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EFFECT OF SEEDLING AGES, ROW RATIOS AND GA_3 APPLICATION ON YIELD AND ITS COMPONENTS OF HYBRID RICE (K17A X IR195R).

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ABSTRACT: *Two field experiments were carried out at the experimental farm of Sakha Agricultural Research Station, Kafr El-Sheikh Governorate, Egypt, during the two summer seasons of 2009 and 2010. The field experiments were conducted to study the effect of seedling ages; row ratios and GA_3 application on yield and its components of hybrid rice.*
The material under study included the parental lines of K17A (female line) and IR195 R (restorer line) to produce F_1 hybrid seeds. A split split- plot design with three replications was used. The main plot devoted to seedling ages while row ratios arranged in the sub- plots and the doses of GA_3 were assigned in the sub-sub plots. Four doses of GA_3 i.e, 300 ; 350 ; 400 g/ha and the control where the plants were sprayed with water in two sprayings. The highest values were recorded for panicle length (cm), seed set (%), panicle weight (g), panicle exertion (%), harvest index and grain yield with using seedling age of 20 days; 2R:8A row ratio and 400 g/ha GA_3 and their first and second order interactions in both seasons. While, 1000-grain weight was highly significant affected by using 20 days seedling age; 2:12 row ratio and zero g/ha GA_3 both and their first and second order interactions.

***Key words**: Seedling ages, row ratios, GA_3 application, hubrid rice.*

INTRODUCTION

Rice (*Oryza sativa,*L.) is considered as one of the most important cereal crops not only in Egypt, but also in the world. The total cultivated area of rice was about 0.6 million ha, which produced 6.174.000 tons of paddy rice with an average of 10.29 t/ha. Researcher at RRTC (2008).

In Egypt, the averaged national yield level of rice has to be increased by 25-30% to meet the demands of the increasing population, this seems to be difficult considering the narrow gap between yield potential and actual yield (9.6 t/ha) in 2004. However, among available technologies to increase yield above the present ceiling, is the utilization of heterosis in hybrid rice, which appears to be practical approach in Egypt. (Bastawisi *et al* 1998).

Hybrid rice seed production is a systematic, complex and demanding approach compared with inbred seed production. The most important step from research for commercialization of hybrid rice is seed production. The main objectives are to determine the optimum doses of GA_3 application for the promising hybrids, identify the best row ratio of male parent to that of female parent in seed production plots and the suitable age of seedling transplanting in the permanent field which give the highest yield.

MATERIALS AND METHOD

Two field experiments were carried out at the experimental farm of Sakha Agricultural Research Station, Khafr El-Sheikh Governorate, Egypt, during the two successive summer seasons of 2009 and 2010. The field experiments were conducted to study the effect of seedling age, row ratio and (GA_3) application on yield and its components of hybrid rice (K17A x IR195R).

The materials under study included the parental line of K17 A (CMS Line) and HR195R (restorer line) to produce F_1 hybrid seeds under space and time isolation.

A split split-plot design with three replications was used. The main plot was devoted to seedling ages while row ratios arranged in the subplots and the doses of GA_3 application were assigned in the sub-subplots. The permanent field was identified and well prepared. The sub-subplot size was 12 m^2 (3 x 4 m). The data were recorded for panicle exertion percentage, panicle length (cm), seed set percentage, panicle weight (g), weight of 1000 grains, grain yield/ m^2 (ton/ha) and harvest index.

Statistical analysis:

All data collected were subjected to the analysis of variance according to Gomez and Gomez (1984). All statistical analysis was performed using analysis of variance technique by means of "MSTAIC" computer soft ware package. Treatment means were computed by Duncan's multiple range test (Duncan, 1955)

RESULTS AND DISCUSSION

Results in Table (1) revealed the effect of seedling ages, row ratios, GA_3 application and their first and second order interactions on yield and its components i.e., panicle exertion (%), panicle length, seed set (%), panicle weight, 1000-grain weight, grain yield and harvest index (%) during the two seasons of 2009 and 2010. The results indicated that the three factors and their interactions had highly significant effect on all studied traits. The seedling age of 20 days had superiority over the other seedling ages, where the significantly highest values were obtained for all studied traits in both seasons. The significantly highest values of all studied traits were observed as a result of 2:8 rows ratio, except 1000-grain weight and grain yield, where the row ratio of 2:12 was significantly surpassed the other row ratios, this was true during the two seasons.

