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EVALUATE SOME NEW INBRED RICE AND MALE STERILE VARIETIES UNDER DUS AND VCU EXPERIMENTS

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ABSTRACT. The main objective of study are evaluated some new inbred rice and male sterile varieties under Distinct, Uniform and Stability (DUS) and Value of Cultivated and Used (VCU) Experiments. A number of seven rice varieties were used, Sakha 101, Sakha 102, Sakha 104, Giza 177, Giza 178, Giza 182 and Egyptian yasmine; moreover, GZ 10154 and GZ 8564-Sp 70, as well as EGMS and CMS1 as promising lines to evaluating by DUS and VCU. The data were recorded on morphological and yield characters. The results could be concluded that: regarding to qualitative characteristics (PQ and QL), from 24 PQ and QL characters, the nine rice varieties recorded the same score for 19 characters; moreover, the rice varieties Egyptian jasmine was dissimilar in the score No. 24, 39, and 60, that referred to this variety belong to *Indica* type, while the rice varieties Sakha 101 and Giza 178 were similar only in score no.11, which belong to *Japonica* and *Indica japonica* types, that meaning these varieties were highly uniform and stability in qualitative characters than the other promising line GZ 10154. Regarding to quantities characteristics (QN), from 27 QN characters, nine rice varieties recorded the same score for 20 characters; moreover, the rice varieties Sakha 101, Sakha 102, Sakha 104, Giza 177, Giza 178, Giza 182, Egyptian yasmine and GZ 8564-Sp70 were similar in the score no. 1, 12, 23, 48, 49 and 50, while the promising line GZ 10154 was dissimilar in these scores during the two seasons, meaning that all these varieties were highly uniform and stability than the other promising, line GZ 10154. These results were conformed to VCU results, where the studied varieties recorded the highest grain yield/day. From these results could be concluded that all the varieties, except GZ 10154, accepted as a new rice release variety, but the promising line GZ 10154 required to more recurrent selection to increase their uniform, as well as CMS line was

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accepted could be evaluated under different conditions, but EGMS should be evaluated under heat stress conditions.

Keywords: DUS: Distinctness, Uniformity and Stability; VCU: Value for Cultivation and Used.

INTRODUCTION

Rice (*Oryza sativa* L.) is one of the most important cereal crops in all over the world. In Egypt it is one of the major cereal crops. The total cultivated area of rice crop about 0.858 million fed., produced about 3.12 million ton of paddy rice with an average of 3.64 t/fed., which was considered one of the highest average yield in the world**.** This is a unique and model act, which gives equal importance to the farmers and breeders and treats them as partners in their efforts for sustainable food security (Patra, 2000; Hafez *et al.,* 2019a). Thus, the process of variety identification includes several steps (Identification of a variety, Confirmation of the variety, Distinctness of the variety from all other in common knowledge, Purity of the variety and Characterization of the variety), which enumerates its full descriptors. For a future release of cultivars, it is important to know the correlation among genotypes, especially male sterile across the environments, the coefficients of determination the effects of genotype and the interactions with other effects, such as locations, years, seasons, etc. and the components of total phenotypic variance. In the VCU tests, inferences should be drawn on individual environments, medium environments and new environments outside the experimental network (Resende, 2007; Hafez and Abou El-Hassan, 2015). Therefore, the main objective is: using DUS and VCU testing to characterization some of rice varieties and two types of male sterile.

MATERIALS AND METHODS

This experiment was carried out at the experimental Farm of Sakha Agriculture Research Station, Kafr El Sheikh Governorate, Egypt, and some inbred rice were evaluated during two successive summer seasons of 2016 and 2017. The main objective was to test varieties and two types of male sterile by using Distinct, Uniform and Stability (DUS) and the Value of Cultivated and Used (VCU.)

