

## **RICE PRODUCTIVITY AS INFLUENCED BY PLANTING DATES AND SEEDLING AGES**

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### **ABSTRACT**

Two field experiments were conducted in extension field at El-Busrate village, El-Manzala Farm, Dakhalia region, during 1998 and 1999 growing seasons. The objectives of this investigation was aimed to study the effect of sown dates (April 25, May 10, May 25 and June 10), seedlings ages (20, 25, 30, 35 and 40 days after sown) and their interaction on growth, yield and yield components of rice Sakha 101 cultivar. A split plot design with four replications was used. The main findings could be summarized as follows:

- 1- Early sowing date on 10<sup>th</sup> May successfully improved with marked effect of number of panicles /m<sup>2</sup>, number of filled grains/panicle, panicle weight, 1000 -grain weight, grain and straw yield/fed over the planting on 25<sup>th</sup> April. However, late planting on 25<sup>th</sup> May or 10<sup>th</sup> June significantly reduced the above mentioned characteristics than the early planting.
- 2- The seedling age of 30 days old significantly gave higher yield and its components than the older seedlings at 35 or 40 days old or the youngest of 20 or 25 days from sowing.
- 3- The interaction between planting dates and seedling ages had a significant effect on number of filled grains/panicle in both seasons and straw yield/fed in the first season. Maximum number of filled grains/panicle and straw yield were recorded from planting on May 10 with using seedling 30 days old.
- 4- The results stated that grain yield/fed showed positive and highly significant correlation coefficients with both plant height, number of filled grains/panicle, number of panicles/m<sup>2</sup>, panicle weight, panicle/length and 1000-grain weight.
- 5- Multiple regression analysis showed that plant height ( $R^2 = 35.46\%$ ), panicle length ( $R^2 = 6.25\%$ ) and panicle weight ( $R^2 = 5.85\%$ ) were the most variables affecting grain yield/fed. Stepwise regression analysis indicated that both plant height ( $R^2 = 31.19\%$ ) and panicle weight ( $R^2 = 61.58\%$ ) were accepted as significantly contribution for grain yield/fed.

In general, it could be summarized that for obtain highest grain yield production from planting rice on 10<sup>th</sup> May using seedlings 30 days old of Sakha 101 cultivar under the environmental condition of El-Manzala district, Dakhalia Governorate.

### **INTRODUCTION**

Rice (*Oryza sativa*) is one of the most important cereal crops in Egypt and world. Selection of right type of variety and the suitable date of planting are most important factors for maximizing rice production. Time of transplanting tremendously influences the growth and yield of rice. Late planting may increase insect-posts and diseases. In this respect the following article will be reviewed under titles:

Regarding transplanting date effect, Abd El-Rahman *et al.* (1992) found that the earlier seeding (May 1<sup>st</sup>) the superior plant height, panicle length, 1000- grain weight, number of grains/panicles, number of panicles/m<sup>2</sup>, panicle weight, grain and straw yields. Singh *et al.* (1993) reported that early planting on 1<sup>st</sup> July was significantly superior to the delayed planting on 16<sup>th</sup> and 13<sup>th</sup> July and 16<sup>th</sup> August in respect of grain yield. The yield attributes and grain yield decreased markedly with delay in transplanting date. Lakpale *et al.* (1994) found that the time of planting significantly affected the yield components and grain yield of rice. Rice planted in the third week of July significantly gave higher grain yield than the rice planted on other times. Parihar *et al.* (1995) showed that the highest yield was recorded at 15 July transplanting which was markedly superior to both 30 June and 30 July transplanting under these dates, number of effective tillers and grains/panicle were significantly less resulting poor yield. Bali and Uppal (1995) recorded that transplanting on 10 July increased root density and head rice recovery along with significant increase in grain yield by 9.4 and 7.9 % over 30 July in both seasons, respectively. Singh *et al.* (1995) found that maximum head rice recovery and the highest kernel length were recorded for 4<sup>th</sup> August planting. Although grain yield declined with delayed planting. Singh *et al.* (1997) found that rice planted on 15<sup>th</sup> June gave higher grain yield than rice planted on June 29 owing to more productive tillers, filled grains, panicles and more grain weight/panicle. Consequent delay in planting beyond June 15 reduced the grain yield. Hariom *et al.* (1997) revealed that the rice transplanted on June 25 produced taller plants, highest number of productive tillers/m<sup>2</sup>, dry matter accumulation, panicle weight and grain yield followed by July 5, June 15 and July 25 transplanting. Finally, Gangwar and Sharma (1998) reported that highest grain yield was recorded from planting on 1<sup>st</sup> July compared with July 31 and August 16 planted. They added that a linear reduction in grain yield with every 15 days delay in planting was recorded from 1<sup>st</sup> July to August 16.