Concerning the GA_3 application, it could be observed that, the significantly highest values of all studied traits were detected when GA_3 added in the dose of 400 g/ha, with one exception i.e., 1000-grain weight where the control treatment showed the highest values in both seasons. However, the obtained results were in agreement with those obtained by Lu *et al.* (1999) indicated that yield decrease with delay in transplanting. For row ratio, Ramos *et al.*(2001) found that 2R:6A or 8A gave the highest seed set (%) and highest grain yield, while row ratio of 2R:12A gave the lowest ones. Abo-Youssef (2003) found that the row ratio 2:8 gave the highest values of panicle exertion, panicle weight and seed set. Akhter *et al.* (2007) reported that the highest grain yield was recorded at the row ratio of 2:10.

For GA_3 application, Abo-Yossef (2003) reported that 200g GA_3/ha gave the highest values of panicle exertion, panicle weight, seed set and grain yield (t/ha) and Abo-Yossef *et al.* (2005) found that, 1000-grain weight decreased with increasing the doses of GA_3, while the high doses increased seed set percentage.

The results shown in Tables 2,3 and 4 indicated that, the seedling of 20 days old when interacted with row ratio 2R:8A gave significantly higher values of panicle exertion, panicle length, panicle weight, seed set and harvest index, while 1000-grain weight and grain yield recorded its higher values a result of 20 days seedling age x 2:12 row ratio interaction, these results were true in both seasons.

The results listed in Tables 5, 6 and 7 pointed out that, the interaction of 20 days seedling age x 400g GA_3/ha dose gave significantly higher values of all studied trait, in both seasons, except 1000-grain weight where the trait in view gave the highest values when 20 days seedling age was interacted with the control treatment of GA_3 in both seasons.

The results presented in Tables 8,9 and 10 indicated that, 2:8 row ratio x 400g GA_3/ha interaction gave significantly higher values of all studied traits in both seasons, except 1000-grain weight where the highest values in both seasons were obtained a results of the interaction between 2:12 row ratio and the control treatment of GA_3. While grain yield (t/ha) gave its highest values in both season a result of 2:12 row ratio x 400g GA_3/ha interaction.

The data shown in Tables 11-17 indicated the effect of the second order

TABLE 1

Table (2) : Panicle exsertion (%) and panicle length (cm) as affected by the interaction between seedling age and row ratio during 2009 and 2010 seasons.

Seedling age	Row ratio	Panicle exsertion (%)		Panicle length(cm)	
		2009	2010	2009	2010
20days	2:8	69.74a	70.47a	20.87a	21.03a
	2:10	67.15d	68.15d	19.05d	19.33d
	2:12	63.93g	64.84h	17.33q	18.17g
25 days	2:8	68.97b	69.96b	20.15b	20.32b
	2:10	66.36e	67.37e	18.16e	18.73e
	2:12	62.65h	66.41g	16.73h	17.37h
30 days	2:8	68.23c	69.20c	19.37c	19.68c
	2:10	65.74f	66.74f	18.07f	18.44f
	2:12	62.40i	63.41i	16.17i	16.81i

In each season, the values having the same letter (s) not significantly differed according to Duncan's multiple range test.

Table (3): Panicle weight (g) and seed set % as affected by the interaction between seedling age and row ratio in 2009 and 2010 seasons.

Seedling age	row ratio	Panicle weight (g)		*Seed set (%)*	
		2009	2010	2009	2010
20 days	2:8	3.50a	3.15a	41.12a	40.21a
	2:10	3.16c	2.96d	39.05d	38.10d
	2:12	2.95f	2.73q	36.70g	35.78g
25 days	2:8	3.30b	3.10b	40.25b	39.49b
	2:10	3.10d	2.90e	38.42e	37.50e
	2:12	2.85g	2.59h	35.88h	35.01h
30 days	2:8	3.26b	3.05c	40.02c	39.15c
	2:10	3.02e	2.84f	37.72f	36.84f
	2:12	2.65h	2.38i	34.65i	33.14i

In each season, the values having the same letter (s) not significantly differed according to Duncan's multiple range tests.