A number of 7 rice varieties were used, Sakha 101, Sakha 102, Sakha 104, Giza 177, Giza 178, Giza 182 and Egyptian yasmine. Moreover (GZ.10154, GZ8564-Sp70, CMS and EMS), as promising lines under releasing and evaluating by DUS and VCU tests under tow planting methods: the first one is drill method and was planted by machine for DUS and the second planting method is manual transplanting for VUC, during 15th May for each of 2015, 2016 and 2017 seasons, respectively. The experimental design was a randomized complete block design with three replications; the culture practices were applied as recommended by RRTC (2014). The date was recorded according to UPOV (2004).

For DUS test "Quantitative characteristics" are those where the expression covers the full range of variation from one extreme to the other. The expression can be recorded on a one-dimensional, continuous or discrete, linear

scale. "Qualitative characteristics" are those that are expressed in discontinuous states (*e.g.* sex of plant: dioeciously female (1), dioeciously male (2), monoecious unisexual (3), monoecious hermaphrodite (4). These states are self-explanatory and independently meaningful. In the case of "Pseudo-qualitative Characteristics," the range of expression is at least partly continuous, but varies in more than one dimension [*e.g.* shape: ovate (1), elliptic (2), circular (3), obviate (4)] and cannot be adequately described by just defining two ends of a linear range.

For VCU test, the data were recorded on morphological and yield characters as research by SES 2014**.** All statistical analysis was performed using analysis of variance technique by means of "COSTAT" computer soft war package (Gomez and Gomez 1984).

RESULTS AND DISCUSSION

The results obtained from the present investigation in the three successive seasons of 2015, 2016 and 2017 are presented and discussed in two topics, as follows:

1) (DUS) Distinct, Uniform and Stability (DUS) tests under drill planting method;

2) Value of Cultivated and Used (VCU) of some rice varieties under transplanting methods.

To establish distinctiveness among rice cultivars, 51 characters have been used. Qualitative characters are considered as morphological markers in the identification of rice varieties, because they are less influenced by environmental changes.

Regarding to **qualitative characteristics** (PQ and QL), as shown in (*Tables 1* and *3*), the nine rice varieties recorded the same score for 19 characters; moreover, the promising varieties under releasing were dissimilar in the testing no.1, 24, 39, 46, and 60, indicating to the variances in morphological characters, while the promising varieties Sakha 101 and Giza 178 were similar only in testing no.11, as well as promising lines GZ8564-Sp70 and Sakha 101 were similar in testing no. 39, that meaning the promising line GZ 8564-Sp70 it's homozygous line during the two seasons. The Egyptian yasmin was dissimilar with studied varieties in the testing no. 39 and 60, but similar with Giza 182 in the testing no. 60, that meaning could be distinguish between *Indica* and *Japonica* type by these testing. For the male sterile, the CMS line was dissimilar with studied varieties in the testing no 20 and 39, while the EGMS line was similar to the studied varieties in the testing no. 20 and 39; that meaning could be evaluate the CMS line under different condition, but the EGMS line should be evaluate under heat stress conditions. These results were confirmed by Raut (2003), who concluded that characterization of variety is useful to identify and avoid duplication.

Table 1 - Scaling test for PQ (pseudo-qualitative) and QL (qualitative) under DUS experiment, during 2015 and 2016 seasons

