*Assiut J. of Agric. Sci., 39 (5) (93-106)*

# EVALUATION OF THIRTEEN GARLIC ECOTYPES IN NEWLY RECLAIMED LAND UNDER SOHAG CONDITIONS

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**Abstract**: A field study was carried out at the Experimental Research Farm , Faculty of Agriculture, Sohag University during two consecutive seasons of 2006/2007 and 2007/2008 to evaluate thirteen Garlic ecotypes collected from different area of Egypt under newly reclaimed land. The results showed significant differences among these ecotypes for all studied characters. Elgharbia ecotype was the tallest plant, Aswan ecotype was the largest for bulb diameter, Sids 40 was the best for plant fresh weight and weight of cloves/bulb. Bani Sweif ecotypes gave the highest bulbing ratio while Assiut ecotype gave the lowest. However, Sids 40 had the least number of cloves/bulb, Elgharbia ecotype gave the highest value for total soluble solids and the highest yielding was obtained from Sids 40. Also, Onion Yellow Dwarf Virus (OYDV) disease infection was studied for these garlic ecotypes. Elbehera, Elwady and El-faiyum showed light degree of symptoms. While, medium degrees of symptoms were found in Sids 40, Gehena, Sohag, Qena and Aswan ecotypes. The heaviest degrees of symptoms for OYDV were found on plants of Tahrir, Elgharbia, Bani swief and Assiut ecotypes.

**Key words:** evaluation for OYDV resistance,morphological characters, yield characters,

## Introduction

*Allium sativum* is a diploid species ($2n = 2X = 16$), which cultivation is historically dated back to 3000 years B.C. (Figliuolo *et al.*, 2001). It is generally sterile and thus propagated by cloves. The origin of garlic is considered to be Central Asia from where it has spread to west, south and east of Asia (Etoh *et al.*, 2001).

Garlic (*Allium Sativum* L.) is cultivated as vegetable crop and also for its medicinal properties. It lowers total plasma cholesterol, reduces blood pressure and decreases platelet aggregation (Sterling and Eagling, 2001). Most of the medicinal effects of garlic are attributable to a sulfur compound known as allicin (Schulz *et al.*, 1998).

**Received on**: 25/12/2008 **Accepted for publication on**: 10/3/2009

**Referees**: Prof.Dr. Mohamed Foad Prof.Dr. Mohamed Abd Allah

Many investigations were carried out on the different garlic ecotypes and differences were reported in protein (Kevresan *et al.*, 1997) or in morphological characters. Gvozdanovic-Varga *et al.*, (2002) studied the variability of characteristics of ecotypes of winter and spring garlic collected in the Vojvodina Province, Yugoslavia. The analysis showed that winter and spring ecotypes significantly varied in respect to the number of outer leaves of the bulb, bulb mass, clove mass, number of cloves, dry matter content and yield. Highly significant variability was found among the ecotypes of spring garlic for the height of the aboveground part and the number of leaves.

Twenty-four garlic ecotypes 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: bulb mean weight, clove mean weight and clove number per bulb. A significant positive correlation between clove and bulb mean weight as well, negative correlation between clove mean weight and clove number were detected.

Islam *et al.*, (2004) used 22 garlic genotypes of local origin in Bogora (Bangladesh). The results indicated that the germplasm differed significantly as to the different morphological attributes, yield and other desirable traits. Ecotypes 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.

The reduction in yield and quality of product due to virus infection is a serious economic problem now. Garlic can be often infected with Onion Yellow Dwarf Virus (OYDV) Potyvirus. Biological and molecular characterization of viruses infected *Allium* crops were reviewed by Van Dijk (1993); Diekmann (1997); and Chen *et al.* (2001). Reduction on yield and quality of garlic production is managed within the certification scheme including recovery of garlic and virus indexing (Walkey *et al.* 1987; Szyndel *et al.* 1994; Lot *et al.* 1998 and Dovas *et al.*, 2001). OYDV has been distributed worldwide including Egypt (El-Kewey *et al.* 2004 and Mahmoud *et al.*, 2007).

The aim of this work was to evaluate genetic diversity of some Egyptian garlic ecotypes collected from different location in Egypt grown in newly reclaimed land under Sohag conditions.

**Materials and Methods**

A total of 13 (12 produced from Egyptian garlic and sids 40) clones were collected from different areas in Egypt. The experiment was performed in the Experimental farm, Faculty of Agriculture, Sohag University during two consecutive seasons of 2006/2007 and 2007/2008 in a reclaimed soil. Geographical origin of the13 garlic ecotypes are listed in Table 1.

