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## Impact of New Agricultural Systems on Some Garlic Cultivars

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### ABSTRACT

Garlic (*Allium sativum*) is one of the nature's versatile medicine plants, it is an important vegetable in Egypt. Mixture agriculture system was used to increase yield in various crops. Three garlic cultivars were used; Balady, Sids40 and Eggaseed1. The garlic cultivars and their mixtures were grown for two seasons, the fresh and cured yield were recorded and relative yield total (RYT) and mixture effect were calculated. Significant differences were found between monoculture and mixture system. Mixtures had a positive effect on yield. RYT higher value was found with the "Mixture 80% Balady+20%" of either colored (Sids 40 or Eggaseed1) recording 0.896 and 0.929 respectively; and the same mixture gave a higher value of fresh yield. For the mixture effect% the higher value was found with the mixture 80% Balady+20% Eggaseed1 or Sids 40. Mixture cultivar system reduces disease severity of garlic purple blotch disease, and the data showed there was a significant difference between mixtures and monoculture for the sensitivity of garlic cultivars to this disease.

**Keywords:** Garlic; agriculture system; mixture effect%; RYT; disease severity



### INTRODUCTION

Garlic (*Allium sativum* L.) is a species in the onion genus. It is native to central Asia and Northeastern Iran (Block, 2010). It has long been a common seasoning worldwide with a history of several thousand years of human consumption (Kik and Gebhardt, 2001).

During the agriculture revolution of the 17<sup>th</sup> and 18<sup>th</sup> centuries there were a major development included an increase in the diversity of plant species (Okonya and mass, 2014). Some plant breeders maintained and developed the concept that the yield may be decreased by using mono or single culture because of disease problems (Finckh *et al.*, 2000). In cowpea using variety mixtures show certain yield advantage (Lenne and Smithson, 1994). The use of soft red wheat mixtures gave a significantly effect on yield and its component (Cowger and Weisz, 2008). Different regions are grown common bean in a mixture system that produce a significant differences compared with monoculture (Lenne and Smithson 1994) and (Wortmann *et al.*, 1992).

Finckh *et al.*, 1992 reported that variety mixtures shown higher and stable yield in a commercial field. Subsistence farmers cultivated mixtures of potato varieties (up to 30 varieties) that gave a high yield (Bruch *et al.*, 1981). In Rwanda, Tanzania and Uganda Sweet potato cultivated with a mixture system to control disease (Lenne, 1991). Wolf 1985 reported that mixture cultivars and variety is considered a good way to reduce disease injuries that leads to increased yield.

In Washington state, in USA, the wheat varieties when grown with a mixture system proved its efficiency in increasing the yield (USDA, 2007).

Among the diseases, *Alternaria* leaf blight is one of the most destructive foliar disease which causes great loss in *Alliums*. The causal organism of the disease is *Alternaria porri* (Ellis) Ciff. Studies on *Alternaria* leaf blight of onion includes, survey for incidence of disease in parts of Northern Kamataka, effect of date of sowing on the incidence of the

disease, evaluation of varieties for disease resistance, cultural and nutritional studies, in vitro and in vivo evaluation of fungicides were done by Narla *et al.*, (2011). Using the mixture cultivars system for controlling this disease should be tested. However, some results confirmed that the use of this type of cultivation helps reduce the severity of disease (Lenne 1991).

In this study, using mixture of three garlic cultivars (Balady, Sids40 and Eggaseed-1), the research activities were undertaken with the following objectives:

- 1- Evaluating different mixture treatments among two colored and one white garlic cultivars for bulb and growth characteristics.
- 2- Evaluate the reaction of various mixture ratios to the natural infection of purple blotch

### MATERIALS AND METHODS

Two field experiments were carried out in two successive winter seasons of 2017/2018 and 2018/2019. The experimental site lies between 29.066 latitude and 31.099 longitude and 32.23 meters above sea level, at the Horticultural Research Station Farm, of Sids, Beni-Suef Governorate. Cloves of three cultivars i.e. Balady, Sids 40 and Eggaseed 1 as well as the mixture treatments as shown in Table(2) were planted in hill at 10 cm apart within each row on October 4<sup>th</sup> and 14<sup>th</sup> in the first and second seasons, respectively. Each plot consisted of five ridges 4 m long and 60 cm width, (12m<sup>2</sup>) the total numbers of hills per plot were 400. Garlic cloves were planted on both sides of each row. The treatments were arranged in randomized complete block design with three replicates. In the second season, more treatments were tested according to the results of the first season as shown in Table (2). All agriculture practices i.e., fertilization; irrigations; pest and control were managed in accordance with local recommendations for garlic production. Soil texture of the experimental plots was clay loam, in both seasons. The physical and chemical properties of at the experimental soil are presented in Table(1).