Table (4): 1000- grain weight, grain yield and harvest index (%) as affected by the interaction between seedling age and row ratio during 2009 and 2010 seasons.

Seedling age	row ratio(R)	1000-grain weight (g)		Grain yield t/ha		Harvest Index (%)	
		Season 2009	Season 2010	Season 2009	Season 2010	Season 2009	Season 2010
20 days	2 : 8	23.37c	23.00c	1.17gh	1.35g	19.20a	20.17a
	2 : 10	23.65b	23.12b	1.87c	2.09c	17.94d	18.89d
	2 : 12	23.74a	23.44a	2.18a	2.34a	16.49g	17.49g
25 days	2 : 8	22.27f	22.0e	1.16h	1.31h	18.89b	19.87b
	2 : 10	22.60e	22.30d	1.72e	1.91e	17.73e	18.70e
	2 : 12	22.69d	22.37c	1.96b	2.13b	16.18h	17.15h
30 days	2 : 8	21.49i	21.20h	1.09i	1.23i	18.44c	19.42c
	2 : 10	21.63h	21.33g	1.16f	1.80f	17.05f	18.02f
	2 : 12	22.00g	21.43f	1.78d	1.94d	15.62i	16.58L

In each season, the values having the same letter (s) not significantly differed according to Duncan's multiple range tests.

Table (5): Panicle exsertion (%) and panicle length (cm) as affected by the interaction between seedling age and GA_3 doses during 2009 and 2010 seasons.

Seedling age	GA_3 doses g/h	Panicle exsertion (%)		Panicle length (cm)	
		2009	2010	2009	2010
20days	0	25.40k	26.03j	14.84i	15.07j
	300	74.72f	75.71f	19.86e	20.09f
	350	80.90d	81.89d	21.89c	22.09c
	400	94.92a	95.90a	23.92a	24.11a
25 days	0	23.75L	24.76k	13.11j	3.84k
	300	72.26h	73.23h	18.09g	18.50h
	350	77.80e	78.82e	20.90d	20.43c
	400	91.86b	92.88b	20.40b	22.55b
30 days	0	22.34m	23.03L	12.65k	12.93L
	300	68.90j	72.90i	16.60h	17.17i
	350	73.85g	74.76g	18.11g	18.83g
	400	87.85c	88.86c	19.60f	20.85d

In each season, the values having the same letter (s) not significantly differed according to Duncan's multiple range tests.

Table (6): Seed set (%) and panicle weight (g) as affected by the interaction between seedling age and GA_3 doses during 2009 and 2010 seasons.

Seedling age	GA_3 doses g/h	Seed set (%)		Panicle weight (g)	
		2009	2010	2009	2010
20 days	0	20.83j	20.27j	1.93g	1.76i
	300	42.16g	41.27f	3.55d	3.35d
	350	46.83d	45.81d	3.76b	3.55b
	400	52.04a	51.11a	3.97a	3.75a
25 days	0	19.37k	18.42k	1.77h	1.57j
	300	39.93h	39.07h	3.35e	3.17e
	350	44.70e	43.73e	3.55d	3.35d
	400	49.60b	48.70b	3.71c	3.52c
30 days	0	17.20L	16.30L	1.53i	1.33k
	300	37.40i	36.39i	3.21f	2.78h
	350	41.37f	41.07g	3.22f	3.03g

	400	47.01c	46.11c	3.32e	3.12f

In each season, the values having the same letter (s) aren't significantly differed according to Duncan's multiple range tests.

