Minia J. of Agric. Res. & Develop.
Vol. (٣١) No. ٣ pp ٤٥٥-٤٧٥,
٢٠١١

FACULTY OF AGRICULTURE

COMPARATIVE EFFECTS OF SCAPE REMOVAL AND SEED-CLOVE SELECTION ON YIELD AND STORAGE ABILITY OF GARLIC CV. "EGASEED ٢ "

N. S. Youssef; A.H.A, El-Morsy. and U. M. Saif El-Deen
Vegetable Res. Dept. Hort. Res. Inst.,
Agric. Res. Center (ARC) Giza, Egypt
. N-Youssef-elsh@yahoo.com

Received ٢١ Dec. ٢٠١١ Accepted ٢٩ Dec. ٢٠١١

ABSTRACT

This study was conducted at the Experimental Farm of Mallawy Agriculture Research Station, (Hort. Res. Institute, Giza, Egypt) on hard-neck garlic cv."Egaseed٢" during the growing seasons of ٢٠٠٨/٢٠٠٩, ٢٠٠٩/٢٠١٠ and ٢٠١٠/٢٠١١. The aim was to investigate the effect of scape (flower stalk) excision and selection based on clove weight on garlic yield and storage ability. Selected population (SP) for high bulb weight and bulk population (BP) (origin population) were obtained during ٢٠٠٨/٢٠٠٩ season. The treatments were removed scape at ١ month before harvest (SRM), removed scape (cut) on harvest time (SRH), scape remained (SR), selected population (SP) and bulk population (BP). The obtained results revealed that the highest significant promotion for fresh and cured yield, bulb diameter (cm) and clove weight (g) in both seasons were obtained by planting large clove size (selected population) and their scapes were removed at one month before harvest. Significant decrease in weight loss during curing process were obtained by SRM treatment compared to SR and SRH treatment. Bulb mean weight data, revealed a pronounced increase in bulb mean weight by removed scape at one month before harvest (SRM) compared to scape remained (SR) (١٠.٠٨ % and ١٢.٧ %) and by selected population (SP) compared to bulk

population (BP) (.١٧.٥٢ % and ١٠.٢٧ %) in the first and the second season, respectively

Regarding weight loss during storage, the tested treatments differed significantly in weight loss during storage after ٢,٤ and ٦ months. Unscaped plants remained (SR) had the highest value while the lowest weight loss was recorded with SRM in the first season and BP in the second season.

Concerning dry weight and TSS, significant differences in the mean values of dry matter and TSS were found during storage. Dry matter and T.S.S increased after ٢ and ٤ months and decreased after ٦ months from storage. The highest dry weight in the bulb was found with SRM and SP treatments. In both seasons, SR, SRM and SP recorded the highest values for T.S.S with insignificant differences among them. While, the lowest values were recorded for SRH and BP.

INTRODUCTION

Garlic is the second most important bulb crop after onion (Bose and Som, ١٩٩٠). It is an aromatic bulb and herbaceous annual spice crop (Kurian, ١٩٩٥). It has been cultivated for thousands of years and is widely used for culinary and medicinal purposes (Hahn, ١٩٩٦). It may be divided into two sub species; *Allium sativum* var..*ophioscorodon*" which includes bolting or hard-neck cultivars and *Allium* var. *sativum* or non-bolting soft-neck cultivars (Bachmann, ٢٠٠٨).

In Egypt, the Egyptian garlic (soft-neck types) is one of the oldest cultivated crops although its productivity and cultivation area declined in the last years. Recently, the demand for high-quality garlic encouraged grower in producing this crop for direct markets (Walters, ٢٠٠٨). Hard-neck types have generally tended to have greater winter survival and higher yields compared with soft neck types (Rosen, *et al*., ٢٠٠٦). Most research on garlic production has been conducted on improving production of soft-neck cultivars (Brewster and Rabinowitch, ١٩٩٠), with only minimal efforts on hard-neck cultivars. Large bulbs with good storage potential are desired by growers. Several reports suggested that removal of scapes (false seed-stalks) during the growing season will enhance bulb size and total yield compared with leaving scapes on until harvest (Orlowski *et al*. ١٩٩٤.;

Pelter *et al.*, ٢٠٠٥, Nam *et al.*, ٢٠٠٨ and Choi *et al.*, ٢٠١١). Erlebacher, (١٩٩٨) showed that larger bulbs from hard-neck garlic could be obtained by cutting off the seed stalks as soon as they developed. How ever, bulbs store better if the scape is left on until harvest or removed only few days before harvest (Engeland, ١٩٩١).