Scaling test no.	Traits		SK101		SK102		SK104		GZ177		GZ178		GZ182		JASM	
			15	16	15	16	15	16	15	16	15	16	15	16	15	16
2	Basal leaf: sheath color	PQ	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
4	Leaf: anthocyanin coloration	QL	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
6	Leaf sheath: anthocyanin coloration	QL	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
9	Leaf: anthocyanin coloration of auricles	QL	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
10	Leaf: anthocyanin coloration of collar	QL	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
11	Leaf: shape of ligules	PQ	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**
12	Leaf: color of ligules'	PQ	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
17	Culm: habit	PQ	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
20	Male sterility	PQ	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
21	Lemma: anthocyanin coloration of keel (early observation)	QN	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
22	Lemma: anthocyanin coloration of area below apex	QN	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
24	Spikelet: color of stigma	PQ	**1**	**1**	**3**	**3**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**3**	**3**
27	Stem: anthocyanin coloration of nodes	QL	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
29	Stem: anthocyanin coloration of internodes	QL	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
32	Panicle: awns	QL	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
37	Spikelet: color of tip of lemma	PQ	1	1	1	1	1	1	1	1	1	1	1	1	1	1
39	Panicle: attitude in relation to stem	PQ	2	2	2	2	2	2	2	2	2	2	2	2	3	3
40	Panicle: presence of secondary branching	QL	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**
41	Panicle: type of secondary branching	PQ	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
46	Lemma: color	PQ	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
47	Lemma: ornamentation	PQ	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
52	Glume: color	PQ	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
60	Decorticated grain: shape (in lateral view)	PQ	**3**	**3**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**5**	**5**	**5**	**5**
61	Decorticated grain: color	PQ	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

Qualitative traits being more stable over generations reveled that meet the continuously expanding needs of varietals improvement, the

assemblage, evaluation, preservation and characterization of the entire existing genotypes are essential to more rewarding breeding efforts. Also, Shobha *et al.* (2004) reported that among the qualitative trait, 46 (22 essential and 24 additional) visually assessed characteristics were observed, according to the National Test Guidelines for DUS test in rice, which was developed by Directorate of Rice Research Rajendranagar, Hyderabad (Hafez and Seleiman, 2017)

Regarding to **quantitive characteristics** (QN) (*Tables 2* and *4*), from 27 QN characters, the nine rice genotypes recorded the same score for 20 characters; moreover, the promising varieties Sakha 101, Sakha 102, Sakha 104, Giza 177, Giza 178, Giza 182, Egyptian yasmin, GZ8564-Sp70 and GZ10154 were dissimilar in the testing No. 3, 13, 16, 19 and 44, while the promising line GZ10154 was dissimilar in the testing No.3,8,13,19 36,42,43,44 and 53, during two season, that meaning the promising line GZ 8564-SP70 was highly uniform and stability in quantitive characteristics than the other promising line GZ10154. For the testing No. 19 and 44, as shown in *Tables 2* and *4*, the early maturing varieties, Sakha 102, Giza 177 and Giza 182, recorded the score no. 3, while the medium maturing varieties Sakha 104 and Giza 178 recorded the score no. 5, but the medium late maturing varieties Sakha 101, GZ 8564-Sp70 and GZ10154 recorded the score no. 7. Finally, the variety Egyptian yasmin recorded the score no. 9, as late maturing variety. On the other side, the CMS line record the score no. 7 as medium late maturing variety, while the EGMS line recorded the score no. 5 as medium maturing variety. The results were confirmed by those obtained from VCU experiment**.**

For any variety to be capable of protection it must first be clearly defined. Only after a variety has been defined can it be finally examined for fulfillment of DUS criteria required for protection. All acts of the (UPOV) convention have established that a variety is defined by its characteristics and that those characteristics are therefore the basis on which a variety can be examined for DUS. In addition to their use in defining a variety, characteristics are the basis for examining distinctness, uniformity and stability (Hafez *et al.*, 2014; Kheir *et al.,* 2019; Seleiman *et al.,* 2019).

The material to be submitted for the examination of DUS should be representative of the candidate variety. In the case of varieties with a particular cycle of propagation, such as hybrid and synthetic varieties, this means that the material tested should include the final stage in the cycle of propagation. The plant material submitted for examination should be visibly healthy, not lacking in vigor or affected by any important pests or diseases and, in the case of seed, should have sufficient germination capacity for the conduct of a satisfactory examination (Hafez and Kobata, 2012).