Table (7): 1000- grain weight (g) grain yield (t/ha) and harvest index (%) as affected by the Interaction among seedling age and GA_3 doses during 2009 and 2010 seasons.

row ratio(R)	GA_3 doses(D)	1000-grain weight (g)		Grain yield t/ha		Harvest Index (%)	
		Season 2009	Season 2010	Season 2009	Season 2010	Season 2009	Season 2010
20 days	0	26.50a	26.25a	0.71j	0.89j	14.11j	15.09j
	300	24.06d	23.73d	1.96e	2.06e	18.84f	19.82f
	350	22.07f	21.83f	2.53b	2.73b	20.15c	21.12c
	400	21.66h	21.53g	2.69a	2.88a	22.28a	23.26a
25 days	0	25.46b	25.17b	0.58k	0.81k	12.87k	13.84k
	300	22.90e	22.97e	1.80f	1.99f	17.71g	18.66g
	350	21.13j	20.48h	2.23d	2.42d	18.96e	19.93e
	400	20.59k	20.26j	2.31c	2.51c	20.75b	21.73b
30 days	0	24.35c	24.05c	0.48L	0.64L	11.39L	12.36L
	300	21.80g	21.54g	0.12i	1.20i	16.30i	17.27i
	350	21.18i	20.50i	1.48h	1.63h	17.52h	18.52h
	400	19.48L	19.18k	1.59g	1.72g	19.18d	20.16d

In each season, the values having the same letter (s) not significantly differed according to Duncan's multiple range tests.

Table (8): Panicle exsertion (%)and panicle length (cm)as affected by the interaction between row ratio and GA_3 doses during 2009 and 2010 seasons.

row ratio	GA_3 doses g/h	Panicle exertion (%)		Panicle length (cm)	
		2009	2010	2009	2010
2:8	0	26.04j	24.03k	13.85i	14.35j
	300	75.71f	72.70h	20.30e	19.46g
	350	81.89d	78.50e	21.88c	20.80d
	400	95.90a	92.51a	23.05a	24.14a
2:10	0	24.76k	23.47L	13.40k	13.84k
	300	73.23h	71.92i	18.16h	18.44h
	350	78.82e	77.48f	19.77e	20.00e
	400	92.88b	91.51b	22.03b	22.48b
	0	23.02l	23.40L	13.31L	13.64L
	300	72.90i	71.23j	17.52i	17.87i

2:12	350	74.76g	76.57g	19.45f	19.84f
	400	88.86c	90.60c	21.19c	20.93c

In each season, the values having the same letter (s) not significantly differed according to Duncan's multiple range tests.

Table (9): Seed set % and panicle weight (g) as affected by the interaction between row ratio and GA_3 doses during 2009 and 2010 seasons.

row ratio	GA_3 doses g/ha	Seed set %		Panicle weight(g)	
		2009	2010	2009	2010
2:8	0	19.80j	18.90j	1.61j	1.81g
	300	40.46g	39.57g	3.20g	3.43e
	350	45.32d	44.36d	3.40c	3.60c
	400	50.24a	49.28a	3.57a	3.77a
2:10	0	18.77L	18.17L	1.57kL	1.74h
	300	39.80h	38.87h	3.13h	3.44e
	350	44.60f	43.61e	3.30e	3.51d
	400	49.57b	48.68b	3.45b	3.60b
2:12	0	18.83k	17.92k	1.47k	1.67i
	300	39.23i	38.28i	2.96i	3.25f
	350	42.97e	42.64f	3.23f	3.43e
	400	48.83c	47.97c	3.36d	3.57c

In each season, the values having the same letter (s) not significantly differed according to Duncan's multiple range test.

Table (10): 1000- grain weight, grain yield and harvest index (%) as affected by the interaction between row ratio and GA_3 doses during 2009 and2010 seasons.

row ratio(R)	GA_3 doses(D)	1000-grain weight (g)		Grain yield t/ha		Harvest Index (%)	
		Season 2009	Season 2010	Season 2009	Season 2010	Season 2009	Season 2010
2:8	0	25.30c	25.00c	0.57L	0.60L	13.11j	14.08j
	300	22.50e	22.27e	1.50j	1.58i	17.97g	18.92g
	350	22.00f	21.40f	1.93f	2.11f	19.23d	20.24d
	400	20.40k	20.10k	2.03e	2.20e	21.20a	22.17a
2:10	0	25.49b	25.20b	0.59k	0.78k	12.94k	13.90k
	300	23.17d	22.83d	2.07d	1.74h	17.75h	18.73h
	350	21.09h	20.76h	2.20c	2.24d	18.82e	19.80e
	400	20.59j	20.46	2.25b	2.37c	20.90b	21.87b
2:12	0	25.58a	25.27a	0.61j	0.83j	12.32L	13.30L
	300	23.13d	22.83d	1.78g	1.93g	17.13i	18.10i