Rosen and Tong (٢٠٠١) showed that scape removal increased dry matter partitioning to the bulbs, but had no effect on total. Plant weight and the increase in bulb dry mass when scapes were removed was offset by an increase in scape dry mass when scapes were left on. Zandstra and Squire,(٢٠٠٤) reported that if scapes are left on the garlic plant, yields (bulb sizes) are reduced and suggested that scape must be removed before it negatively affects yield. In these studies, scape removal was based on the length of scape. Several reports suggest that removal of scapes should be done prior to maturity

Guenther and Stonaker, (٢٠٠٦) demonstrated that removing scapes resulted in slightly higher bulb weights, removing scapes takes extra labor and may not be worth the time for only slightly higher bulb weights: however, selling the edible scapes may offset the cost and generate extra income. Agrawal *et al.*, (٢٠٠٣) showed that despite the importance of crop, the first step of breeding program is collection and evaluation of germplasm. Using large clove weight gave significantly the highest garlic yield and average bulb weight compared with small clove weight. Mahadeen (٢٠١١) and Agustin (١٩٩٢) suggested that the selection of garlic seeds should be based on only weight of cloves. Also, Yanmaz *et al.*, (١٩٩٩) showed that using large size cloves (٢.٥-٣.٥g) as planting materials significantly increased bulb size and total yield in all tested cultivars.

Zepeda, *et al.*, (١٩٩٧) showed that after six selection cycles and two years of yield trials, most promising selections show average of ١٠ to ١٤ CPB (cloves per bulb) with yields as high as ٤١.٤ ton/ha. Response to bulb size was dramatic. In big bulbs (Colossal >٧١ mm.) and (Jumbo ٥٧–٧٠ mm), selections were ٨٥٪ and ٤٨٪ superior to original population. In medium size bulbs (Gigante ٤٣–٥٦ mm) no differences were observed, but in small bulbs (Flor ٢٧–٤٢ mm) always have more (٥٠٪) than the selections. There are significant

differences in emergence, height of plant, and bulb shelf life in eight of the selections as to justify them as new varieties. Selection pressure for high yields should be included to obtain better results (Zepeda, ١٩٩٧ and Jenderek and Zewdie, ٢٠٠٥).

Bulb weight, number of cloves, and clove weight are the main factors contributing to garlic yield. Individual bulb and clove weight are of economic importance; medium or large bulbs with large cloves receive a higher price than a large bulb with small cloves (Zepeda and Laborde, ١٩٩٧).

The value of scape removal has not been clearly studied in other garlic-growing areas. At present, as far as we now there is no data on the effect of scape removal on garlic performance and storage in Egypt.

Therefore, the objective of the present study was to compare the effect of selecting plants having high bulb weight with larger clove size and scape (flower stalks) excision on improving yield and storage ability of hard-neck cultivar cv. "Egaseed ٢"

MATERIALS AND METHODS

The experiment was carried out at the Experimental Farm of Mallawy (Agriculture Research Station, Hort. Res. Institute, Giza, Egypt) during garlic growing seasons of ٢٠٠٨/٢٠٠٩, ٢٠٠٩/٢٠١٠ and ٢٠١٠/٢٠١١. Soil sample were collected from the fields at depth of ٠-١٥ cm. for determining the initial nutrient status of the soil. Average soil test values over the ٢ years prior to planting were as follows: texture grade, clay loam; pH, ٨.١١; organic matter, ١.١٢ %; E.C, ١.٣٢; $CaCO_3$, ٢.١٢ %; total N %, ٠.٠٨; total P %, ٠ .٧; Exch. K mg/١٠٠g, ٢.٣١.

In ٢٠٠٨/٢٠٠٩ season:

Plant material. Garlic bulbs cv. "Egaseed٢ " were kindly obtained from Prof Dr. Seif El-Nasr Husein Gad El-Hak, (Department of Horticulture Vegetable branch, Minia University). The bulb color of this genotype is purple. It is one of the hard-neck varieties which produce a central stalk that goes straight up; it is called a scape (flower stalks).