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**Table 1. Physical and chemical properties of the experimental soil.**

Item	2017/2018	2018/2019
Coarse sand	0.63	0.77
Fine sand	8.50	10.19
Silt %	24.38	19.21
Clay %	66.49	69.83
Texture	Clay	Clay
pH (1:2.5 soil water ratio)	7.7	7.8
E.C.(1:2.5 extract) m mohos /cm	0.9	0.8
CaCo <sub>3</sub>	2.6	2.9
Organic matter%	1.90	2.02
Total N ppm	15.0	23.8
Available P ppm	7.7	5.8
Available K ppm	351.3	345.8

**Table 2. Various cultivars mixtures percentage in both seasons for the three garlic cultivars which differed in their skin in color as follows**

Code	No. of cloves / plot mixed percentage	
	First season	Second season
1	100% Balady(white)	100% Balady(white)
2	80% Balady+ 20% Sids 40	75% Balady+ 25% Sids 40
3	60% Balady+ 40% Sids 40	80% Balady+20% Sids 40
4	40 % Balady+ 60 % Sids 40	85 % Balady+15 % Sids 40
5	20% Baladyand+80% Sids 40	90% Balady+10% Sids 40
6	100% Sids 40 (purple)	95% Balady+ 5% Sids 40
7	80% Balady+ 20% Egagseed-1	100% Sids 40(purple)
8	60% Balady+ 40% Egagseed-1	75% Balady+ 25% Egagseed-1
9	40 % Balady+60 % Egagseed-1	80% Balady+20% Egagseed-1
10	20% Balady+ 80% Egagseed-1	85 % Balady+15 % Egagseed-1
11	100% Egagseed-1(purple)	90% Balady+10% Egagseed-1
12		95% Balady+ 5% Egagseed-1
13		100% Egagseed-1(purple)

**Data were recorded as follows:**

At harvest, ten plants were taken randomly from each experimental plot to determine the following characters:

- 1- Plant height (cm.).
- 2- Number of leaves/plant.
- 4- Neck diameter (cm)
- 5- Bulb diameter (cm)
- 6- Plant fresh weight (g/plant)
- 7- Fresh bulb yield (kg/plot) was recorded and presented as ( ton/fed.).

**Table 3. Effect of garlic mixtures on plant height, No.of leaves, bulb diameter, neck diameter and whole plant fresh weight in the first season (2017/2018)**

Code	Treatments	Plant height			No. of leaves			Bulb diameter			Nick diameter			Plant fresh weight		
		Balady	Sids40	Egga.1	Balady	Sids40	Egga.1	Balady	Sids40	Egga.1	Balady	Sids40	Egga.1	Balady	Sids40	Egga.1
1	Balady (B)	82.00	-	-	11.00	-	-	5.83	-	-	1.30	-	-	125.0	-	-
2	80%B+20%S(Sid40)	98.00	71.00	-	12.00	12.20	-	7.20	7.70	-	1.86	2.23	-	155.0	125.66	-
3	60%B+40%S	93.00	64.60	-	11.40	11.60	-	6.20	7.10	-	1.46	1.71	-	140.3	120.67	-
4	40%B+60%S	92.00	62.90	-	11.30	11.40	-	5.70	6.50	-	1.30	1.56	-	138.7	117.67	-
5	20%B+80%S	95.00	66.00	-	11.30	11.90	-	6.87	7.33	-	1.46	1.83	-	140.7	121.67	-
6	Sids40 S	-	60.70	-	-	11.20	-	-	5.20	-	-	1.33	-	-	114.00	-
7	80%B+20%E(Egagseed1)	96.06	-	66.06	11.80	-	12.20	7.37	-	8.13	1.73	-	2.30	151.0	-	127.67
8	60%B+40%E	.91.0	-	59.40	11.50	-	11.90	6.43	-	7.07	1.50	-	1.60	142.7	-	122.33
9	40%B+60%E	89.30	-	57.63	11.80	-	11.70	5.50	-	6.56	1.30	-	1.50	140.6	-	121.33
10	20%B+80%E	95.00	-	61.13	11.90	-	12.00	5.97	-	6.93	1.50	-	1.70	149.3	-	125.67
11	Egagseed1 (E)	-	-	55.40	-	-	11.40	-	-	5.46	-	-	1.23	-	-	118.33
	LSD	1.673	1.780	2.164	0.2160	0.2441	0.2526	0.2500	0.359	0.3775	0.1089	0.1773	0.394	3.842	3.544	5.996

