

PERFORMANCE OF SOME EGYPTIAN RICE VARIETIES FOR SOME AGRONOMICAL AND PHYSIOLOGICAL TRAITS

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ABSTRACT

The research work was carried out at Experimental Farm of Rice Research and Training Center (RRTC), Sakha, Kafr EL-Sheikh Egypt, during two successive rice seasons 2014 and 2015 to study the behaviour of nine tested genotypes which differs mainly in their growth duration and relationship between growth duration and cropping intensification in Egypt. Also, to study the performance of some Egyptian rice varieties for some agronomical and physiological traits. Analysis of variance indicated that genotypes under study were significantly different in all studied traits. Based on days to heading, data obtained revealed that short durations rice varieties such as Sakha105 and Sakha102 could be a pertinent use for cropping intensification and ensured a third crop with a short duration period like vegetable crops or save the area after rice to raise onion seedlings which are grown in 1.5 months.

Key words: *Rice, physiological and agronomical traits, short duration.*

INTRODUCTION

Rice (*Oryza sativa* L.) is the world's most important food crop and energy source for about half of the world's population and ranks second in production after wheat (**Manjappa and Shailaja, 2014**). In Egypt rice is considered the most popular and important field crop for several reasons: as a staple food after wheat for Egyptian population, as a exporting crop, as a land reclamation crop for improving the productivity of the saline soils widely spread in North delta and coastal area, and finally it is a social crop in which all farmers family member could gain money during its growing season. The objectives of the present investigation are: To Study the behavior of the tested genotypes which differs mainly in their growth duration and relationship between growth duration and cropping intensification in Egypt based on total duration for tested varieties. Also, to study the performance of some Egyptian rice varieties for some agronomical and physiological traits.

MATERIALS AND METHODS

The research work was carried out at Experimental Farm of Rice Research and Training Center (RRTC), Sakha, Kafr EL-Sheikh Egypt, during two successive rice seasons 2014 and 2015 to study the Performance of some early and late rice genotypes for morphological and physiological traits. Nine rice genotypes namely; Giza 177, Giza 179, Sakha 102, Sakha 105, Sakha 106 as early maturing varieties, Giza 176, Sakha 101, Sakha 104 and Giza 178 as medium to late varieties were chosen for this study under Egyptian conditions. These genotypes have a wide range of variation due to their different genetic background. The experimental plots were grown in a randomized complete block design (RCBD), with three replications. The seeds were direct seeded in dry soil followed by irrigation and single seed per hill was maintained in the nursery, thirty days after sowing, seedlings of each genotype were individually transplanted in the permanent field in seven rows of five meters length and 20 X20 cm spacing between rows and plants as transplanting methods. The following characters were measured chlorophyll content (SPAD), reading flag leaf area (cm²) at heading stage, vegetative stage (days), plant height (cm), no. of days to heading (days), no. of panicles plant⁻¹, panicle length (cm), no. of filled grains panicle⁻¹, 1000 grain weight (g) and grain yield Plant⁻¹ (g). Other agricultural practices were applied as recommended for ordinary rice field. Weeds were chemically controlled as recommended. The data were recorded on an individual plant.

RESULTS AND DISCUSSIONS

Mean performance of rice varieties in chlorophyll content in flag leaf at heading and leaf area in 2014 and 2015 rice seasons:

From analysis of variance, all rice varieties differed significantly in all studied traits.

For chlorophyll content the rice varieties differed significantly in their chlorophyll content in 2014 and 2015. The rice variety Sakha 101 recorded the highest values of chlorophyll content at heading in flag leaf in 2014 46.00 SPAD reading while, Giza 178 showed the lowest values 41.47 in 2015 the rice varieties Giza 179, Sakha 101 and Giza 176 exhibited the highest values of chlorophyll content 44.53, 44.30 and 43.83, respectively, as presented in table (1).

