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EVALUATION OF NEW PROMISING GARLIC CLONES THROUGH SELECTION PROGRAM OF SIDS- 40 VARIETY

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ABSTRACT

In recent years, it was noticed that yield and quality of Sids-40 garlic variety was reduced as well as the number of cloves per bulb increased with a small clove size, which makes it undesirable for export .These expenments were carried out to select some new garlic clones from Sids-40 garlic variety under the local conditions at the Horticultural Research Farm of El-Baramoon, Dakahlia Governorate, Egypt

Several plants of Sids-40 variety (about 10000 plants) which had good quality of bulbs, characterized by large bulb size, large clove size, regular shape and lower number of cloves per bulb were selected and maintained over three years and nine clones were established as new clones.

Comparative studies were carried out among these nine clones in addition to the standard variety (Sids-40) during the two successive seasons of 2002/2003 and 2003/2004. The results indicated that the clones No. 10, 12 and 13 were the best clones.

The three clones No. 10, 12 and 13 were planted with the standard variety (Sids-40) in the two successive growing seasons of 2004/2005 and 2005/2006 The results illustrated that the clone number 10 surpassed the other selected clones and also the standard variety in all the studied characters i.e, plant height, leaves number per plant, leaves dry weight, bulbing ratio, total yield, bulb weight, bulb diameter, number of cloves per bulb and clove weight as well as the storability during the 1st and 2nd seasons of study.

Data indicated that the clone No 10 recorded increments of total yield reached (13.6 – 13.74 %) compared with the standared variety (Sids-40) during the last seasons of 2004/2005 – 2005/2006, respectively.

Thus, this new promising garlic clone (No. 10) can replace of the common ones for its high productivity and good quality .

INTRODUCTION

Garlic (*Allium sativum* L.) is considered one of the most important vegetable crops in Egypt for both local consumption and export. The total area in Egypt devoted for garlic production in the year of 2004 * was 19871 fed. with total production of 187833 tons.

Garlic cultivars often vary in some characteristics including bulb weight, bulb diameter, cloves number per bulb, date of maturity and storage-life . Garlic is vegetatively propagated crop that does not set seed under standard growing conditions (Volk *et al.*, 2004) and new genotypes have not been obtained through hybridization of spontaneous and induced mutations.

* Agriculture Economic Bulletin, November 2004, Ministry of Agriculture, Cairo, Egypt.

Several investigators worked in improving garlic, in this respect , Menzes (1979), reported that breeding work on garlic is mainly concerned with investigating the morphological variability resulting from the interaction between genotypes and environment effects. Lammerink (1988). selected better garlic clones from commercial cultivars, with high yield, larger bulbs with fewer and larger cloves and high storage quality. Attempts have been made under Egypt condition to achieve the goal of improving garlic (Osman and Abd El-Hamid, 1990 and 1994). Al-Zahim et al (1997), Ipek et al (2003) and Volk et al (2004) mentioned that the diversity of the clones is described by a set of phenotypic and morphological descriptors. The present study was conducted to select a new promising garlic clones for rising the productivity of garlic in Egypt.

MATERIALS AND METHODS

These experiments were carried out at the Horticultural Research Farm of El-Bramoon, Dakahlia Governorate, Egypt . The experiments started in 2000/2001, where 10000 plants of Sids-40 variety were taken from the previous season after their examination and these plants were planted to produce the bulbs. The producing bulbs were examined and selected according to some characters i.e, bulb weight, bulb diameter and cloves number per bulb. Nine clones were chosen and planted with the standard variety (Sids-40) during the two successive seasons of 2002/2003 and 2003/2004 for evaluation. Three clones i.e. clone 10, clone 12 and clone 13, were chosen according to their superiority in all the tested characters and planted in the two seasons of 2004/2005 and 2005/2006 with the standard variety (Sids-40).

These three clones were laid out in randomized complete block design with three replicates. Each experimental basic unit was 17.5m^2 which contained 5 rows, 5 m long and 0.7 m width.

Planting was done in the last week of September for both seasons. The agricultural practices for garlic commercial production were done according to the recommendation of the Ministry of Agriculture, Egypt.

Plants were harvested at the full maturity in both seasons and the following data were recorded:

Growth parameters :

A random sample of ten plants was taken from the two outside rows of each plot after 120 days from planting to estimate:

1- Plant height (cm).
2- Number of leaves/plant.
3- Bulbing ratio, according to the following equation:

$$\text{bulbing ratio} = \frac{\text{Neck diameter (cm)}}{\text{Bulb diameter (cm)}}$$

4- Leaves dry weight for garlic plant : fresh leaves were dried out in an oven at 70°C until constant weight, and then leaves dry weight/plant was calculated.

