

Performance of Some Egyptian Garlic Strains (*Allium sativum* L.) Under Assiut Conditions

Dalia I. Ahmed, Nashaat M. Kandeel, Ayman K. Metwaly and Magdi A. Ahmed

Dept. Horticulture Fac. Agric., Assiut Univ., Assiut, Egypt.

Key words: Evaluation; Garlic selection; Correlation

Abstract

A field study was carried out at the Experimental Research Farm, Faculty of Agriculture, Assiut University, Assiut, Egypt during two consecutive winter seasons of 2007/2008 and 2008/2009 to evaluate eleven Egyptian garlic genotype selections collected from different areas of Egypt under Assiut condition.

The results show significant differences among these genotypes for most of the studied characters. To meet the requirement of garlic production with good quality characteristics under Assiut growing condition, selections 5(El-Behera), 6(El-Gharbia) and 8(El-Minia) were very promising genotypes.

Phenotypic coefficients correlations between all possible pairs of the studied characters of the Egyptian garlic genotype selections were estimated. Direct selection for yield improvement may be not possible, but may be feasible through indirect selection of other secondary traits, there for estimation of correlation will be helpful for the breeder

Introduction:

Allium sativum is a diploid species ($2n=2x=16$). Garlic cultivation is historically dated back

to 3000 years BC. (Figliuola *et al.*, 2001).

Garlic (*Allium sativum* L.) is cultivated as a vegetable crop and also for its medicinal properties. Most of the medicinal effects of garlic are attributable to a sulfur compound known as allicin (Schulz *et al.* 1998).

Islam *et al.* (2004) used 22 garlic genotypes of local origin in Borga (Bangladesh).

The results indicated that the germplasm differed significantly as to the different morphological attributes, yield and other desirable traits. Genotypes varied in plant height, number of cloves/bulb, individual bulb weight, and in length and width of individual bulb. However, there was no significant difference in number of leaves/plant.

Twenty-four garlic genotypes were collected from the main cultivation areas of Iran were evaluated for their genetic diversity by Baghalian Kambiz *et al* (2005).The studied morphological characters were bulbs mean weight, cloves mean weight and cloves number per bulb. A significant positive correlation between clove mean weight and cloves number were detected.

The productivity of the Egyptian garlic (Balady cultivar) was reported to be related to used bulb seeds. The total amount of

Egyptian exported garlic to the foreign market was decreased also. The key to get sufficient production and good quality is to select garlic clones for heavy yield and good quality from the available materials.

The aim of this work was to evaluate the performance of eleven selected genotypes from the Egyptian garlic (Balady cv.) were collected from different

locations in Egypt grown under Assiut condition.

Materials and Methods

A total of 11 Egyptian garlic genotypes were collected from different areas in Egypt. The two experiments were performed in the Experimental Farm, Faculty of Agriculture, Assiut University during two winter consecutive seasons of 2007/2008 and 2008/2009.

Table (1) Geographical origin of Egyptian garlic (Balady) cultivar collection

Selection genotypes	Location name	Selection genotypes	Location name
1	Gehena	7	Beni Swief
2	Tahrir	8	El-Minia
3	Sohag	9	Assiut
4	Qena	10	El-wady El-Gaded
5	El-Behera	11	El-Faiyum
6	El-Gharbia		

The cloves were planted on 20 September each year. Normal culture practices i.e. irrigation, fertilization, and pest and diseases control were followed as recommended for commercial fields.

A randomized complete blocks design were used with three replicates. Each experimental unit consisted of three rows, 3meters long and 60 cm in width spacing between plants on ridges was 7 cm.

Plots were harvested when 75% of the top of plants down. On harvest time, 10 randomly plants from each plot were taken and the following data were recorded:-

A : Vegetative growth measurements

- 1-Average plant height
- 2-Average number of leaves per plant
- 3-Weight of 10 plants per plot

B: Bulb quality

- 1- Average neck diameter (cm)
- 2- Average bulb diameter (cm)
- 3- Bulbing ratio
- 4- Cloves weight of 5 bulbs (gm)
- 5- Number of cloves per bulbs

C: Yield and yield components

- 1- Number of plants per plot
- 2- Number of plants per fed.
- 3- Yield per plot(gm)
- 4- Total yield (ton/fed)
- 5-Total soluble solids (T.S.S. %)

D: Phenotypic coefficient correlation

Statistical analysis:

Data were analyzed following the procedure of analysis of variance according to random-

ized complete blocks design as described by Gomez and Gomez (1984). Means were compared to Duncan's multiple range test (Duncan, 1995) also, phenotypic correlation coefficients among traits were calculated and analyzed according to Falconer (1960).