Yield and storage ability of garlic

Good garlic cloves were chosen visually from the medium,-largest healthy bulbs, then planted on October ٥,th ٢٠٠٨. Each experimental plot consisted of ٥ rows, ٦٠ cm wide and ٣ m long. The cloves were spaced on one side of each row at ١٠ cm apart. The total area of each plot was ١٠.٥ $m^{٢}$ (١/٤٠٠ fed.). All experimental plots received the same field treatments commonly known for garlic production.

Thirty plants from each plot (١٥٠ plants) which showed good growth characters were selected and labeled. At the harvest time, ٢٠ plants from the ٣٠ screened plants were selected based upon their highly bulb weight, bulb size and clove size and considered as selected population (SP). The other plants from each plot were mixed and considered as bulk population (BP).

In ٢٠٠٩/٢٠١٠ season:

Clove/Seed Preparation. The selected populations (SP) (٢٠ plants) from each plot and bulk population (BP) (mixed plants) were prepared first by cracking the clove from bulbs. The cloves from the outer parts of the SP bulb of the ٢٠ selected plants were selected as planting materials. The cloves from bulk population (BP) (mixed plants) were prepared by separating the cloves from the bulbs and discarding the defected or mechanical damaged ones.

Scape removal treatment.

The cloves from origin population (OP) were prepared by choosing the good looking cloves from the bulbs and discarded the defected or mechanical damaged ones. Garlic cloves were planted on October ٣, th ٢٠٠٩ and October ٧, th ٢٠١٠. Each field experimental plot consisted of ٣ rows, ٦٠ cm wide, ٣ m long where, the cloves were spaced on one side (north) of each row at ١٠ cm apart. All experimental plots received the same field treatments commonly known for garlic production.

Scapes were removed by a sharp knife or scissors one month before harvest (when scape first appeared) as shown in **Fig.** ١. All experimental plots received the same field treatments commonly known for garlic production. The tested treatment are shown in the following Table:

Treatments	
Scape (flower stalks) excision	**Garlic clove selection**
١- Scape removal ١ month before harvest (SRM)	٤- Selected population (SP)
٢- Scape removal at the harvest time (SRH)	٥- Bulk population (BP)
٣- Scape remained, it was left on plants (SR)	

In ٢٠١٠/٢٠١١ season:

The healthy cloves from each selected bulbs (SB) were planted individually in plots on ٧ October, ٢٠١٠. The selected bulbs were repeated again as mentioned before in the previous season. Also, the cloves of bulk population (BP) were randomly taken from origin population (OP). and also planted and treated as mentioned before in the previous season.

Harvest measurements:

At harvest time, on ١٥th of April ٢٠١٠ and on ٢٠th of April ٢٠١١, all plants from each treatment were harvested and the fresh weight g/plant were recorded. Then, the harvested plants were cured in the field for ٢١ days and then weighted. The following characteristics were measured after curing process:

١- Cured weight (g/plant)
٢- Weight loss (%)
٣- Bulb head weight (g/plant)
٤- Bulb diameter (cm.)
٥- No. cloves/bulb
٦- Clove weight (g/bulb)

Random samples (about ٥ kg) of cured bulbs were taken from each plot, placed in a mesh plastic bags and stored under room condition for ٦ months. The stored bulbs were evaluated for the following characteristics:

Storage treatments

١- Weight loss percent after ٢, ٤ and ٦ months. Percentage of weight loss was calculated as the difference between the initial weight and the weight recorded at each sampling data, divided by the initial weight, and multiplied by ١٠٠ (Vazquez-Barrios *et al.*, ٢٠٠٦)

٢- Total Soluble solids (T.S.S) and dry matter content after ٢, ٤ and ٦ months.

For each storage batch, ١٥ cloves (without sprouts) were cut and mixed together. Total soluble solids content (^{o}Bx) was determined using an Abb refractometer previously calibrated to ٢٠^{o}C. ٣- Dry matter, %: The samples were then dried at ٨٠ ^{o}C for ٢٤ h and the percentage of dry matter content was determined in accordance to Vazquez-Barrios *et al.*, ٢٠٠٦

Statistical analysis

Data were compared using analysis of variance (ANOVA) procedures according to Gomez and Gomez (١٩٨٤) and mean differences were performed using Duncan multiple range test (١٩٥٥).

