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Evaluation of New Egyptian Japonica Green Super Rice Varieties Under Fertilization and Plant Spacing

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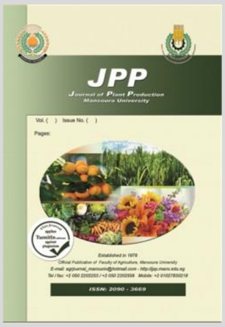

ABSTRACT

JRL-23 (Sakha Super 300) and JRL-96 line are new Egyptian Japonica Green Super Rice varieties which reach an optimum yield if fertilized properly and planted in the suitable spacing. A field experiment was conducted in two successive seasons 2019 and 2020 at the Experimental Farm of Rice Research and Training Center (RRTC), Sakha, Kafrelsheikh, Egypt; to evaluate the effect of different levels of fertilizers ($N_0P_0K_0$, $N_{82.5}P_{18}K_{30}$, $N_{123.75}P_{27}K_{45}$, $N_{165}P_{36}K_{60}$ and $N_{330}P_{72}K_{120}$) and two plant spacing (15×15 cm and 20×20 cm) on the new Egyptian Japonica Green Super Rice varieties Sakha Super 300 and JRL-96 line. The results indicated that the new rice variety Sakha Super 300 was better than the JRL-96 line in all studied characteristics. Moreover, there were significant positive effects of application the $N_{330}P_{72}K_{120}$ without any significant differences with $N_{165}P_{36}K_{60}$ under 20×20 cm plant spacing on chlorophyll content, leaf area index, plant height, number of tillers m^{-2}, panicle weight, panicle length, filled grain weight panicle^{-1}, number of panicles m^{-2}, 1000-grain weight, percentage of filled grain, grain and straw yields. $N_{330}P_{72}K_{120}$ or $N_{165}P_{36}K_{60}$ showed the best growth characteristics, grain yield and its attributes. Besides, a wider plant spacing of 20×20 cm better than a plant spacing of 15×15 cm in terms of all growth metrics in the two seasons. The new Egyptian Japonica Green Super Rice varieties, Sakha Super 300 and JRL-96 line, were benefiting from the application of $N_{165}P_{36}K_{60}$ with a plant spacing of 20×20 cm, saving NPK dosage up to $N_{330}P_{72}K_{120}$ with the maximum grain yield per hectare.

Keywords: Green Super Rice, Japonica, NPK, Plant spacing

INTRODUCTION

Rice is one of the world's leading cereals and staple foods, which is abundantly grown in Egypt. A yearly average cultivated area of 9.59 t ha^{-1} (RRTC, 2020).

Fertilizer application are the most important practices in rice production. Balanced fertilization and recommended doses can achieve the best status of all nutrients in the soil and the optimum growing environment for growth and yield of rice (Elekhtyar, 2007; Mantovani et al., 2017). The recommended combination of Nitrogen (N), phosphorus (P), and potassium (K) fertilizers are vital for productive crop of rice (Stellacci et al., 2013). Moreover, available NPK nutrients coming from mineralization and available sources of fertilizer, can be directly absorbed by plants, contributing greatly to the paddy rice (Vogeler et al., 2009).

Optimum transplanting spacing is an important parameter for the maximum grain yield of rice (Menete et al., 2008) and (Thakur et al., 2010). The plant spacing in rice has high effects on biomass, tillering, productive tillers hill^{-1} and number of grains panicle^{-1} (Hatta, 2012). Wider plant spacing allows rice plant to express the growth potential (Pratiwi et al., 2010). Wider plant spacing can increase the capture of solar radiation by plants for photosynthesis, absorption of nutrients by roots, efficiency of plant water needs, circulation of CO_2 and O_2 from photosynthesis, that can increase the productivity of rice (Syahri and Somantri, 2016). Also, availability of space that determines weed populations, and microclimate under the canopy which affects the development of plant pests (Makarim et al., 2005). Suitable spacing has a positive affect important processes in rice tillers, volume and length of roots, plant dry weight, and grain weight per hill (Lin et al., 2009). the dense plant spacing can cause a high planting population and decrease in the number of tillers hill^{-1} (Mobasser et al., 2009).