Yield and its components :

At harvest time, marketable plants in the three central rows of each plot of each clone were cured, 15 days after harvest, weighted in kg and converted to the total yield (tons/fed). A random sample (30 bulbs) was taken from each clone to determine the following :

1- Bulb weight (gm).
2- Bulb diameter (cm).
3- Number of cloves/bulb.
4- Clove weight (gm).

Storability:

After curing, random samples (each of 10 kg of marketable yield from every plot of each clone), were taken, stored at the normal room conditions and total weight loss percentage was recorded after 150 days after curing (DAC).

Statistical analysis:

Data obtained were statistically analyzed according to Gomez and Gomez (1984) .

RESULTS AND DISCUSSION

1- Plant growth parameters :

a- plant height (cm):

Data presented in tables (1 and 3), illustrated that the clone number 10 recorded highest plant height followed by clones number 12 and 13. These clones (10, 12 and 13) surpassed the other selected clones and the standard variety.

Table (1): Vegetative growth characters of 9 garlic clones under selection during 2002/2003 (S1)* and 2003/2004 (S2)* seasons.

Characters / Clones	Plant height (cm)		Number of leaves/plant		Bulbing ratio		leaves dry weight (gm)	
	S1	S2	S1	S2	S1	S2	S1	S2
2	59.1	63.8	8.1	8.3	0.43	0.43	8.7	10.3
5	59.5	63.9	8.7	8.6	0.43	0.42	9.5	10.7
7	70.3	71.1	9.1	9.2	0.40	0.40	9.5	11.1
8	59.3	61.3	9.9	9.8	0.39	0.40	10.7	11.8
10	103.5	104.8	12.9	12.5	0.31	0.29	13.1	14.6
12	97.0	102.2	12.1	12.0	0.33	0.31	11.7	13.3
13	96.1	96.8	11.3	11.1	0.33	0.33	11.1	12.7
17	60.7	62.5	10.7	10.7	0.37	0.38	9.5	10.7
19	70.2	73.5	9.4	9.9	0.39	0.40	9.0	10.6
Sids-40	91.6	95.3	11.4	11.9	0.33	0.33	11.3	12.6
L.S.D. at 5%	3.2	6.1	0.6	0.4	0.01	0.02	0.6	0.7

* 2002/2003 (S1) - 2003/2004 (S2)

It is clear that, the selection intensity was fair, a positive and significant correlation between plant height and the other important characters were

found (El-Shourbagy, 1987). These results are in harmony with those obtained by Singh (1981) and Osman and Abd El-Hamid (1994).

b- Number of leaves/plant:

Tables (1 and 3) showed significant differences among the selected clones and the standard variety (Sids-40) in the leaves number per plant. Data indicated that the highest leaves number per plant was obtained from clone No. 10 followed by clones No. 12 and 13, while the lowest number of leaves per plant was obtained from clones No. 2 and 5 in the study seasons

c- Bulbing ratio:

Bulbing ratio character can be used as an indication to determine the maturity of garlic plants. As the value of bulbing ratio decreased, the maturity increased. Data in tables (1 and 3) ndicated significant variations between the selected clones and the standard variety in bulbing ratio character

The lowest value of bulbing ratio was obtained from clone No. 10 in all seasons of study. Similar conclusions were obtained by Osman and Abd El-Hamid (1990) , who found significant differences in bulbing ratio among the studied ecotypes.

d- leaves dry weight/plant (gm.):

Tables (1 and 3) indicated that there were significant differences between the selected clones and the standard variety (Sids-40) in the leaves dry weight/plant trait, the highest value of this trait was obtained from clone No 10 These results are in accordance with those obtained by Osman and Abd El-Hamid (1990), who found significant differences in fresh weight and percentage of dry matter content in foliage among different ecotypes of garlic.

2- Yield and its components:

a- Total cured yield:

Data presented in tables (2 and 4), indicate significant differences among the selected clones and the standard variety. The highest yield was produced by clone No. 10 followed by No. 12 and 13, respectively, in the four seasons of study This superiority may be due to its vigorous vegetative growth which increase net assimilation. Data in table (4) revealed that the highest increment of total yield was recorded by the clone No. 10 and reached (13.6 – 13.74 %) during the last both seasons of 2004/2005 – 2005/2006 respectively, compared with the standared variety (Sids-40).