Scape ready for removal ١ month before harvest

Scape remained till harvest time

Selected cloves

Fig ١: Treatments of garlic hard-neck cv."Egaseed ٢" from top to bottom: (scape removal ١ month before harvest, scape remained till harvest time, selected population (bulbs and cloves)

RESULTS AND DISCUSSION

Fresh, cured weight (g/plant) and weight loss after curing:

The data shown in Table ١ illustrate the effect of scape removal and selection on fresh, cured weight g/plant and weight loss% after curing. The highest significant promotion for the fresh and cured yield in the two seasons was shown by the selected population (SP). Similar results were also reported by Agrawal *et al.*, (٢٠٠٣).and Mahadeen, (٢٠١١) where they reported that the production of garlic increased by using large clove. Scape removal at ١ month before harvest (SRM) and (SP) tended to decrease the weight loss (%) after curing in the two seasons with insignificant differences between them only in the first season. These results are in agreement with those reported by Pelter *et al.*, (٢٠٠٥) who showed that scape removal enhanced garlic storage life. Scape removal at the harvest time (SRH) caused highly significant increase in weight loss (٣١.٧٪ and ٣٣.١٠ %) and least cured yield (٨٦.٧٨ g/plant and ٧٩.٨٣ g/plant) in the first and the second seasons, respectively. Loss in mass is primarily due to water loss from the bulb through the neck (Komochi, ١٩٩٠)

Table ١ : Fresh and cured weight (g)/plant and weight loss (%) of garlic cv. "Egaseed ٢: as affected by scape removal and selection in the two seasons of ٢٠٠٩/٢٠١٠ and ٢٠١٠/٢٠١١.

Treatments	First season			Second season		
	Fresh weight g/plant	Cured weight g/plant	Weight loss %	Fresh weight g/plant	Cured weight g/plant	Weight loss %
Scape removal at ١ month before harvest (SRM)	١٣٠.٠ cd	١٠٠.٧٠ b	٢٢.٥٦ c	١٢٨.٢٠ b	٨٩.٦٧ b	٣٠.٠٤ b
Scape removal at the harvest time (SRH)	١٢٧.٢ d	٨٦.٧٨ d	٣١.٧٠ a	١١٩.٣٠ c	٧٩.٨٣ d	٣٣.١٠ a
Scape remained (SR)	١٣٣.٠ bc	٩٧.٨٨ bc	٢٦.٣٥ b	١٢٧.٧٠ b	٨٢.٦٧ cd	٣٥.٢٣ a
Selected population (SP)	١٦٧.٧ a	١٢٩.٠٠ a	٢٣.٠٨ c	١٦٦.٣٠ a	١٠٨.٠٠ a	٣٥.٠٣ a
Bulk population (BP)	١٣٤.١ b	٩٦.٠٠ c	٢٨.٤١ b	١٣٠.٠٠ b	٨٥.٠٠ c	٣٤.٦١ a

Values with similar alphabetical letter don't significantly differ from each other, in the same column using Duncan's Multiple Range test, at ٠.٠٥ levels.

Bulb quality and yield component

The results obtained for bulb diameter, clove weight (g/plant) and no. cloves/bulb are recorded in Table ٢. The selected population and scape removal at ١ month before harvest resulted in significant increase in bulb diameter (٦.٩٨ cm and ٦.٨١ cm for SP) and (٧.٠٢ cm and ٦.٣٢ cm for SRM) and clove weight g/bulb (٦.٨٢ g/bulb and ٦.٨٧ g/bulb for SP) and (٦.٦٩ g/bulb and ٦.٨٨ g/bulb for SRM) in the first and the second seasons respectively, without significant differences between them. The results obtained by Erlebacher, (١٩٩٨) and Pelter *et al*., (٢٠٠٥) show that the grower larger bulbs from hardneck garlic can be obtained by cutting off seed stalks as soon as they come up. In the first season, the highly mean value for the no. cloves/bulb (١٤.٦٠) was recorded with the scape remained (SR) but the lowest (١٣.٩٧ clove/bulb) with (SRM). In the second season, the mean values for the no. cloves/bulb was insignificant..

Table ٢ : Bulb diameter (cm), clove weight (g/plant) and no. cloves/bulb of garlic cv. "Egaseed ٢" as affected by scape removal and clove selection in the two seasons of ٢٠٠٩/٢٠١٠ and ٢٠١٠/٢٠١١.

