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EFFECT OF PLANT DENSITY, MINERAL AND ORGANIC FERTILIZATION ON TWO RICE CULTIVARS

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ABSTRACT

Two field experiments were carried out at a private Farm at El-Zarka Center, Damietta Governorate during 2008 and 2009 summer seasons to study the effect of planting density (15 X 15, 20 X 20 and 25 X 25 cm) and mineral nitrogen fertilizer and poultry manure only and in combinations as follows: 100 % N, 75 % N + 25 % poultry manure, 50 % N + 50 % poultry manure, 25 % N + 75 % poultry manure and 100 % poultry manure addition on two rice cultivars *i.e.* Egyptian hybrid rice 1 (H_1) and local cultivar (Giza 178). The main parameters of growth, yield and its components of rice were recorded.

The obtained results could be summarized as follows:

1. Overall, Egyptian hybrid rice 1 cultivar (H1) significantly surpassed the local cultivar (Giza 178) in all studied characters in both growing seasons.
2. Using planting spacing 20 X 20 cm significantly recorded the highest values of grain yield in both seasons. While, the narrow spacing at 15 X 15 cm recorded the highest values of plant height and straw yield. Moreover, the wider spacing at 25 X 25 cm recorded the highest values of number of days from planting to 50 % flowering, flag leaf area, panicle length, number of grains/panicle, weight of grains/panicle and 1000-grain weight in both seasons.
3. Application of 100 % mineral nitrogen fertilizer alone significantly increased all studied characters and markedly recorded the highest values of these characters in both seasons. However, application of 75 % N + 25 % poultry manure came in the second rank and may be recommended in view of economic costs and maintenance of environment.

According to the obtained results from this study, it can be concluded that, planting Egyptian hybrid rice 1 cultivar (H1) at the plant spacing 20 X 20 cm and application 100 % N or 75 % N + 25 % poultry manure could be recommend to raise rice productivity and alleviate environmental pollution under the environmental conditions at El-Zarka Center, Damietta Governorate.

Keywords: Rice, *Oryza sativa* L., plant spacing, plant density, poultry manure, organic manures, nitrogen fertilizer, growth, yield.

INTRODUCTION

Rice (*Oryza sativa* L.) is a cereal crop and major source of income for a large number of peoples. In Egypt, rice is playing a major role in food security and we need to produce rice with self sufficiency and exported to improve the national income. Increasing rice productivity can be achieved through using high yielding cultivars and optimizing the cultural practices such as plant density and combined application of inorganic and organic fertilizers. Introduction of hybrid rice increased the yields about 15 – 20 % more than the promising high yielding commercial varieties. Hybrid rice varieties significantly reported better growth performance than the local cultivar Giza 178 at heading date, panicle length, number of panicles/hill,

filled grains/panicle, panicle weight, 1000-grain weight and grain yield (Zayed *et al.*, 2006 and Zayed *et al.*, 2010).

With respect to plant density, several studies reported that density is the important factor for controlling rice grain yield and its components. In this concern, Madkour (1993) and Bassal and Zahran (2002) reported that there was a tendency of decreasing plant height, number of panicles/m^2, grain and straw yields/fed and increasing flag leaf area, panicle length, number of filled grains/panicle, grains weight/panicle and 1000-grain weight in wider spacing. They stated that the increase in grain yield/fed with the narrow hill spaces may be attributed to the increase in the number of panicles/m^2. Ahmad *et al.* (2008) showed that plant density significantly affected grain yield and 1000-grain weight, while did not significantly affect plant height and number of grains/panicle. Lin *et al.* (2009) reported that rice grain yield was significantly affected by plant density. Greater plant density contributed to formation of higher biomass. Ogbodo *et al.* (2010) found that grain yield of rice was significantly increased with each increase in plant spacing. Wider spacing showed superior influence on crop growth traits such as plant height and number of tillers and it produced plant with more vigorous growth and larger plant size. The wider spacing area provided by transplanting at 30 X 30 cm and provided opportunity for greater growth which increased the availability of nutrients to plants as compared with plant spacing of 20 X 20 cm and 20 X 10 cm.

