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Screening of Some Garlic Genotypes for Yield and Quality Traits under Middle Egypt Conditions.

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ABSTRACT

Eight genotypes of white skin garlic (Balady) in addition to compared variety (control) Sids 50, also seven genotypes from purple skin garlic, in addition, two varieties for compared with (control) Sids 40 and Eggaseed 1 collected from some governorate of Egypt to study their performance under middle Egypt Conditions. Field experiments was carried out in the two successive winter seasons 2021/2022 and 2022/2023 at the farm Sids Hort. Res. Station A. R. C. Beni- suef governorate, Egypt. Genotypes were arranged in (RCBD) with three replicates. Data were recorded on some vegetate growth characteristics, as well as yield components fresh and cured yield, and storage ability. The results for cured yield showed the following, concerning genotype white skin, (Balady) Sids 50 var., genotype GWS-1 (El-Minia source) and genotype GWS-7 (Suhag Source) gave the highest yield followed by genotype GWS-3 (EL-Behairah source) and genotype GWS-2 (Kafr El-Sheakh source). Regarding purple skin genotype GPS-7 (Assiut source), Eggaseed (ll) var. and Sids 40 var. gave the highest cured yield respectively followed by genotype GPS-6 (Qena source), and Eggaseed (l) variety (Sids source). This study recommends that the mentioned genotypes can be used in selecting programs for better genotype of garlic yield and quality.

KEYWORDS: Garlic. Genotypes. Yield. Storage ability. *Allium sativum*

1. INTRODUCTION

Garlic (*Allium sativum L.*) belongs to the family Alliaceae, Kilgori *et al.*(2007). Garlic is one of the oldest and most economical vegetable crops in Egypt. It is the second most widely used of the cultivated bulb crops after onion. Garlic can be used as an antioxidant, antimicrobial, reduction of cardiovascular diseases, anti-cancer and anti-hypersensitive agent Efiong *et al.* (2020),and Figliuolo *et al.* (2001) Garlic is a diploid species (2n = 2X = 16) whose cultivation history dates back 3000 years Etoh *et al.* (2001) It is generally

not fertile and is thus asexually propagated by cloves. The origin of garlic is considered to be Central Asia from where it has spread to the west, south, and east of Asia, García Lampasona *et al.* (2003). Garlic is classified into two types, one of them is softneck (*Allium sativum sub var. sativum*) and the other one is hardneck (*Allium sativum sub var.*). Egypt grows garlic in large areas for home consumption and export. Increasing quality and quantity are important aims in garlic improvement. The major garlic growing areas are EL-Minia, Beni-suef, and EL Fayoum governorates (middle Egypt) The activities of the selection process are continued and concentrated on purple skin and white skin. Under Sids conditions, Osman and Abdel-Hameid (1994) registered individual Sids 40 cultivar by using individual bulb selection. At the same local conditions Osman *et al* .(2018) registered Sids 50 cultivar as a new white skin garlic.

Table 1. Growing areas and Production of garlic in Egypt from 2019-2022.

Growing Areas	YEARS / Ch.	2019	2020	2021	2022
	Area (fed.)	4135	4896	7407	9291
EL.Minia	Production (ton)	37619	50507	85012	109606
	Average, (ton/fed)	9.098	10.316	11.477	11.797
	Area (fed.)	12873	14227	17055	20198
Beni Suef	Production (ton)	132823	152778	189629	216378
	Average, (ton/fed)	10.318	10.739	11.119	10.713
	Area (fed.)	1880	1607	2167	943
EL Fayoum	Production (ton)	12729	10654	13.002	5337
	Average, (ton/fed)	6.771	6.630	6.000	5.660
	Area (fed.)	921	904	601	870
Elsharkia	Production (ton)	6282	6663	4359	7698
	Average, (ton/fed)	6.821	7.371	7.253	8.848
	Area (fed.)	38483	38975	44591	50642
A.R.E	Production (ton)	360113	372250	445712	519562
	Average, (ton/fed)	9.358	9.551	9.996	10.260

From Arab Republic of Egypt Ministry of Agriculture and Land Reclamation Economic Affairs Sector from 2019 to 2022.