**Table(1):** Geographical origin of garlic ecotypes

| Ecotype code | Name location region | Ecotype code | Region Originated |
|---|---|---|---|
| 1 | Sids 40 | 8 | Bani Swief |
| 2 | Gehena | 9 | Elminia |
| 3 | Tahrir | 10 | Aswan |
| 4 | Sohag | 11 | Assiut |
| 5 | Qena | 12 | Elwady El-Gaded |
| 6 | Elbehera | 13 | El-Faiyum |
| 7 | Elgharbia | | |

Garlic ecotypes were arranged in a complete randomized block design with three replicates. Each experimental plot consisted of 5 ridges (60 cm wide and 3.5m long). The plot area was 10.5$m^2$ (1/400fed.). The cloves were planted on both sides of each ridge at 10 cm apart on the 5 $^{th}$ of October in both seasons. Normal cultural practices of soil preparation, irrigation and fertilization were followed. Garlic plants were harvested on the first week of April in 2006 and 2007 seasons. Data were recoded on 15 plants randomly taken from each experimental plot to determine the following characters:

1-Plant height (cm)

2- Number of leaves/plant.

3-Average cured bulb diameter (cm).

4- Average curd bulb height (cm)

5-Bulbing ratio (neck diameter/bulb diameter);calculated as described by Mann(1952).

6- Plant fresh weight (g)

7- Number of cloves/bulb

8-Weight of cloves/bulb (g)

9- Total soluble solids (T.S.S.)

10-Curd yield (ton/fed.), garlic plants were cured for two weeks and weighted.

**Determination of onion dwarf virus diseases (OYDV).**

Garlic cloves of the 13 ecotypes which taken from the harvested plants in second season 2008 were cultivated in greenhouse to determine the sensitivity to OYDV. At three or four weeks after germination, the frequency of viral disease symptoms was determined and the degree of disease symptoms was classified into four grads by visual examination: heavy (H), medium (M), Light (L) and none

(N). On the other hand, leaf samples were taken and the presence of OYNV was detected by DAS-ELISA technique according to Clark and Adams (1977). One gram of garlic leaf was homogenized in 5 ml extraction buffer, and then the extract was used as antigen. 200 µl of extract per well was added to the ELISA plate (three well per treatment) previously coated with 200 µl OYDV immunoglobiolin (1/1000 dilution) and incubated overnight at 4°C. Alkaline phosphatase conjugated immunoglobiolin was added at 1/2000 dilution and incubated for 3 h at 37 °C. Plates were washed three times between each step with phosphate buffered saline containing 0.05% Tween-20. Later, *p*-nitrophenyl phosphate was added at 1 mg/ml and incubated for 1 h at room temperature. The reaction was terminated with addition of 3 M NaOH. ELISA reactions were measured spectrophotometrically at 405 nm using ELISA-reader and positive reaction was confirmed by visual observations. The ELISA values presented two folds of negative control were considered positive reactions. Symptoms were determined and the degree of diseases symptoms was classified into four grades by visual examination: heavy (H), medium (M), light (L) and none (N) as described by Takaichi *et al.*, 1998.

**Statistical analysis**: Data were analyzed following the procedure of analysis of variance (ANOVA) according to randomized complete block design as described by Gomez and Gomez (1984). Means were compared with Duncan's multiple range test (Duncan, 1955). Also, phenotypic correlation coefficients among traits were calculated in the second season.

## Results and Discussion

### Plant height (cm)

The average plant height of 13 garlic ecotypes in both seasons are presented in Table 2. The results indicated that there no significant differences among the 13 ecotypes except Sids 40 and Aswan in the first season. In the second season, there were no significant differences among these ecotypes except for Sids 40, Aswan and Al-Faiyum ecotypes. The tallest plants were those from Elgharbia ecotype. However, the shortest plant obtained from Sids 40 in both seasons.

### Number of leaves/plant

Data in Table 2 showed significant differences among all the studied garlic ecotypes for this trait in both seasons. The highest values were recorded by Sohag and Elbehera ecotypes (11.40) in first season. While, in the second season the highest values for number of leaves/plant were obtained from Elgharbia ecotype (11.40).