Concerning seedlings ages effects, under the new Egyptian conditions using of machines become a matter of need seedling age is the most important age that affect rice productivity. Earlier transplanting with younger seedlings significantly gave higher grain yield is reported by many researchers. In this connection, Hassan *et al.* (1991) showed that planting of 30 days old seedlings resulted in more tillers, while delayed transplanting with 50 days old seedlings produced lower grain yield. Similar conclusions were reported by Reddy and Reddy (1992). Assey *et al.* (1992) reported that increasing seedling age from two to four weeks old significantly increased each of plant height, number of panicles/m<sup>2</sup>, number of grains/panicles, panicle grain weight, 1000 -grain weight, grain and straw yields/fed. Bali *et al.* (1995) showed that five weeks old seedlings gave higher grain yield than 7 weeks old seedlings. Banik *et al.* (1997) found that 40 days old seedlings gave the maximum grain yield followed by 50 days old ones. Viraktamath *et al.* (1998) found that seedling age exerted a significant and positive effect on flowering, older seedlings at transplanting delayed flowering.

With respect to interaction effects, grain yield was higher after transplanting during July and seedlings 60 days old (Chandra and Manna, 1988) and / or seedlings 21 days old (Nayak *et al.*, 1994). Grain yield and its components were greater with transplanting on 30 July and with 45 days old seedlings (Krishnan and Nayak, 1997).

The purpose of the present investigation was aimed to determine the optimum transplanting times together with the suitable seedling ages to maximize rice productivity.

## MATERIALS AND METHODS

Two field experiments were carried out in extension field at El-Busrate village, El-Manzala Center, Dakhalia region during the two successive seasons of 1998 and 1999. The objectives of this investigation are aimed to study the effect of seeding dates and seedling ages on yield and yield components of rice. A split plot design with four replications was used. The main plots were assigned for seeding dates and sub-plots were devoted to seedling age. The sub-plot area was 21 square meters (5.0 x 4.2 m). Four seedlings were translocated per hill 20 cm apart in rows 20 cm apart. The preceding crop was clover in both seasons. The seeding dates were as 1- 25<sup>th</sup> April. 2- 10<sup>th</sup> May. 3- 25<sup>th</sup> May. 4- 10<sup>th</sup> June. The seedling ages were 20, 25, 30, 35 and 40 days old. The soil texture was clay loam. The mechanical and chemical analysis of experimental soil as described by Page *et al.* (1982) are shown in Table 1. Seedbeds were prepared by moldboard plowing disc harrowing and leveling twice. The nursery was planted according to above mentioned seeding dates. Seedlings were translocated to permanent field for transplanting according to above mentioned seedling ages. Rice cultivar Sakha 101 was used.

**Table 1: Mechanical and chemical analysis of the experimental area during 1998 and 1999 seasons.**

Soil analysis	1998	1999
A: Mechanical analysis		
Sand %	12.0	13.0
Silt %	21.0	22.0
Clay %	66.0	64.0
B: Chemical analysis		
Organic matter (%)	1.80	1.95
Available N (ppm)	50.0	65.0
Available P (ppm)	11.0	13.0
Available K (ppm)	280.0	350.0
pH	7.85	8.00
EC. ds / m at 25 °C	1.80	2.00

The studied characteristics were: plant height, panicle length, number of panicles/m<sup>2</sup>, number of filled grains/panicle, panicle weight (gm),

1000 -grain weight (gm), grain and straw yields (t/fed) and harvest index. Grain (14 % moisture) and straw yields were determined from 6 m<sup>2</sup> sampling area in the center of each sub plot using wooden frame 2 x 3 m.

The collected data were statistically analyzed using analysis of variance (ANOVA) technique of split-plot design according to Gomez and Gomez (1984). The differences among treatment means were compared using Duncan multiple range test as mentioned by Waller and Duncan (1969).

Simple correlation coefficients and multiple linear regression were estimated according to Snedecor and Cochran (1981). Stepwise regression analysis was carried out according to Draper and Smith (1966) method.