The great variation in the growth and production of different garlic cultivars according to the different locations in Egypt was recorded by many investigators , Ahmed *et al.* (2019), Bagchi *et al.* (2020), Anand *et al.*(2022), Abdou *et al.*(2022), Ragheb and Hemeid (2022) , and Selen *et al.* (2022). The present study was conducted to evaluate the performance of 8 selections from the white skin. As well as 7 selections from the purple skin under Sids growing conditions. Sids location is in middle Egypt. These selections were selected for their yield superiority compared with their three original cultivars Sids50 and Sids40 and Eggaseed 1 cultivars. This study aimed to select high productivity genotypes from white and purple skin of garlic under the Sids location which are preferred by both Egyptian and foreign consumers. Some vegetative, yield and storability characters were studied compared to control.

2. MATERIALS AND METHODS

The present study was carried out in the two successive winter seasons of 2021/2022 and 2022/2023 at Sids Horticulture Research Station, Agriculture Research Centre, Beni-Suef Governorate Egypt. The purpose of this study was to be screening of some garlic genotypes for yield and quality traits under middle Egypt conditions. As well as to evaluate the performance of these garlic genotypes derived from white skin and purple skin genotypes. These genotypes were obtained from different Governorates of Egypt Table (2). In this present study, eight selections from the white skin genotypes and one check cultivars (Sids 50) was used ,

Table 2. Names, landraces and source of garlic genotypes used in the present study.

Parental variety	Genotypes	Landraces Sources
white skin	GWS- 1	EL-Minia (EL-Edwa)
	GWS-2	Kafer El-sheakh
	GWS-3	El- Behairah
	GWS-4	Beni-suef
	GWS-5	Qena
	GWS-6	Assiut(Arab-EL-Awamer)
	GWS-7	Suhag(Akhmim)
	GWS-8	El-Minia (Talla)
Cheek, cultivar	Sids-50	Sids -50(sids)
purple skin	GPS-1	Eggaseed 2(sids)
	GPS-2	Sids -40(El-ayat)
	GPS-3	El- Behairah
	GPS-4	EL-Minia (EL- Edwa)
	GPS-5	Suhag(Akhmim)
	GPS-6	Qena
	GPS-7	Assiut(Arab-EL-Awamer)
Cheek, cultivars	Sids-40	Sids -40(sids)
	Eggaseed 1	Eggaseed 1(sids)

GWS= white skin genotype GPS= purple skin genotype

Also, seven selections from purple skin genotypes as well as the two cultivars (Sids 40 and Eggaseed 1) were used as controls.

The cloves of the tested materials were planted on the 22 of Sept. in both seasons, on clay loam soil at Sids Horticultural Research Station, Agriculture Research Centre, Beni-Suef Governorate Egypt. The field soil was ploughed and pulverized. Ten soil samples from each season of 2021 /2022 and 2022/ 2023 were randomly taken from the experimental field before planting at 0-30 cm depth. Soil physical and chemical characteristics were determined according to Chang and Jackson (1958) at the soil laboratories of Sids Agric. Res. Station and data are shown in Table (٣). The genotypes plus the three checks were planted in a Randomized Complete Block Design (RCBD) with three replications. Each experimental plot consisted of 5 rows 60 cm wide and 4 m long where the cloves were planted on two sides of each row at 10 cm apart. The total area of each plot was 12 m^2= 1/350 fed. The Fertilization program for garlic commercial production were done as recommended by Egyptian Ministry of Agriculture.

Table 3. Means of some physical and chemical soil properties of the experimental field plots before planting in the two winter seasons of 2021/22 and 2022/23.

