EVALUATION OF NEW PROMISING GARLIC CLONES THROUGH SELECTION PROGRAM OF SIDS-40 VARIETY
Abdel-Hamid, A.M.; E.N. El-Banna and A.H.A El-Morsy

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 experiences 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-Baramoorn, Dakahlia Governorate, Egypt.

Several plants of Sids-40 variety (about 10000 plants) which had good quality of bulus, 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 standard variety (Sids-40) during the last seasons of 2004/2005 – 2005/2006, respectively.

Thus, this new promising garlic clone (No. 10) can replace 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.

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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 raising 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 17.5m² 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:
   Neck diameter (cm)
   Bulbing ratio = ----------------------------
   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.

<table>
<thead>
<tr>
<th>Characters</th>
<th>Clones</th>
<th>Plant height (cm)</th>
<th>Number of leaves/plant</th>
<th>Bulbing ratio</th>
<th>Leaves dry weight (gm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>S1</td>
<td>S2</td>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>59.1</td>
<td>63.8</td>
<td>8.1</td>
<td>8.3</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>59.5</td>
<td>63.9</td>
<td>8.7</td>
<td>8.6</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>70.3</td>
<td>71.1</td>
<td>9.1</td>
<td>9.2</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>59.3</td>
<td>61.3</td>
<td>9.9</td>
<td>9.6</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>103.5</td>
<td>104.8</td>
<td>12.9</td>
<td>12.5</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>97.0</td>
<td>102.2</td>
<td>12.1</td>
<td>12.0</td>
</tr>
<tr>
<td>13</td>
<td></td>
<td>96.1</td>
<td>96.8</td>
<td>11.3</td>
<td>11.1</td>
</tr>
<tr>
<td>17</td>
<td></td>
<td>60.7</td>
<td>62.5</td>
<td>10.7</td>
<td>10.7</td>
</tr>
<tr>
<td>19</td>
<td></td>
<td>70.2</td>
<td>73.5</td>
<td>9.4</td>
<td>9.9</td>
</tr>
<tr>
<td>Sds-40</td>
<td></td>
<td>91.6</td>
<td>95.3</td>
<td>11.4</td>
<td>11.5</td>
</tr>
<tr>
<td>L.S.D. at 5%</td>
<td>2002/2003 (S1)</td>
<td>3.2</td>
<td>6.1</td>
<td>0.6</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td>2003/2004 (S2)</td>
<td>3.2</td>
<td>6.1</td>
<td>0.6</td>
<td>0.4</td>
</tr>
</tbody>
</table>

It is clear that, the selection intensity was fair, a positive and significant correlation between plant height and the other important characters were
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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) indicated 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 standard 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>
<thead>
<tr>
<th>Characters</th>
<th>Total cured yield (tons/seed)</th>
<th>Average of bulb weight (gm)</th>
<th>Bulb diameter (cm)</th>
<th>No. of cloves/bulb</th>
<th>Clove weight (gm)</th>
<th>Total weight loss at 150 DAC* %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clones</td>
<td>S1</td>
<td>S2</td>
<td>S1</td>
<td>S2</td>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>2</td>
<td>4.700 4.913 4.27 47.8 4.2 4.5</td>
<td>20.0 18.7 1.9 2.1</td>
<td>69.25 69.10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4.853 5.133 4.4 49.8 4.4 4.8</td>
<td>16.7 15.7 2.2</td>
<td>65.93 66.43</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>5.103 5.283 46.3 51.2 4.3 4.8</td>
<td>19.0 19.0 2.2</td>
<td>65.00 65.03</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>5.373 5.817 48.9 56.1 4.5 4.8</td>
<td>19.0 18.0 2.4</td>
<td>62.30 63.03</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>8.687 9.133 79.1 86.3 6.7 7.1</td>
<td>14.3 13.7 5.3</td>
<td>43.25 42.48</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>8.430 8.990 76.6 84.0 6.3 7.0</td>
<td>16.3 15.3 4.5</td>
<td>45.47 45.10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>7.663 8.070 71.7 76.5 5.5 6.0</td>
<td>17.3 16.7 3.9</td>
<td>47.08 47.96</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>17</td>
<td>6.207 6.357 56.4 60.9 4.8 5.2</td>
<td>17.3 17.0 3.1</td>
<td>58.33 57.19</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>5.707 5.867 92.5 96.5 4.5 4.9</td>
<td>18.7 18.7 2.6</td>
<td>56.54 56.49</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sids-40</td>
<td>7.853 8.150 71.4 77.3 6.0 6.5</td>
<td>18.3 18.0 3.8</td>
<td>46.73 46.01</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L.S.D. at 5%</td>
<td>10.13</td>
<td>0.41</td>
<td>0.79</td>
<td>0.37</td>
<td>0.4</td>
<td>0.2</td>
</tr>
</tbody>
</table>

*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.