Concerning the combined application of organic manures and mineral nitrogen fertilizer, Ebaid (2000) found that increasing nitrogen level up to 144 kg N/ha under addition of 30 t/ha as organic manure produced the highest values of plant height, panicle length, 1000-grain weight and grain yield. Singh *et al.* (2000) reported that application of farmyard manure at the rate of 12 t/ha along with 45-77 kg N/ha (to make up to 150 kg N/ha) resulted in significant lower yield than adding 150 kg N/ha from urea. This indicated to lower availability of nitrogen from farmyard manure than urea to rice. Begum *et al.* (2001) showed that application of poultry manure alone or in combination with mineral nitrogen as urea significantly increased plant height, panicle length, number of grains/panicle and filled grains/panicle. Usman *et al.* (2003) found that application of poultry manure at the rate of 20 t/ha in combination with chemical fertilizers at 50 - 37.5 and 30 kg NPK/ha produced maximum number of grains per panicle, 1000-grain weight and grain yield. Kishk (2006) noticed that application of organic manure as poultry manure + foliar application significantly recorded higher plant height, number of tillers/m^2, number of panicles/m^2, panicle length, panicle weight, number of grains/panicle, 1000-grain weight and grain weight (t/fed) as compared with other studied fertilization treatments. In addition, Majumder *et al.* (2008) evaluated the impact of farmyard manure (FYM) along with inorganic fertilizers on grain and straw yields of rice – wheat cropping system in subtropical India. They observed that cropping with only N–P–K fertilization just maintained soil organic carbon content, while N–P–K plus organics increased soil organic carbon by 24.3 % over the control. They suggested that balanced fertilization with FYM is suitable management for sustaining

crop productivity of the rice–wheat system. Sarwar *et al.* (2008) found that farmyard manure (FYM) was used for nutrient supplementation alone and along with chemical fertilizer for rice crop. Rice grain yield (3.36 t/ha) significantly increased with the use of FYM in combination with chemical fertilizer. Manivannan *et al.* (2009) showed that addition of organic or mineral nitrogen as urea significantly improved rice yield over the control treatment in both seasons. Rice grain yield was more with 100 % nitrogen as urea compared with 100% organic manure alone. Hasanuzzaman *et al.* (2010) found that different plant characters of rice such as plant height and number of tillers were significantly influenced by different organic manure application in combination with inorganic fertilizers. From the observation, the tallest plants of rice were resulted from application of 100 % NPK.

Therefore, this study aimed to maximize grain yield of Egyptian hybrid rice 1 compared with local cultivar Giza 178 under plant density and combined application with poultry manure and mineral nitrogen fertilizer under environmental conditions of Damietta Governorate.

MATERIALS AND METHODS

Two field experiments were carried out at a Private Farm in El-Zarka Center, Damietta Governorate, during 2008 and 2009 summer seasons to study the effects of planting spacings and the combined applications from poultry manure and mineral nitrogen fertilizer on growth, yield and its components of two rice cultivars *i.e.* Egyptian hybrid rice 1 (H_1) and local cultivar (Giza 178).

Each cultivar (H_1 and Giza 178) was practiced in separate experiments. Every experiment was carried out in strip plot design with three replications. Rice seeds of the studied cultivars (Egyptian hybrid rice 1and Giza 178) were obtained from the Agricultural Research Center (ARC), Ministry of Agriculture and Land Reclamation.

The vertical plots were occupied with plant density reporting three hill spacing as follows: D_1- 15 × 15 cm, D_2- 20 × 20 cm and D_3- 25 × 25 cm. The horizontal plots were assigned to the combinations of nitrogen fertilizer levels together with poultry manure treatments as follows: 100 % N (mineral fertilization with 70 kg N/fed), 75 % N + 25 % poultry manure, 50 % N + 50 % poultry manure, 25 % N + 75 % poultry manure and 100 % poultry manure addition. The poultry manure composition include 3 – 3.5 % nitrogen which calculated to equal mineral nitrogen needed by rice crop at 70 kg N/fed.

The experimental plot area was 3.0 m width and 3.5 m length, resulted plot area of 10.5 m^2 (1/400 fed). The preceding winter crop was wheat (*Triticum aestivum* L.) in the two seasons. The soil was clay in texture and having a pH of 8.07 and 7.80 with organic matter at 2.68 and 2.70 % in 2008 and 2009 seasons.