	Mechanical analysis				Chemical analysis			Available nutrients		
seasons	Sand %	Silt %	Clay%	Texture	Organic matter %	PH	EC. mmbos/cm	N ppm	P PPM	K ppm
2021	2.5	15.0	82.5	Clay loam	2.2	7.8	2.26	83.0	9.75	500.0
2022	3.5	15.0	81.5	Clay loam	2.1	7.6	2.24	80.1	9.80	500.0

2.1.Vegetative growth characteristics

Data of these traits were measured two weeks before harvest on the 25 th of March in the first and second seasons, respectively. Ten plants were randomly taken from the middle ridge of each experimental plot to determine, plant height (cm), fresh weight of whole plant (g) and fresh yield at harvesting kg/plot .Garlic plants were harvested at the full maturity on April 14 and 16 in the first and second seasons, respectively .Fresh yield (kg/plot) of whole plants was determined. Data were estimated and represented as ton/fed. (fed =4200m^2).

2.2.Cured yield and bulb quality:

The harvested plants were left in the field for about one month for curing and the cured plants were weighed. The cured yield was estimated as ton/fed. Ten random cured bulbs from each experimental plot were randomly taken to determine the following bulb characteristics, cured bulb weight (g) and number of cloves.

2.3.Weight loss and storage ability:

After curing three samples (each five kgs of cured plants) were randomly taken from each treatment and stored in the plastic net under normal room conditions. These samples were weighed after, three, and six months from the starting date of storage and the percentages of weight loss were calculated, weight loss after three months % and weight loss after six months %

2.4.Statistical analysis:

The recorded data were subjected to statistical analysis according to the MSTAT-C, (1985) program to study the Means of estimated characters were calculated and subjected to analysis of variance using procedures outlined by Gomez and Gomez (1984). Multiple range tests were used for means comparison among the estimated means of each character (Duncan 1955).

3. RESULTS AND DISCUSSION

3.1. White skin garlic genotypes tested:

3.1.1. Vegetative growth

Data in Table (4) indicated that the differences in mean Plant height among the studied genotypes were significant, in both seasons. The highest mean values was obtained from genotype GWS-5 Which had the tallest plants of 109.40 and 107.90 cm in the first and second seasons, respectively. As compared with control plants mean plant height did not show any significant difference with those obtained from genotype GWS-5 In the second season. The lowest plant height was obtained from genotypes GWS-2 and GWS-7 in both seasons and genotype GWS- 4 in first season. These results indicated that some degree of adaptability in these genotypes in this trait occurred in their genetic materials. These results are quite similar to those obtained by Fanaei *et al.* (2014) ,and El Nagar and El-Zohiri (2015). Also, Data in Table (4) showed significant differences in the average fresh weight of whole plants (g) among the tested genotypes, Sids-50 variety, and genotypes GWS- 5 and GWS-7 did not show any significant differences in their Fresh weight of whole plant (g), in both seasons. The lowest values of this parameter was obtained from genotype GWS- 2 in both seasons. The obtained results are in agreement with those reported by Hegazy *et al.* (2018), and Ahmed *et al.* (2019). It is known that garlic genotypes are able to control their developmental processes in such a way to give high and consistent performance.

3.1.2. Yield component

Results in Table (5) indicate that the cured bulb weight (g) showed significant differences in this character , in both seasons. Among the studied genotypes the genotypes GWS- 1, and GWS-3 showed the highest values with insignificant differences as compared with genotypes GWS-5, GWS-6, GWS-7 and Sids-50 var.(control) plants, in both seasons. On the other hand, genotype GWS- 2 gave the lowest value (55.87 g). Good field curing has a great impact to maintain the quality of garlic fresh bulb. Similar results were reported by Hassan (2002) and Ali (2013). Demonstrated in Figure (1) show the differences among studied garlic landraces .Also The average cloves number were ranged from 26.03 to 42.80 per bulb as listed in table (5) which showing that the differences on the number of cloves per bulb of the genotype selections was significant.

Table 4. Means of plant height (cm), and Fresh weight of whole plant (g) of 8 genotypes , and control of white skin garlic evaluated at Sids experimental station during 2021/2022 and 2022/2023 growing seasons.