Results and Discussion:

A: Vegetative growth

1- Plant height(cm)

Data in Table (2) indicate that there were insignificant differences among their means in the first season, while, there are significant differences in the second season.

The highest values of plant height were obtained from Balady's genotype selection number 8 in the first and second seasons.

2- Number of leaves / plant

Results illustrated in Table (2) indicate that number of leaves/plant were significantly affected in the first season and insignificantly affected in the second season by the tested selections. The Egyptian selections No.11 and 4 had a more number of leaves/plant in the first and second seasons, respectively.

3-10 plants weight (gm)

Data presented in Table (2) show a significant differences in the first season and insignificant differences in the second season in the average fresh weight of 10 plants among selections. The highest values of this character were obtained by selections number 5 and 11 in the first season and selection number 8 in the second season.

B: Bulb quality

1- Neck diameter (cm)

Data in Table (3) show that there is an insignificant difference in all selections in both seasons. The highest neck diameter in the first season was selection No. 2 and the highest neck diameter in the second season was selection No. 8.

2- Bulb diameter (cm)

Data in Table (3) show that there were significant differences in the first season and insignificant differences in the second season between the tested selections. The highest bulb diameter in the first season was selection 8 and in the second season was selection 11 .

3- Bulbing ratio

As shown in Table (3) data indicated that there were insignificant differences among the tested selections in both seasons. Selections 4,7,8 gave the early maturity in the first season and selections 2,3,9,10,11 in the second season.

4- Cloves weight of 5 bulbs (gm)

Data in Table (3) indicated that there were significant differences between the 11 selections of Egyptian garlic in both seasons. The highest value was selection number 10 in both seasons.

5- Cloves number of 5 bulbs

Data in Table (3) indicated that there were significant differences between the selections in the first season and insignificant differences in the second season. The lowest value was selection

number 11 in the first season and selection number 10 in the second season.

C: Yield and yield component

1- Plants number per plot

Data on this character are presented in Table (4). Results show that there were significant differences between the 11 selection genotypes in both seasons. In the first season the highest value was selection number 8. In the second season the highest value was selection number 6 .

2- Plants number per fed

Data in Table (4) indicate that there were significant difference between the selections genotypes in both seasons. The highest value was selections No. 6 in the both seasons.

3- Plot yield (gm)

Data on this character are presented in Table (4). Results show that there were significant differences between the selections in both seasons. The highest value was selection number 6 in both seasons.

4- Yield (ton/fed)

Data on this character are presented in Table (4). Results show that the performances of the 11 tested selections genotypes indicate that there were insignificant differences among them in the first season and significant differences in the second season. The highest values were obtained from selection number 6 gave in both seasons.

5- Total soluble solids (T.S.S. %)

Data in Table (4) indicate that there was an insignificant

difference among the garlic genotype selections in both seasons. In the first season the highest values were obtained from selections number 4 and number 11. In the second season the highest value was obtained from selection number 5.

Convention selection of accessional sports in vegetative propagated crops requires large scale plantings, keen observations, and the chance occurrence of rare event.

A solution is sought on the use of domestic genotypes, which are fully adapted to local conditions and are important genetic resource and initial breeding material (Gvozdanovic Vagar *et al.* 2002). The variability among these garlic genotypes showed similar and dissimilar properties. Also, the farmer depends on their own seeds and the differences among these regions gave us possibility to find differences among these genotypes. The results in this investigation showed that there were significant differences among these genotypes such as plant height, number of leaves per plant, 10 plant weight, bulb diameter, cloves number and yield. These results are in agreement with those reported by Nassar *et al.*(1972) ,Shalaby (1973) ,Kumer *et al.*(1994) and Khar *et al.*(2005)

D: Phenotypic coefficients correlation

The phenotypic coefficients correlations for all possible pairs of the studied characteristics are

shown in Table (5) and 6 respectively.