The nursery of rice at the experimental field was well prepared and divided to two areas, one for Egyptian hybrid rice and the other for Giza 178 rice cultivar. Calcium superphosphate (15.5 % P_2O_5) was added at the rate of

100 kg/fed on the dry soil before plowing. Rice as seeded by broadcasting at the recommended rates of both studied cultivars. The seeds were soaked in fresh water for 48 hours and incubated for 48 hours. The pre-germinated seeds were broadcasted by hand on the first of May during 2008 and 2009 seasons in the nursery soil. Permanent soil was well prepared and divided to two areas for each cultivar, then divided to horizontal and vertical plots. Poultry manure treatments was distributed in horizontal plots. After 25 days from planting, the seedlings were transplanted of both cultivars carefully. The vertical plots were occupied with plant density reporting three hill spacing *i.e.* D_1= 15 × 15 cm, D_2= 20 × 20 cm and D_3= 25 × 25 cm between hills and rows with the seedling rate at 3 plants per hill for both cultivars. Normal watering management, at four to six days was followed. Nitrogen fertilizer in the form urea (46 % N) was added as previously mentioned levels in two equal portions. The first part was added at the time of soil preparation after dividing the horizontal plots, and the second was added after 30 days from transplanting. Potassium in the form of potassium sulphate (48 % K_2O) was added at the rate of 24 kg K_2O/fed with the second dose of nitrogen fertilizer. However, commonly other agricultural practices according to the recommendations of Ministry of Agriculture for growing rice crop were followed.

Data Recorded:

A. Growth characters:

1- Number of days from planting to 50 % heading.

2- Flag leaf area (cm^2): At maximum tillering stage, the leaf area of flag leaf was estimated by using the formula reported by Yoshida *et al.* (1976) as follows:

Flag leaf area (cm^2) = K x Length (cm) x width (cm). Where: K (0.75).

B. Yield and its components:

At harvest, the following parameters were recorded:

3- Plant height (cm).
4- Number of panicles/m^2.
5- Panicle length (cm).
6- Number of grains/panicle.
7- Grains weight/panicle (g).
8- 1000- grain weight (g).

9- Grain yield (t/fed): Plants in the inner four square meter of each experimental unit were harvested, labeled and tied. Thereafter, plants were transported to the threshing floor for air drying for five days, then the plants were threshed and the grains were separated. The grain yield was recorded in kg/4 m^2, and then it was converted to record grain yield t/fed at 14 % moisture content.

10- Straw yield (t/fed): It was estimated using the same steps for grain yield.

All obtained data were statistically analyzed according to the technique of analysis of variance (ANOVA) for the strip plot design to each experiment (cultivar experiments), then combined analysis was done between cultivar experiments by means of "MSTAT-C " computer software package as published by Gomez and Gomez (1984). Least Significant Difference (LSD) method was used to test the differences between treatment means at 5 % level of probability as described by Waller and Duncan (1969).

RESULTS AND DISCUSSION

1- Cultivars performance:

Data presented in Tables 1 and 2 showed significant differences detected in the growth, yield and its components of the tested rice cultivars including Egyptian hybrid rice 1 (H1) and local cultivar Giza 178. It seemed that H1 cultivar was superior in all studied traits as compared with the local cultivar G 178in the two growing seasons. Egyptian hybrid rice 1 (H1) gave the longest period to 50 % flowering and the highest values of flag leaf area, plant height, number of panicles/m^2, panicle length, number of grains/panicle, weight of grains/panicle, 1000-grain weight, grain and straw yields/fed as compared with local cultivar Giza 178 in the first and second seasons of this study. These results may be due to genetic factors makeup variations. Zayed *et al.* (2010) came to the same conclusion.

2- Plant spacings effect:

Plant spacings exhibited significant effect on all studied characters in both seasons (Tables 1 and 2). It can be observed that the narrow plant spacing at 15 X 15 cm significantly recorded the highest values of plant height, number of panicles/m^2 and straw yield/fed. Whereas, the lowest values of number of days from planting to 50 % flowering, flag leaf area, panicle length, number of grains/panicle, grains weight/panicle and 1000-grain weight were resulted from the narrow plant spacing at 15 X 15 cm. Noteworthy, the wider plant spacing at 25 X 25 cm markedly recorded the highest values of number of days from planting to 50 % flowering, flag leaf area, panicle length, number of grains/panicle, weight of grains/panicle and 1000-grain weight in both seasons. Whilst, the lowest values of plant height, number of panicles/m^2, grain and straw yields/fed were obtained when using plant spacing of 25 X 25 cm in both seasons. With respect intermediate plant spacing at 20 X 20 cm, it gave the highest values of grain yield/fed in both seasons. These results may be due to the increase in number of panicles/m^2 with plant spacing at 20 X 20 which markedly superior more than plant spacing at 25 X 25 cm. More, panicle length at plant spacing 20 X 20 cm markedly out yielded more than plant spacing at 15 X 15 cm. Furthermore, number of grains/panicle of plant spacing at 20 X 20 cm was more superior than the plant spacing at 15 X15 cm and weight of grains/panicle in plant spacing 20 X 20 cm was the largest than plant spacing at 15 X 15 cm. Finally, the vegetative growth is vigorous in the wider spacing more than the narrow spacing and this encourage the yield components formation. In this connection Madkour (1993) and Bassal and Zahran (2002) reported similar results.

3- Mineral and organic fertilization effect:

From obtained results that listed in Tables 1 and 2, revealed that combined application of poultry manure and mineral nitrogen fertilizer treatments exhibited significant effect on all growth traits, yield and its components in both growing seasons. Application of 100 % nitrogen fertilizer alone significantly increased period to 50 % flowering, flag leaf area, plant height, number of panicles/m^2, panicle length, number of grains/panicle,

grains weight/panicle, 1000-grain weight, grain and straw yields/fed in both seasons. If compare with manure and nitrogen combinations; Nitrogen application encourages vegetative growth due to cell elongation and cell division and this appeared to be improved vegetative growth and increased yield attributes and grain yield if compared with the rest of treatments. Salem (2006) and Zayed *et al.* (2006) reported similar results. Application of 75 % mineral nitrogen + 25 % poultry manure came in the second rank after application of 100 % mineral nitrogen alone with respect of all studied characters in both seasons. This treatment may be recommended when take into consideration of economic costs and also environmental pollution with nitrite and nitrate. On the other side, application of 100 % poultry manure alone gave the lowest values of all studied characters in the two growing seasons. The release of nitrogen mineralization is slow and maintain within the soil to the consequent crops (Singh *et al.*, 2000 and Majumder *et al.,* 2008).

4- Interactions effect:

There are many significant interaction effects among studied factors on most reported characters in both seasons. We enough reported the significant interaction among studied factors on grain yield only. As seems to appear from data in Table 3, the highest values of rice grain yield (4.669 and 4.896 t/fed) were obtained when planting Egyptian hybrid 1 cultivar at the plant spacing 20 X 20 cm in the first and second seasons, respectively. On the other hand, the lowest values of rice grain yield were resulted from planting Giza 178 cultivar at plant spacing 25 X 25 cm, which were 3.773 and 3.858 t/fed in the first and second seasons, respectively.

Data presented in Table 4 show that the highest values of rice grain yield (5.101 and 5.054 t/fed) were obtained when fertilizing Egyptian hybrid 1 cultivar with 100 % mineral nitrogen fertilizer in the first and second seasons, respectively. Application of 75 % mineral nitrogen + 25 % poultry manure in addition using H1 cultivar came in the second rank in both seasons. On the other hand, the lowest values of rice grain yield were resulted from fertilizing Giza 178 cultivar with 100 % poultry manure alone, which were 3.411 and 3.504 t/fed in the first and second seasons, respectively.

From data listed in Table 5 which indicated that, the highest values of rice grain yield (4.887 and 5.113 t/fed) were obtained when using plant spacing 20 X 20 cm and application of 100 % mineral nitrogen fertilizer in the first and second seasons, respectively. On the other hand, the lowest values of rice grain yield were resulted from plant spacing 25 X 25 cm and application of 100 % poultry manure alone, which were 3.520 and 3.603 t/fed in the first and second seasons, respectively.

The highest values of rice grain yield (5.247 and 5.560 t/fed) were obtained when fertilizing Egyptian hybrid 1 cultivar with 100 % mineral nitrogen fertilizer along with planting at 20 X 20 cm in the first and second seasons, respectively (Table 6). Application of 75 % mineral nitrogen + 25 % poultry manure in addition with using H1 cultivar beside planting at 20 X 20 cm came in the second rank in both seasons.