Genotypes	plant height (cm)			Fresh weight of whole plant (g)		
	2021/2022	2022/2023	Mean	2021/2022	2022/2023	Mean
GWS- 1	99.10 c	107.77 a	103.44	156.7 b	205.7ab	181.2
GWS-2	97.50 c	95.80 c	96.65	116.0 e	185.0 c	150.5
GWS-3	98.57 c	104.00 a	101.30	155.0 b	195.3 bc	175.2
GWS-4	91.50 e	106.90 a	99.22	139.3 c	199.3 abc	169.3
GWS-5	109.40 a	107.90 a	108.70	159.7 ab	195.7 bc	177.7
GWS-6	104.90 b	101.70 abc	103.30	157.7 b	211.7 a	184.7
GWS-7	97.77 c	96.53 bc	97.15	158.3ab	204.0 ab	181.2
GWS-8	95.40 d	101.70 abc	98.53	133.0 d	194.3 bc	163.7
Sids-50 var	103.20 b	103.50 ab	103.30	163.3 a	207.7 ab	185.5
Grand Mean	99.6	102.86		148.7	199.8	

Means followed by the same letter(s) in each column are not significantly different from each other at 0.05% probability level.

Table 5. Means of Cured bulb weight (g), and Number of cloves/bulb of 8 genotypes ,and control of white skin garlic evaluated at Sids experimental station during 2021/2022 and 2022/2023 growing seasons.

Genotypes	Cured bulb weight (g)			Number of cloves/bulb		
	2021/2022	2022/2023	Mean	2021/2022	2022/2023	Mean
GWS- 1	61.11 a	65.60 a	63.37 a	39.33 b	39.20 ab	39.27ab
GWS-2	54.90 d	56.83 c	55.87 b	42.80 a	40.57 a	41.68 a
GWS-3	61.67 a	64.93 ab	63.30 a	30.50 d	36.73 ab	33.62cd
GWS-4	57.27bcd	58.53 bc	57.90 b	38.37 b	38.47 ab	38.42ab
GWS-5	60.23 ab	60.17 abc	60.20ab	30.83 d	34.60 b	32.72 d
GWS-6	56.30 cd	62.40 abc	59.35ab	33.83 c	39.00 ab	36.42bcd
GWS-7	59.47abc	61.33 abc	60.40ab	32.03cd	35.23 ab	33.63 cd
GWS-8	57.07bcd	57.60 c	57.33 b	37.43 b	37.60 ab	37.52abc
Sids-50 var.	60.33 ab	61.00 abc	60.67ab	26.30 e	26.03 c	26.17 e
Grand Mean	58.70 b	60.93 a		34.60 b	36.3 a	

Means followed by the same letter(s) in each column are not significantly different from each other at 0.05% probability level.

The genotype GWS- 2 had significantly more cloves per bulb than the genotype Sids-50 var. (control). The data of the tested white genotypes indicated that three genotypes GWS- 2, GWS- 1, GWS- 4 and GWS- 8 genotypes had more cloves per bulb. Their averages were (41.68, 39.27, 38.42 and 37.52) cloves per bulb, respectively). On the other hand, sids-50 var, genotype GWS- 5 and GWS- 3 gave the lowest values (26.17, 32.72, and 33.62 cloves per bulb, respectively). Our goal in this study is to select genotypes that produce fewer cloves .These results are in harmony with those obtained with Abdou *et al.* (2022). The lowest number of cloves per bulb was obtained from the control plants, with significant differences as compared with all the tested genotypes , In both seasons.

Figure 1. Cross section, and cloves shape of the 8 genotypes, and control of white skin garlic evaluated at Sids experimental station during 2021/2022 and 2022/2023 growing seasons.

3.1.3. Yield

Data presented in Table (6). Showing significant differences between genotypes under study. The highest significant value for Fresh yield (ton/fed) was obtained from genotypes GWS-5 and Sids-50 var (control) in both seasons. However, insignificant differences was obtained between the mean values of fresh yield of genotypes GWS-1 and GWS-3 that obtained from respectively followed by genotype GWS-7. Quite similar results were by Ahmed *et al.* (2019). Concerning data in Table (6) for Cured yield (ton/fed) show that Sides 50 var (Control) significantly produced higher yield (7.58 ton/fed) than other genotypes. The performance of genotype showed that three genotypes GWS-1, GWS- 5, and GWS- 7 had the higher yield (7.33, 7.21 and 7.21 ton / fed) without significant differences between them, while genotypes GWS-8 gave the lowest value (4.67 ton/fed). High yield and good quality are the targets of plant breeding programs. These results are in agreement with those obtained by Ibrahim *et al.* (2020).