Finally, the fertilization and planting system are the important technological components in rice cultivation, which increase contribution to high rice productivity (Elekhtyar, 2016).

Thus, the main objective of this study was to evaluate new Egyptian Japonica Green Super Rice varieties under various NPK fertilizers doses and two plant spacings.

MATERIALS AND METHODS

A field experiment was conducted in two successive seasons of 2019 and 2020 at the Experimental Farm of Rice Research and Training Center (RRTC), Sakha, Kafrelsheikh, Egypt; to evaluate the effect of different levels of NPK fertilizers and plant spacing of the new Egyptian rice varieties Sakha Super 300 and JRL-96 line.

Egyptian Japonica Green Super Rice (EJGSR), JRL-23 line (Sakha Super 300), and JRL-96 line are medium grain and medium maturity rice varieties produced by the Rice Research and Training Center at the Sakha Research Station in Kafrelsheikh, Egypt.

To hasten early germination, seeds were soaked in water for 24 hours and then incubated for another 48 hours at a rate of 96 kg ha^{-1} of each variety. On the 20th of May of both seasons, pre-germinated seeds were uniformly broadcasted in

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the nursery. After preparing the permanent field, seedlings were carefully removed from the nursery after 30 days of sowing and distributed among the plots. At a rate of 2-3 seedlings hill^{-1}, seedlings were manually transplanted into 9 m^2 sub-plots with 15×15 cm and 20×20 cm plant spacing. During the growing season, all other agronomic practices were carried out as recommended. In both seasons, the prior crop was barley. At a depth of 30 cm from the soil surface, samples of soil were obtained from each site. Methods of soil analysis clarified (Black et al., 1965). Table 1. Shows some of the soil's chemical properties at the experimental site.

Table 1. Soil chemical properties of the experimental sites in 2019 and 2020 seasons.

	2019	2020
Soluble anions (meq. L^{-1})		
HCO_3^-	7.80	17.00
Cl^-	7.20	16.90
SO_4^{--}	3.12	2.90
Soluble Cations (Meq. L^{-1})		
Ca^{++}	9.41	8.25
Mg^{++}	4.52	3.80
K^+	1.48	1.22
Na^{++}	12.40	13.05
Availabe micronutrients (ppm)		
Fe^{++}	5.95	5.30
Mn^{++}	3.30	3.10
Zn^{++}	1.00	1.15
Available NH_{4+} (mg kg^{-1})	14.15	13.70
Available P (mg kg^{-1})	11.92	12.00
Available K (mg kg^{-1})	375	380
Ec (ds.m^{-1})	2.55	2.25
pH (1:2.5 water suspension)	8.12	8.18
Organic Matter (O.M) %	1.59	1.53
Soil texture	Clayey	Clayey

330 N:72 P:120 K kg ha^{-1}, 165 N:36 P: 60 K kg ha^{-1}, 123.75 N: 27 P: 45 K kg ha^{-1} and 82.5 N: 18 P:30 K kg ha^{-1} were used as 200%, 100%, 75% and 50%, of Egyptian rice recommended NPK fertilizers respectively. Nitrogen fertilizer in the form of urea "CH_4N_2O" (46.5%N) were applied in two equal splits, the first half as basal application and incorporated into the soil then immediately the soil was flooded. The second dose was top-dressed 30 days after transplanting. Phosphorus fertilizer in the form of single super phosphate (15.5% P_2O_5) was applied in the permanent field and incorporated into soil during land preparation. Potassium fertilizer in the form of potassium sulfate (48% K_2O) was applied in the permanent field and incorporated into soil during land preparation. The usual agricultural practices of growing rice were performed as the recommendation of Rice Research and Training Center, Egypt. (RRTC, 2020)

A split-split plot design with four replications was used. Varieties were located to the main plots, the sub-plots to plant spacing and the sub-sub plots to the levels of NPK fertilizer at random:

Varieties:

1. JRL-23 Line (Sakha Super 300), the JRL-23 line was registered by Egyptian Ministerial Resolution No. 1115 of 2018, under the trademark Sakha Super "300" Rice cultivar.
2. JRL-96 Line is almost certain to be registered as the Sakha Super "301" trademark.