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On the other hand, the lowest values of rice grain yield were resulted from fertilizing Giza 178 cultivar with 100 % poultry manure alone and planting at 25 X 25 cm, which were 3.310 and 3.353 t/fed in the first and second seasons, respectively.

Table 3: Grain yield (t/fed) as affected by the interaction between rice cultivars and plant spacing during 2008 and 2009 seasons.

Plant spacing / Cultivars	15 × 15	20 × 20	25 × 25
2008 season			
Giza 178	3.906	4.037	3.773
Hybrid 1	4.575	4.669	4.407
LSD at 5 %	0.016		
2009 season			
Giza 178	4.004	4.164	3.858
Hybrid 1	4.765	4.896	4.350
LSD at 5 %	0.018		

Table 4: Grain yield (t/fed) as affected by the interaction between rice cultivars and mineral and organic (MO) fertilization during 2008 and 2009 seasons.

Mineral and Organic fertilization / Cultivars	100 % M	75 % M + 25 % O	50 % M + 50 % O	25 % M+ 75 % O	100 % O
2008 season					
Giza 178	4.402	4.159	3.893	3.662	3.411
Hybrid 1	5.101	4.832	4.576	4.258	3.986
LSD at 5 %	0.017				
2009 season					
Giza 178	4.514	4.254	4.002	3.768	3.504
Hybrid 1	5.054	5.016	4.736	4.402	4.143
LSD at 5 %	0.020				

MO = Mineral and Organic fertilization

Table 5: Grain yield (t/fed) as affected by the interaction between plant spacing and mineral and organic (MO) fertilization during 2008 and 2009 seasons.

Mineral and Organic fertilization / Plant spacing	100 % M	75 % M + 25 % O	50 % M + 50 % O	25 % M+ 75 % O	100 % O
2008 season					
15 × 15	4.732	4.478	4.255	3.998	3.738
20 × 20	4.887	4.608	4.335	4.100	3.837
25 × 25	4.637	4.400	4.113	3.782	3.520
LSD at 5 %	0.018				
2009 season					
15 × 15	4.928	4.632	4.395	4.112	3.855
20 × 20	5.113	4.750	4.510	4.263	4.013
25 × 25	4.812	4.523	4.202	3.880	3.603
LSD at 5 %	0.023				

MO = Mineral and Organic fertilization

Table 6: Grain yield (t/fed) as affected by the interaction among rice cultivars, plant spacing and mineral and organic (MO) fertilization during 2008 and 2009 seasons.

Mineral and Organic fertilization / Plant spacing		100 % M	75 % M + 25 % O	50 % M + 50 % O	25 % M+ 75 % O	100 % O
2008 season						
Giza 178	15 × 15	4.403	4.150	3.943	3.643	3.390
	20 × 20	4.527	4.300	4.010	3.817	3.533
	25 × 25	4.277	4.027	3.727	3.527	3.310
Hybrid 1	15 × 15	5.060	4.807	4.567	4.353	4.087
	20 × 20	5.247	4.917	4.660	4.383	4.140
	25 × 25	4.997	4.773	4.500	4.037	3.730
LSD at 5 %		0.022				
2009 season						
Giza 178	15 × 15	4.520	4.253	4.020	3.740	3.487
	20 × 20	4.667	4.387	4.153	3.940	3.673
	25 × 25	4.357	4.123	3.833	3.623	3.353
Hybrid 1	15 × 15	5.337	5.010	4.770	4.483	4.223
	20 × 20	5.560	5.113	4.867	4.587	4.353
	25 × 25	5.267	4.923	4.570	4.137	3.853
LSD at 5 %		0.032				

MO = Mineral and Organic fertilization

It could be stated that maximizing grain yield of rice could be achieved by planting Egyptian hybrid rice 1 with plant spacing at 20 X 20 cm under addition of 100 % mineral nitrogen fertilizer.

REFERENCES

Ahmad, S.M. ; H. Ziaul ; H. Ali ; S.A. Shael ; A. Ahmad ; M. Maqsood ; M.B. Khan ; S. Mehmood and A. Hussain (2008). Water and radiation use efficiencies of transplanted rice (*Oryza sativa* L.) at different plant densities and irrigation regimes under semi arid environment. Pakistan J. Bot., 40 (1): 199-209.