Table 6. Means of Fresh yield (ton/fed), and Cured yield (ton/fed) of 8 genotypes ,and control of white skin garlic evaluated at Sids experimental station during 2021/2022 and 2022/2023 growing seasons.

Genotypes	Fresh yield (ton/fed)			Cured yield (ton/fed)		
	2021/2022	2022/2023	Mean	2021/2022	2022/2023	Mean
GWS- 1	15.17 ab	15.90 bc	15.54	6.88 a	7.77 a	7.33
GWS-2	12.60 c	14.00 d	13.30	5.91 b	6.30 b	6.10
GWS-3	12.82 c	13.80 d	13.31	6.06 b	6.47 b	6.27
GWS-4	11.02 d	12.31 e	11.67	5.05 c	5.46 c	5.26
GWS-5	15.46 a	16.57 ab	16.02	6.78 a	7.64 a	7.21
GWS-6	11.96 c	13.18 de	12.57	5.31 c	6.16 b	5.73
GWS-7	14.35 b	15.48 c	14.91	6.73 a	7.70 a	7.21
GWS-8	10.29 d	10.29 f	10.29	4.51 d	4.84 d	4.67
Sids-50 var	15.50 a	17.23 a	16.36	7.00 a	8.17 a	7.58
Grand Mean	13.24	14.30		6.02	6.72	

Means followed by the same letter(s) in each column are not significantly different from each other at 0.05% probability level.

3.1.4. Weight loss and storage ability

Data presented in Table (7) show significant differences among the eight genotypes and control in weight loss percentage after three months of storage, in the first season. The mean weight loss after three months was ranged from 4.0 to 7.5 %., in both seasons. The highest significant loss after three months storage was obtained from genotype GWS- 6 in both seasons. These results are in harmony with those obtained by Ibrahim *et al.*(2018). Regarding data present in Table (7) indicated insignificant differences among the tested genotypes in weight loss percentage after six months of storage. In the second season. The weight loss due to evaporation of moisture can be controlled by genotypes of growing varieties. These results are in line with those obtained by El-Sanousy *et al.* (2017).

3.2.purple skin garlic genotype tested:

3.2.1. Vegetative growth

Data in Table (8) indicated that the differences in mean Plant height (cm) were significantly affected by the genotypes, in both seasons. The highest mean values was obtained from genotype GPS-1 which had the tallest plants of (88.07 and 78.03 cm) in the first and second seasons, respectively. while genotype GPS-2 and GPS-4 gave the lowest character with mean values of 66.03 and 65.85cm in the first and second seasons respectively. These results are in agreement with those obtained by Ibrahim *et al*. (2020). Also, data in Table (8) indicated that the Fresh weight of the whole plant was significantly affected by the genotypes, in the first season. The highest values of this parameter was obtained from genotype Eggaseed- 1 var (control) and Sids 40

Table 7. Means Weight loss % after three, and six months of storage on 8 genotypes ,and control of white skin garlic genotypes evaluated at Sids experimental station during 2021/2022 and 2022/2023 growing seasons.

Genotypes	Three months			Six months		
	2021/2022	2022/2023	Mean	2021/2022	2022/2023	Mean
GWS- 1	6.0 ab	6.0 a	6.0	13.0 abc	8.0 a	10.5
GWS-2	6.0 ab	7.0 a	6.5	15.0 a	10.0 a	12.5
GWS-3	6.0 ab	7.0 a	6.5	14.0 ab	11.0 a	12.5
GWS-4	5.0 b	5.0 a	5.0	11.0 bc	9.0 a	10.0
GWS-5	5.0 b	4.0 a	4.5	13.0 abc	10.0 a	11.5
GWS-6	8.0 a	7.0 a	7.5	15.0 a	9.0 a	12.0
GWS-7	4.0 b	4.0 a	4.0	11.0 bc	10.0 a	10.5
GWS-8	4.0 b	5.0 a	4.5	10.0 c	8.0 a	9.0
Sids-50 var	4.0 b	6.0 a	5.0	11.0 bc	9.0 a	10.0
Grand Mean	5.77	5.66		12.55	10.33	

Means followed by the same letter(s) in each column are not significantly different from each other at 0.05% probability level.