These results are in agreement with those obtained by Osman and Abd El-Hamid (1994), who indicated that there were presence of significant differences in source potentials and sink capacities among the tested genotypes.

b- Average of bulb weight (gm):

It is clear from data presented in tables (2 and 4), that there were significant differences in the average of bulb weight between both the selected clones and the standard variety. The clone No. 10 surpassed all the

other selected clones and the standard variety (Sids-40) in this trait followed by clones No. 12 and 13 during all seasons of study. On the other hand, the lowest values were obtained from clones No. 2 and 5. The variation between the selected clones is in agreement with those obtained and reported by Lee and Kim (1977) in S. Korea and Osman and Abd El-Hamid (1990).

Table (2): Total yield, yield components and total weight loss% of garlic clones under selection during 2002/2003 and 2003/2004 seasons.

Characters	Total cured yield (tons/fed)		Average of bulb weight (gm)		Bulb diameter (cm)		No. of cloves/bulb		Clove weight (gm)		Total weight loss at 150 DAC* %	
Clones	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
2	4.700	4.913	42.7	47.8	4.2	4.5	20.0	18.7	1.9	2.1	69.25	69.10
5	4.853	5.133	44.1	49.8	4.4	4.8	18.7	18.7	2.2	2.2	65.93	66.43
7	5.103	5.283	46.3	51.2	4.3	4.8	19.0	19.0	2.2	2.2	65.00	65.03
8	5.373	5.817	48.9	56.1	4.5	4.8	19.0	18.0	2.4	2.7	62.30	63.03
10	8.697	9.133	79.1	86.3	6.7	7.1	14.3	13.7	5.3	5.7	43.25	42.48
12	8.430	8.890	76.6	84.0	6.3	7.0	16.3	15.3	4.5	5.00	45.47	45.10
13	7.893	8.070	71.7	76.5	5.5	6.0	17.3	16.7	3.9	4.2	47.08	47.98
17	6.207	6.357	56.4	60.9	4.8	5.2	17.3	17.0	3.1	3.1	58.33	57.19
19	5.707	5.867	52.5	56.5	4.5	4.9	18.7	18.7	2.6	2.6	56.54	58.49
Sids-40	7.853	8.150	71.4	77.3	6.0	6.5	18.3	18.0	3.8	3.9	46.73	48.01
L.S.D. at 5%	0.131	0.407	3.88	3.7	0.4	0.3	2.0	2.8	0.4	0.5	2.06	2.13

* 2002/2003 (S1) - 2003/2004 (S2) * DAC = days after curing

c- Bulb diameter (cm):

Data presented in tables (2 and 4) reveal that, there were significant differences between the selected clones and the standard variety (Sids-40) in bulb diameter. The results indicted that clone No. 10 produced the highest bulb diameter followed by clones No. 12 and 13, Meanwhile, the clones No. 2 and 5 produced the lowest bulb diameter in the study seasons. These results are in agreement with those obtained by Lee and Kim (1977) and Osman and Abd El-Hamid (1990).

Table (3): Vegetative growth characters of garlic clones under evaluation during 2004/2005 (S3)* and 2005/2006 (S4)* seasons.

Characters	Plant height (cm)		Number of leaves/plant		Bulbing ratio		leaves dry weight (gm)	
Clones	S3	S4	S3	S4	S3	S4	S3	S4
10	102.8	107.5	12.7	12.9	0.30	0.30	13.5	14.0
12	98.1	103.1	12.0	12.2	0.32	0.33	12.0	13.1
13	92.6	96.4	11.2	11.3	0.33	0.34	11.2	12.1
Sids-40	92.6	97.6	11.9	12.0	0.32	0.32	11.4	11.9
L.S.D. at 5%	7.1	7.3	0.5	0.4	0.01	0.03	0.6	0.4

* 2004/2005 (S3) - 2005/2006 (S4)

d- Number of cloves / bulb:

Concerning the cloves number per bulb, the results in tables (2 and 4), reported that there were clearly significant variations between the selected clones and the standard variety . Clone No. 10 produced the lowest number of cloves per bulb followed by clones No. 12 and 13, respectively in the four seasons of study The lower cloves number per bulb of clone No 10 is very important character for increase of garlic export value.

Table (4): Total yield and its components of garlic clones under evaluation during 2004/2005 (S3) and 2005/2006 (S4) seasons.