### Average curd bulb diameter (cm)

Data in Table 2 indicated no significant differences among garlic ecotypes in the first season but the differences were more pronounced

**Table(2)**: Means of plant height, number of leaves/plant, bulb diameter, bulb height and bulbing ratio for 13 garlic ecotypes grown in two successive seasons 2006/2007 and 2007/2008 under Sohag conditions.

| Ecotypes number | Origin Originated | Plant height (cm) | | Number of leaves/plant | | Average cured bulb diameter (cm) | | Average cured bulb height (cm) | | Bulbing ratio | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1st Season | 2nd Season | 1st Season | 2nd Season | 1st Season | 2nd Season | 1st Season | 2nd Season | 1st Season | 2nd Season |
| 1 | Sids 40 | 58.80 b | 58.67 c | 11.13 ab | 10.93abc | 4.76a | 5.12ab | 3.06ab | 3.43a | 0.567 abc | 0.568 abc |
| 2 | Gehena | 82.27 a | 81.67 a | 10.27 cd | 10.00 d | 5.01a | 5.01ab | 2.75b | 2.99ab | 0.489 cd | 0.490 cd |
| 3 | Tahrir | 85.87 a | 87.20 a | 10.93abc | 11.17ab | 4.81a | 5.05ab | 2.76b | 2.68b | 0.523 abcd | 0.523 abcd |
| 4 | Sohag | 85.73 a | 86.67 a | 11.40 a | 11.27ab | 4.99a | 5.14ab | 2.90ab | 2.86ab | 0.527 abcd | 0.527 abcd |
| 5 | Qena | 89.33 a | 88.67 a | 11.07abc | 10.93abc | 5.27a | 5.12ab | 2.94ab | 2.92ab | 0.527 abcd | 0.527 abcd |
| 6 | Elbehera | 84.77 a | 88.07 a | 11.40 a | 10.93abc | 5.01a | 5.18ab | 2.80b | 2.88ab | 0.476 de | 0.478 de |
| 7 | Elgharbia | 91.27 a | 90.43 a | 11.27 ab | 11.40a | 4.97a | 5.26ab | 2.95ab | 2.82b | 0.508 abcd | 0.510 abcd |
| 8 | Bani Swief | 85.07 a | 87.60 a | 10.47bcd | 10.47cd | 4.93a | 5.13ab | 2.75b | 2.88ab | 0.583 a | 0.585 a |
| 9 | El-Minia | 83.67 a | 83.13 a | 10.13 d | 10.70bc | 4.82a | 4.72b | 2.83b | 2.72b | 0.578 ab | 0.578 ab |
| 10 | Aswan | 58.93 b | 61.07 c | 10.53bcd | 10.80abc | 5.26a | 5.57a | 3.30a | 2.88ab | 0.494 bcd | 0.498 bcd |
| 11 | Assiut | 84.00 a | 84.67 a | 10.67abcd | 10.87abc | 5.05a | 5.00ab | 2.82b | 3.11ab | 0.400 e | 0.401 e |
| 12 | Elwady | 81.28 a | 82.07 a | 11.13 ab | 11.20ab | 5.01a | 5.03ab | 2.98ab | 2.76b | 0.475 de | 0.475 de |
| 13 | El-faiyum | 81.93 a | 71.67 b | 11.00abc | 11.07abc | 5.13a | 5.46ab | 2.96ab | 2.90ab | 0.545 abcd | 0.545 abcd |

Means followed by the same letters are not significantly different from each other at 0.5% level.

and statistically approved only in the second season. The highest values of Average curd bulb diameter were obtained from Aswan ecotype in the first and second season, respectively.

**Average curd bulb height (cm)**

There were significant differences among garlic ecotypes in both seasons. The highest value was obtained from Aswan in the first season and Sids 40 in second season. The lowest values were obtained from Gehena and Bani swief ecotypes in first season and from Tahrir in the second season.

**Bulbing ratio**

The Average of garlic ecotypes for bulbing ratio in Table (3) indicated that there were signifycantly differences among the 13 garlic ecotypes in both studied seasons. The earliest bulb formation (earlier harvest) was obtained from Bani Swief ecotype, however the latest form Assiut ecotype in both seasons.

**Plant fresh weight (gm)**

Data in Table 3 indicated significant differences among the 13 garlic ecotypes for plant fresh weight in both seasons. The highest plant fresh weight was obtained from Sids 40 while, the lowest value was obtained from El-Minia ecotype in both seasons.