	350	21.29g	21.01g	2.25b	2.42b	18.57f	19.53f
	400	20.75i	20.41j	2.36a	2.52a	20.12c	21.09c

In each season, the values having the same letter (s) not significantly differed according to Duncan's multiple range tests

Table (11): Panicle exsertion as affected by the interaction among seedling Age; row ratio and GA_3 doses during 2009 and 2010seasons.

Seedling age	GA_3 doses g/h	Season2009			Season2010		
		2R:8A	2R:10A	2R:12A	2R:8A	2R:10A	2R:12A
20 days	0	26.07\	25.24/	23.90^	25.97\	24.62/	24.10/
	300	75.25q	74.90r	74.01s	76.26q	75.90r	74.97t
	350	82.80k	80.90L	80.01m	82.81j	81.90k	80.97L
	400	95.84a	94.90b	92.02d	96.6a	95.90b	93.96c
25 days	0	24.01-	23.70/	22.46\	24.97^	22.90/	22.50/
	300	73.01u	71.97w	71.80x	73.93v	72.97w	72.80x
	350	79.80n	77.80o	76.80p	79.90m	78.80o	77.86p
	400	92.80c	91.89e	90.90f	93.86d	92.90e	91.90f
30 days	0	22.03b	21.50/	21.90.	23.00-	22.95/	22.90c
	300	69.90x	68.90z	67.90v	71.90y	70.90n	68.90z
	350	74.91r	73.76t	72.92u	75.55s	74.80u	73.93v
	400	89.89g	87.76i	86.90h	89.90g	88.80h	87.91i

In each season, the values having the same letter (s) not significantly differed according to Duncan's multiple range tests.

Table (12): Panicle length (cm) as affected by the interaction among seedling age; row ratio and GA_3 doses during 2009 and 2010seasons.

Seedling age	GA_3 doses g/h	Season2009			Season2010		
		2R:8A	2R:10A	2R:12A	2R:8A	2R:10A	2R:12A
20 days	0	14.87z	14.91y	14.74/	15.04v	15.02u	15.08u
	300	20.90i	19.89L	18.77p	21.06k	20.01o	19.20p
	350	22.80e	21.80g	20.97h	23.01e	22.06h	21.22i
	400	24.88a	23.89b	22.97c	25.01a	24.05b	23.24c
25 days	0	13.90\	12.71^	12.00^	14.01x	13.95y	13.26z
	300	18.68e	17.72t	16.96t	19.10q	18.21r	17.97s
	350	20.79j	19.71n	18.98n	21.01L	20.20m	20.01m
	400	22.84d	22.48f	20.90h	23.20d	22.24f	20.89L

30 days	0	11.95-	11.20-	11.00.	13.02z	13.00z	12.60z
	300	17.00v	16.40w	15.90	18.01r	17.20n	16.21t
	350	19.01o	17.76r	17.20u	19.05p	19.00p	18.25r
	400	20.38k	18.89o	17.98q	20.96i	20.50i	19.65n

In each season, the values having the same letter (s) not significantly differed according to Duncan's multiple range test.

Table (13): Seed set (%) as affected by the interaction among seedling age, row ratio and GA_3 doses during 2009 and 2010 seasons.