Bassal, S.A.A. and F.A. Zahran (2002). Effect of farmyard manure, bio and mineral nitrogen fertilizer and hill spacing on rice crop productivity. J. Agric. Sci. Mansoura Univ., 27 (4): 1975-1988.

Begum, S. ; M.M. Rahman ; M.J. Abedin ; M.R. Islam and M. Uddin (2001). Effect of nitrogen supplied from manure and fertilizer on the growth, yield and nutrient uptake of rice. J. of Biol. Sci., 1 (8): 708-710.

Ebaid, R.A. (2000). Rice production as affected by integration of organic and inorganic nitrogen fertilizers. J. Agric. Sci. Mansoura Univ., 25 (12): 7359-7365.

Gomez, K.N. and A.A. Gomez (1984). Statistical procedures for agricultural research. John Wiley and Sons, New York, 2nd Ed., 68 P.

Hasanuzzaman, M. ; K.U. Ahmad ; N.M. Rahmatullah ; N. Akhter ; K. Nahar and M.L. Rahman (2010). Plant growth characters and productivity of wet land rice (*Oryza sativa* L.) as affected by application of different manures. Emir. J. Food Agric., 22 (1): 46-58.

Kishk, A.M.S. (2006). Effect of different irrigation and organic fertilizer treatments on yield and technological characteristics of some rice cultivars. M. Sc. Thesis, in Agron. Fac. of Agric. Mansoura Univ.

Lin, X.Q. ; D.F. Zhu ; H.Z. Xhen ; S.H. Cheng and N. Uphoff (2009). Effect of plant density and nitrogen fertilizer rates on grain yield and nitrogen uptake of hybrid rice (*Oryza sativa* L.). J. of Agric. Biotech. & Sustain. Develop., 12 (1): 44-53 (C.F. Computer Search).

Madkour, M.A.M. (1993). Effect of some practices on yield potentiality of rice. Ph D. Thesis, Fac. of Agric., Zagazig Univ.

Majumder, B. ; B. Mandal ; P.K. Bandyopadhyay ; A. Gangopadhyay ; P.K. Mani ; A. L. Kundu and D. Mazumdar (2008). Organic amendments influence soil organic carbon pools and rice–wheat productivity. Soil Sci. Soc. Am. J., 72: 775–785.

Manivannan, R. ; M.V. Sriramach and R. Asckhan (2009). Effect of organic sources and urea on N. transformation and yield of low land rice growth in clay loam soil. Res. J. Agric. & Biol. Sci., 5 (6): 1104-1109.

Ogbodo, T.N. ; I.I. Tkpe ; T.B. Utobo and T.O. Ogah (2010). Effect of plant spacing and N rates on the growth and yields of rice at Abakaliki state, Southeast Nigeria. Res. J. Agric. & Biol. Sci., 6 (5): 658-668.

Salem, A.K. (2006). Effect of nitrogen levels, plant spacing and time of farmyard manure application on the productivity of rice. J. Appl. Sci. Res., 2 (11): 980-987.

Sarwar, G. ; N. Hussain ; H. Schmeisky ; S. Suhammad ; M. Ibrahim and S. Ahmad (2008). Efficiency of various organic residues for enhancing rice-wheat production under normal soil conditions. Pakistan J. Bot., 40(5): 2107-2113.

Singh, Y. ; B. Singh ; O.P. Meelu and C.S. Kind (2000). Long – term effects of organic manuring and crop residues on the productivity and sustainability of rice – wheat cropping system in Northwest India. Punjab Agric. Univ., Ludhiana, 141004, Punjab, India, pp. 149-162 (C.F. Computer Search).

Usman, M. ; T. Ullah ; G.A. Warriach ; M. Farooq and A. Liaqat (2003). Effect of organic and inorganic manures on growth and yield of rice variety Basmatti-2000. Int. J. Agric. Biol., 5 (4): 481-483.

Waller, R. A. and D. B. Duncan (1969). A bays rule for symmetric multiple comparison problem. Amer stat. Assoc. J. 1485-1503.

Yoshida, S. ; D.A. Forno ; J.H. Cock and K.A. Gomez (1976). Laboratory manual for physiological studies of rice. International Rice Research Institute, Los Banos, Laguna, Philippines, p. 83.