In the first season Plot yield was highly significant correlated with number of plants per plot, 10 plants weight, and plants number per feddan and total yield per feddan. Number of plants per plot was highly correlated with plants number per feddan and yield per feddan. Neck diameter was significant correlated with 10 plants weight, bulb diameter and highly significant correlated with bulbing ratio. 10 plants weight was significant correlated with bulb diameter and highly significant correlated with yield per feddan. Plant height was highly significant correlated with cloves weight per 5 bulbs. Number of plants per feddan was highly significant correlated with yield per feddan. Many research workers found one or more from these correlations among garlic traits ,El-Muraba *et al.*(1983);El-Mansi *et al.*(1999) and El-Mahday and Mohamed (2003).

In the second season plot yield showed highly significant correlation with number of plants per plot, 10 plants weight, plant height, plants number per feddan

and yield per feddan. Plants number per plot was highly significant correlated with plant height, plants number per feddan and yield per feddan. Neck diameter was highly significant correlated with bulbing ratio. 10 plants weight was highly significant correlated with plant height, bulb diameter and significant correlated with yield per feddan. Plants height was highly significant correlated with plants number per feddan and highly significant negative correlation with cloves weight per 5 plants. Plants number per feddan was highly significant correlated with yield per feddan.

In general conclusion, the ecological factors have led to the differences among the tested strains, which allowed us to select the best genotypes among these strains. The selection for the future can give the ability to improve the Egyptian garlic plants which is a major crop in local and export production.

To meet the requirement of garlic production with good quality characteristics under Assiut growing condition, selections 5, 6 and 8 are very promising.

Table (2): Means of plant height (cm), number of leaves/plant and 10 plants weight (gm) for 11 garlic genotypes selections grown in the two consecutive seasons 2007/2008 and 2008/2009 under Assiut condition

Genotypes number	Plant height(cm)		Number of leaves/plant		10 plants weight(gm)	
	1 st season	2 nd season	1 st season	2 nd season	1 st season	2 nd season
1	71.80 a	61.60 ab	6.73 ab	6.03 a	600.00 a	500.00 a
2	69.50 a	60.37 ab	6.77 ab	6.10 a	816.67 ab	433.33 a
3	67.83 a	60.30 ab	6.73 ab	6.33 a	603.33 b	533.33 a
4	66.03 a	60.67 ab	6.90 ab	6.47 a	600.00 b	590.00 a
5	72.10 a	69.80 a	7.03 a	6.27 a	900.00 a	533.33 a
6	68.33 a	70.10 a	6.33 ab	6.17 a	806.67 ad	566.67 a
7	68.60 a	54.80 b	5.83 c	5.83 a	650.00 ad	450.00 a
8	72.97 a	71.20 a	6.83 ab	6.23 a	783.33 ad	633.33 a
9	67.80 a	61.70 ab	6.93 ab	5.77 a	666.67 ad	566.67 a
10	66.00 a	58.20 b	7.07 a	6.30 a	783.33 ad	550.00 a
11	69.37 a	58.00 b	7.10 a	6.33 a	900.00 a	440.00 a

Means with in each column followed by the same letter or letters are not significantly different from each other at 0.5% level

