African Journal of Plant Science Vol. 3 (4), pp. 053-058, April 2009
Available online at http://www.academicjournals.org/AJPS
ISSN 1996-0824 © 2009 Academic Journals

Full Length Research Paper

Evaluation of some hybrid rice varieties in under different sowing times

Ali Abdalla Basyouni Abou-Khalif

Rice research and training center, filed crops, research institute, ARC, Egypt. E-mail: khalifaaliabdalla@yahoo.com.

Accepted 26 of March, 2009

A field experiment was conducted in the experimental farm of Rice Research and Training Center (RRTC) – Sakha, Kafr- El Sheikh Governorate, and Egypt during rice season in 2008 for physiological evaluation of some hybrid rice varieties in different sowing dates. Four hybrid rice H1, H2, GZ 6522 and GZ 6903 were used. Seeds were sown on six different sowing dates April 10th, April 20th, May 1st, May 10th, May 20th and June 1st; and seedlings of 26 days old were transplanted at 20 × 20 cm spacing. All agricultural practices recommended for each cultivar were applied. Nitrogen fertilizer was used as urea (46.5% N) in two splits; that is, 2/3 were added and mixed in dry soil before flooding of irrigation water and the other 1/3 was added at panicle initiation stage. Experimental design was spilt plot design, with sowing dates as main and varieties as sub plot treatments. Results indicated that early date of sowing (April 20th) was superior to other dates of sowing for MT, PI, HD, number of tillers /M2, (plant height and root length) at PI and HD stage, chlorophyll content, number of days up to PI and HD, leaf area index, sink capacity , spikelets-leaf area ratio, number of grains / panicle, panicle length(cm), 1000-grain weight (g), number of panicles/ M2, panicle weight (g) and grain yield (ton/ha). Sterility percentage was the lowest in sowing 20th April. 1st of June, sowing gave the lowest with all traits under study. H1 hybrid rice variety surpassed other varieties for all characters studied except for number of days to PI and HD.

Key words: Sowing dates, hybrid rice, physiological characters and yield.

INTRODUCTION

The variation in rice production could be attributable to different climates when other conditions are suitable. The optimal growing season of popular cultivars has been determined by testing their growth and yields at different sowing dates. Singh and Parsed (1999), Hari et al. (1999), and Pirdashfy et al. (2000). Found that delayed sowing decreased the grain and, 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 showed marked effect on number of panicles /m^2, number of filled grains / panicle, 1000-grain weight, grain and straw yields/fed by early sowing (May 10). As compared to the planting in April 25th, however, late planting in May 25th or June 10 significantly reduced the above characteristics mentioned. El-Hity et al. (1987) found that the number of days from sowing 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. Khalifa (2005) observed that early sowing date on April 20th gave the highest values of leaf area index (LAI), sink capacity [number of spikelets per M^2 X1000], spikelets/leaf area ratio, panicle length, and number of filled grains (%). H5 hybrid rice cultivar surpassed the other cultivars in leaf area index and sink capacity (Toole, 1993).

Reports of Ritchie et al. (1989), Penning de Varies et al. (1989), William et al. (1989), Singh et al. (1993) and Toth (1978) indicated that the highest grain yield of rice came from the 2nd may of sowing under of Philippines conditions.

More than 80% variation in rice yield was attributable to variation in spikelet number / m^2 at different of the seasonal (Yoshida and Parao, 1976).

MATERIALS AND METHODS

A field experiment was conducted in Rice Research and training center (Sakha—kafr El sheikh – Egypt). During season for physiological evaluation of some hybrid rice varieties under different sowing dates. Four rice hybrids - H1, H2, GZ 6522 and GZ 6903 were tested in six sowing dates, that is, (D1) April 10th, (D2) April 20th, (D3) May 1st, (D4) May 10th, (D5) May 20th and (D6) June 1st, and the seedlings of 26 days age were transplanted at 20 × 20 cm

Table 1. Number of days from sowing date up to maximum tillering, Panicle initiation, heading dates, B.V.P and P.S.P. of some hybrid rice as affected by different sowing dates.