**Number of cloves/bulb**

The average number of cloves /blub of 13 garlic ecotypes are presented in Table 3. There were significant differences among these ecotypes for number of colves/blub in both seasons. The highest values of number of cloves/bulb were obtained from Bani swief and Assiut ecotypes in the first and second seasons respectively. While, the lowest number of cloves/bulb were obtained from sids 40 in both seasons.

**Weight of cloves/bulb (g)**

Data in Table 3 showed that there were significant differences among ecotypes for weight of cloves/bulb in both seasons. The highest weight of cloves/bulb was obtained from Sids 40 ecotype in both seasons. The lowest value of weight of cloves/bulb was obtained from Gehena ecotype in both seasons. Sids 40 ecotype surpassed Gehena by 41.83% and 38.22% in the first and second season respectively.

**Total soluble solids (TSS)**

Data in Table 3 indicated that Elgharbia ecotype gave the highest value for this trait total soluble solids in both seasons while, Gehena ecotype gave the lowest value in both seasons.

**Total yield (ton/fed.)**

There were significant differences for total yield character in both seasons (Table 3). The highest yielding was obtained from Sids 40 ecotype in both studied seasons. This finding could be explained in the light of the induced

**Table(3):** Means of plant fresh weight, number of colves/bulb, weight of cloves/bulb, total soluble solids and total yield for 13 garlic ecotypes grown in two successive seasons 2006/2007 and 2007/2008 under Sohag conditions.

| Ecotypes code | Name/location | Plant fresh weight (gm) | | Number of cloves/bulb | | Weight of cloves/bulb (gm) | | Total soluble solids (T.S.S) | | Total yield (ton/fed.) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1st Season | 2nd Season | 1st Season | 2nd Season | 1st Season | 2nd Season | 1st Season | 2nd Season | 1st Season | 2nd Season |
| 1 | Sids 40 | 59.18a | 59.36a | 14.90d | 15.00c | 54.67a | 52.43a | 40.33ab | 36.50abc | 8.28a | 8.31a |
| 2 | Gehena | 41.09bc | 42.01c | 30.47c | 30.47ab | 31.80d | 32.39c | 34.50c | 35.33c | 5.75c | 5.88e |
| 3 | Tahrir | 49.87abc | 51.06abc | 35.60ab | 36.33a | 34.98d | 36.89bc | 38.00abc | 39.50abc | 6.97abc | 7.14b |
| 4 | Sohag | 48.57abc | 46.51c | 31.87bc | 31.33ab | 37.33d | 38.02bc | 39.50abc | 38.33abc | 6.77abc | 6.51c |
| 5 | Qena | 45.72abc | 45.67c | 32.87bc | 33.20ab | 35.93d | 36.75bc | 35.83bc | 36.83abc | 6.39bc | 6.39cd |
| 6 | Elbehera | 48.75abc | 45.33c | 30.13c | 30.00ab | 39.03cd | 38.37bc | 35.00bc | 35.83bc | 6.82abc | 6.34cd |
| 7 | Elgharbia | 48.15abc | 48.00bc | 32.67bc | 32.67ab | 37.73d | 39.55abc | 41.67a | 40.90ab | 6.73abc | 6.72c |
| 8 | Bani Swief | 45.08abc | 46.78c | 38.67a | 35.67ab | 40.00cd | 40.67abc | 36.67abc | 36.50abc | 7.63ab | 6.54c |
| 9 | El-Minia | 36.19c | 41.93c | 33.20bc | 32.33ab | 37.87d | 32.72c | 36.50abc | 37.00abc | 5.47c | 5.90e |
| 10 | Aswan | 51.51abc | 46.69c | 15.87d | 15.20c | 48.00ab | 49.33ab | 40.83ab | 40.83a | 6.87abc | 6.53c |
| 11 | Assiut | 42.60abc | 42.85c | 36.33ab | 36.47a | 32.67d | 32.85c | 36.50abc | 36.17abc | 5.96bc | 5.99de |
| 12 | Elwady | 43.00abc | 43.16c | 30.27c | 28.80b | 33.67d | 34.32c | 36.50abc | 36.67abc | 6.10bc | 6.06de |
| 13 | El-faiyum | 54.09ab | 58.28ab | 17.93d | 17.33c | 46.00bc | 45.56abc | 38.00abc | 38.33abc | 6.69abc | 7.42b |

Means followed by the same letters are not significantly different from each other at 0.5% level.

increment in weight of cloves/bulb as previously discussed.

Garlic is an obligate apomictic plant (all forms are sterile) propagated vegetative by planting cloves, which are the small bulblets making up the whole garlic bulb (Novak *et al.* 1986). However, the large number of small-size cloves represents an undesirable character (Badria and Ali, 1999).