Table 8. Means of plant height (cm), and Fresh weight of whole plant (g) of 7 genotypes and control of purple skin garlic genotypes evaluated at Sids experimental station during 2021/2022 and 2022/2023 growing seasons.

Genotypes	plant height (cm)			Fresh weight of whole plant (g)		
	2021/2022	2022/2023	Mean	2021/2022	2022/2023	Mean
GPS-1	78.03 a	88.07 a	83.05	113.30 b	168.30 a	140.80
GPS-2	54.13 g	77.93 bcd	66.03	90.33 e	151.00 a	120.70
GPS-3	62.87 de	77.93 bcd	70.40	101.00 cd	148.00 a	124.50
GPS-4	61.43 e	70.27 d	65.85	105.00 c	143.00 a	124.00
GPS-5	58.97 f	85.53 ab	72.25	98.33 d	178.70 a	138.50
GPS-6	68.43 b	80.60 abc	74.52	115.00 b	184.70 a	149.80
GPS-7	64.40 cd	73.13 cd	68.77	115.00 b	161.00 a	138.00
Sids-40 var	62.50 e	79.47 bc	70.98	122.30 a	172.70 a	147.50
Eggaseed 1 var	64.70 c	74.47 cd	69.58	123.70 a	173.70 a	148.70
Grand Mean	63.94	78.60		109.33	164.55	

Means followed by the same letter(s) in each column are not significantly different from each other at 0.05% probability level.

var. (control) with insignificant differences between their mean values. On the other hand , the lowest values were obtained for the genotype GPS-2 in the first season .The results obtained are in harmony with those reported by Anwar and Gouda (2012).

3.2.2. yield component

Data on cured bulb weight are presented in Table (9). Significant differences between the genotypes on the cured yield was obtained , in both seasons. The Highest values was obtained from sids-40 var (control), and genotype GPS-1, GPS-6 and genotype GPS-7 with insignificant differences between their mean values in both seasons. Also, the lowest value was obtained from genotype GPS-4 in the second seasons. Their results are in line with those reported by Ammar *et al*. (2007).

Figure (2) shows the differences among studied garlic landraces. Data on the No. of cloves/ bulb are presented in Table (9) The results showed significant differences in the mean number of cloves /bulb among the studied genotypes, in both seasons. The highest values of a number of cloves per bulb were obtained from Eggaseed 1 var (control) followed by genotypes GPS-7 and sids-40 var. (control) with insignificant differences among their mean values

Table 9. Means of Cured bulb weight (g), and Number of cloves/bulb of 7 genotypes and control of purple skin garlic genotypes evaluated at Sids experimental station during 2021/2022 and 2022/2023 growing. Seasons.

Genotypes	Cured bulb weight (g)			Number of cloves/bulb		
	2021/2022	2022/2023	Mean	2021/2022	2022/2023	Mean
GPS-1	60.77 a	60.67 abc	60.72	11.77 d	12.73 bc	12.25
GPS-2	53.00 c	59.73 abcd	56.37	13.93 ab	12.47 c	13.20
GPS-3	53.17 c	54.30 de	53.73	13.03 c	13.27 bc	13.15
GPS-4	54.30 bc	49.13 e	51.72	13.07 c	14.03 ab	13.55
GPS-5	56.33 b	57.17 bcd	56.75	12.93 c	13.43 bc	13.18
GPS-6	63.90 a	62.20 ab	63.05	12.63 c	13.37 bc	13.00
GPS-7	61.07 a	59.27 abcd	60.17	13.27 bc	15.10 a	14.18
Sids-40 var	61.20 a	65.17 a	63.18	14.00 ab	13.90 ab	13.95
Eggaseed 1 var	61.40 a	55.27 cd	58.33	14.50 a	13.97 ab	14.23
Grand Mean	58.34	58.10		13.23	13.58	

Means followed by the same letter(s) in each column are not significantly different from each other at 0.05% probability level.

in both seasons. These results are similar to those obtained by Kıraç *et al.* (2022).