Sowing dates	April 10th	April 20th	May 1st	May 10th	May 20th	June 1st	B.V.P	P.S.P
Rice varieties								
Number of days from sowing to maximum tillering (MT)								
Rice varieties	70		60	55	54	52		
H1	73	65	58	56	54	54		
H2	64	70	54	51	47	46		
GZ 6522	75	63	62	59	55	48		
GZ 6903		73						
LSD at 5%								3.71
CV								3.3
Number of days from sowing to panicle initiation (PI)								
Rice varieties								
H1	74	70	62	60	59	57		
H2	77	74	64	61	59	59		
GZ 6522	68	67	58	56	52	51		
GZ 6903	80	77	66	64	60	53		
LSD at 5%								3.1
CV								2.4
Number of days from sowing to 50% heading								
Rice varieties								
H1	108	105	95	95	94	92	73	14
H2	112	107	96	95	94	94	77	18
GZ 6522	102	101	96	91	87	86	67	16
GZ 6903	115	112	100	99	95	88	80	27
LSD at 5%								3.13
CV								1.7

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 Yoshida and Parao 1976).

spacing in 4 × 4 M plots. All cultural practices were applied uniformly as recommended for rice varieties. The split plot design with four replications was used. Sowing dates were allocated in the main plots, while rice varieties occurred in sub plot. Nitrogen fertilizer was used in the urea form (46.5%N) in two splits (2/3 of dose were applied and mixed in the dry soil before flooding, and the other 1/3 dose was added at panicle initiation stage). 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 was recorded using leaf area meter and total chlorophyll content in the leaves of plants was recorded using chlorophyll meter (5 SPAD-502 Minolta Camera Co. Ltd.), Japan (Futuhara et al., 1979). Plant height was measured prior to harvest as the distance between soil surfaces up to the top of the main panicle. Number of tillers /hill was counted. Average number of tillers for five hills calculated. The seedling and plant were carefully pulled to keep whole root and then transferred to the laboratory to determine the following, plant height (cm) it was determined for each sample in cm from the base to the tip of the tallest leaf blade and root length (cm) was determined by the same way as in plant length. Grain yield was measured from 12 m^2 (3×4 m) in the center of sub-plot. Grain yield was adjusted to 14% moisture content determined according to Yoshida (1981). Physiological parameters such as 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). Sink capacity (number of spike lets per m^2 Yoshida and Parao, 1976); Spike lets-leaf area ratio (number of spikelets/ unit leaf area), 1000-grain weight and number of grain per panicle were also recorded. Data collected were subjected to statistical analysis of variance according to Gomez and Gomez (1984) using IRRISTAT computer program.

RESULTS AND DISCUSSION

Mean of observations recorded and the results of statistical analysis are given in Tables 1 - 5.

Data in Table 1 showed that number of days from sowing up MT, PI and HD were gradually decreased to delay of sowing up to June 1st. GZ 6903 surpassed other

Table 2. Number of tillers / M2, (plant height, Root length) at panicle initiation (PI) and heading dates (HD) stage as affected by some hybrid rice under different sowing dates.

Characters Treatments	Number of tillers /M^2	PI stage		HD stage	
		Plant height	Root length	Plant height	Root length
Sowing dates					
April 10th	361	62	31.08	97.08	15.50
April 20th	404	65	31.08	97.75	17.22
May 1st	373	63	30.65	95.08	15.77
May 10th	347	61	29.92	93.17	15.23
May 20th	306	59	28.92	91.50	14.17
June 1st	254	58	25.75	89.00	13.36
LSD at 5%	32.22	2.59	1.09	1.39	1.10
CV	8.40	3.6	3.10	1.3	6.20
Rice varieties					
H1	374	62	31.17	95.44	16.77
H2	353	57	29.82	91.28	15.80
GZ 6522	304	64	27.83	93.56	12.99
GZ 6903	332	62	29.44	95.44	15.27
LSD at 5%	21.89	2.48	1.11	2.12	0.83
CV	6.70	4.0	3.70	2.2	5.40