## **RESULTS AND DISCUSSION**

### **1- Seeding dates effect:**

The influence of seeding dates on yield and other characters contributing to yield of the rice variety sakha 101 are presented in Tables 2 and 3. Early sowing dates i.e. 25<sup>th</sup> April or 10<sup>th</sup> May significantly increased plant height, panicle length, number of panicles/plant, number of filled grains/panicle, panicle weight, 1000 -grain weight, grain and straw yields/fed as well as harvest index compared with late sowing. More, the seeding on 10<sup>th</sup> May successfully improved with marked effect of number of panicles/m<sup>2</sup>, number of filled grains/panicle, panicle weight, 1000 grain weight, grain and straw yields/fed over the planting on 25<sup>th</sup> April. However, late seeding on 25<sup>th</sup> May or 10<sup>th</sup> June significantly reduced the above mentioned characteristics than these early seeding. The maximum productivity was achieved by planting the crop at the optimum date (10<sup>th</sup> May). At this time maximum and significant production of panicles number/m<sup>2</sup>, number of filled grains/panicle as well as panicle weight and 1000 grain weight. In contrast, reduction in yield and its attributes with the delay in planting time was also reported due to the lower values of the former characters. These findings are in conformity with the results obtained by Assey *et al.* (1987); El-Kalla *et al.* (1994); Abou Khalifa (1996) and El-Rewiny (1996) as they got highest grain yield when seedbed was planted by May 10. The reduction in the grain yield of the early planting in April 25 as compared to May 10 may be due to the lower temperature degree during the time of planting than the optimum degree needed for germination and seedlings establishment. In addition, the inferiority of delaying seeding beyond 10<sup>th</sup> May may be attributed to that the short period of the vegetative growth, the adverse weather conditions, such as temperature degree and solar radiation resulted in lower photosynthetic product accumulated in the source and transported to the sink.

### **2- Seeding ages effect:**

The effect of seedling age on plant height, panicle length, number of panicle/m<sup>2</sup>, number of grains/panicle, panicle weight, grain and straw yields/fed and harvest index are presented in Tables 2 and 3. The seedling ages of transplanted rice significantly affected yield and its attribute

characteristics. The seedlings age 30 days old significantly gave higher yield and its components than the older seedlings at 35 or 40 days from sowing. The results indicated clearly that raising seedling age from 20 through 30 days significantly increased grain yield/fed and yield attributes. The superiority

**Table 2: Mean of plant height, panicle length, number of panicles/m<sup>2</sup> and number of grains/panicle as affected by planting dates and seedling ages during 1998 and 1999 seasons.**

-Characters	Plant height		Panicle length		No. of panicles /m <sup>2</sup>		No. of filled grains/panicle	
	1998	1999	1998	1999	1998	1999	1998	1999
<b>Planting dates:</b>								
April 25	91.7a	91.6b	22.9a	22.8a	463.8 b	478.8 b	134.8 b	136.0 b
May 10	92.5a	92.7a	23.0a	23.0a	557.5 a	500.0 a	140.0 a	142.0 a
May 25	88.7b	89.6c	22.4b	22.5b	432.5 c	452.5 c	129.6 c	132.0 c
June 10	84.8c	87.8d	22.3b	22.2c	395.0 d	410.0 d	127.3 d	128.4 d
F test	**	**	**	**	**	**	**	**
<b>Seedling ages:</b>								
20 days	89.2bc	90.8 c	22.5abc	22.6bc	445.3 c	450.0 c	133.6 c	134.4 c
25 days	89.9ab	91.4 b	22.6 ab	22.8ab	478.1 b	487.5 b	135.7 b	136.5 b
30 days	90.2 a	92.0 a	22.7 a	22.9a	481.3 a	517.2 a	137.9 a	139.7 a
35 days	89.0 bc	89.9 d	22.3 bc	22.5bc	461.0 d	437.5 d	129.9 d	132.4 d
40 days	88.7 c	88.2 e	22.2 c	22.4c	445.3 c	409.4 e	127.4 e	130.0 e
F test	**	**	*	**	**	**	**	**
<b>Interactions:</b>								
F test	N.S	N.S	N.S	N.S	N.S	N.S	**	**

**Table 3: Mean of panicle weight, 1000-grain weight and straw yields /fed and harvest index as affected by planting dates and seedling ages during 1998 and 1999 seasons.**

