyll content with rice varieties under study. But may 10th was lowest value of chlorophyll content with rice varieties under study also. While Sakha was the best variety with early sowing date April 10th .

Table .4. panicle length(cm), Number of grains/panicle, 1000-grains weight (g) and grains yield (t/ha) as affected by some rice varieties and different sowing dates

Characters Treatments	Panicle length (cm)		Number of grains/panicle		1000- grains weight(g).		Grains yield /ha	
	2009	2010	2009	2010	2009	2010	2009	2010
Sowing dates								
April 1st	21.00	20.91	117	117	25.45	25.13	10.01	9.83
April 10th	20.53	20.26	115	113	24.45	24.16	9.88	9.56
April 20th	19.50	19.36	113	112	23.78	23.47	9.71	9.33
May 1st	18.68	18.74	110	109	23.25	22.97	9.50	9.07
May 10th	18.39	18.23	108	107	22.81	22.33	9.07	8.77
L.S.D at 5%	*0.56*	*0.39*	*1.70*	*1.15*	*0.4*	*0.93*	*0.15*	*0.13*
Varieties								
Sakha 106	20.59	20.33	117	116	26.26	25.83	10.85	10.56
Sakha 105	20.11	19.96	116	115	24.89	24.53	10.21	9.82
G.Z. 7576	19.46	19.53	112	111	23.76	23.57	9.45	9.12
G.Z. 9057	19.38	19.22	111	110	22.67	23.37	9.17	8.89
G.Z. 9362	18.50	18.37	107	106	22.16	21.77	8.49	8.17
L.S.D at 5%	*0.38*	*0.29*	*1.37*	*1.08*	*0.65*	*0.49*	*0.16*	*0.16*

Data in table .4. Showed that April 1st gave the highest value on panicle length(cm), Number of grains/panicle, 1000-grains weight (g) and grains yield (t/ha). While May 10th date of sowing gave the lowest value on all previous attributes. Sakha 106 rice variety surpassed other varieties under study on panicle length(cm), Number of grains/panicle, 1000-grains weight (g) and grains yield (t/ha). While G.Z. 9362 gave the lowest value of panicle length(cm), Number of grains/panicle, 1000-grains weight (g) and grains yield (t/ha). These data are in agreement with those reported by Singh and Parsed (1999), Hari et al., (1999), Pirdashfy et al., (2000).

Fig.4. Grains yield (T/ha) as affected by some rice varieties under different sowing dates

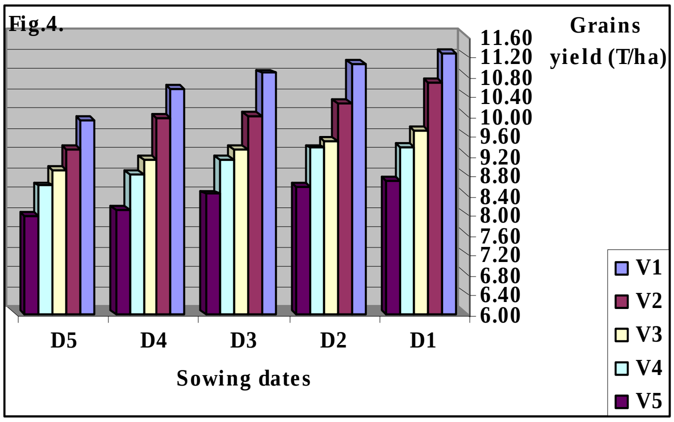


Fig.4. found that the interaction in between first date of sowing April 1st with Sakha 106 gave the highest value of grains yield(T/ha) and G.Z. 9362 with May 10th gave the lowest value of grains yield (T/ha) therefore Sakha 106 the best of variety. And the best of period for rice sowing from April 1st up to last of May.

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