Regarding to flag leaf area, Giza 179 rice variety showed the highest flag leaf area in the two seasons 42.90 and 43.57 respectively. While, Sakha 106 recorded the lowest values of flag leaf, also the data in Table 1 indicated that no significant differences among Giza 177, Sakha 102, Sakha 105 and Sakha 106 in their flag leaf area.

Data in Table 2 Concerning plant height revealed that Sakha 104, Sakha 102 and Sakha 106 exhibited the tallest plants in 2014 and 2015. On the other hand, Sakha 101 recoded the shortest one in the two years.

For vegetative stage the rice varieties, Sakha 105, Sakha 102 and Giza 179 recorded the lowest no. of days from sowing to panicle initiation (vegetative stage) while, Giza 176 and Sakha 101 showed the highest no. of days from sowing to panicle initiation in the two years as shown in table 2.

Regarding to no. of days to heading, the rice varieties varied significantly in no. of days to heading in the two seasons as presented in Table 3. The early maturing varieties Sakha 105 and Sakha 102 exhibited the lowest days to heading. On the other hand, a late varieties Giza 176 and Sakha 101 showed the highest values of days to heading in the two years. From above results in Table 2 and 3 we can observe that most variation among the rice varieties in total duration due to the differences among them in their vegetative stage. The early maturing varieties could be involved in the system of cropping intensification in Egypt to maximize the farmer income of land unit area through planting wheat after early varieties in winter season, planting Egyptian clover or maize for feeding the animal between rice and winter crops. The cropping intensification could be a tool to improve the soil characteristics in addition to increase the income of unit area for the farmers. With regarding to yield and its attributes such panicle length, no. of filled grains/panicle, 1000-grain weight and grain yield data in Table 4 and 5 showed that all tested rice genotypes were significantly differed according to genetic back ground in both seasons of study. Giza 179 and Sakha102 showed superiority in panicle length, no. of filled grain/panicle, 1000-grain weight/g and grain yield/plant in both seasons.

Table 1: Mean performance of rice varieties for flag leaf area cm² and chlorophyll content (SPAD) in 2014 and 2015 seasons

Genotype	Flag leaf area (cm ²)		Chlorophyll content (SPAD)	
	2014	2015	2014	2015
Early maturing (125days)				
Giza 177	26.53	28.63	42.23	40.77
Giza 179	42.90	43.57	43.43	44.53
Sakha 102	26.20	28.90	40.43	40.17
Sakha 105	27.47	29.97	41.47	41.20
Sakha 106	26.53	26.47	43.53	41.70
Medium to late(135-days)				
Giza 178	38.30	33.80	41.47	39.50
Sakha 104	30.20	28.97	44.00	42.53
Late variety(> 145 days)				
Sakha 101	32.77	31.00	46.00	44.30
Giza 176	31.90	28.43	44.93	43.83
LSD 0.05	1.20	0.98	1.43	1.02

Table 2: Mean performance of rice varieties for plant height (cm) and vegetative stage (days) in 2014 and 2015 seasons

Genotype	Plant height (cm)		Vegetative stage (days) Days to heading	
	2014	2015	2014	2015
Early maturing (125days)				
Giza 177	100.67	103.00	70.33	70.67
Giza 179	97.27	100.33	65.00	64.67
Sakha 102	106.47	110.33	64.67	66.00
Sakha 105	98.37	101.33	62.00	71.00
Sakha 106	105.50	106.67	71.67	72.33
Medium to late(135-days)				
Giza 178	98.00	103.00	75.00	76.33
Sakha 104	108.00	109.00	75.67	75.33
Late variety(> 145 days)				
Sakha 101	91.27	91.67	91.00	92.67
Giza 176	95.87	99.50	93.00	94.33
LSD 0.05	1.69	2.12	1.92	1.95

Table 3: Mean performance for vegetative characters of rice genotypes in 2014 and 2015 seasons