-Characters	Panicle weight (g)		1000-grain weight (g)		Grain yield (t/faed)		Straw yield (t/fed)		Harvest index	
	1998	1999	1998	1999	1998	1999	1998	1999	1998	1999
<b>Planting dates:</b>										
April 25	3.7b	3.6b	27.5a	26.8	4.350b	4.180a	4.690b	4.660b	0.480a	0.470
May 10	3.9a	3.9a	27.9a	27.7	4.840a	4.580b	5.165a	4.925a	0.481a	0.479
May 25	3.4c	3.3c	26.2b	25.0	3.965c	3.810c	4.475c	4.205c	0.461b	0.475
June 10	3.2d	3.1d	25.1c	24.5	3.110d	3.035d	3.880d	3.300d	0.442c	0.476
F test	**	**	**	**	**	**	**	**	**	N.S
<b>Seedling ages:</b>										
20 days	3.5c	3.4c	25.9cd	25.1d	4.075c	3.794c	4.556c	4.200c	0.467ab	0.473ab
25 days	3.7b	3.6b	27.4b	26.5b	4.325b	4.038b	4.794b	4.463d	0.464b	0.473ab
30 days	3.8a	3.8a	28.0a	27.6a	4.581a	4.438a	4.944a	4.719a	0.479a	0.484a
35 days	3.4d	3.4c	26.4c	25.7d	3.788d	3.806c	4.375d	4.188c	0.461b	0.478ab
40 days	3.3e	3.2d	25.0d	25.0d	3.563e	3.431d	4.094e	3.794d	0.459b	0.475n
F test	**	**	**	**	**	**	**	**	**	**
<b>Interactions:</b>										
F test	N.S	N.S	N.S	N.S	N.S	N.S	**	N.S	N.S	N.S

of 30 days old seedlings of grain yield may be attributed to that 30 days old seedlings produced the highest number of panicles/m<sup>2</sup>, filled grains/panicle and 1000 -grain weight that produced due to the fact that since long duration cultivars process the maximum tillering stage within 60 days of sowing, transplanting during that period led to maximum yield depression of rice (Banik *et al.*, 1997) and rice versa number of panicles/m<sup>2</sup> at 40 days seedlings age was minimum. The seedling age of 30 days old markedly improved grain yield followed by the age at 25 days seedlings. However, increasing the age of seedling at 35 and 40 days reduced the grain yield. In the mean time, yield characteristics especially number of panicle/m<sup>2</sup> and panicle weight, 1000-grain weight significantly associated with the yield of grains. Similar conclusions were reported by Assey *et al.* (1992); Reddy and Reddy (1992); Bali *et al.* (1995); Banik *et al.* (1997) and Viraktamath *et al.* (1998).

It could be stated that the suitable seedling age is 30 days followed by the age 25 days old seedlings. The farmer should choose the age of 30 days old seedlings to get more grain yield and avoid planted old seedlings age of 35 or 40 days old.

### 3- Significant interaction effect:

The interaction between planting times and seedling ages on number of filled grains was markedly significant in both seasons are presented in Table 4. The medium transplanting time in 10<sup>th</sup> May statistically produced the highest number of filled grains under different studied seedling ages in both seasons with some exceptions. More, the 30 days seedlings old improved the number of filled grains under different planting dates. The highest number of filled grains was realized with planting in May 10 under using seedlings 30 days old. However, the lowest number of filled grains realized with seedlings 40 days old and late planting time.

**Table 4: Mean of number of filled grains/panicle as affected by the interaction between planting times and seedling ages during 1998 and 1999 seasons.**

Treatments	1998				1999			
	April 25	May 10	May 25	June 10	April 25	May 10	May 25	June 10
Seedling ages:								
20 days-old	B 133 c	A 142 b	B 132 b	C 127 b	B 134 c	A 144 b	B 132bc	C 128 b
25 days-old	B 135 b	A 143 b	C 133ab	C 132 a	B 137 b	A 145 b	C 133 b	C 131 a
30 days-old	B 141 a	A 145 a	C 134 a	D 132 a	B 143 a	A 148 a	C 136 a	D 132 a
35 days-old	B 134bc	A 135 c	C 125 c	C 124 c	B 134 c	A 139 c	C 131 c	D 126 c
40 days-old	B 131 d	A 134 d	C 124 d	D 122 d	A 133 c	A 134 d	C 128 d	C 125 c

**Table 5: Mean of straw yield (t/fed) as affected by the interaction between planting times and seedling ages during 1998 season.**