The results of number of leaves/plant at harvest time are shown in Table (3) for season one and in Table (4) for season two the highest number of leaves were obtained with

Plants were diged up and were lefted three weeks in the field for curing purpose and then the following characters were recorded:

8- Cured yield (kg/plot) and presented yield/fed.

Also, the Relative Yield Total (RYT) was calculated according to the following formula:

$$RYT = \frac{\text{yield of mixture Balady(Ton/fed.)} + \text{yield of pure Egyptian} + \text{Yield of Eggaseed 1 cultivar}}{\text{yield in sole stand system}}$$

Mixture effect % value more than one indicates yield superiority of mixed planting, the mixture effect was determined following the equation stated by Okonyaand and Mass (2014) Whereas,

$$\text{Mixture effect} = \frac{\text{Yield of mixture} - \text{Mono cultivar average}}{\text{Mono cultivar average}} \times 100$$

**Disease severity (DS%)**

Numbers of leaf purple blotch spots per leaf were counted for each individual garlic plants to calculate disease severity after 130 day from planting

Disease severity index formula developed by Townsend and Heurberger 1943 was used as a follow

$$\text{Disease severity (DS\%)} = \frac{\text{Sum (n+r)}}{4N} \times 100.$$

**Where:**

n= frequency number/category

r= 0-4 categories

N = the total number of examined leaves.

Data of each trait were statistically analyzed according to the procedures outlined by Gomez and Gomez, (1984); and the treatments mean were compared by LSD and Duncan, (1955).

**RESULTS AND DISCUSSION**

Data in Table (3) showed that there are a significant differences between all mixtures and controls from the three tested cultivars, the highest values for plant height character were obtained with mixture 80% Balady + 20% colored garlic cultivars (Sids 40 or Egagseed1), the obtained values were 98.0 cm for Balady cultivar, 71.0 cm for Sids 40 cultivar and 62.06 cm for Egagseed1, the lowest were values observed with cultivars in the control (82.0 cm , 60.67 and 55.40 cm for Balady, Sids 40 and Egagseed1 cultivars. Respectively, in the first season, In the second season, the same results were achieved for the plant height character (Table 4 ) and mixture 80%Balady +20% colored cultivars followed by 75% Balady+25 % Sids 40 and 85%Balady+15%Sids40 in descending order.

mixture 80% Balady + 20% colored garlic cultivars (Sids 40 or Egagseed1) for the two season, Balady cultivar gave 12.0, Sids40 12.2 and 12.2 for Egagseed1 cultivar in the first

season, and the gave 11.1, 10.9 and 11.1 in the second season, respectively.

The highest values for bulb diameter were (7.20, 7.70 and 7.07 for three cultivars Balady, Sids40 and Eggaseed1 respectively, this data recorded with 80% Balady + 20% colored garlic cultivars (Sids 40 or Eggaseed1), the same mixture gave the highest values for the second season compared with another mixture treatments. The highest value for whole plant fresh weight was observed with the mixture 80% Balady + 20% Sids40 and Eggaseed1 cultivars. Data in table (3) showed high significant differences for

plant fresh weight (g/plant). This data showed the highest value with 80% Balady+20% Sids40 or Eggaseed1 cultivars their plant fresh weight were 280 and 278 g/plant for Sids 40 and Eggaseed1, respectively in the first season and 257 and 270 for Sids 40 and Eggaseed1, respectively, in the second (Table 4). Increasing genetic diversity by growing cultivar mixtures instead of monoculture have been suggested by Okonya and Mass, (2014). However, trait values could be different in mixture and mono culture due to their adaptability (Wortmann *et al.*, 1992 and Lenne and Smithson, 1994).