Treatments	First season			Second season		
	Bulb diameter (cm)	Clove weight (g/plant)	No. cloves/bulb	Bulb diameter (cm)	Clove weight g/plant	No. cloves/bulb
Scape removed at ١ month before harvest (SRM)	٧.٠٢ a	٦.٦٩ a	١٣.٩٧ b	٦.٣٢ ab	٦.٨٨ a	١٤.٠٠ a
Scape removed at the harvest time (SRH)	٦.٥١ b	٦.٤٠ b	١٤.١٠ ab	٥.٧٩ bc	٥.٧٠ b	١٤.١٠ a
Scape remained (SR)	٦.٥١ b	٥.٨٠ c	١٤.٦٠ a	٥.٥١ c	٥.٦٢ b	١٣.٩٠ a
Selected population (SP)	٦.٩٨ a	٦.٨٢ a	١٤.٣٠ ab	٦.٨١ a	٦.٨٧ a	١٣.٨٠ a
Bulk population (BP)	٦.٤٣ b	٥.٦٥ c	١٤.٥٠ ab	٥.٧٧ c	٤.٧٥ c	١٤.٨٠ a

Values with similar alphabetical letter don't significantly differ from each other, in the same column using Duncan's Multiple Range test, at ٠.٠٥ probability level.

Bulb weight (g):

Data presented in Table ٣ show a pronounced increase in bulb mean weight (g) and percentage of weight increase for two seasons. In the two seasons, both scape removal ١ month before harvest (SRM) caused highly significant increase in bulb mean weight when compared to scape remained (SR) (١٠.٠٨ % and ١٢.٧٠ %). On the other hand, the bulb mean weight was significantly decreased when the scape (flower stalks) (remained) or excised at the harvest time. The results reported by Nam *et al*. (٢٠٠٨) who showed that the yield of no scape cut was decreased to ٨.٦ % compared to ١.١٩٧ kg/١٠a for scape cut. Similar results were obtained by Hui-lian *et al*., (٢٠٠١) and Choi *et al*., (٢٠١١)..Selected population (SP) in the two seasons gave the highly significant increase in bulb mean weight (g) (١٧.٥٢ % and ١٠.٢٧ %) when compared with bulk population (BP). These results are in agreement with that reported by Agustin, (١٩٩٢); Zepeda, *et al*. (١٩٩٧) and Mahadeen, (٢٠١١).

Table ٣ : Effect of garlic scape removal and selection on garlic cv. "Egaseed ٢" bulb yield and the percentage of weight increase in the two seasons of ٢٠٠٩/٢٠١٠ and ٢٠١٠/٢٠١١.

Treatments	Bulb mean weight (g)		
		Second season	Second season
Scape	Removed ١ month before harvest (SRM)	٩٥.٦٦ b	٨٠.٧٣ a
	Remained (SR)	٨٦.٩٠ cd	٧١.٦٣ b
	Weight increase %	+ ١٠.٠٨ %	+ ١٢.٧٠ %
	Removed at harvest time (SRH)	٨٢.٧٣ d	٧٢.٦٠ b
	Remained (SR)	٨٦.٩٠ cd	٧١.٦٣ b
	Weight increase %	- ٥.٠٤ %	+ ١.٣٥ %
Selection	Selected population (SP)	١٠٧.٣٠ a	٨٠.٥ a
	Bulk population (BP)	٩١.٣٠ bc	٧٣.٠٠ b
	Weight increase %	+ ١٧.٥٢ %	+ ١٠.٢٧ %

Values with similar alphabetical letter don't significantly differ from each other, in the same column using Duncan's Multiple Range test, at ٠.٠٥ probability level.

Weight loss:

Data regarding weight loss during storage period revealed that there were significant differences in the mean values of scape removal and selection in the two seasons (Fig,٢ and Fig,٣). After ٢ months from storage, the highly significant increase in weight loss was recorded with bulbs which the scape was remained (SR) in the first season. Weight loss differed significantly. After ٤ months from storage, data differed between the first and second season, and selected population (SP) exhibited the highest decrease in weight loss . Scape removed at ١ month before harvest (SRM) and (BP) gave the lowest significant decrease in weight loss after ٦ months from storage in the two seasons.

Total weight loss:

Data presented in Figure ٣ showed that scape remained (SR) caused the highest significant increase in total weight loss % (٤٢.٧٣ % and ٤٤.٥٢ %) in the first and the season respectively. These results are in harmony with that reported by Rosen and Tong, (٢٠٠١). Scape removed ١ month before harvest (SRM) in the first season and bulk population (BP) in the second season gave significant decrease in total weight loss % (٣٧.٢٩ % and ٣٨.٣٧ %, respectively).