Plant spacing:

1. 15×15 cm
2. 20×20 cm

Treatments:

T1: $N_0P_0K_0$ (Control), T2: $N_{82.5}P_{18}K_{30}$ "82.5 Kg N ha^{-1}: 18 Kg P ha^{-1}: 30 Kg K ha^{-1}", T3: $N_{123.75}P_{27}K_{45}$ "123.75 Kg N ha^{-1}: 27 Kg P ha^{-1}: 45 Kg K ha^{-1}", T4: $N_{165}P_{36}K_{60}$ "165 Kg N ha^{-1}: 36 Kg P ha^{-1}: 60 Kg K ha^{-1}" and T5: $N_{330}P_{72}K_{120}$ "330 Kg N ha^{-1}: 72 Kg P ha^{-1}: 120 Kg K ha^{-1}".

The following characteristics were investigated: chlorophyll content at the booting stage, leaf area index at the booting stage, plant height at harvest, number of tillers m^{-2} at harvest, panicle weight, panicle length, filled grain weight panicle^{-1}, number of panicles m^{-2} at harvest, 1000-grain weight, percentage of filled grains, grain and straw yields.

$$\textbf{\% filled grains} = \frac{\textbf{No. of filled grains panicle}^{-1}}{\textbf{Total No. of grains panicle}^{-1}} \times \textbf{100}$$

$$\textbf{LAI} = \frac{\textbf{Leaf area of fixed number of hills}}{\textbf{Ground area occupied by these hills}}$$

All collected data were statistically analyzed according to the technique of analysis of variance as a split-split plot design analysis for the two seasons and the Duncan's Multiple Range Test (Duncan, 1955) was used to test the difference among the treatment means as published by (Gomez and Gomez, 1984). All statistical analysis was performed using analysis of variance technique using "MSTAT-C" computer software package (Elekhtyar, 2018).

RESULTS AND DISCUSSION

Results presented in Table 2. Revealed that the new rice variety Sakha Super 300 better than new rice variety JRL-96 line in all current growth characteristics (chlorophyll content, leaf area index, plant height at harvest and the number of tillers m^{-2} at harvest) in 2019 and 2020 seasons

Table 2. Chlorophyll content, leaf area index, plant height and number of tillers m^{-2} of Sakha Super 300 rice variety and JRL-96 line as affected by NPK fertilizers and plant spacing in 2019 and 2020 seasons.

Treatments	Chlorophyll content (SPAD)		LAI		Plant height (cm)		No. of tillers m^{-2}	
	2019	2020	2019	2020	2019	2020	2019	2020
Rice varieties (V)								
Sakha Super 300	40.03 a	39.51 a	4.595	4.799 a	110.8 a	112.1 a	572.0 a	536.0 a
JRL-96 line	39.47 b	38.72 b	4.530	4.242 b	108.0 b	107.1 b	529.8 b	504.5 b
F. Test	*	*	NS	*	*	**	**	**
Plant spacing (S)								
15×15 cm	38.75 b	38.10 b	4.435 b	4.271 b	107.7 b	108.2 b	534.6 b	498.0 b
20×20 cm	40.75 a	40.13 a	4.690 a	4.771 a	111.1 a	111.0 a	567.2 a	542.5 a
F. Test	**	**	**	**	**	*	**	**
NPK fertilization (F)								
$N_0P_0K_0$	37.25 d	36.58 d	4.023 b	4.126 d	98.38 d	98.50 d	471.8 d	444.2 c
$N_{82.5}P_{18}K_{30}$	38.25 c	37.38 c	4.102 b	4.271 cd	103.5 c	103.1 c	500.9 c	464.1 c
$N_{123.75}P_{27}K_{45}$	39.63 b	38.69 b	4.418 b	4.465 bc	112.3 b	111.3 b	545.6 b	513.3 b
$N_{165}P_{36}K_{60}$	41.75 a	41.25 a	5.050 a	4.740 ab	115.3 a	117.0 a	610.1 a	577.7 a
$N_{330}P_{72}K_{120}$	41.88 a	41.69 a	5.220 a	5.001 a	117.5 a	118.0 a	626.1 a	602.1 a
F. Test	**	**	**	**	**	**	**	**
Interaction (V*S, V*F, S*F & V*S*F)	NS	NS	NS	NS	NS	NS	NS	NS