**Table 4. Effect of garlic mixtures on plant height, No. of leaves, bulb diameter, neck diameter and whole plant fresh weight in the second season (2018/2019)**

Code	Treatments	Plant height(cm)			No. of leaves/plant			Bulb diameter(cm)			Nick diameter(cm)			Plant fresh weight(g)		
		Balady	Sids40	Egga.1	Balady	Sids40	Egga.1	Balady	Sids40	Egga.1	Balady	Sids40	Egga.1	Balady	Sids40	Egga.1
1	Balady (B)	86.67	-	-	11.00	-	-	5.33	-	-	1.23	-	-	110.00	-	-
2	95%B+5%S(Sid40)	92.83	63.33	-	11.10	10.90	-	5.30	5.60	-	1.33	1.40	-	114.00	104.70	-
3	90%B+10%S	95.00	65.16	-	11.20	11.00	-	5.40	5.80	-	1.40	1.47	-	123.00	108.30	-
4	85%B+15%S	96.50	66.50	-	11.40	11.30	-	5.50	6.00	-	1.46	1.83	-	130.00	112.30	-
5	80%B+20%S	98.00	71.00	-	12.00	11.70	-	6.20	6.80	-	1.80	2.06	-	140.00	117.33	-
6	75%B+25%S	97.80	70.00	-	11.80	11.60	-	6.00	6.40	-	1.57	2.00	-	134.57	116.20	-
7	S(Sid40)	-	60.80	-	-	11.00	-	-	5.30	-	-	1.30	-	-	100.00	-
8	95%B+5%E(Eggaseed1)	86.33	-	63.00	11.20	-	11.10	5.20	-	5.80	1.36	-	1.20	120.00	-	110.20
9	90%B+10%E	87.67	-	64.06	11.40	-	11.23	5.30	-	6.00	1.47	-	1.40	125.00	-	115.10
10	85%B+15%E	90.33	-	65.40	11.50	-	11.30	5.60	-	6.40	1.60	-	1.60	131.00	-	125.30
11	80%B+20%E	92.33	-	68.00	11.80	-	11.56	6.00	-	7.00	1.90	-	1.90	142.00	-	128.60
12	75%B+25%E	91.00	-	64.00	11.60	-	11.70	5.90	-	6.80	1.70	-	1.60	137.00	-	123.00
13	Eggaseed1	-	-	58.33	-	-	11.00	-	-	5.70	-	-	1.20	-	-	103.00
	LSD	2.652	1.335	2.520	0.1881	0.2681	0.333	0.2064	0.026	0.4247	0.1578	0.2706	0.036	2.801	2.012	5.318

Tables (5) and (6) showed that there are significant differences between mixtures and mono culture for garlic cultivars, the highest value of disease severity was founded with a monoculture of Balady cultivar (4.8), Sids 40 (6.80) and Eggaseed1 cultivar (8.4) compared with mixture in the first season, and ( 5.6, 7.20 and 8.93 for Balady, Sids 40 and Eggaseed1 cultivars respectively. In this regard, similar trend was found with mixture of Barley cultivars, in barley that yield losses due to powdery mildew were less in mixture than in pure stand with a positive correlation between the yield advantage in mixtures and the yield loss due to powdery mildew in monoculture as reported by Newton and Thomas 1992.

**Table 5. Effect of garlic mixture cultivars on purple blotch disease severity after 130 day from planting(2017/2018)**

Code	Treatments	Disease Severity %		
		Balady	Sids40	Eggaseed1
1	Balady (B)	4.8 A	-	-
2	80%B+20%S(Sid40)	2.3 D	3.4 BC	-
3	60%B+40%S	2.3 D	3.0 C	-
4	40%B+60%S	3.1 B	3.5 BC	-
5	20%B+80%S	2.6 CD	3.6 B	-
6	Sids40 S	-	6.8 A	-
7	80%B+20%E(Eggaseed1)	2.8 BC	-	2.7 B
8	60%B+40%E	2.7 BC	-	3.7 B
9	40%B+60%E	3.0 BC	-	3.2 B
10	20%B+80%E	2.7 BC	-	3.8 B
11	Eggaseed1 (E)	-	-	8.4 A

Note: In each column mean of each treatment followed by the same letter (s) are not significant at 0.05 level of probability by Duncan's Multiple Range Test (DMRT)