Dry matter %:

Statistical significant differences in the mean values of dry matter (%) during storage period was found (Table ٤). Data revealed that dry matter increased after ٢ and ٤ months and then decreased after ٦ months from storage. These results are in agreement with that reported by Vazquez-Barrios *et al*., (٢٠٠٦); Cantwell, (٢٠٠٤) and Ceci *et al*. (١٩٩١). The highest dry matter (%) were found with (SRM) after ٢ and ٤ months in the first season and after ٢,٤ and ٦ months in the second season. These results are in harmony with that reported by Rosen and Tong, ٢٠٠١ who showed that scape removal increased dry matter partitioning to the bulbs.

Selected population (SP) after ٤ and ٦ months in the first season and after ٢,٤ and ٦ months in the second season also showed highest increase with insignificant differences among them. The lowest values

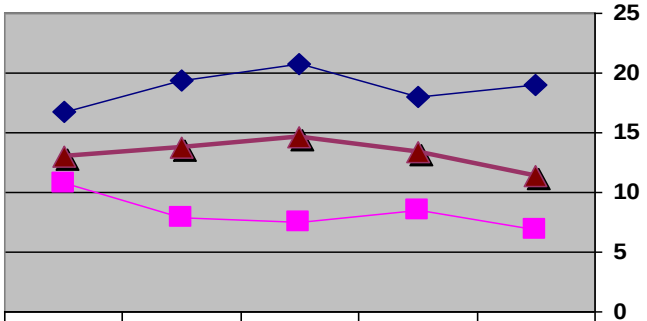
for dry matter were recorded for SRH after ٢ and ٤ months in the first season and after ٢,٤ and ٦ months in the second season.

Total Soluble Solid (T.S.S):

Total soluble solid of garlic bulbs at different days after storage was significantly influenced by scape removal and selection (Table ٥) treatment. Data exhibited linearly increased in T.S.S at the first months from storage and then decreased at the end of storage (after ٦ months). The initial TSS increase may have been the result of the high loss in mass that occurred during the first month of storage (Kopsell and Randle, ١٩٩٧). Soluble solids increases also may have resulted from the conversion of non soluble highly polymerized fructans to soluble sugars during storage (Kopsell and Randle, ١٩٩٧). Also, Rutherford and Whittle, ١٩٨٢ reported that total soluble sugars decreased due to respiration. In the two seasons, both SR and SP recoded the highest values for T.S.S with insignificant differences between them. Also, SRM after ٢ and ٤ months in both seasons gave the highest values. The lowest values were found with SRH and BP specially after ٤ and ٦ months in both seasons.

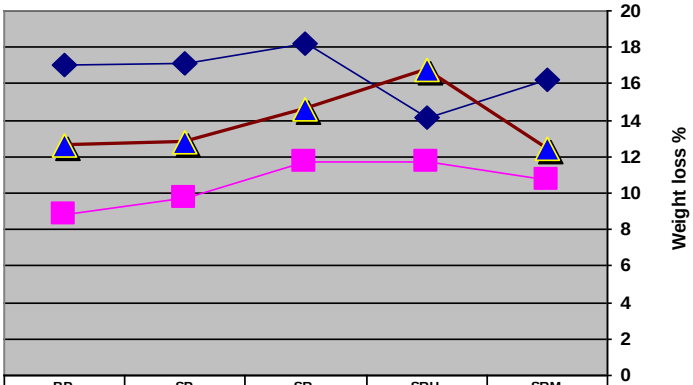
In conclusion, scape (flower stalks) excision of garlic hard-neck cultivar Egaseed ٢ one month before harvest and selected garlic seeds based on clove weight of cloves could be effective in increasing garlic bulb production and enhanced garlic storability of this cultivar.