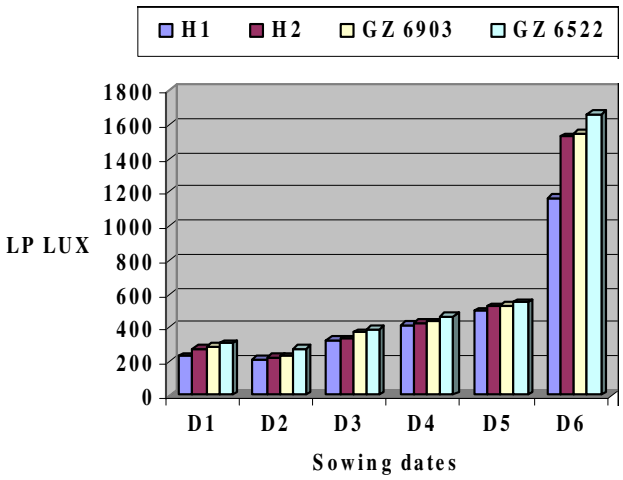

Figure 1. Light penetration of some hybrid rice as affected by sowing dates.

varieties under study on number of days from sowing up to MT, PI and HD. So GZ 6522 was the lowest Number of days from sowing up to MT, PI and HD. GZ 6903 variety gave the highest value of B.V.P. and P.S.P. therefore GZ 6903 high sensitive for light and temperature. It was high sensitive to different sowing dates. The current findings are in good harmony with those reported by Singh and Parsed (1999), Hari et al. (1999) and Pirdashfy et al. (2000).

Data in Table 2 revealed that April 20th resulted in the highest number of tillers /M^2, plant height and root length at PI and HD stages. Difference among the four tested rice varieties was highly significant. H1 was superior to other verities under study with respect to number of tillers/M^2, and (plant height and root length) at PI and HD stages. However Root length at PI stage gave the highest value compared with root length at HD, which may be due to more activity of plant during first growth stage. Whereas June 1st gave the lowest value for all qualities under study.

Figure 1 indicated that H1 hybrid rice variety gave the lowest value of light pentration under the first date of sowing. While GZ6522 hybrid rice variety gave the highest value of light pentration at June 1st sowing date. This may be due to a higher leaf area index at first dates of sowing than latter dates of sowing. These results are in agreement with earlier reports of Yoshida and Parao (1976).

Data in Table 3 showed that April 20th offered higher LAI, but April 10th gave higher number of days up to PI and HD. While May 30th gave the highest value of light penetration and chlorophyll content. However H1 hybrid rice surpassed other varieties under study of LAI and chlorophyll content. While H2 gave the highest value of number of days up to PI and HD. The current findings are in good harmony with those reported by Song et al. (1990), Singh and Parsed (1999), Hari et al. (1999) and Pirdashfy et al. (2000).

The highest sink capacity and number of grains/ panicles was obtained from field sown on April 20th (Table 4). But it gave the lowest value in sterility %. While April

Table 3. Effect of sowing dates and some hybrid verities on LAI, LP, Chlorophyll content and Number of days up to PI and HD.

Characters Treatments	LAI	LP	Chlorophyll content	Number of days up to	
				PI	HD
Sowing dates					
April 10th	5.62	276	38.79	75	109
April 20th	6.84	237	39.64	72	106
May 1st	6.24	355	39.70	63	96
May 10th	5.52	438	41.27	60	95
May 20th	4.83	526	43.78	58	93
May 30th	4.33	1478	44.50	55	90
LSD at 5%	0.28	70.00	1.56	1.76	2.19
CV	4.50	9.20	3.2	2.40	1.90
Rice varieties					
H1	5.98	474	42.28	64	98
H2	5.09	611	41.98	65	100
GZ 6522	5.46	553	39.98	59	93
GZ 6903	5.72	569	40.88	65	102
LSD at 5%	0.39	81.06	1.50	1.54	1.57
CV	6.90	14.15	3.6	2.40	1.60

Table 4. Sink capacity, Sterility %, Spikelets-leaf area ratio and Number of grains/ panicle as effected by sowing dates of some hybrid rice varieties.