**Table 6. Effect of garlic mixture cultivars on purple blotch disease severity after 130 day from planting (2018/2019)**

Code	Treatments	Disease Severity %	
		Balady	Eggaseed1
1	Balady (B)	5.60 D	-
2	75%B+25%S(Sid40)	2.90 GH	-
3	80%B+20%S	2.67 H	-
4	85%B+15%S	3.17 G	-
5	90%B+10%S	3.03 GH	-
6	95%B+5%S	4.97 E	-
7	Sids40 S	7.20 B	-
8	75%B+25%E(Eggaseed1)	-	3.77 F
9	80%B+20%E	-	2.80 GH
10	85%B+15%E	-	3.83 F
11	90%B+10%E	-	4.83 E
12	95%B+5%E	-	6.10 C
13	Eggaseed1 (E)	-	8.93 A

Note: In each column mean of each treatment followed by the same letter (s) are not significant at 0.05 level of probability by Duncan's Multiple Range Test (DMRT)

Effect of mixing garlic cultivars on fresh and cured yield, in the first season, cultivar Sids 40 had the lowest fresh yield of 12.70 Ton/Feddan, while the highest value of 18.23 Ton/Feddan and 17.23 Ton/Feddan was realized from both mixtures 80% Balady + 20% Sids 40 and 80% Balady + 20% Eggaseed respectively (Table 7). Mixing of garlic cultivars had a positive effect on fresh yield. Relative yield total ranged from 0.971 in mixture 4 to 28.42 in mixture 7. The mixture effect was significant at P<0.05 Cultivar Balady in this season yielded better than the other two cultivars in the monoculture plots as well as the mixtures 10, 9, 5 and 4. The

differences were significant at  $P \leq 0.05$  with mixtures 9,5,4 and with cultivars Eggaseed1 and Sids 40. In the second season, cultivar Sids 40 followed significantly by cultivar Eggaseed1 that gave the lowest fresh yield of 12.30 and 12.60 Ton/Feddan respectively. Results indicated that the maximum fresh yield was obtained when 80% Balady+20% Eggaseed1

and 75% Balady+25% Eggaseed1 mixtures were planted followed significantly by mixture number 10 and 5 in the first and second season, respectively. Similar results were recorded by Pandita *et al.*, 1998; Sarker *et al.*, 1999; Patra *et al.*, 2000. Their results confirmed the superiority of growing mixtures than monoculture.

**Table 7. Effect of cultivar mixture on fresh yield of garlic in season 1(2017/2018)**

Code	Treatments Mixture	Fresh Yield(Ton/Feddan)			Total	RYT	Mixture effect %
		Balady	Sids 40	Eggaseed1			
1	Balady(B)	15.0	-	-	15.40 E	1.164	-
2	80%B+20%S(Sid40)	13.8	3.4	-	17.23 B	1.171	22.63
3	60%B+40%S	9.9	6.7	-	16.57 D	0.971	17.93
4	40%B+60%S	5.0	8.2	-	13.23 H	1.047	5.84
5	20%B+80%S	4.0	10.0	-	14.00 F	-	3.50
6	Sids40 S	-	12.7	-	12.70 J	-	-
7	80%B+20%E(Eggaseed1)	14.3	-	4.0	18.23 A	1.234	28.42
8	60%B+40%E	10.2	-	6.8	17.00 C	1.181	19.29
9	40%B+60%E	5.7	-	8.6	14.30 G	1.013	0.980
10	20%B+80%E	4.0	-	11.0	15.00 F	1.100	0.140
11	Eggaseed1 (E)	-	-	13.1	13.10 H	-	-

Note: In total yield column mean of each treatment followed by the same letter (s) is not significant at 0.05 level of probability by Duncan's Multiple Range Test (DMRT)

In both seasons planting colored cloves of cultivars Eggaseed1 and Sids 40 in mixture with Balady (White) cultivar consisted of 80%Balady+20% colored cultivars produced the highest total yield. However, increasing or decreasing the mixture of clove-seed ratio decreased significantly or insignificantly. The obtained fresh yield and the relative mixture effects ranged from 5.84 to 28.72% in 80% Egyptian+20% Eggaseed1 (Table 7). On average

positive effects were observed for five out the eight tested treatments in the first season. The magnitude of the mixture effects in the second season ranged from 7.92% to 22.46% and positive effects were detected in all mixture treatments. Cured yield combinations (Table 8) differences among mixture treatments means were significant in both seasons (Tables 9 and 10).