Table 2 - Scaling test for quantitive characters under DUS experiment, during 2015 and 2016 seasons

Scaling test no.	Traits		SK101		SK102		SK104		GZ177		GZ178		GZ182		JAS M E	
			15	16	15	16	15	16	15	16	15	16	15	16	15	16
1	Coleoptiles: anthocyanin coloration	QN	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	Leaf: intensity of green color	QN	5	5	5	5	5	5	3	3	5	5	5	5	3	3
8	Leaf blade: pubescence of surface	QN	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12	Leaf: color of ligule	QN	1	1	1	1	1	1	1	1	1	1	1	1	1	1
13	Leaf blade: length	QN	22.8	22.9	26.3	26.3	23.5	23.4	24.3	24.3	22.5	22.6	26.3	26.3	29	29
14	Leaf blade: width	QN	1.1	1.1	1.2	1.2	1.3	1.3	1.4	1.4	0.9	0.9	1.4	1.4	1.6	1.6
15	Flag leaf: attitude of blade (early observation)	QN	3	3	3	3	3	3	1	1	1	1	1	1	3	3
16	Flag leaf: attitude of blade (late observation)	QN	3	3	3	3	3	3	3	3	5	5	3	3	1	1
19	Time of heading (50% of plants with heads)	QN	88	88	75	75	82	83	70	71	85	85	81	81	90	91
23	Lemma: anthocyanin coloration of apex (early observation)	QN	1	1	1	1	1	1	1	1	1	1	1	1	1	1
25	Stem: thickness	QN	5	5	3	3	5	5	5	5	3	3	5	5	7	7
30	Panicle: Length of main axis	QN	20.2	21.2	21.3	21.3	19.5	19.3	22.5	22.5	17.3	17.3	20.8	21.8	25.6	25.6
31	Panicle: number per plant	QN	3	3	5	5	5	5	5	5	5	5	7	7	7	7
36	Spikelet: pubescence of lemma	QN	5	5	3	3	5	5	5	5	5	5	3	3	3	3
42	Panicle: attitude of branches	QN	3	3	3	3	5	5	3	3	5	5	5	5	5	5
43	Panicle: exertion	QN	7	7	7	7	7	7	7	7	7	7	5	5	5	5
44	Time of maturity	QN	7	7	5	5	5	5	5	5	5	5	5	5	9	9
45	Leaf: time of senescence	QN	7	7	5	5	5	5	5	5	7	7	5	5	3	3
48	Lemma: anthocyanin coloration of keel (late observation)	QN	1	1	1	1	1	1	1	1	1	1	1	1	1	1
49	Lemma: anthocyanin coloration of area below apex (late O.)	QN	1	1	1	1	1	1	1	1	1	1	1	1	1	1
50	Lemma: anthocyanin coloration of apex (late observation)	QN	1	1	1	1	1	1	1	1	1	1	1	1	1	1
51	Glume: length	QN	1	1	1	1	1	1	1	1	1	1	1	1	1	1
53	Grain: weight of 1000 (fully developed grains)	QN	25.6	25.6	24.2	24.4	26.6	26.3	24.5	24.1	23.1	23.2	22.5	22.5	24.5	24.3
54	Grain: length	QN	0.7	0.7	0.8	0.8	0.7	0.7	0.7	0.7	0.6	0.6	0.9	0.9	1	1
55	Grain: width	QN	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3
58	Decorticated grain: length	QN	0.5	0.5	0.6	0.6	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.8	0.8
59	Decorticated grain: width	QN	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.2

Table 3 - Scaling test for PQ and QL under DUS experiment, during 2016 and 2017 seasons