Seedling age	GA_3 doses g/h	Season2009			Season2010		
		2R:8A	2R:10A	2R:12A	2R:8A	2R:10A	2R:12A
20 days	0	21.80z	20.00z	20.00z	20.90z	20.01i	19.90^
	300	42.70r	42.00s	41.80t	41.90q	41.01s	40.90t
	350	47.48i	47.01j	46.01k	46.50h	45.93j	45.01L
	400	52.53a	52.00b	51.60c	51.54a	51.01b	50.80c
25 days	0	19.80\	19.30\	19.01\	18.90-	18.41/	17.97/
	300	40.80u	39.90v	39.10w	39.80v	39.01w	38.40x
	350	45.40L	44.80m	43.90n	44.40m	43.80n	43.01o
	400	50.20d	49.70e	48.90f	49.13d	48.80e	48.01f
30 days	0	17.80-	17.01	16.80	16.90\	16.10/	15.90/
	300	37.90	37.50	36.80	37.01y	36.60x	35.56d
	350	43.10	42.01	39.01	42.20b	41.20y	39.90u
	400	48.01	47.02	46.01	47.01g	46.23m	45.10k

In each season, the values having the same letter (s) not significantly differed according to Duncan's multiple range tests.

Table (14): Panicle weight as affected by the interaction among seedling age; row ratio and GA_3 doses during 2009 and 2010 seasons.

Seedling age	GA_3 doses g/h	Season2009			Season2010		
		2R:8A	2R:10A	2R:12A	2R:8A	2R:10A	2R:12A
20 days	0	1.90o	1.89p	1.91p	1.80s	1.77t	1.71u
	300	3.60fg	3.57fg	3.50h	3.40i	3.35j	3.30k
	350	3.80c	3.77cd	3.72de	3.60e	3.55f	3.51g
	400	4.10a	3.98ab	3.93b	3.80a	3.76b	3.71c
25 days	0	1.85pq	1.80q	1.66r	1.65v	1.60w	1.47x
	300	3.40i	3.37ij	3.30k	3.20L	3.16m	3.16m
	350	3.60fg	3.56gh	3.50h	3.40i	3.35j	3.30k

	400	3.81c	3.70e	3.63f	3.62d	3.50g	3.44h
30 days	0	1.60rs	1.54s	1.45t	1.40y	1.35z	1.25/
	300	3.31jk	3.39i	2.95n	3.01o	2.90q	2.43r
	350	3.40i	3.20L	3.07m	3.20L	3.01o	2.89q
	400	3.50h	3.30k	3.16L	3.31k	3.10n	2.95p

In each season, the values having the same letter (s) not significantly differed according to Duncan's multiple range tests.

Table (15): 1000 -grain weight as affected by the interaction among seedling; row ratio and GA_3 doses during 2009 and 2010seasons.

Seedling age	GA_3 doses g/h	Season2009			Season2010		
		2R:8A	2R:10A	2R:12A	2R:8A	2R:10A	2R:12A
20 days	0	26.40c	26.60b	26.60a	26.30c	26.36b	26.90a
	300	23.90k	24.10j	24.20i	23.50k	23.80j	23.90i
	350	21.71t	22.20q	22.30p	21.70r	21.80q	22.01o
	400	21.50u	21.70t	21.80s	21.20t	21.90p	21.49s
25 days	0	25.30f	25.50e	25.59d	25.01f	25.22e	25.28m
	300	22.40o	23.20m	23.11n	22.31n	22.90L	22.80m
	350	21.01y	21.11x	21.29v	20.71w	20.80v	21.01u
	400	20.40\	20.60\	20.78z	20.10z	20.30y	20.40x
30 days	0	24.20i	24.90g	24.47g	23.90i	24.10h	24.17g
	300	21.20w	22.11r	22.10r	21.01u	21.80q	21.81q
	350	23.30L	19.97^	20.28/	21.80r	19.70\	20.01/
	400	19.30/	19.44/	19.97/	19.01/	19.20/	19.35\

In each season, the values having the same letter (s) not significantly differed according to Duncan's multiple range tests.

Table (16): Grain yield t/ha as affected by the interaction among seedling; row ratio and GA_3 doses during 2009 and 2010 seasons.