**Table 8. Effect of cultivar mixture on cured yield of garlic in season 1(2017/2018).**

Code	Treatments Mixture	Cured Yield(Ton/Feddan)			Total	RYT	Mixture effect %
		Balady	Sids 40	Eggaseed1			
1	Balady (B)	7.0	-	-	7.0 DE	1.00	-
2	80%B+20%S(Sid40)	6.3	1.9	-	8.2 BC	1.20	24.24
3	60%B+40%S	4.2	3.6	-	7.9 C	1.180	19.69
4	40%B+60%S	2.1	4.5	-	6.6 F	1.02	1.50
5	20%B+80%S	1.9	5.	-	7.2 D	1.13	9.09
6	Sids40 S	-	6.2	-	6.2 F	1.00	-
7	80%B+20%E(Eggassed1)	6.6	-	2.2	8.8 A	1.27	28.40
8	60%B+40%E	5.0	-	3.5	8.5 AB	1.23	24.08
9	40%B+60%E	2.6	-	4.5	7.1 D	1.04	3.64
10	20%B+80%E	2.0	-	5.9	8.5 AB	1.17	24.08
11	Eggaseed1 (E)	-	-	6.7	6.7 EF	1.00	-

Note: In total yield column, mean of each treatment followed by the same letter (s) is not significant at 0.05 level of probability by Duncan's Multiple Range Test (DMRT)

**Table 9. Effect of cultivar mixture on fresh yield of garlic in season 2(2018/2019)**

Code	Treatments Mixture	Fresh Yield(Ton/Feddan)			Total	RYT	Mixture effect %
		Balady	Sids 40	Eggaseed1			
1	Balady (B)	13.5	-	-	13.5 F	-	-
2	95%B+5%S(Sid40)	12.9	1.2	-	14.4 CD	1.058	11.63
3	90%B+10%S	12.4	1.8	-	14.2 DE	1.066	10.07
4	85%B+15%S	11.8	2.7	-	14.5 CD	1.090	12.40
5	80%B+20%S	11.1	3.6	-	14.7 D	1.112	13.95
6	75%B+25%S	10.5	4.0	-	14.5 CD	1.095	12.40
7	S(Sid40)	-	12.3	-	12.3 G	1.000	-
8	95%B+5%Eggaseed1	12.9	-	1.1	14.0 E	1.037	7.27
9	90%B+10%E	12.3	-	2.2	14.5 CD	1.084	11.11
10	85%B+15%E	11.8	-	3.3	15.1 B	1.131	15.70
11	80%B+20%E	10.1	-	5.9	16.0 A	1.218	22.60
12	75%B+25%E	10.6	-	5.1	15.7 A	1.194	20.30
13	Eggaseed1	-	-	12.6	12.6 G	1.000	-

Note: In total yield column, mean of each treatment followed by the same letter (s) is not significant at 0.05 level of probability by Duncan's Multiple Range Test (DMRT)

**Table 10. Effect of cultivar mixture on cured yield of garlic in season 2**

Code	Treatments Mixture	Cured Yield(Ton/Feddan)			Total	RYT	Mixture effect %
		Balady	Sids 40	Eggaseed1			
1	Balady (B)	6.3	-	-	6.3FG	1.000	-
2	95%B+5%S(Sid40)	6.0	0.7	-	6.7DE	1.064	8.06
3	90%B+10%S	5.6	0.8	-	6.4EFG	1.021	3.22
4	85%B+15%S	5.1	1.5	-	6.6EF	1.156	6.45
5	80%B+20%S	5.0	2.1	-	7.1BC	1.134	14.51
6	75%B+25%S	4.4	2.3	-	6.7DE	1.077	8.06
7	S(Sid40)	-	6.1	-	6.1G	1.000	-
8	95%B+5%E(Eggaseed1)	5.8	-	0.6	6.4EFG	1.017	2.40
9	90%B+10%E	5.5	-	1.2	6.7DE	1.063	7.20
10	85%B+15%E	5.2	-	1.8	7.0CD	1.120	12.00
11	80%B+20%E	4.6	-	3.2	7.8A	1.246	24.80
12	75%B+25%E	4.7	-	2.7	7.4B	1.181	18.40
13	Eggaseed1	-	-	6.2	6.2G	1.000	-

Note: In total yield column, mean of each treatment followed by the same letter (s) is not significant at 0.05 level of probability by Duncan's Multiple Range Test (DMRT)

In the first season, The highest cured yield was obtained from mixture (80% Balady+20% Eggaseed1), (60% Balady +40% Eggaseed1) and (80% Balady +20% Sids40). Depending on the increase in colored garlic proportions in the mixture, cured yield values showed a tendency to decrease when less than 60% white garlic was used.