Scaling test no.	Traits		GMS		EMRB1		10154		SP 70		Sakha 105	
			2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
2	Basal leaf: sheath color	PQ	1	1	1	1	1	1	1	1	1	1
4	Leaf: anthocyanin coloration	QL	1	1	1	1	1	1	1	1	1	1
6	Leaf sheath: anthocyanin coloration	QL	1	1	1	1	1	1	1	1	1	1
9	Leaf: anthocyanin coloration of auricles	QL	1	1	1	1	1	1	1	1	1	1
10	Leaf: anthocyanin coloration of collar	QL	1	1	1	1	1	1	1	1	1	1
11	Leaf: shape of ligules	PQ	3	3	3	3	3	3	3	3	3	3
12	Leaf: color of ligules'	PQ	1	1	1	1	1	1	1	1	1	1
17	Culm: habit	PQ	1	1	1	1	1	1	1	1	1	1
20	Male sterility	PQ	3	3	1	1	1	1	1	1	1	1
21	Lemma: anthocyanin coloration of keel (E.r observation)	QN	1	1	1	1	1	1	1	1	1	1
22	Lemma: anthocyanin colorationof area below apex	QN	1	1	1	1	1	1	1	1	1	1
24	Spikelet: color of stigma	PQ	1	1	3	3	3	1	3	3	1	1
27	Stem: anthocyanin coloration of nodes	QL	1	1	1	1	1	1	1	1	1	1
29	Stem: anthocyanin coloration of internodes	QL	1	1	1	1	1	1	1	1	1	1
32	Panicle: awns	QL	1	1	1	1	1	1	1	1	1	1
37	Spikelet: color of tip of lemma	PQ	1	1	1	1	1	1	1	1	1	1
39	Panicle: attitude in relation to stem	PQ	1	1	2	2	2	2	2	2	3	3
40	Panicle: presence of secondary branching	QL	9	9	9	9	9	9	9	9	9	9
41	Panicle: type of secondary branching	PQ	1	1	1	1	1	1	1	1	1	1
46	Lemma: color	PQ	1	1	1	1	1	1	1	1	1	1
47	Lemma: ornamentation	PQ	1	1	1	1	1	1	1	1	1	1
52	Glume: color	PQ	1	1	1	1	1	1	1	1	2	2
60	Decorticated grain: shape (in lateral view)	PQ	3	3	3	3	2	2	4	4	4	4
61	Decorticated grain: color	PQ	1	1	1	1	1	1	1	1	3	3

Table 4 - Scaling test for quantitive characters under DUS experiment, during 2016 and 2017 seasons

Scaling test no.	Traits		GMS		EMrB1		LINE1		LINE2		Sakha 105	
			16	17	16	17	16	17	16	17	16	17
1	Coleoptiles: anthocyanin coloration	QN	1	1	1	1	1	1	1	1	1	1
3	Leaf: intensity of green color	QN	3	3	3	3	5	7	5	5	1	1
8	Leaf blade: pubescence of surface	QN	3	3	5	5	3	1	3	3	1	1
12	Leaf: color of ligule	QN	1	1	1	1	1	1	1	1	1	1
13	Leaf blade: length	QN	26.3	26.3	22.1	22.0	27.2	31.2	27.5	25.2	1	1
14	Leaf blade: width	QN	1.4	1.4	1.1	1.2	1.1	1.5	1.2	1	5	5
15	Flag leaf: attitude of blade (early observation)	QN	3	3	5	5	3	3	3	3	3	3
16	Flag leaf: attitude of blade (late observation)	QN	3	3	5	5	3	3	3	3	5	5
19	Time of heading (50% of plants with heads)	QN	95	95	91	92	95	100	90	95	1	1
23	Lemma: anthocyanin coloration of apex (early observation)	QN	1	1	1	1	1	1	1	1	1	1
25	Stem: thickness	QN	3	3	5	5	5	5	5	5	5	5
30	Panicle: length of main axis	QN	19.3	19.4	21.2	21.3	20.1	21.5	19.3	24.1	5	5
31	Panicle: number per plant	QN	3	3	5	5	5	5	3	5	3	3
36	Spikelet: pubescence of lemma	QN	5	5	5	5	7	5	5	3	5	5
42	Panicle: attitude of branches	QN	1	1	3	3	1	3	1	1	3	3
43	Panicle: exertion	QN	1	1	9	9	3	9	3	3	5	5
44	Time of maturity	QN	7	7	5	5	9	7	9	9	9	9
45	Leaf: time of senescence	QN	7	7	5	5	7	5	5	7	5	5
48	Lemma: anthocyanin coloration of keel (late observation)	QN	1	1	1	1	1	1	1	1	1	1
49	Lemma: anthocyanin coloration of area below apex (late O.)	QN	1	1	1	1	1	1	1	1	1	1
50	Lemma: anthocyanin coloration of apex (late observation)	QN	1	1	1	1	1	1	1	1	1	1
51	Glume: length	QN	3	3	3	3	3	3	3	3	3	3
53	Grain: weight of 1000 (fully developed grains)	QN	22.5	22.5	22.5	22.4	28.2	30.1	27.1	29.8	5	5
54	Grain: length	QN	0.9	0.9	0.7	0.7	0.7	0.6	0.6	0.7	5	5
55	Grain: width	QN	0.3	0.3	0.3	0.3	0.5	0.3	0.3	0.3	5	5
58	Decorticated grain: length	QN	0.6	0.6	0.5	0.6	0.5	0.5	0.5	0.5	5	5
59	Decorticated grain: width	QN	0.1	0.1	0.3	0.3	0.3	0.2	0.2	0.2	5	5