Treatments	April 25	May 10	May 25	June 10
<b>Seedling ages:</b>				
	A	A	A	B
20 days-old	4.625 bc	4.875 c	4.675 ab	4.050 b
	B	A	B	C
25 days-old	4.800 b	5.350 b	4.750 a	4.275 a
	B	A	C	C
30 days-old	5.225 a	5.625 a	4.525 b	4.400 a
	B	A	B	C
35 days-old	4.550 c	5.275 b	4.275 c	3.400 c
	B	A	B	C
40 days-old	4.250	4.700 c	4.150	3.275

A significant interaction effect on straw yield/fed between planting times and seedling ages in 1998 season are presented in Table 5. The planting date on May 10 markedly increased straw yield/fed under old seedling age. Furthermore, seedling age of 30 days markedly increased straw yield/fed under all planting date with some exceptions. The highest straw yield/fed was realized under planting on May 10 together with the seedling age of 30 days. The lowest straw yield/fed was recorded with planting on June 10 and seedlings 40 days old.

**4- The relationship between grain yield and its attributing variables:**

**a- Simple correlation coefficients:**

The results of phenotypic correlation coefficients between grain yield/fed and each its attributing variables show that grain yield/fed was positively and significantly associated with plant height (0.874), number of fallied grains/panicle (0.390), panicle weight (0.932) and 1000- grain weight (0.899) as shown in Table 6. In addition, 1000-grain weight positively and significantly associated with panicle weight (0.967), number of grains/panicle (0.850), panicle length (0.780), panicles number/m<sup>2</sup> (0.435) and plant height (0.849). Meanwhile, a positive and significant correlation coefficients were found between panicle weight and number of grains/panicle (0.937), panicle length (0.785), panicles number/m<sup>2</sup> (0.449) and plant height (0.753).

**Table 6: Matrix of simple correlation coefficients among rice grain yield and its attributing variables (over treatments and seasons).**

Characters	6	5	4	3	2	1
Y: Grain yield/fed	0.899**	0.932**	0.886**	0.721**	0.390*	0.874**
1- Planting height	0.967**	0.211	0.836**	0.722**	0.722**	1.000

2- No. of panicle/m <sup>2</sup>	0.350*	0.449**	0.408**	0.362*	0.362*	
3- Panicles length	0.720**	0.785**	0.720**	1.000	1.000	
4- No. of grains/panicle	0.435**	0.937**	1.000			
5- Panicle weight	0.752**	1.000				
6- 1000-grain weight	1.000					

r at 5% = 0.304

r at 1% = 0.393

**b- Multiple linear regression analysis:**

The results presented in Table 7 show the results of multiple linear regression analysis produced in predicting grain yield of rice. Regression coefficients, standard error, relative contribution (R<sup>2</sup>) for rice grain yield/fed and its components and also collected in the same Table. The results revealed that the prediction equation for rice grain yield (Y<sup>^</sup>) was formulated as follows:

$$Y^{\wedge} = - 5.9715 + 0.098 X_1 - 0.2168 X_3 + 1.0174 X_5$$

Where: X<sub>1</sub> = plant height , X<sub>3</sub> = panicle length , X<sub>5</sub> = panicle weight

The multiple correlation coefficients for grain yield in this equation was equal to 0.9575. This explains that 95.75 % of the total variation in rice grain yield/fed could be linearly related to the previously mentioned characters and only 4.25 % due to the residual. Plant height, panicle length and panicle weight were the most effective traits affecting rice grain yield/fed which recorded a significant coefficient of determination reached 35.46, 6.21 and 5.85 %, respectively. This mean that the most limiting factors for rice grain yield under investigation due to plant height, panicle length and panicle weight. Similar results were reported by El-Sayed (1998).

**Table 7: The regression coefficient, relative contribution (R<sup>2</sup>) and probability of yield attributing variables in predicting rice grain yield/fed using multiple linear regression analysis.**

Characters	Regression coefficient	Standard error	Relative contrib. R <sup>2</sup> (%)
1- Planting height	0.0980	0.0230	35.46**
2- No. of panicle/m <sup>2</sup>	0.0001	0.0004	0.43
3- Panicles length	- 0.2168	0.1462	6.25**
4- No. of grains/panicle	0.0005	0.0215	0.00
5- Panicle weight	1.0174	0.7847	5.85*
6- 1000-grain weight	0.0941	0.1172	0.91

y intercept = - 5.9715 Adjusted R<sup>2</sup> = 0.9017 R<sup>2</sup> = 0.9168 Multiple R = 0.95