Characters	Total cured yield (tons/fed)		Average of bulb weight (gm)		Bulb diameter (cm)		No. of cloves/ bulb		Clove weight (gm)	
Clones	S3	S4	S3	S4	S3	S4	S3	S4	S3	S4
10	9.080	9.247	82.5	86.5	6.7	7.00	12.7	13.0	6.3	6.7
12	8.523	8.383	77.5	79.2	6.5	6.5	15.3	15.0	4.8	5.4
13	8.067	8.063	73.3	76.3	6.0	5.9	16.7	17.3	4.4	4.6
Sids-40	7.993	8.130	72.6	76.9	6.2	6.4	16.7	17.7	4.2	4.5
L.S.D. at 5%	0.490	0.580	4.5	4.78	0.5	0.5	1.5	1.6	0.5	0.6

* 2004/2005 (S3) - 2005/2006 (S4)

e- Clove weight:

Data presented in tables (2 and 4), illustrated that there were significant differences between the selected clones and the standard variety (Sids-40) . The results indicated that the clone No. 10 produced the largest weight of clove, followed by the clones of No. 12 and 13, while the lowest clove weight was produced by the clones of No. 2 and 5, respectively.

3- Storability :

Data presented in table (2), indicate the significant variations between the selected clones and the standard variety (Sids-40) during the two seasons of 2003/2003 and 2003/2004. The clone No. 10 gave lower weight loss percentage and higher storability at 150 days after curing (DAC) than the other clones and standard variety , while the higher weight loss percentage values produced by the clones No. 2 and 5, respectively during the two study seasons of2002/2003 and 2003/2004.

The results indicated that the storability character of clone No. 10 at 150 DAC was higher than the standard variety (Sids-40) by (9.45 –11.52 %) in the 1st and 2nd seasons of study, respectively .

Thus, clone No. 10 followed by clones No. 12 and 13 could be recommended as new promising clones, as their superiority was fairly stable during the seasons of this study.

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تقييم سلالات ثوم جديدة واعدة من خلال برنامج انتخابى للصنف سدس-٤٠

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لوحظ فى السنوات القليلة الماضية انخفاض إنتاجية وجودة محصول الثوم وكذلك زيادة عدد الفصوص بالبصله مع صغر حجم الفص مما يجعله غير مرغوب فيه للتصدير . لذلك أجريت هذة التجارب فى مزرعه بحوث البساتين بالبرامون - محافظة الدقهلية - مصر لانتخاب بعض سلالات ثوم جديدة من صنف الثوم (سدس-٤٠) تحت الظروف المحلية.

تم انتخاب نباتات عديدة من الصنف سدس-٤٠ (١٠٠٠٠ نبات) تتميز بصفات جودة عالية من حيث كبر حجم البصلة وكبر حجم الفص مع قلة عدد الفصوص بالبصلة وانتظام شكلها واكثارها لمدة على ثلاث سنوات ثم أخذ منها تسعة سلالات جديدة .

أجريت دراسات مقارنة للسلالات التسع المنتخبة بالإضافة إلى الصنف القياسي (سدس-٤٠) لموسمين زراعيين متتاليين ناجحين ٢٠٠٢/٢٠٠٣ و ٢٠٠٣/٢٠٠٤ بالمزرعة البحثية لمعهد بحوث البساتين بالبرامون وقد أوضحت النتائج أن السلالات أرقام (١٠، ١٢ و ١٣) كانت أفضل السلالات .

تمت زراعة السلالات الثلاثة المتفوقة مع الصنف القياسي (سدس-٤٠) لموسمين متتاليين ٢٠٠٤/٢٠٠٥ و ٢٠٠٥/٢٠٠٦ وقد أشارت النتائج الى تفوق السلالة رقم (١٠) على بقية السلالات المختبرة وكذلك على الصنف القياسي (سدس-٤٠)فى جميع الصفات الخضرية المدروسة مثل طول النبات، عدد الأوراق /نبات والوزن الجاف للأوراق وكذا المحصول الكلى ومكوناته مثل وزن وقطر البصلة وقلة عدد الفصوص بالبصلة مع زيادة وزن الفص، وكذلك زيادة القدرة التخزينية خلال الموسمين الأول والثانى للدراسة .

أوضحت النتائج أن السلالة رقم (١٠) قد سجلت زيادا ت فى المحصول الكلى بلغت (١٣,٦- ١٣,٧٤%) مقارنة بالصنف القياسي (سدس-٤٠)خلال الموسمين الأخيرين ٢٠٠٤/٢٠٠٥ و ٢٠٠٥/٢٠٠٦ على التوالى.

لذا يمكن لسلالة الثوم الجديدة الواعدة (السلالة رقم ١٠) أن تحل محل الأصناف القديمة وذلك لإرتفاع إنتاجيتها وجودة مواصفاتها .