The expression of a characteristic or several characteristics of a variety may be affected by factors, such as pests and disease, chemical treatment (*e.g.* growth retardants or pesticides), effects of tissue culture, different rootstocks, scions taken from different growth phases of a tree, etc. In some cases (*e.g.* disease resistance), reaction to certain factors is intentionally used as characteristic in the DUS examination. However, where the factor is not intended for DUS examination, it is important that it's influence does not distort the DUS examination. Ramalingam *et al.* (1992), Gharib *et al.* (2016) and Hafez and Abdelaal (2015) found that the mode of gene action of the two restorer genes for CMS - WA varied with one of the two genes having stronger action than the other. Certain crosses should dominant epistasis, while, other should dominance.

For the EGMS lines, Virmani *et al.,* 2003 and Hafez *et al.* (2018) mentioned that the EGMS is composed of two major types: photo period sensitive genic male sterility (PGMS), which is responsive to variations in day length, and thermo sensitive genic male sterility (TGMS), which is caused temperature.

To enable the appropriate use of characteristics in DUS testing, it's important to understand the different ways in which characteristics can be expressed. The following section identifies the different types of expression and considers their application in DUS testing (Hafez and Farig, 2019).

Evaluating the materials under VCU experiment

The planting method play importing role in gene (s) expression for rice plant, where the rice growth rate, tilliring ability, plant height, panicle length, days to heading, days to maturity and grain yield/ hill were highly affected by planting method, because the transplanting method enhancement the growth rate, then recording the highest values for most of the studied characters under the VCU experiment, compared to drill seeding method for the DUS experiment. The same results were obtained by Laary *et al*. (2012); Hafez and Gharib (2016); Hafez *et al.* (2019b). They mentioned that, among examined planting methods, the most consistent planting method and best in almost all examined parameters under individual years was the seedling transplanting method, followed by direct seed dibbling method.

In *Table 5*, the gene(s) expression for rice plant were highly affected by planting methods, especially for DUS test, where the transplanting method recorded the desirable values for the most studied characters; moreover, highly phenotype variance among the rice varieties were recorded, especial for no. of tillers/ hill, plant height, panicle length and grain yield (g/day). The results in *Table 6* showed the highly variance within the grain yield for the rice varieties, compared to the other rice variety; moreover, all the varieties recorded more than 9.50 (t/ha), during both seasons (Hafez and Geries, 2018).