3.2.3. Yield

Data presented in Table (10) show significant differences between the various genotypes in mean fresh yield ,in both seasons. The highest values were obtained from genotype GPS-1 and GPS-6 in both seasons. Where as the lowest values were obtained from GPS-2 in both seasons. These results are similar to those obtained by Nandini *et al.* (2018) and Khan *et al.* (2018). Concerning cured yield , data in Table (10) showed that purple skin genotypes indicate significant differences between their mean values of cured yield in both seasons. The highest mean value was obtained from genotype GPS-7 which gave the highest Cured yield value of (5.76 ton/fed), followed by genotypes GPS-1, Sids 40 var GPS-6 and Eggaseed- 1 var with insignificant differences between their mean values. Quite similar results were obtained by Hassan (2002).

Table 10. Means of Fresh yield (ton/fed), and Cured yield (ton/fed) of 7 genotypes and control of purple skin garlic evaluated at Sids experimental station during 2021/2022 and 2022/2023 growing seasons.

Genotypes	Fresh yield (ton/fed)			Cured yield (ton/fed)		
	2021/2022	2022/2023	Mean	2021/2022	2022/2023	Mean
GPS-1	9.74 ab	9.86 ab	9.80	5.38 bc	5.44 a	5.41
GPS-2	6.98 e	6.90 d	6.94	3.81 e	4.08 d	3.94
GPS-3	8.01 d	8.65 bc	8.33	4.45 d	4.99 bc	4.72
GPS-4	7.79 d	8.13 cd	7.96	4.31 d	4.41 d	4.36
GPS-5	9.17 c	7.99 cd	8.58	5.03 c	4.78 c	4.91
GPS-6	9.84 ab	9.33 abc	9.58	5.56 b	5.03 bc	5.29
GPS-7	10.19 a	8.84 bc	9.51	5.95 a	5.58 a	5.76
Sids-40 var	9.47 bc	9.51 ab	9.49	5.34 bc	5.42 a	5.38
Eggaseed 1 var	9.47 bc	10.34 a	9.90	5.17 c	5.35 ab	5.26
Grand Mean	8.96	8.84		5.00	5.01	

Means followed by the same letter(s) in each column are not significantly different from each other at 0.05% probability level.

Figure 2. Cross section ,and cloves shape of the 7 genotypes ,and control of purple skin garlic evaluated at Sids experimental station during 2021/2022 and 2022/2023 growing seasons.

3.2.4. Weight loss and storage ability

Data presented in Table (11) show significant differences among the seven genotype and control in Weight loss % after three months of storage, in both seasons. Weight loss after three months showed mean loss ranged from 4.0 to 7.5 %. The performances of the tested genotype showed that the genotype GPS-1 Followed by GPS-4 Had the highest weight loss % after three months (7.5, and 5.5 % respectively) in both seasons, without significant different between their mean values. On the other hand, genotypes GPS-3 and Eggaseed-1 var. gave the lowest values (4.0%), in both seasons. These results are in harmony with those obtained by Ahmed *et al.* (2018) . Data present in Table (11) for six months weight loss % demonstrated insignificant differences among the tested genotypes in weight loss percentage after six months of storage purple skin garlic genotypes , in the second season. Weight loss % after six month showed the lowest value was obtained from genotype GPS-2 in the first season. Insignificant different were obtained as compared with all the other genotypes except genotype GPS-1 which showed the highest value These results are quite similar to those obtained by Ibrahim *et al.* (2020) and Selen *et al.* (2022).

Table 11. Means Weight loss percentage after three months ,and six months of 7 genotypes and control of purple skin garlic genotypes evaluated at Sids experimental station during 2021/2022 and 2022/2023 growing seasons.