Fig: 1 Weight loss (%) of garlic cv." Egaseed2" as affected by scape removal 1 month before harvest (SRM), at harvest time (SRH), scape remained (SR), selected population (SP) and bulk population (BP) after 2, 4 and 6 months from storage (First season)



	BP	SP	SR	SRH	SRM
2, months (LSD =1.21)	16.8	19.4	20.7	17.97	18.94
4, months (LSD = 0.928)	10.7	7.82	7.45	8.44	6.93
6, months (LSD = 0.925)	13	13.8	14.61	13.39	11.42

Fig 2: Weight loss % of garlic cv. "Egaseed2" as affected by scape removal 1 month before harvest (SRM), at harvest time (SRH), scape remained (SR),selected population (SP) and bulk population (BP) after 2, 4 and 6 months from storage (Second season)



	BP	SP	SR	SRH	SRM
2, months (LSD = 1.01)	17	17.11	18.19	14.1	16.2
4, months (LSD = 0.49)	8.81	9.69	11.73	11.74	10.73
6, months (LSD =0.26)	12.65	12.8	14.6	16.76	12.42

Fig 3: Total weight loss (%) of garlic cv. "Egaseed 2" as affected by scape removal 1 month before harvest (SRM), at harvest time (SRH), scape remained (SR), selected population (SP)and bulk population (BP) in the first and second season.

Table ٤ : Dry matter (%) of garlic cv. "Egaseed ٢" as affected by scape removal and selection after ٢,٤ and ٦ months from storage in the two seasons of ٢٠٠٩/٢٠١٠ and ٢٠١٠/٢٠١١.

Treatments	Storage period					
	First season			Second season		
	٢ months	٤ months	٦ months	٢ months	٤ months	٦ months
Scape removed ١ month before harvest (SRM)	٤٢.٩٠ a	٤٥.٧٠ a	٣٧.٠٠ b	٤٣.٨٠ a	٤٤.٦٠ a	٣٩.٧٠ a
Scape removed at the harvest time (SRH)	٤١.٨٠ c	٤٣.٠٠ c	٣٨.٥٠ ab	٤١.٠٠ b	٤٢.٥٠ c	٣٨.٠٣ b
Scape remained (SR)	٤٢.١٠ bc	٤٤.٦٠ ab	٣٨.٩٥ a	٤٣.٦٠ a	٤٣.٩٠ b	٤٠.٠٠ a
Selected population (SP)	٤٢.١٧ b	٤٥.٠٧ a	٣٨.٦٣ ab	٤٤.٠٠ a	٤٤.٢٠ ab	٣٩.٢٣ a
Bulk population (BP)	٤١.٨٧ bc	٤٣.١٧ bc	٣٨.١٢ ab	٤٢.٧٠ ab	٤٣.٦٣ b	٣٧.٧٧ b

Values with similar alphabetical letter don't significantly differ from each other, in the same column using Duncan's Multiple Range test, at ٠.٠٥ probability level.

Table ٥ : Total soluble solids (T.S.S) of garlic cv. "Egaseed ٢" as affected by scape removal and selection after ٢, ٤ and ٦ months from storage in the two seasons of ٢٠٠٩/٢٠١٠ and ٢٠١٠/٢٠١١.

Treatments	Storage period					
	First season			Second season		
	٢ months	٤ months	٦ months	٢ months	٤ months	٦ months
Scape removed at ١ month before harvest (SRM)	٤٠.٥ a	٤٢.٥ a	٣٦.٧٠b	٤٢.١٧ ab	٤٣.١٠ a	٣٨.٤٠ bc
Scape removed at the harvest time (SRH)	٣٩.٨٣ a	٤٠.٧٥ b	٣٦.٧٥ b	٤٠.٣٠ c	٤١.٨٠ b	٣٧.٥٠ c
Scape remained (SR)	٤٠.٠٠ a	٤٣.١٧ a	٣٧.٩١ a	٤٣.٢٥ a	٤٣.٧٧ a	٣٨.٨١ ab
Selected population (SP)	٤٠.٩٠ a	٤٢.٥٠a	٣٨.١٠ a	٤٣.٧٠ a	٤٣.٨٧ a	٣٩.٧٤ a
Bulk population (BP)	٤٠.٨٠ a	٤١.٣٣ b	٣٧.٥٠ a	٤١.٣٣ bc	٤٢.٣٠ b	٣٨.٠٠ bc

Values with similar alphabetical letter don't significantly differ from each other, in the same column using Duncan's Multiple Range test, at ٠.٠٥ probability level.