***, ** and NS indicate P < 0.05, P < 0.01 and not significant, respectively. Means of each factor designated by the same latter in a column are not significantly different at 0.05 level using Duncan's Multiple Range Test (DMRT).**

20×20 cm plant spacing was better than 15×15 cm plant spacing in two rice varieties Sakha Super 300 and JRL-96 line. The wider plant spacing has positive effects on all growth characteristics in two seasons. Wider plant spacing allows rice plant to express the growth potential (Pratiwi, et al., 2010). The plant spacing in rice has high effects on tillering as productive tillers hill^{-1} (Hatta, 2012). Also, suitable spacing has a positive affect important processes in rice tillers, volume and length of roots, plant dry weight, and grain weight per hill (Lin, et al., 2009). The dense plant spacing can cause a high planting population and decrease in the number of tillers hill^{-1} (Mobasser, et al., 2009). Without any significant differences from $N_{165}P_{36}K_{60}$, the present growth characteristics of 2019 and 2020 seasons significantly increased by $N_{330}P_{72}K_{120}$. Compare with other dose levels, $N_{330}P_{72}K_{120}$ or $N_{165}P_{36}K_{60}$ showed the highest growing characteristics. Because of available balanced NPK nutrients, the favorable effect of fertilization could be absorbed directly by plants and greatly contribute to rice growth (Vogeler, et al., 2009). This was confirmed by (El-Kramany, et al., 2010; Elekhtyar, 2016), who found that all rice growth characteristics were enhanced by increasing chemicals NPK fertilizer. $N_0P_0K_0$ had the lowest value of the preceding characteristics. The interaction was not significantly affected by any treatment.

According to the data in Table 3., the new rice variety Sakha Super 300 outperforms the new rice variety JRL-96 line in yield attributes characteristics in the 2019 and 2020 seasons. Panicle weight, panicle length, and filled grain weight panicle^{-1} were higher in 20×20 cm plant spacing than in 15×15 cm plant spacing in two rice varieties, Sakha Super 300 and JRL-96 line. The wider plant spacing has a positive effect on yield attributes in two seasons. Rice plant spacing has a significant impact on biomass and the filled grains weight panicle^{-1} (Hatta, 2012). Furthermore, appropriate spacing has a positive effect on plant dry weight and grain weight per hill (Lin, et al., 2009; Elekhtyar, et al., 2017). All present yield attribute features improved greatly by $N_{330}P_{72}K_{120}$ in the 2019 and 2020 seasons, with no notable variations between $N_{165}P_{36}K_{60}$ (Zaki, et al., 2009; Mikael, et al., 2021), when compared to other doses, $N_{330}P_{72}K_{120}$ or $N_{165}P_{36}K_{60}$ had the highest yield attributes. Rice can develop to its full potential with balanced fertilization and proper doses (Elekhtyar, 2011; Elekhtyar, 2016; Mantovani, et al., 2017). All preceding features were reduced by $N_0P_0K_0$. On the other hand, the interactions are unaffected by the treatments.