References

- Baghalian, K; M.R. Sanei,; Khaloghi , A and H.A. Naghdi Badi, 2005. Post-culture evaluation of morphological divergence in Iranian garlic ecotypes. *Acta Horticulture*, no 688:123-128.
- Duncan, D.B 1995. Multiple range and multiple F.test *Biometrical* 1-42.
- El-Mahdy I.M. and M.E.El-Denary. 2003. Evaluation of "AVRDC" international garlic collection under Egyptian condition. *Acta Hort.*604:559-563.
- El-Mansi.A.A.; E.A.El-Ghamriny; H.M.E.Arisha and E.E.Abou El-Khair. 1999. Effect of cultivar, irrigation interval and irrigation water quantity on garlic under drip irrigation system in sandy soil. *Zagazig J.Agric.Rec.*26(6):1677-1694
- El-Muraba, A.I; G.L.Shlaby; M.K.Imam; E.A.Waly and H.A.Hussein. 1983. Effect of different photoperiod on some horticultural characteristics of garlic (*Allium sativum* L.) harvesting date and bulb quality. *Assiut J. of Agriculture Sciences*14:141-154
- Falconer, D.S. 1960. Introduction to quantitative genetics. The Ronald press company, N.Y.
- Figliuolo, G; v.Candido; G.Logozzo; V. Miccolis & P.L. Spagnuolo. 2001. Genetic evaluation of cultivated garlic germplasm (*Allium sativum* L.) and *A. ampeloprasum* L.) *Euphytica* 121:325-334.
- Gomez, K.A. and A.A. Gomez. 1984. Statistical procedures for agricultural research. John Wiley & Sons. New York, Second Ed. pp 680.
- Gvozdanovic-Varga J.; M., Vasic and J., cervenski. 2002. Variability of characteristics of garlic (*Allium sativum* L.) ecotypes *Acta Hort.* (ISHS) 579:171-175.
- Islam, M. J., M.A. Islam, Tania, S. A., Saha, S. R., Alam, M. S. and Hasan, M. K. 2004. Performance evaluation of some garlic genotypes in Bangladesh. *Asian Journal of Plant Sciences* 3 (1):14-16.
- Khar, -A; Devi, -A-A; Mahajan, -V and Lawande, -K-E. 2005. Genotype x environment interactions and stability analysis in elite lines of garlic (*Allium sativum* L.). *Journal-of-Spices-and-Aromatic-Crops.*14 (1):21-27.
- Kumar ,A.; B Prasad ; B.C. Saha; R.P. Sinha and K.R. Pnaurya (1994). Phenotypic stability in garlic (*Allium sativum* L.) *Journal of Applied – Biology.*1994 Pubi 1996; 4(1/2):23-26.
- Nassar, S.H.; S., Moustapha; Sh.Foda; M.Ghera and S.Ghebrial. 1972. A better garlic variety for export. *Agric.Res.*50(4):47-58.
- Schulz V., R. Hansel and V.E, Tyler. 1998. Rational phytotherapy A Physicians Guide to herbo medicine, Springer. Pp107-127.
- Shalaby, G.I. 1973. Some horticultural characteristics of two

Dalia Ahmed et al. 2010

species of garlic Assiut
J.Agric.Sci, 4 (3):115-123.

سلوك بعض سلالات الثوم المصرى تحت ظروف أسبوط

دلينا إبراهيم أبو العيون احمد ، نشأت محمود قنديل ، أيمن قطب متولى

مجدى على أحمد

قسم البساتين كلية الزراعة – جامعة أسبوط

أجريت هذه الدراسة بمزرعة التجارب البحثية – كلية الزراعة – جامعة أسبوط جمهورية مصر العربية خلال موسمى زراعة متتاليين هما (2008/2007 و 2009/2008) لتقييم بعض التراكيب الوراثية المنتخبه من الثوم المصرى(البلدى) جمعت من مناطق مختلفه بجمهورية مصر العربية. السلالات المنتخبه تم زراعتها فى ثلاث مكررات بتصميم قطاعات الكاملة العشوائيه وكان ميعاد الزراعة فى كلا الموسمين فى الاسبوع الثالث من سبتمبر . وقد أجريت جميع العمليات الزراعيه حسب توصيات وزارة الزراعة. وقد أظهرت الدراسه وجود تباين بين التراكيب الوراثيه التى درست لمعظم الصفات التى تم قياسها مما يشجع عملية الانتخاب بين هذه السلالات. كذلك قدر الارتباط الظاهرى بين كل الأزواج الممكنه للصفات التى درست.وأظهرت النتائج وجود ارتباط معنوى بين بعض الصفات مما يساعد المربى فى تنفيذ برنامجه. من النتائج يمكن التوصيه بالسلالات المنتخبه رقم 8،6،5 بأنها سلالات واعده لاعطاء محصول جيد من الثوم عند زراعتها تحت ظروف محافظة أسبوط.