**c- Stepwise regression analysis:**

Accepted and removed variables and their relative contributions in predicting rice grain yield/fed are shown in Table 8. The results collected in this Table reveal that plant height (R<sup>2</sup> = 31.19 %) and panicle weight (R<sup>2</sup> = 61.52 %) were the main variables related with rice grain yield/fed. Hence, these variables were accepted as significantly contribution for these two



variables. The best prediction equation ( $\hat{Y}$ ) for grain yield/fed was formulated as follows:

$$\hat{Y} = -8.2691 + 0.0859 X_1 + 1.2884 X_2$$

Where:  $X_1$  = plant height,  $X_2$  = panicle weight

**Table 8: Accepted and removed variables according to stepwise analysis and their relative contribution ( $R^2$ ) in rice grain yield.**

Characters	Regression coefficient	Standard error	Relative contrib. $R^2$ (%)
<b>A: Accepted varieties</b>			
1- Planting height	0.0859	0.0210	31.19**
2- No. of panicle/m <sup>2</sup>	1.2884	0.1673	61.58**
<b>B: Removed variables</b>			
3- Panicles length			0.52
4- No. of grains/panicle			4.91
5- Panicle weight			0.40
6- 1000-grain weight			1.46

y intercept = - 8.2691 Adjusted  $R^2$  = 0.9046  $R^2$  = 0.9095 Multiple R = 0.95

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### تأثر إنتاجية الأرز بمواعيد الزراعة وأعمار الشتلات

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أقيمت تجربتان حقليتان في حقل إرشادي بقرية البصراط - مركز المنزلة محافظة الدقهلية خلال موسمي الزراعة 1998 و 1999 وذلك لدراسة تأثير كل من مواعيد الزراعة (25 أبريل - 10 مايو - 25 مايو - 10 يونيو) وعمر الشتلات (20، 25، 30، 35 و 40 يوما) وكذلك التفاعل بينهما على النمو والمحصول ومكوناته للأرز صنف سخا 101. تم تنفيذ التجارب في تصميم القطع المنشقة مرة واحدة في أربع مكررات.

ويمكن تلخيص النتائج المتحصل عليها فيما يلي:

- 1- أوضحت النتائج تفوق الزراعة المبكرة في 10 مايو حيث سجل أعلى قيم لعدد الداليات / م<sup>2</sup>، عدد الحبوب الممتلئة / دالية، وزن الدالية، طول الدالية، وزن الألف حبة وكذلك محصول الحبوب والقش للقدان مقارنة بمواعيد الزراعة الأخرى في كلا موسمي الزراعة.
  - 2- لقد سجلت الزراعة بشتلات ذات أعمار 30 يوما تأثيرا معنويا وسجلت أعلى قيم لعدد الداليات / م<sup>2</sup>، عدد الحبوب الممتلئة / دالية، وزن الدالية، طول الدالية، وزن الألف حبة، محصول الحبوب والقش / فدان ودليل الحصاد في كلا موسمي الزراعة مقارنة بالشتلات الأصغر عمرا (20، 25 يوما) والشتلات الأكبر عمرا (35، 40 يوما).
  - 3- لقد سجل التفاعل بين مواعيد الزراعة وعمر الشتلات تأثيرا معنويا لصفة عدد الحبوب الممتلئة / دالية في كلا موسمي الزراعة وصفة محصول القش في الموسم الأول فقط.
  - 4- أوضحت النتائج أنه يوجد ارتباط معنوي موجب بين محصول الحبوب / فدان وكل من طول النبات، عدد الحبوب الممتلئة / دالية، وزن الدالية، طول الدالية، وزن الألف حبة، عدد الداليات / م<sup>2</sup>.
  - 5- أظهر تحليل معامل الانحدار المتعدد أن الصفات طول النبات (35.46%)، طول الدالية (6.25%) ووزن الدالية (5.58%) هي أهم المتغيرات تأثيرا ومساهمة في محصول الحبوب / فدان. بينما أشارت نتائج تحليل معامل الانحدار المرحلي أن صفتي طول النبات (31.19%) ووزن الدالية (61.58%) هي الصفات الأكثر مساهمة في محصول الحبوب / فدان.
- توصى الدراسة للحصول على أعلى إنتاجية من محصول الأرز وذلك بالزراعة في العاشر من مايو وذلك بشتلات عمرها 30 يوما للصنف سخا 101 ولك تحت ظروف مركز المنزلة محافظة الدقهلية.