Number of panicles m^{-2}, 1000 grain weight and filled grain percentage as yield attributes is presented in Table 4.

Table 3. Panicle weight, panicle length and filled grain weight panicle^{-1} of Sakha Super 300 rice variety and JRL-96 line as affected by NPK fertilizers and plant spacing in 2019 and 2020 seasons.

Treatments	Panicle weight(g)		Panicle length(cm)		Filled grain wt. panicle^{-1}	
	2019	2020	2019	2020	2019	2020
Rice varieties (V)						
Sakha Super 300	3.566 a	3.485 a	23.30	23.49	2.622	2.578
JRL-96 line	3.420 b	3.144 b	22.72	23.49	2.549	2.497
F. Test	**	**	NS	NS	NS	NS
Plant spacing (S)						
15×15 cm	3.260 b	3.099 b	22.72	22.65 b	2.362 b	2.427 b
20×20 cm	3.726 a	3.529 a	23.30	24.34 a	2.809 a	2.648 a
F. Test	**	**	NS	**	**	**
NPK fertilization (F)						
$N_0P_0K_0$	2.878 d	2.645 d	19.83 d	20.80 d	1.888 d	1.967 d
$N_{82.5}P_{18}K_{30}$	3.257 c	3.106 c	21.23 c	21.75 c	2.243 c	2.229 c
$N_{123.75}P_{27}K_{45}$	3.548 b	3.362 b	23.20 b	23.60 b	2.579 b	2.537 b
$N_{165}P_{36}K_{60}$	3.844 a	3.671 a	25.34 a	25.63 a	3.071 a	2.928 a
$N_{330}P_{72}K_{120}$	3.938 a	3.786 a	25.45 a	25.70 a	3.149 a	3.026 a
F. Test	**	**	**	**	**	**
Interaction (V*S, V*F, S*F & V*S*F)	NS	NS	NS	NS	NS	NS

**** and NS indicate P < 0.05, P < 0.01 and not significant, respectively. Means of each factor designated by the same latter in a column are not significantly different at 0.05 level using Duncan's Multiple Range Test (DMRT).**

Table 4. Number of panicles m^{-2}, 1000 grain weight and filled grain percentage of Sakha Super 300 rice variety and JRL-96 line as affected by NPK fertilizers and plant spacing in 2019 and 2020 seasons.

Treatments	No. of panicles m^{-2}		1000 grain wt. (g)		Filled grain %	
	2019	2020	2019	2020	2019	2020
Rice varieties (V)						
Sakha Super 300	557.2 a	526.8 a	26.75 a	25.00 a	86.45 a	84.80 a
JRL-96 line	523.7 b	490.3 b	25.15 b	23.15 b	84.75 b	78.75 b
F. Test	**	**	**	**	**	**
Plant spacing (S)						
15×15 cm	523.3 b	486.7 b	24.35 b	22.65 b	84.05 b	80.10 b
20×20 cm	557.7 a	530.4 a	27.55 a	25.50 a	87.15 a	83.45 a
F. Test	**	**	**	**	**	**
NPK fertilization (F)						
$N_0P_0K_0$	456.8 d	427.4 c	22.13 d	19.75 e	77.13 d	72.63 e
$N_{82.5}P_{18}K_{30}$	494.4 c	450.0 c	24.38 c	21.50 d	82.00 c	77.88 d
$N_{123.75}P_{27}K_{45}$	537.8 b	505.5 b	25.88 b	24.13 c	85.88 b	82.13 c
$N_{165}P_{36}K_{60}$	597.9 a	566.3 a	28.13 a	26.75 b	91.25 a	86.13 b
$N_{330}P_{72}K_{120}$	615.5 a	593.6 a	29.25 a	28.25 a	91.75 a	90.13 a
F. Test	**	**	**	**	**	**
Interaction (V*S, V*F, S*F & V*S*F)	NS	NS	NS	NS	NS	NS