Conventional selection of occasional sports in vegetative propagated crops requires large-scale plantings, keen observations, and the chance occurrence of rare events (Reisch, 1983). A solution is sought in the use of domestic ecotypes, which are fully adapted to local conditions and are important genetic resources and initial breeding material (Gvozdanovic-Vagar *et al.*, 2002). The variability among these garlic ecotypes (originating from the main cultivation areas) showed similar and dissimilar properties. Also, the farmers depends own self's to produced their own seeds and the differences among these regions gave us possibility to find differences among these ecotypes. If we see to our results in this investigation we can noticed that there were significant differences among these ecotypes such as number of leaves/plant which effect in bulb weight. Also, the variations among these ecotypes clearly in plant fresh weight, number of cloves, weight of cloves/bulb, percentage of T.S.S in cloves and total yield characters. These differences could be attributed to genetic architecture of the ecotype. These results are in agreement with those reported by Kevresan *et al.*, 1997; Gvozdanovic-Varga *et al.*, 2002 ; Islam *et al.*, 2004 and Baghalian Kambiz *et al.*, 2005.

**Phenotypic correlation coefficients**

Data presented in Table 4 show that plant height was positively correlated with number of cloves but negatively correlated with both weight of cloves/bulb and total soluble solids (T.S.S.).While, number of leaves was positively correlated with total soluble solids. Bulb diameter was significantly correlated with plant fresh weight, weight of cloves and total yield. Also, bulb height was positively correlated with plant fresh weight, weight of cloves/bulb and total yield. Data also showed a positive correlation for plant fresh weight with both weight of cloves and total yield characters but negatively with number of cloves/blub. There was negative correlation between number of cloves, weight of cloves and total soluble solids. Finally, weight of cloves was positively correlated with total yield character. Many research workers found one or more from these correlations between garlic traits, El-Muraba *et al.* 1983; Metwally et al. 1990; El-Ghamriny 1991 ; El-Mansi *et al.* 1999 and El-Mahdy and Mohamed 2003.

**Table(4)**: Phenotypic correlation coefficients among 9 characters of garlic in 2007/2008 season.

| Characters | Plant height (cm) | Number of leaves/plant | Bulb diameter (cm) | Bulb height (cm) | Plant fresh weight (gm) | Number of cloves/bulb | Weight of cloves/bulb (gm) | Total soluble solids (T.S.S) | Total yield (ton/fed.) |
|---|---|---|---|---|---|---|---|---|---|
| Plant height (cm) | - | -0.062 | 0.056 | -0.197 | -0.005 | 0.702** | -0.408* | -0.314* | -0.085 |
| Number of leaves/plant | | - | -0.143 | -0.062 | -0.035 | -0.165 | 0.104 | 0.346 | -0.017 |
| Bulb diameter (cm) | | | - | 0.147 | 0.664** | -0.235 | 0.439** | 0.086 | 0.399* |
| Bulb height (cm) | | | | - | 0.329* | -0.228 | 0.364* | -0.158 | 0.372* |
| Plant fresh weight (gm) | | | | | - | -0.330* | 0.713** | 0.062 | 0.783** |
| Number of cloves/bulb | | | | | | - | -0.653* | -0.322* | -0.171 |
| Weight of cloves/bulb (gm) | | | | | | | - | 0.117 | 0.669** |
| Total soluble solids (T.S.S) | | | | | | | | - | 0.033 |
| Total yield (ton/fed.) | | | | | | | | | - |

**Table(5):** Plant samples used for OYDV indexing by visual symptoms and DAS-ELISA on garlic ecotypes

| Ecotypes code | Name/location | Number of Cultivated Plants | Number of infected plants detected by | | ELISA-values at 405 nm | Degree of symptoms |
|---|---|---|---|---|---|---|
| | | | Visual symptoms | DAS-ELISA | | |
| 1 | Sids 40 | 14 | 7 | 9 | 0.448 | Medium |
| 2 | Gehena | 14 | 5 | 5 | 0.425 | Medium |
| 3 | Tahrir | 10 | 7 | 9 | 0.751 | Heavy |
| 4 | Sohag | 15 | 11 | 12 | 0.476 | Medium |
| 5 | Qena | 12 | 3 | 6 | 0.482 | Medium |
| 6 | Elbehera | 12 | 8 | 8 | 0.215 | Light |
| 7 | Elgharbia | 11 | 4 | 6 | 0.738 | Heavy |
| 8 | Bani- Swief | 12 | 6 | 8 | 0.727 | Heavy |
| 9 | El-Minia | 12 | 7 | 10 | 0.783 | Heavy |
| 10 | Aswan | 14 | 5 | 7 | 0.463 | Medium |
| 11 | Assiut | 15 | 8 | 10 | 0.765 | Heavy |
| 12 | Elwady | 15 | 9 | 10 | 0.207 | Light |
| 13 | El-Faiyum | 14 | 8 | 12 | 0.231 | Light |