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مقارنة تأثير إزالة الحامل النورى وانتخاب تقاوي الفصوص على محصول وتخزين صنف الثوم ايجا سيد ٢

ناصر سيد يوسف – عبدا لله حلمي على المرسى – أسامة محمد سيف الدين

قسم التكاثر الخضري والبطاطس – معهد بحوث البساتين –الجيزة –مصر

. N-Youssef-elsh@yahoo.com

نفذت هذه الدراسة بالمزرعة التجريبية بمحطة البحوث الزراعية – ملوي – معهد بحوث البساتين – الجيزة – مصر على صنف الثوم ذات العنق الصلد (ايجاسيد ٢) خلال المواسم الزراعية الثلاث ٢٠٠٨/٢٠٠٩و ٢٠٠٩/٢٠١٠و٢٠١٠/٢٠١١

الهدف من ذلك البحث هو دراسة تأثير إزالة الحامل النورى وكذالك الانتخاب (معتمدا على وزن الفص) على محصول الثوم وكذالك قدرته التخزينية

خلال الموسم الزراعي ٢٠٠٨/٢٠٠٩ قد تم الحصول على عشيرة منتخبة ذات أوزان أبصال عالية وكذالك عشيرة مجمعة (العشيرة الأصلية المختلطة) للمقارنة. وخلال المواسم الزراعية لأعوام ٢٠٠٩/٢٠١٠و ٢٠١٠/٢٠١١ قد كانت المعاملات على النحو التالي: إزالة الحامل النورى قبل الجمع ب ١ شهر – إزالة الحامل النورى عند الجمع مباشرة – بقاء الحامل النورى بدون إزالة – عشيرة منتخبة على أساس الوزن والحجم العالي للفصوص – عشيرة مجمعة (مختلطة)

وقد أظهرت النتائج أن:

- أعلى زيادة في الوزن الطازج والمعالج للنبات وكذالك قطر البصلة ومتوسط وزن الفص قد تحقق بواسطة استخدام فصوص منتخبة ذات حجم ووزن عالي وهذا في كلا الموسمين
- إزالة الحامل النورى قبل الجمع بشهر أدى إلى انخفاض في النسبة المئوية للفقد في الوزن أثناء العلاج التجفيفى عند مقارنته ببقاء الحامل النورى دون إزالة أو إزالة الحامل النورى عند الجمع مباشرة

- فيما يتعلق بمتوسط وزن البصلة أظهرت النتائج أن إزالة الحامل النورى قبل الجمع بشهر أدى إلى زيادة النسبة المئوية للوزن بمقدار ١٠.٠٨% و ١٢.٧% في الموسم الأول والثاني على التوالي عند مقارنته ببقاء الحامل النورى بدون إزالة
- ايضا استخدام فصوص كبيره الحجم منتخبة على أساس الوزن أدت إلى زيادة في النسبة المئوية للوزن بمقدار ١٧.٥٢% و ١٠.٢٧% في الموسم الأول والثاني على التوالي عند مقارنة العشيرة المجمعة (الأصلية المختلطة)
- فيما يتعلق بالفقد في الوزن أثناء فترات التخزين فقد أوضحت النتائج أن المعاملات قد اختلفت معنويا فيما بينها خلال أشهر التخزين (بعد ٢-٤-٦ أشهر) من العلاج التجفيفى وأعلى فقد في الوزن قد تحقق عند ترك الحامل النورى بدون تقطيع وحتى الحصاد وان اقل فقد في الوزن قد تحقق مع إزالة الحامل النورى في الموسم الأول ومع العشيرة المجمعة في الموسم الثاني
- فيما يتعلق بالمادة الجافة والمواد الصلبة الذائبة الكلية فقد وجد إن متوسطات القيم للمادة الجافة والمواد الصلبة الذائبة الكلية قد حدث لها زيادة خلال الأشهر الأولى من التخزين بعد ٢و٤ أشهر ثم حدث لها انخفاض بعد ٦ أشهر من التخزين . وان إزالة الحامل النورى قبل الجمع بشهر و الانتخاب أدى إلى زيادة المادة الجافة بالأبصال.
- اقل القيم للمادة الصلبة الذائبة الكلية قد تحقق مع إزالة الحامل النورى عند الجمع مباشرة ومع العشيرة المختلطة .

الخلاصة:

١- من الأهمية إزالة الحامل النورى لصنف الثوم " ايجاسيد ٢" ذات العنق الصلد قبل الجمع بشهر وعدم تركه حتى الحصاد أو حتى إزالته عند الحصاد في حالة الرغبة في تخزينه لاستخدامه كتقاوي.

٢- انتخاب التقاوي على أساس وزن الفص وإزالة الحامل النورى قبل الجمع بشهر أدى إلى زيادة معنوية في متوسط وزن وقطر البصلة و إلى تحسين القدرة التخزينية