Seedling age	GA_3 doses g/h	Season2009			Season2010		
		2R:8A	2R:10A	2R:12A	2R:8A	2R:10A	2R:12A
20 days	0	0.68\	0.70z	0.76y	0.84\	0.90y	0.94x
	300	1.70o	1.94m	2.25h	1.80o	2.04m	2.35j
	350	2.30g	2.50d	2.80b	2.51g	2.70d	2.98b
	400	2.44e	2.70c	2.93a	2.62e	2.90c	3.11a
25 days	0	0.60\	0.59\	0.57/	0.78/	0.79/	0.86z
	300	1.60q	1.80n	2.00L	1.80o	1.98n	2.20L
	350	2.11k	2.20i	2.40f	2.29k	2.39i	2.60f

	400	2.15j	2.30g	2.50d	2.34j	2.49h	2.70d
30 days	0	0.40-	0.50-	0.55^	0.58-	0.66^	0.69\
	300	1.20v	1.05x	1.10w	1.15w	1.20v	1.25u
	350	1.40u	1.50t	1.55r	1.55t	1.65s	1.70r
	400	1.52s	1.60g	1.65p	1.66s	1.74q	1.77p

In each season, the values having the same letter (s) not significantly differed according to Duncan's multiple range tests.

Table (17): Harvest index (%) as affected by the interaction between seedlings, row ratios and GA_3 doses during 2009 and 2010 seasons.

Seedling age	GA_3 doses g/h	Season2009			Season2010		
		2R:8A	2R:10A	2R:12A	2R:8A	2R:10A	2R:12A
20 days	0	14.42x	14.15y	13.77z	15.40x	15.13y	14.75z
	300	19.30ij	19.01k	18.20o	20.29i	20.01k	19.18o
	350	20.48e	20.11f	19.85gh	21.45e	21.09f	20.82h
	400	22.60a	22.30b	21.95c	23.57a	23.28b	22.93g
25 days	0	13.20\	13.05/	12.35\	14.17/	14.01.	13.34/
	300	18.01p	17.83q	17.30s	18.90p	18.80q	18.28s
	350	19.35i	18.90L	18.63m	20.34i	19.88L	19.59m
	400	21.20d	21.15d	19.90g	22.18d	22.13d	20.88g
30days	0	11.70^	11.62/	10.85.	12.68^	12.58-	11.82.
	300	16.60u	16.41v	15.90w	17.59u	17.38v	16.85w
	350	17.86q	17.46r	17.24t	18.93p	18.44r	18.19
	400	19.80h	19.25j	18.50n	20.78h	20.22j	19.48n

In each season, the values having the same letter (s) not significantly differed according to Duncan's multiple range tests.

interactions on the studied traits. The data recorded that, the second order interaction of 20 days seedling age x 2:8 row ratio x 400g GA_3/ha gave significantly higher values for panicle exertion, panicle length, seed set and panicle weight in both seasons. However, 1000-grain weight had its highest values in both seasons a result of the interaction between 20 days seedling age, 2:12 row ratio and the control treatment of GA_3. While grain yield (t/ha) had its higher values in both season due to 20 days seedling age x 2:12 row ratio x 400g GA_3/ha interaction and harvest index gave the highest values in both seasons a result of 20 days seedling age x 2:8 row ratio x 400g GA_3/ha interaction.

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تأثير عمر الشتلات ، النسبة بين خطوط الأباء والأمهات وجرعات الجبريللين على المحصول ومكوناته للأرز الهجين

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الملخص العربي

أقيمت تجربتان حقليتان فى المزرعة البحثية لمحطة البحوث الزراعية بسخا– محافظة كفر الشيخ خلال موسمى النمو ٢٠٠٩ ، ٢٠١٠ لدراسة تأثير عمر الشتلات ، النسبة بين خطوط الأباء والأمهات وجرعات الجبريللين المضافة على المحصول ومكوناته للأرز الهجين.

احتوت المواد الوراثية للدراسة على السلالة العقيمة ذكريا (K17A) والسلالة المعيدة للخصوبة (IR195R) واللتان تم التهجين بينهمالانتاج حبوب الأرز الهجين.

استخدم تصميم القطع المنشقة مرتين ذات الثلاثة مكررات حيث كانت أعمار الشتلات الثلاثة (٢٠ يوما ، ٢٥ يوما ، ٣٠ يوما) فى القطع الرئيسية ونسبة الخطوط بين الأباء والأمهات هى (٢:٨ ، ٢:١٠ ، ٢:١٢) فى القطع الشقية الاولى بينما كانت جرعات الجبريللين (صفر ، ٣٠٠ ، ٣٥٠ ، ٤٠٠ جرام جبريللين/هكتار) فى القطع الشقية الثانية.