Genotype	Days to heading (days)		No. of panicles plant ⁻¹	
	2014	2015	2014	2015
Early maturing (125days)				
Giza 177	95.33	91.33	18.00	18.33
Giza 179	92.67	90.33	22.33	23.67
Sakha 102	89.33	92.00	17.67	19.00
Sakha 105	88.00	89.00	19.33	20.33
Sakha 106	91.67	93.33	20.33	20.67
Medium to late(135-days)				
Giza 178	101.00	103.33	23.33	23.00
Sakha 104	102.67	103.00	21.33	21.67
Late variety(> 145 days)				
Sakha 101	117.00	117.33	23.67	23.67
Giza 176	123.00	124.00	22.33	22.33
LSD 0.05	1.58	1.98	1.13	1.13

Table 4: Mean performance for vegetative characters of rice genotypes in 2014 and 2015 seasons

Genotype	Panicle length (cm)		No. of filled grains panicle-1	
	2014	2015	2014	2015
Early maturing (125days)				
Giza 177	21.10	20.83	126.33	128.00
Giza 179	23.73	24.30	156.00	159.33
Sakha 102	23.50	22.93	125.00	129.00
Sakha 105	20.50	20.77	127.00	130.00
Sakha 106	22.83	21.47	135.67	142.33
Medium to late(135-days)				
Giza 178	23.26	23.97	150.67	156.33
Sakha 104	22.53	23.43	134.33	137.00
Late variety(> 145 days)				
Sakha 101	22.03	21.57	147.67	153.33
Giza 176	22.06	22.53	132.33	137.67
LSD 0.05	0.425	1.02	3.700	5.686

Table 5: Mean performance for vegetative characters of rice genotypes in 2014 and 2015 seasons

Genotype	1000-grain weight (g)		Grain yield (t/ha.)	
	2014	2015	2014	2015
Early maturing (125days)				
Giza 177	27.53	27.76	9.23	9.40
Giza 179	25.40	25.56	10.83	11.00
Sakha 102	28.20	27.70	9.03	9.30
Sakha 105	26.60	26.10	9.10	9.00
Sakha 106	27.93	27.93	9.50	9.50
Medium to late(135-days)				
Giza 178	22.00	21.20	10.43	10.50
Sakha 104	26.40	26.46	9.80	9.86
Late variety(> 145 days)				
Sakha 101	27.86	27.70	10.73	10.85
Giza 176	25.23	25.26	7.40	7.30
LSD 0.05	0.64	0.71	0.21	0.12

Correlation coefficient

Highly significant and positive correlation was observed between flag leaf area and each of no. of panicles plant⁻¹ and no. of filled grain panicle⁻¹. These results were in agreement with that of (Takane *et al.* 1997 and Sedeek *et al.* 2009). Positive correlation also was observed between vegetative stage (from seeding to panicle initiation) and days to heading as presented in Table 6.

Grain yield was significant and positively correlated with no. of filled grains panicle⁻¹. Also, no. of panicles plant⁻¹ was highly significant and positive correlated with no. of filled grains panicle⁻¹. These findings were in agreement with (Yolanda and Das 1995 and Ashvani *et al.* 1997).

Table (6): Correlation coefficient of flag leaf area (m²), no of panicle.hill-1, no of filled grains/panicle as well as vegetative stage (days) and no of days to heading

	Correlations									
	1	2	3	4	5	6	7	8	9	10
1-Chlorophyll content		.276	-.561	.654	.653	.636	.016	.418	.191	.077
2- Flag leaf area (cm ²)			-.405	.089	.024	.672	.646	.846	-.569	.584
3- Plant height (cm)				-.583	-.549	-.607	.231	-.495	.180	-.182
4-Vegetative stage (days)					.980	.565	-.131	.192	-.095	-.256
5-Days to heading						.612	.016	.235	.193	-.256
6-No of panicle/ plant							.443	.869	-.540	.411

7-Panicle length (cm)	.597	-	.383
8-No. of filled grain		.467	.711*
9-1000-grain weight (g)		.514	
10-Grain yield (t/ha)			-.127

*. Correlation is significant at the 0.05 level (2-tailed).