In the second season, there were significant differences and the obtained values ranged from 6.133 to 7.900Ton/Feddan among the mixture rate treatments. The highest bulb cured yield values were obtained in mixtures (80% Balady+20% Eggaseed1) and (75% Balady+25% Eggaseed1) followed significantly by mixtures (80% Balady+20% Sids 40), (95% Balady+5% Eggaseed1) and (75 % Balady+25% Sids 40). The differences among the last three mixtures treatments, were significantly higher with cultivar Eggaseed1 than with cultivar Sids40. Plant species mixtures (i.e intercropping) have been studied in many investigations for the pest management as a tool for their potential to improve pest control Landis *et al.*, 2000 and Gaba *et al.*, 2015. Plant – Plant interactions (i.e plant species mixture) identify higher yielding of varieties of the dominated component. Francis 1986. Kabululu *et al.*, 2015 and Eraskine 1977 studied the positive and the negative effects of mixtures on cowpea grains yield, some of the positive characters like leaf size and number of pods were found with the mixture cultures of cowpea varieties as well as compensation of pests damage susceptible cowpea plants by mixture culture. The results of the present study were agreed with the previous results. However, mixture cultures are being used successfully in many countries in the world and this practice are reducing disease and increasing the yield values according to Finch *et al.*, (2000).

### CONCLUSION

Genetic diversity effects on garlic growth, development and disease susceptibility showed be studied the different sites in Egypt. In the present study all the mixture treatments showed higher yield and decreased purple blotch susceptibility. In seasons, 80% white cloves of Balady cultivar plus 20% colored cloves of Sids 40 and Eggaseed 1 gave the higher yield value and could be recommended for large scale field trail.

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### تأثير بعض النظم الزراعية الجديدة علي بعض أصناف الثوم

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الثوم من محاصيل الخضر الهامة للتصدير والاستهلاك المحلي. وفي هذه الدراسة تم خلط تقاوي صنفين من الثوم الملونة مع الصنف الأبيض (الثوم البلدي) بنسب مختلفة بغرض محاولة زيادة المحصول. وتم زراعة أصناف الثوم ومخالطتها خلال موسمين زراعيين متتاليين وتم حساب المحصول الطازج والجاف وجمالي المحصول النسبي وكذلك حساب النسبة المئوية لتأثير الخلط. وأظهرت النتائج فروق ذات دلالة معنوية بين الزراعة الأحادية ونظام الخلط. كان للخلط تأثير ايجابي على المحصول الطازج والجاف وجمالي المحصول النسبي وكذلك حساب النسبة المئوية لتأثير الخلط. حيث كانت اعلي القيم مع كل هذه الصفات الخلط العشوائي بنسبة ( 80% من الثوم البلدي + 20% من الثوم الملون ( سدس 40 أو ايجاسيد 1). حيث زاد المحصول الطازج بنسبة حوالى 16% والمحصول الجاف زاد بنسبة 20% للصنفين سدس 40 و ايجاسيد 1 مقارنة بالصنف البلدي عندما زرع منفردا كما أظهرت النتائج أن خلط فصوص الثوم البلدي (الأبيض) مع فصوص الثوم الملون قلل من شدة الإصابة بالطفحة الأرجوانية فى الثوم حيث أظهرت النتائج فروق ذات دلالة أخصائية معنوية بين الزراعة الأحادية ونسب الخلط محل الدراسة تجاة حساسية أصناف الثوم لهذا المرض. وتحت ظروف هذه الدراسة يمكن ان نوصى باستخدام نظام زراعة تقاوي الثوم مع بعضه البعض بنسبة خلط 80% من الثوم الأبيض (البلدي) مع 20% من الثوم الملون (سدس 40 ايجاسيد 1)