أشارت النتائج أن أعلى القيم سجلت لطول الدالية ، نسبة عقد البذور ، وزن الدالية ، نسبة خروج الدالية، دليل الحصاد ومحصول الحبوب مع استخدام عمر الشتل ٢٠ يوما، ٢ خط للأب المذكر : ٨ خطوط للأمهات واضافة ٤٠٠ جرام جبريللين /هكتار وكذلك تفاعلاتهما من الرتبتين الأولى والثانية فى كلا الموسمين.

بالنسبة لوزن الـ ١٠٠٠ حبة فقد تأثرت تأثيرا عالى المعنوية عند الشتل بعد ٢٠ يوم من الزراعة واستخدام ٢ خط للأب المذكر : ١٢ خط للأمهات وعدم اضافة الجبريللين (معاملة المقارنة) وكذا تفاعلاتها من الرتبتين الأولى والثانية فى كلا الموسمين.

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Table (1): Effect of seedling age, row ratio and GA_3 doses, as well as, the interaction on No of panicles/ m^2, panicle length, seed set % , panicle weight, 1000 grain weight, grain yield and harvest index during 2009 and 2010seasons.

Main effect and interaction	Panicle exsertion (%)		Panicle length (cm)		Seed set (%)		Panicle weight (gm)		1000- grain weight (g)		Grain yield (t/ha)		Harvest Index (%)	
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
Seedling age(s)														
20 days	68.89a	69.80a	21.13a	20.34a	40.47a	39.62a	3.31a	3.10a	23.95a	23.33a	1.95a	2.14a	18.84a	19.82a
25 days	66.42b	67.43b	18.43b	18.02b	38.40b	37.49b	3.02b	2.90b	22.52b	22.23b	1.73b	1.93b	17.57b	18.54b
30 days	65.80c	64.89c	17.87c	16.98c	35.75c	34.97c	2.82c	2.57c	21.70c	21.32c	1.16c	1.30c	16.10c	17.08c
F- Test	* *	* *	* *	**	* *	* *	* *	* *	**	**	**	**	**	**
Row ratio : (R)														
2:08	66.98a	67.98a	19.08a	18.94a	38.96a	38.01a	3.15a	2.94a	22.50c	22.19c	1.52c	1.60c	17.88a	18.86a
2:10	65.02b	66.85b	18.34b	18.45b	38.18b	37.34b	3.09b	2.87b	22.60b	22.49b	1.61b	1.78b	17.60b	18.57b
2:12	65.98c	66.23c	16.74c	17.31c	37.47c	36.70c	2.98c	2.76c	22.89a	22.71a	1.74a	1.93a	17.04c	18.00c
F- test	* *	* *	* *	* *	* *	* *	**	* *	**	**	**	**	**	**
GA_3.doses (D)														
0	25.01d	24.61d	14.53d	13.95d	19.14d	18.32f	1.74d	1.56d	25.45a	25.15a	0.59d	0.72d	12.79d	13.76d
300	71.96c	73.95c	18.19c	18.59c	39.83c	38.91c	3.38c	3.10c	22.92b	22.64b	1.62c	1.75c	17.62c	18.58c
350	77.51b	78.49b	20.03b	21.46b	44.30b	43.54b	3.51b	3.31b	21.46c	21.06c	2.08b	2.26b	18.88b	19.85b
400	91.55a	92.55a	21.98a	22.18a	46.55a	48.65a	3.67a	3.46a	20.58d	20.38d	2.19a	2.37a	20.74a	21.71a
F- test	**	* *	* *	**	**	* *	* *	* *	**	**	**	**	**	**
Interaction														
S x R	**	**	**	**	**	**	**	**	**	**	**	**	**	**
S x D	**	**	**	**	**	**	**	**	**	**	**	**	**	**
R x D	**	**	**	**	**	**	**	**	**	**	**	**	**	**
S x Rx D	**	**	**	**	**	**	**	**	**	**	**	**	**	**

. : highly significant at the 1% level of probability .In each season, the values having the same letter(s) not significantly differed according to Duncan's multiple range test.