Characters Treatments	Sink capacity	Sterility %	Spikelets –leaf area ratio	Number of grains / panicle
Sowing dates				
April 10th	54	4.2	0.95	153
April 20th	61	3.6	0.88	155
May 1st	53	3.8	0.84	146
May 10th	46	4.3	0.84	139
May 20th	39	5.1	0.80	135
June 1st	29	6.4	0.65	112
LSD at 5%	5.30	0.63	0.03	5.35
CV	9.6	11.5	10.6	5.00
Rice varieties				
H1	61	3.5	1.01	165
H2	51	3.9	0.89	152
GZ 6522	32	6.2	0.63	108
GZ 6903	43	4.7	0.89	134
LSD at 5%	4.13	0.58	0.10	9.83
CV	8.80	12.6	11.4	7.10

Sink capacity = (Number of spikelets/M2)*10
Sterility % = (Number of unfilled grains /Total of grins per panicle)*100

10th gave the highest value of spikelets –leaf area ratio. H1 gave the highest value of sink capacity, spikelets-leaf area-ratio and number of grains/panicles. On the other hand GZ6522 gave the lowest value for all previous quailties under study. Whoever the lowest sterility was obtainned from H1 hybrid rice. These data are in agreement with those reported by Yoshida and Parao (1976) and El-Hity et al. (1987).

Numbers of grains/panicles were markedly influenced by different sowing dates (Figure 2): Found that First date of sowing at April 10th with H1 hybrid rice gave the highest value of number of grains/panicle. While June 1st

Table 5. Effect of sowing dates and some hybrid rice varieties on Panicle length (cm), 1000-grain weight (g), Number of panicles/ M2, Panicle weight (g) and grain yield (T/h).

Characters Treatments	Panicle length(cm)	1000-grain weight (g)	Number 0f panicles/ M^2	Panicle weight (g)	Grain yield (T/h)
Sowing dates					
April 10th	21.46	24.01	350	20.4	11.47
April 20th	22.42	27.62	394	21.6	12.44
May 1st	21.22	26.37	363	20.9	11.51
May 10th	20.30	25.93	340	20.5	8.28
May 20th	20.20	25.08	298	18.6	6.13
May 30th	18.63	19.98	250	18.0	5.33
LSD at 5%	0.89	1.11		1.19	1.58
CV	3.7	3.80		5.10	3.3
Rice varieties					
H1	21.16	25.74	365	21.7	9.84
H2	20.99	25.08	346	20.5	9.75
GZ 6522	20.01	23.94	294	17.6	8.38
GZ 6903	20.65	24.56	324	20.1	8.79
LSD at 5%	0.76	0.96		1.35	1.67
CV	3.60	3.90		6.70	4.00

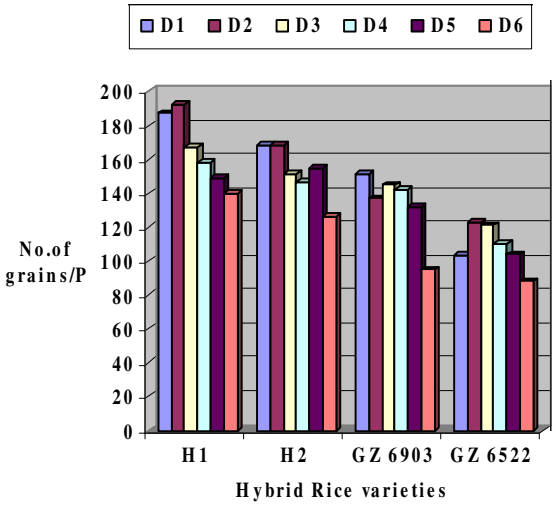

Figure 2. Number of grains / panicle of some hybrid rice as affected by sowing dates.

gave the lowest value of number of grains/panicle. These data are in agreement with those reported by RRTC (2002).