**** and NS indicate P < 0.05, P < 0.01 and not significant, respectively. Means of each factor designated by the same latter in a column are not significantly different at 0.05 level using Duncan's Multiple Range Test (DMRT).**

The new rice variety Sakha Super 300 better than new rice variety JRL-96 line in the yield attributes characteristics in 2019 and 2020 seasons. 20×20 cm plant spacing was better than 15×15 cm plant spacing in two rice varieties Sakha Super 300 and JRL-96 line. In the two seasons, the wider plant spacing has a beneficial impact on yield attribute features. Rice plant spacing has a significant impact on biomass and panicle^{-1} grain quantity (Hatta, 2012). Furthermore, proper spacing influences plant dry weight and grain weight per hill (Lin, et al., 2009). In the 2019 and 2020 seasons, all yield characteristics recorded the greatest values with $N_{330}P_{72}K_{120}$, with no significant differences with $N_{165}P_{36}K_{60}$. When compared to other dosages, $N_{330}P_{72}K_{120}$ or $N_{165}P_{36}K_{60}$ produced the greatest yield attributes. (Zidan and Elekhtyar, 2015). Rice growth may be optimized with balanced fertilization and suitable dosages (Elekhtyar, 2007; Elekhtyar 2015; Mantovani, et al., 2017). $N_0P_0K_0$ had the lowest value of the preceding features. On the other hand, the interaction was not significantly altered by any treatment.

Table 5. Shows that in the 2019 and 2020 seasons, the new rice variety Sakha Super 300 had a higher grain and straw yield (t ha^{-1}) than the JRL-96 line. In two rice varieties, Sakha Super 300 and JRL-96 line, a 20×20 cm plant spacing outperformed a 15×15 cm plant spacing.

Table 5. Grain and straw yield of Sakha Super 300 rice variety and JRL-96 line as affected by NPK fertilizers and plant spacing in 2019 and 2020 seasons.

Treatments	Grain yield (t ha^{-1})		Straw yield (t ha^{-1})	
	2019	2020	2019	2020
Rice varieties (V)				
Sakha Super 300	9.91 a	10.05 a	11.76 a	11.83 a
JRL-96 line	9.45 b	9.90 b	10.93 b	11.06 b
F. Test	**	*	**	*
Plant spacing (S)				
15×15 cm	9.53 b	9.70 b	11.17 b	11.45 b
20×20 cm	9.84 a	10.25 a	11.52 a	11.99 a
F. Test	**	**	**	**
NPK fertilization (F)				
$N_0P_0K_0$	8.89 c	9.13 d	10.58 c	10.73 c
$N_{82.5}P_{18}K_{30}$	9.35 bc	9.58 cd	10.95 c	11.44 bc
$N_{123.75}P_{27}K_{45}$	9.54 bc	10.05 bc	11.07 bc	11.89 ab
$N_{165}P_{36}K_{60}$	10.05 ab	10.46 ab	11.88 ab	12.04 ab
$N_{330}P_{72}K_{120}$	10.55 a	10.68 a	12.25 a	12.50 a
F. Test	**	**	**	**
Interaction (V*S, V*F, S*F & V*S*F)	NS	NS	NS	NS

***, ** and NS indicate P < 0.05, P < 0.01 and not significant, respectively. Means of each factor designated by the same latter in a column are not significantly different at 0.05 level using Duncan's Multiple Range Test (DMRT).**