Genotypes	Three months					Six months				
	2021/2022		2022/2023		Mean	2021/2022		2022/2023		Mean
GPS-1	7.0	a	8.0	a	7.5	15.0	a	11.0	a	13.0
GPS-2	4.0	ab	5.0	ab	4.5	10.0	b	7.0	a	8.5
GPS-3	3.0	b	5.0	ab	4.0	12.0	ab	8.0	a	10.0
GPS-4	5.0	ab	6.0	ab	5.5	13.0	ab	9.0	a	11.0
GPS-5	4.0	ab	5.0	ab	4.5	12.0	ab	7.0	a	9.5
GPS-6	3.0	b	6.0	ab	4.5	13.0	ab	9.0	a	11.0
GPS-7	4.0	ab	5.0	ab	4.5	11.0	ab	8.0	a	9.5
Sids-40 var	5.0	ab	4.0	b	4.5	14.0	ab	7.0	a	10.5
Eggaseed-1 var	3.0	b	5.0	ab	4.0	11.0	ab	8.0	a	9.5
Grand Mean	4.22		5.44			12.33		8.22		

Means followed by the same letter(s) in each column are not significantly different from each other at 0.05% probability level.

4. CONCLUSIONS

Referring to the obtained results, it can be concluded that the highest genotype garlic yield, and its component can be achieved from Concerning genotype white skin (Balady) Sids 50 var. , genotypes GWS-1 (El-Minia source) and GWS-7 (Suhag Source) gave the highest yield followed by genotype GWS-3 (EL-Behairah source) and GWS-2 (Kafr El-Sheakh source). Regarding purple skin genotype GPS-7 (Assiut source), Eggaseed (ll) var. and Sids 40 var. gave the highest cured yield respectively followed by genotype GPS-6 (Qena source), and Eggaseed (l) variety .

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الملخص العربي

انتقاء بعض التراكيب الوراثية من الثوم لصفات المحصول والجودة تحت ظروف مصر الوسطى.

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تم تجميع ثمانية تراكيب وراثيه من الثوم البلدي ذو القشرة البيضاء بالإضافة الى صنف المقارنة (الكنترول) سدس ٥٠ وأيضا سبعة تراكيب من الثوم الملون ذو القشرة الارجواني بالإضافة الى صنفين من أصناف المقارنة (الكنترول) وهما سدس ٤٠ وأجاسيد ١ وذلك من بعض محافظات الجمهورية بهدف دراسة سلوكها تحت ظروف مصر الوسطى. أجريت تجربتان حقليتان خلال عامين متتاليان في الموسم الشتوي ٢٠٢١\٢٠٢٢ و٢٠٢٢\ ٢٠٢٣ بمحطه بحوث البساتين بسدس – مركز البحوث الزراعية– الجيزة – مصر. في قطاعات كامله العشوائية في ثلاث مكررات وتم تسجيل البيانات على بعض صفات النمو الخضري ومكونات المحصول والمحصول الطازج والجاف والقدرة التخزينيه. وقد أظهرت النتائج انه بالنسبة للتراكيب الوراثية ذات القشرة البيضاء ان الصنف سدس ٥٠ والتركيب الوراثي GWS–1الذي مصدره (المنيا) و التركيب الوراثي GWS–7 الذي مصدره (سوهاج) اعطت افضل النتائج من حيث المحصول الجاف يليهم التركيب الوراثي GWS–3والذي مصدره (البحيرة) ثم التركيب الوراثي GWS–2والذي مصدره (كفر الشيخ). بالنسبة للثوم ذو القشرة الأرجوانية فكان التركيب الوراثي GPS–7الذي مصدره(محافظة أسيوط)، والصنف إجاسيد (II)،والصنف سدس ٤٠ ومصدرهما محطة بحوث البساتين بسدس أعطت افضل النتائج من حيث المحصول الجاف يليهم التركيب الوراثي GPS–6الذي مصدره (قنا) والصنف إجاسيد(I)الذي مصدره محطة بحوث البساتين بسدس وتوصى الدراسة بضرورة المحافظة على التراكيب الوراثية المذكورة والتي تعتبر مبشرة لكل من الثوم البلدي الابيض والثوم الملون وادخالها ضمن البرامج البحثية لمحصول الثوم لإنتاج أصناف جديدة ذو محصول وجودة عالية .