Planting rice latter in May 10th resulted in reduction of yield parameters and that in April 20th gave the highest value of panicle length (cm), 1000-grain weight (g), number of panicles /M2, panicle weight (g), and grain yield (Table 5). But no difference between April 10th, April 20th and May 1st was observed; therefore the best of time for rice planting observed was that between, April 10th to May 1st. While June 1st gave the lowest value for all parameters under study including grain yield. This may be due to reduction in leaf area index, number of productive tillers, panicle weight and filling period and increase in sterility percentage. H1 hybrid rice variety surpassed other varieties of panicle length (cm), 1000-grain weight (g), panicle weight (g) and grain yield (T/h). These data are in agreement with those reported by Xu et al. (1997) and Sherief et al. (2000).

Abbreviations: MT, Maximum tillering; **PI**, panicle initiation; **HD**, heading dates; **LAI**, leaf area index; **LP**, Light penetration.

REFERENCES

Khalifa AA (2005). Physiological behaviour of some rice cultivars under Different sowing dates and seedling age. The 11th Conference of Agronomy, Agron. Dept., Assiut Univ., Nov. 15-16: 285-295.

El-Hity MA, El-Keredy MS, Abdel Hafez AG (1987).yield response of same rice varieties to different planting time. J. Agric. Res. Tanta Univ. 13(14): 1006-1014.

Gomez KA, Gomez AA (1984). Statistical procedures for agricultural roses. 2nd Ed., John Wily & Sons.

Hari OS, Katyal K, Dhiman SD, Om H (1999). Response of two rice (Oryza Sativa) hybrid to graded levels of nitrogen. Indian J. Agric. Sci. 70(3):140-142.

Komatsu Y, Matsuo Y, Kamimura Y (1985). Analysis of introduced high yielding rice varieties. 7. Varietal characteristic in Akenohoshi on large vascular bundle in panicle inter-node. Jpn. J. Crop Sci. 54: 10–11.

Penning de Vries FWT, Jesen DM, Ten Berge HFM, Bekema AM (1989). Simulation of ecophysiological processes of growth in several annual crops. IRRI. PUDOC. Wageningen, Netherlands.

Pirdashfy HZ,.Sarvestani T,Narsiri M, fallah V (2000). Effect of transplanting date on yield and yield components of some rice cultivars. Seed and plant 16:164-158.

Ritchie JT, Alocilja EC, Singh U, Uehera G (1989). IBSNAT and CERES- Rice model in: Workshop on the Impact of weather Parameters

on growth and yield of rice. International Rice Research Institute, Los Banos. Philippines pp. 271-281.
RRTC (2002).Rice research and training center report, Agronomy. Sakha. Kafr-El sheikh, Egypt.
Sherief AE, El-Hinidi MH,Abd El-Rahman AA, Abdo GM (2000). Rice productivity as influenced by planting dates and seedling. Age J.Ages.J.Agric.sci. Mansoura Univ. 3: 1511-1521.
Singh UP, Prasad A (1999). Response of promising spring sown rice (Oryza Sativa L,) varieties to sowing time and N levels under upland rained low-hill valley situation of latter Pradesh Annuals of Agric. Res. 20: 296-300.
Song X, Agata W, kawamitsu Y (1990).Studies on dry matter and grain production of F1 hybrid rice in China. II. Characteristics of grain production Jpn. J. Crop Sci. 59:29-33.
Toole OJC (1993). Ricemod: A physically based growth and yield model, IRPS, IRRI, and Manila, Philippines. No. 87. pp. 1-61.
Toth S (1978): Rice yield response to sowing date and sowing rate. Novenytermeles, 27(1)65-75. (C.F. Field Crop Abst., 34(7): 5401, 1981).
William JR, Jones CA, Kiniry JR, Spanel DA (1989). The EPIC growth model. Trans. ASAE. 32(2): 497-511.
Xu Y, Ookawa T, Ishihara K (1997). Analysis of the dry matter production process and yield formation of the high-yielding rice cultivar Takanari, from 1991 to 1994. Jpn. J. Crop. Sci. 66: 42–50.
Yoshida S, Parao FT (1976). Climatic influence on yield and yield components of lowland rice in the tropics. Pages 471-494 in Climate and rice international rice research Institute, Los Banos, Laguna. Philippines.