** . Correlation is significant at the 0.01 level (2-tailed).

Cluster analysis

The cluster analysis based on vegetative stage and no. of days to heading is presented in Fig.1. As shown in Figure 2, two main groups were formed at only 50% similarity. The first group represented 7 varieties including early maturing and medium maturing. While, the second group involved two varieties all of them belonged to late maturing group.

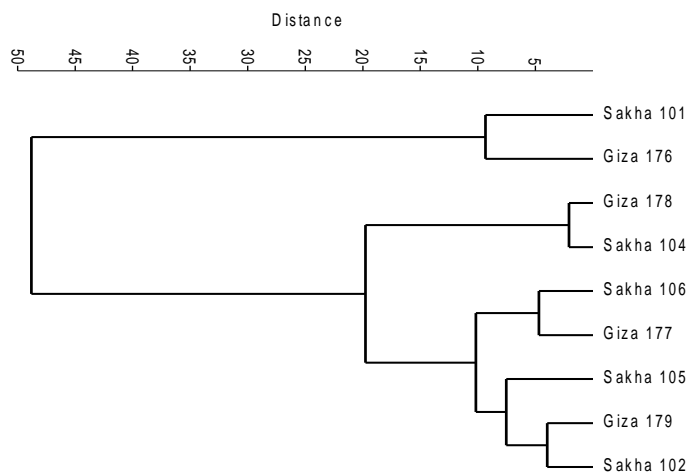


Fig.1: Hierarchical cluster analysis based on vegetative stage and days to heading

The first group sub grouped at almost 80% similarity into two groups, subgroup 1 included the early maturing varieties i.e., Sakha 102, Giza 179, Sakha 105, Giza 177 and Sakha 106. These varieties recorded the shorter vegetative period than medium and late duration group. The subgroup 2 involved the medium duration varieties Sakha 104 and Giza 178. However, the group 2 consisted of the late varieties Giza 176 and Sakha 101 which recorded the longest period for vegetative and reproductive stage.

Conclusion:

Through the result obtained from this study, we could be summarized a new advantage of using the early maturing rice varieties that, there is a chance to penetrated third vegetative crop in the system of cropping intensification or raising the rice field to grow onion seedling which at least maximize the vitalization of rice field to increase the farmer net-return without scarifying with highly production of rice yield.

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الملخص العربي

سلوك بعض أصناف الأرز المصرية لبعض الصفات المورفولوجية والفسولوجية

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1 - قسم بحوث الأرز ، 2- قسم التكايف المحصولي - معهد بحوث المحاصيل الحقلية - مركز
البحوث الزراعية

تم إجراء دراسة بحثية في المزرعة البحثية مركز البحوث والتدريب في الأرز بسخا - كفر الشيخ - مصر خلال موسمي نمو متتالين 2014 ، 2015 وذلك لدراسة سلوك تسعة تراكيب وراثية مختلفة والتي تختلف بصفة رئيسية في فترات النمو والتركيبة المحصولية في مصر. بالإضافة الى دراسة سلوك بعض أصناف الأرز في بعض الصفات المورفولوجية والفسولوجية.

أظهر تحليل التباين معنوية في كل الصفات المدروسة. بناءً على عدد الأيام حتى الطرد وأظهرت البيانات المتحصل عليها بأن الأصناف مبكرة النضج مثل سخا 105 ، سخا 102 يمكن أن تكون مناسبة تماماً للتركيبة المحصولية ويمكن أن تدخل محصول ثالث ذو فترة نمو قصيرة مثل محاصيل الخضر وكذا تسمح بتوفير مساحه أرض بعد محصول الأرز مناسبة لتنمية شتلات البصل والتي تحتاج الى 1.5 شهر.