<table>
<thead>
<tr>
<th>Characters</th>
<th>Plant height (cm)</th>
<th>Number of leaves/plant</th>
<th>Bulbing ratio</th>
<th>Leaves dry weight (gm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clones</td>
<td>S3</td>
<td>S4</td>
<td>S3</td>
<td>S4</td>
</tr>
<tr>
<td>10</td>
<td>102.8</td>
<td>107.5</td>
<td>12.7</td>
<td>12.9</td>
</tr>
<tr>
<td>12</td>
<td>98.1</td>
<td>103.1</td>
<td>12.0</td>
<td>12.2</td>
</tr>
<tr>
<td>13</td>
<td>92.6</td>
<td>98.4</td>
<td>11.2</td>
<td>11.3</td>
</tr>
<tr>
<td>Sids-40</td>
<td>92.6</td>
<td>97.6</td>
<td>11.9</td>
<td>12.0</td>
</tr>
<tr>
<td>L.S.D. at 5%</td>
<td>7.1</td>
<td>7.3</td>
<td>0.5</td>
<td>0.4</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Characters</th>
<th>Total cured yield (tons/ft²)</th>
<th>Average of bulb weight (gm)</th>
<th>Bulb diameter (cm)</th>
<th>No. of cloves/bulb</th>
<th>Clove weight (gm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clones</td>
<td>S3</td>
<td>S4</td>
<td>S3</td>
<td>S4</td>
<td>S3</td>
</tr>
<tr>
<td>10</td>
<td>9.080</td>
<td>9.247</td>
<td>82.5</td>
<td>86.5</td>
<td>6.7</td>
</tr>
<tr>
<td>12</td>
<td>8.523</td>
<td>8.383</td>
<td>77.5</td>
<td>79.2</td>
<td>6.5</td>
</tr>
<tr>
<td>13</td>
<td>8.067</td>
<td>8.063</td>
<td>73.3</td>
<td>76.3</td>
<td>6.0</td>
</tr>
<tr>
<td>Sids-40</td>
<td>7.993</td>
<td>8.130</td>
<td>72.6</td>
<td>76.9</td>
<td>6.2</td>
</tr>
<tr>
<td>L.S.D. at 5%</td>
<td>0.490</td>
<td>0.580</td>
<td>-4.5</td>
<td>4.78</td>
<td>0.5</td>
</tr>
</tbody>
</table>

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

- 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 highest weight loss percentage values produced by the clones No. 2 and 5, respectively during the two study seasons of 2002/2003 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 supernuity was fairly stable during the seasons of this study.

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REFERENCES


تقييم سلالات ثوم جيدة واعدة من خلال برنامج الانتقاء للصنف سدس

عبد المنعم محمد عبد الحميد - السيد ناصر الدين و عبد الله حلمي على المرسى

قسم بيئة نباتات وחקر حشرية النبات - مركز بحوث النباتين - مركز البحوث الزراعية، الجيزة - مصر.

لوحظ في السنوات القليلة الماضية انخفاض إنتاجية وجودة محصول الثوم وكذلك زيادة عدد الفصوص بالبلشة مع صغر حجم الفص مما يجعله غير مريغ للتصدير. لذلك أجريت هذه التجربة في مزرعة بحوث النباتتين بالفرعون - محافظة الدقهلية - مصر لتجربة بعض سلالات ثوم جديدة من صنف الديون (سمس-40) تحت الظروف المحلية.

تم انتخاب نباتات عدد من سلالات سدس-4 (10000 نبات) تميز بصفات جودة عالية من حيث كرب حجم البصلة وكبر حجم الفص مع قلة عدد الفصوص بالبلشة وانظام شكلها.

وإثارة لمدة على ثلاث سنوات ثم أخذ منها تسع سلالات جديدة.


تمت زراعة سلالات الثلاثة المتقدبة مع الصنف القياسي (س.م-40) لمجموع


في جميع المساحات الخضراء المتقدبة أوراق الثوم، وزن وزن الفص البصلة وفروة عدد الفصوص بالبلشة وحجم الفص وورقة وزن النص، وكذلك زيادة

القدرة التخزينية خلال الفصول الأول والثاني للدراسة.

أوضحت النتائج أن السلاة رقم (1) قد سجلت زيادة في المحصول الكلي بلغت

13.1% (12.4) مقارنة بالصنف القياسي (س.م-40) خلال الفصول الأخيرة


إذا يمكن لسلالة الثوم الجديدة الوقفة (الصنف رقم 1) أن تحل محل الأسنان القديمة وذلك لارتقاء تجاهها وجودة مواصلاتها.