Zayed, B.A. ; A.M. El-Ekhtyar ; A.B. El-Abd and M.A. Badawi (2006). Response of hybrid and inbred rice varieties to various nitrogen levels under saline soil conditions. J. Agric. Sci. Mansoura Univ., 31 (12): 7497-7509.

Zayed, B.A. ; I.S. El-Rafaee and S.E.M. Sedeek (2010). Response of different rice varieties to phosphorus fertilizer under newly reclaimed saline soils. J. Plant Production, Mansoura Univ., 1(11): 1479-1493.

تـأثير الكثافـة النباتيـة والتسـميد النيتروجينـى والعضـوى علـى صـنفى الأرز هجـين مصرى ١ وجيزة ١٧٨

عادل محمد سلامة ، محسن عبد العزيز بدوى ، صالح السيد سعده والسيد الشاذلى نعمان
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أجريت تجربتان حقليتان بمزرعة خاصة بمركز الزرقا - محافظة دمياط خلال موسمى ٢٠٠٨ و ٢٠٠٩ بهدف إستجابة صنفى الأرز هجين مصرى ١ وجيزة ١٧٨ للكثافة النباتية (١٥ × ١٥ سم ، ٢٠ × ٢٠ سم و٢٥ × ٢٥ سم) والتسميد النيتروجينى والعضوى (١٠٠ % سماد نتيروجينى فقط ، ٧٥ % سماد نيتروجينى + ٢٥ % سبلة دواجن ، ٥٠ % سماد نيتروجينى + ٥٠ % سبلة دواجن ، ٢٥ % سماد نيتروجينى + ٧٥ % سبلة دواجن و ١٠٠ % سبلة دواجن فقط). أجريت الدراسة فى تجارب منفصلة للأصناف حيث أجريت تجارب الأصناف فى تصميم الشرائح المتعامدة فى ثلاث مكررات.

ويمكن تلخيص أهم النتائج المتحصل عليها فيما يلى:

١- أدت زراعة صنف الأرز الهجين المصرى ١ إلى تفوق معنوى على الصنف المحلى جيزة ١٧٨ فى جميع صفات النمو تحت الدراسة فى كلا موسمى الزراعة.

٢- أظهرت زراعة الأرز على مسافات ٢٠ × ٢٠ سم زيادة معنوية والحصول على أعلى القيم لمحصول الحبوب ومكوناته فى كلا موسمى الدراسة. أما الزراعة على مسافات ضيقة ١٥ × ١٥ سم أدت للحصول على أعلى القيم لصفتى طول النبات ومحصول القش للفدان فى كلا الموسمين. فى حين أن الزراعة على مسافات واسعة ٢٥ × ٢٥ سم أدت للحصول على أعلى القيم لصفات عدد الأيام من الزراعة حتى ٥٠ % إزهار ، طول السنبلة ، عدد ووزن حبوب السنبلة ووزن الألف حبة فى كلا الموسمين.

٣- أدى التسميد النيتروجينى بمعدل ٧٠ كجم/فدان (١٠٠ % سماد نيتروجينى معدنى) إلى زيادة معنوية والحصول على أعلى القيم لجميع الصفات تحت الدراسة فى كلا الموسمين. فى حين أن إستخدام ٧٥ % من السماد النيتروجينى + ٢٥ % من سبلة الدواجن أتت فى المرتبة الثانية بعد المعاملة السابقة إلا أنه يمكن التوصية بها بالأخذ فى الإعتبار الجانب الإقتصادى والحد من التلوث البيئى بالنيتريت والنترات.

من النتائج المتحصل عليها فى هذه الدراسة يوصى بزراعة صنف الأرز هجين مصرى ١ على مسافة ٢٠ × ٢٠ سم والتسميد النيتروجينى بمعدل ٧٠ كجم نيتروجين للفدان او إستخدام ٧٥ % من السماد النيتروجينى + ٢٥ % من سبلة الدواجن للحصول على أعلى إنتاجية للأرز تحت ظروف منطقة الزرقا - محافظة دمياط.

قام بتحكيم البحث

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Table 1: Number of days to 50 % flowering, flag leaf area, plant height, number of panicles/m^2 and panicle length as affected by plant spacing, combined application of mineral nitrogen fertilizer and poultry manure of two rice cultivars during 2008 and 2009 seasons.