Thus, the wider plant spacing improves yield. Wider spacing helps rice plants to exhibit their full development potential (Pratiwi, et al., 2010). Wider plant spacing can enhance the collection of solar radiation by plants for photosynthesis, nutritional absorption by roots, efficiency of plant water demands, circulation of CO_2 and O_2 from photosynthesis, all of which can boost rice output (Syahri and Somantri, 2016). Also, the availability of space dictates weed populations, as does the micro climate under the canopy, which influences the growth of plant pests. (Makarim et al., 2005). The highest yield was reported with $N_{330}P_{72}K_{120}$ in the 2019 and 2020 seasons, with no significant differences with $N_{165}P_{36}K_{60}$. When compared to other dosages, $N_{330}P_{72}K_{120}$ or $N_{165}P_{36}K_{60}$ had the maximum yield. The best conditions of all nutrients in the soil and the optimum growing environment for rice development and production may be achieved with balanced fertilization and prescribed dosages (Elekhtyar, 2007; Mantovani, et al., 2017; Sorour et al., 2018). Rice grain and straw yields were improved by using the ideal levels of chemical NPK fertilizers (El-Kramany et al., 2010; Elekhtyar, et al., 2016). $N_0P_0K_0$ had the lowest value (Elekhtyar 2016; Wissa et al., 2016). On the other hand, no treatment had a positive effect on the interaction in the two seasons.

CONCLUSION

The current study's findings demonstrated that the new rice variety Sakha Super 300 outperformed the new JRL-96 rice line in all investigated parameters. There were substantial favorable impacts of using the $N_{330}P_{72}K_{120}$ with no significant differences with the $N_{165}P_{36}K_{60}$. Furthermore, wider plant spacing 20×20 cm outperforms dense plant spacing 15×15 cm and has a beneficial influence on all growth parameters during the two seasons.

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تقييم أصناف الأرز السوبر جابونكا المصرية الجديدة تحت التسميد ومسافات الزراعة بين النباتات

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أجريت تجربة حقلية في موسمي ٢٠١٩ و٢٠٢٠ بالمزرعة البحثية لمركز البحوث والتدريب في الأرز، سخا، كفر الشيخ، مصر. لتقييم أصناف الأرز السوبر جابونكا المصرية الجديدة سخا سوبر ٣٠٠ والسلالة JRL-96 تحت المستويات المختلفة للأسمدة ومسافات الزراعة بين النباتات. أشارت النتائج إلى أن صنف الأرز الجديد سخا سوبر ٣٠٠ أفضل من السلالة الجديدة JRL-96 في جميع الصفات المدروسة. علاوة على ذلك، كانت هناك تأثيرات إيجابية كبيرة لتطبيق $N_{330}P_{72}K_{120}$ بدون أي اختلافات معنوية مع $N_{165}P_{36}K_{60}$، وكانت مسافة زراعة ٢٠×٢٠ سم أفضل من مسافة زراعة ١٥×١٥ سم على محتوى الكلوروفيل، دليل مساحة الورقة، ارتفاع النبات، عدد الفروع في المتر المربع، وزن السنبلة، طول السنبلة، وزن الحبوب الممتلئة في السنبلة، عدد السنابل في المتر المربع، وزن ١٠٠٠ حبة، النسبة المئوية للحبوب الممتلئة في السنبلة، محصول الحبوب ومحصول القش. سجل $N_{330}P_{72}K_{120}$ أو$N_{165}P_{36}K_{60}$ اعلي القيم للصفات المدروسة مقارنة بالجرعات الأخرى. من ناحية أخرى، فإن مسافات الزراعة الأوسع ٢٠×٢٠ سم كان أفضل من مسافات الزراعة الاضيق ١٥×١٥ سم وكان له آثار إيجابية على جميع صفات النمو والمحصول ومكوناته المدروسة في الموسمين. توصي هذه الدراسة باستخدام سماد NPK بالمعدل $N_{165}P_{36}K_{60}$ حيث يتم توفير ضعف الجرعة السمادية حتي $N_{330}P_{72}K_{120}$ والتي تحقق نفس الإنتاجية، وذلك مع مسافة زراعة ٢٠×٢٠ سم لتعزيز إنتاجية أصناف الأرز السوبر جابونكا المصرية الجديدة سخا سوبر ٣٠٠ والسلالة JRL-96.