**Evaluation for OYDV resistance:**

Thirteen ecotypes of garlic plants were evaluated for OYDV resistance by visual symptoms and DAS-ELISA as show in Table (5). All the resistant ecotypes (6, 12 and 13) had lower ELISA values. These ecotypes were obtained from Elbeherea, El-Wady and El-Faiyum regions and gave light symptoms. The ELISA values were increased until reached to 0.448, 0.425, 0.476,0.482 and 0.463 nm for ecotypes 1, 2, 4, 5 and 10 provided from Sids 40, Gehena, Sohag, Qena and Aswan regions, respectively. On the other hand, the remaning ecotypes had heavy symptoms, and correlated with high ELISA values that reached 0.751, 0.738, 0.727, 0,783 and 0.765 nm for ecotypes 3, 7, 8, 9 and 11 provided from Tahrir, El-Gharbia, Beni-Swief, El-Minia and Assiut regions.

The results of our study indicated the difference among garlic ecotypes in infection of OYDV virus which causes reduction in yield. The variability in garlic ecotypes gave us an idea to tolerant and/or resistant to this virus. These results are in agreement with those reported by Takaichi *et al.* 1998, 2001, Dovas *et al.* 2001 and Jana Klukackova 2004.

In general conclusion, the study has shown that Egypt can produce a large number of ecotypes with high garlic quality. The variation among these ecotypes which due to ecological factors led us to possibility a best selection among these ecotypes. The selection in future gave us ability to improvement in garlic plants which a major crops in local and exporter production.

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# تقييم ثلاثه عشر من سلالات الثوم فى الاراضى المستصلحة تحت ظروف سوهاج

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أجرى هذا البحث بمزرعه الكوثر بكليه الزراعة جامعه سوهاج خلال الاعوام 2007/2006و 2008/2007 وذلك بجمع ثلاثه عشر سلاله خضريه من الثوم من مناطق مختلفه داخل جمهوريه مصر العربيه وذلك لدراسه بعض الصفات المحصوليه لهذه السلالات تحت ظروف الزراعه فى الاراضى الجديده المستصلحه بسوهاج. وقد اظهرت النتائج قيد الدراسة ان هناك اختلافات معنوية فى كل الصفات المدروسة. كما اظهرت النتائج ايضا ان السلاله من منطقه الغربيه كانت اطول السلالات و السلالة من منطقة اسوان كانت افضل السلالات فى قطر البصلة والسلالة بنى سويف اعطت اكبر قيمة بالنسبة الى معدل التبصيل دليلا على سرعة نضج هذه السلاله بعكس السلاله اسيوط فكانت اكثرهم تاخيرا فى النضج. أما السلالة سدس40 كانت افضل السلالات فى الوزن الطازج واقلهم بالنسبه لعدد الفصوص فى البصله. أما السلالة من منطقة الغربيه فاعطت اعطى قيمة بالنسبه الى نسبه المواد الصلبه الذائبة و السلالة سدس40 اعطت اعلى قيمة بالنسبة الى المحصول الكلى للفدان. كذلك تمت دراسة مدى اصابه هذه السلالات بفيروس التقزم الاصفر فى البصل والذى يصيب الثوم ويسبب قله للمحصول وكانت الاصابه قليلة فى السلالات من منطقه البحيرة و الوادى والفيوم وكانت الاصابة متوسطة بالنسبه للسلالات سدس40 وسوهاج وجهينه واسوان وقنا. أما الاصابة العالية فكانت متواجدة فى السلالات من منطقة التحرير و الغربية وبنى سويف واسيوط. ومن خلال هذه الدراسة يمكن انتخاب التركيب الوراثى ذو الجودة والمحصول المرتفع مع مقدرتة على مقاومة الاصابة بفيروس التقزم الاصفر فى البصل والذى يسبب خسائر عالية فى المحصول.