Table 5 - Mean performance for some characters of some rice varieties under VCU experiment, during 2015 and 2016 seasons

Entries	Total duration		Plant height (cm)		Panicle length		No. of panicles/hill		1000-grain weight (g)		Grain yield (t/ha)		Grain yield / day	
	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
Sakha 101	142	143	92	93	24.2	24.5	20.13	20.5	28.46	28.4	11.9	11.819	83.8	85.66
Sakha 102	125	126	105	104	23.3	23.7	15.67	16.2	28.1	28	9.6	9.833	76.8	75.3
Sakha 104	135	133	107	106	22.5	22.3	19.71	19.8	27.1	27.5	10.42	10.628	84.65	84.14
Giza 177	125	124	100	101	23.5	23.7	16.71	15.4	27.15	28	9.8	10.57	78.4	79.31
Giza 178	135	134	99	98	23.3	23.5	19.29	21.3	22.41	22	10.71	10.939	79.36	81.14
Giza182	125	126	95	95	25.8	25.2	18.78	19.3	24.6	25	9.523	10.351	76.18	75.74
Egyptian yasmine	146	145	110	109	26.6	26.1	19.59	18.8	25.65	26	10.19	10.604	69.31	70
Sig. at 0.05%														
0.01%	2.26	2.48	2.459	2.38	1.4	1.43	1.39	1.42	1.23	1.24	0.352	0.38		
	3.25	4.88	4.401	4.67	2.75	2.77	2.8	2.83	2.46	2.47	0.612	0.75		

Table 6 - Mean performance for some characters of some rice varieties under VCU experiment, during 2016 and 2017 seasons

Entries	Total duration		Plant height (cm)		Panicle length		Seed set bagged		No. of panicles/hill		1000- grain weight (g)		Grain yield (t/ha)		Grain yield/ day	
	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
1	134.0	135.0	98.0	100.0	24.1	24.3	96.3	96.42	19.5	20.0	29.70	29.50	11.895	11.980	88.77	88.74
2	127.0	127.0	95.0	96.0	23.5	23.4	94.0	94.25	19.0	19.50	28.75	29.00	11.070	11.292	87.17	88.91
3	119.0	120.0	90.0	90.5	21.5	21.6	95.0	95.10	16.75	17.00	22.20	22.35	10.495	10.745	88.19	89.54
4	119.0	120.0	90.0	90.5	21.5	21.6	00	00	16.75	17.0	22.20	22.35	00	00	00	00
5	133.0	135.0	92.5	93.0	21.9	21.9	0.0	0.00	18.0	17.50	23.33	23.11	--	--	--	--
Sig. at																
0.05%	1.002	1.076	0.9	0.9	1.2	1.23	1.5	1.56	0.940	1.057	0.673	0.725	1.701	1.188		
0.01%	1.318	1.416	1.2	1.1	2.4	2.45	2.7	2.70	1.237	1.391	0.886	0.954	2.240	1.564		

1 - GZ8564-SP-70; 2 - GZ10154; 3 - EGMS; 4 - EGMS; 5 - CMS.

That means the promising line GZ 10154 had the lowest gain yield (t/ha), compared to the promising line GZ 8564-Sp70, which recorded the highest grain yield (g/day). From these results could be concluded that the line GZ 8564-Sp70 and the seven cultivated varieties were accepted as a new rice release varieties, as well as the CMS line as a new female line, while the promising line GZ 10154 required to more recurrent selection to increase their uniformity and stabile and EGMS line recorded to evaluate under high temperature condition (Hafez and Badawy 2018).

CONCLUSIONS

Regarding to quantities characteristics (QN), from 27 QN characters, the nine rice varieties recorded the same score for 20 characters; moreover, the rice varieties Sakha 101, Sakha 102, Sakha 104, Giza 177, Giza 178, Giza 182, Egyptian Yasmine and GZ 8564-Sp70 were similar in the score no. 1, 12, 23, 48, 49 and 50, while the promising line GZ 10154 was dissimilar in these scores during the two seasons, meaning that all these varieties were highly uniform and stability than the other promising, line GZ 10154. These results were conformed to VCU results, where the studied varieties recorded the highest grain yield/day. From these results could be concluded that all the varieties, except GZ 10154, was accepted as a new rice release variety, but the promising line GZ 10154 required to more recurrent selection to increase their uniform, as well as CMS line was accepted and could be evaluated under different conditions, but EGMS should be evaluated under heat stress conditions.

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