Characters	Number of days to 50 % flowering		Flag leaf area (cm^2)		Plant height (cm)		Number of panicles/m^2		Panicle length (cm)	
Treatments	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
A- Cultivars:										
Giza 178	94.0	93.9	22.69	23.07	88.8	90.2	332.6	336.3	20.54	21.14
Hybrid 1	95.6	95.6	34.88	36.06	95.1	96.8	355.0	360.2	22.45	23.36
F. test	*	*	*	*	*	*	*	*	*	*
B- Plant spacing (cm):										
15 × 15	93.7	93.5	27.39	27.57	93.7	95.6	363.1	368.2	20.63	21.37
20 × 20	94.8	94.8	28.62	29.50	91.7	93.1	356.3	363.2	21.66	22.53
25 × 25	96.0	96.0	30.36	31.61	90.5	91.9	312.0	313.3	22.19	22.85
F. test	*	*	*	*	*	*	*	*	*	*
LSD at 5 %	0.2	0.3	0.57	0.62	0.1	0.1	0.38	0.40	0.05	0.09
C- Mineral and organic fertilization:										
100 % Mineral	95.8	95.8	31.41	32.52	97.8	99.3	354.8	357.0	22.99	23.48
75 % Mineral + 25 % Organic	95.3	95.6	30.25	31.26	94.5	95.8	349.1	352.3	22.21	22.90
50 % Mineral + 50 % Organic	94.9	94.8	28.83	29.50	91.3	93.3	343.6	347.8	21.43	22.22
25 % Mineral + 75 % Organic	94.3	94.0	27.42	27.90	89.1	90.7	339.2	344.2	20.75	21.71
100 % Organic	93.7	93.5	26.03	26.62	87.2	88.4	332.3	339.8	20.10	20.95
F. test	*	*	*	*	*	*	*	*	*	*
LSD at 5 %	0.2	0.3	0.63	0.77	0.1	0.2	0.40	0.48	0.08	0.11

Table 2: Number of grains/panicle, weight of grains/panicle, 1000 - grain weight, grain and straw yields/fed as affected by plant spacing, combined application of mineral nitrogen fertilizer and poultry manure of two rice cultivars during 2008 and 2009 seasons.

Characters	Number of grains/panicle		Weight of grains/panicle (g)		1000 - grain weight (g)		Grain yield (t/fed)		Straw yield (t/fed)	
Treatments	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
A- Cultivars:										
Giza 178	115.2	116.1	2.79	2.86	24.27	24.63	3.906	4.009	2.738	2.802
Hybrid 1	124.2	126.0	3.06	3.22	24.54	25.49	4.550	4.670	3.004	3.075
F. test	*	*	*	*	*	*	*	*	*	*
B- Plant spacing (cm):										
15 × 15	115.8	117.0	2.76	2.86	23.94	24.56	4.240	4.384	2.940	3.031
20 × 20	119.1	120.7	2.89	3.01	24.28	24.80	4.353	4.530	2.917	2.966
25 × 25	124.2	125.4	3.12	3.24	25.00	25.82	4.090	4.104	2.756	2.820
F. test	*	*	*	*	*	*	*	*	*	*
LSD at 5 %	0.2	0.3	0.02	0.01	0.06	0.11	0.014	0.023	0.004	0.008
C- Mineral and organic fertilization:										
100 % Mineral	125.1	128.0	3.19	3.36	25.45	26.08	4.752	4.784	3.071	3.162
75 % Mineral + 25 % Organic	123.0	124.3	3.09	3.19	24.95	25.70	4.496	4.635	2.968	3.036
50 % Mineral + 50 % Organic	120.3	121.1	2.93	3.05	24.46	25.18	4.234	4.369	2.873	2.936
25 % Mineral + 75 % Organic	116.6	117.5	2.77	2.86	23.84	24.48	3.960	4.085	2.767	2.829
100 % Organic	113.5	114.3	2.64	2.72	23.32	23.86	3.698	3.824	2.677	2.731
F. test	*	*	*	*	*	*	*	*	*	*
LSD at 5 %	0.3	0.4	0.03	0.02	0.09	0.14	0.015	0.025	0.006	0.010