

*Annals Of Agric. Sc., Moshtohor,*  
*Vol. 44(3): 819-832, (2006).*

**EFFECT OF LOCATIONS, STORAGE PERIOD AND PACKAGING  
MATERIALS ON VIABILITY AND SOME CHEMICAL COMPONENTS  
OF ONION (*Allium cepa* L.) SEED.**

**BY**

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**ABSTRACT**

Maintenance of seed quality in storage from harvesting time until the next planting is imperative to assure its planting value. laboratory experiments were conducted at Seed Technology Research Dep. to investigate the effect of storage conditions on seed viability and chemical changes of two onion varieties (Giza 6 and Giza 20) stored for different periods of 4, 8, 12, 16 and 20 months. Onion seed Giza 6 cv lost about 37, 56, 70, 30, 48 and 23% of their initial germination, Accelerated ageing AA, Electrical conductivity Ec, radical length, shoot and seedling dry weight when stored at room temperature for 20 months in paper bag at Giza location. Long term storage of Giza 6 cv. onion seed from 4 up to 20 months decreased significantly protein and oil % while 1000-seed weight, moisture content and total carbohydrate were significantly increased. The reduction in germination, Accelerated ageing AA, Electrical conductivity Ec, radical length, shoot and seedling dry weight were about 39, 60,71, 31, 48 and 22.4% respectively, when onion seed Giza 20 stored for 20 months in plastic bag at Sakha location. Protein % and oil% of onion seed Giza 20 cv were significantly decreased, on the other hand, total carbohydrate % and moisture content were significantly increased by increasing storage period. In conclusion, onion seed may be stored under room temperature condition at their production locations for 20 months in paper or plastic bags with expecting loss in their germination about 40%.

**INTRODUCTION**

Onions possess one of the most rapidly deteriorating seeds among major crops. They quickly lose completely their viability in less than a year when stored under hot, humid conditions. Onion seeds stored at 6%. Moisture content have retained viability up to three years, However a small lots breeding material are often stored in desiccators calcium chloride under these conditions, their moisture content will equilibrate to about 2 % and germination can remain high for as long as nine years in storage.

Elemery (1991) Showed that the reduction in seed germination increased as the storage period and temperature increased and so that no significant change in seed germination has been taken place when the seed was stored in packaging of polyethylene films coated or not, jute or cloth and when the seed stored at the

lower relative humidity (32%). Onion seed Giza 6 cv lost about 26% of their initial germination % when stored at room temperature for about 2 years (Osman *et al* 1985). Shelar *et al* (1992) showed that onion seeds were dried to a moisture content of 5% and stored in cloth bags, paper bags, cardboard boxes laired with waxed paper, plastic bags or aluminum foil packet and sampled monthly. Percentage of germination was maintained above 70% after 360 days of storage in the plastic bags and the aluminum foil packets, Where > 70% germination was only maintained for 300 days in the other 3 containers (cloth bags, paper bags, cardboard boxes laired with waxed paper) after 440 days of storage, germination percentage had fallen to < 40. Stumpf *et al* (1997) found significant differences in seed germination and viability were observed between different moisture levels (7.15 and 5.30%) and containers (cloth, polyp ouch, cikatainer, polythene, aluminum fail and paper). The accelerated aging test on seeds stored in a cloth bag was useful in predicting the storage potential of seeds at both moisture levels. Storing the onion seed at 5.30% moisture in a polythene bag and aluminum foil increased the storage life by 5 and 7 months, respectively relative to the seed stored in a cloth or paper bag, which had 14 month of storability (Padma and Reddy 2000).

Muhmmad and Muhmmad (2002) showed that germination percentage, rate of germination, seedling length and fresh weight were higher in seed lots stored for one or two years compared with those stored for three or four years.

The objectives of this study were to determine the optimal storage conditions and the effect of these conditions on viability of onion seed.

#### MATERIALS AND METHODS

laboratory experiments were conducted to investigate the effect of some storage conditions on seed viability and chemical changes of two onion varieties (Giza 6 mohassan and Giza 20) stored for different periods of 4, 8, 12, 16 and 20 months. It should be mentioned that immediately after harvest and before applying the storage treatments seed characteristics were measured on an original weight basis as shown in the following table (1):

Table (1): Initial seed characteristics of Giza 6 and Giza 20 varieties

Character	Giza 6	Giza 20
Germination %	96.3	97.0
Electrical conductivity test	20.5	21.3
Accelerated ageing	84.0	85.1
Radical length (mm)	32.5	34.2
Shoot length (mm)	70.1	72.1
Seedling dry weight (mg)	90.1	92.3
1000 – seed weight (g)	4.1	4.2
Protein %	23.1	23.9
Carbohydrates %	32.8	36.1
Oil %	24.4	21.8
Moisture content	9.5	9.4

The experiments were carried out at Giza Agricultural Research Stations, Egypt during the period of October 2003 to May 2005. Onion seed was stored under open –air store (warehouse storage room temperature) at two different storage locations including Kaluobia and Sakha for Giza 20, Giza and Mallawy for Giza 6 Mohassan). Three different types of package material, i.e. cloth bag, paper bag and plastic bag were using. The design of the experiment was randomized complete blocks with three replications. Seed viability and chemical composition were determined as follow:

**Standard germination:** Onion seed were incubated in moist filter paper at  $20\pm 1^{\circ}\text{C}$  for 12 days. Normal seedlings were counted according to the international rules (ISTA, 1985) and expressed as germination percentage.

**Electrical conductivity (EC):** The electrical conductivity of the leach ate was determined according to procedures described by AOSA (1983). Four sub-samples of 50 seeds of each treatment were weighed to 0.001g, placed into plastic cups with 250 ml of distilled water, and held at  $25^{\circ}\text{C}$ . after 24 h., the electrical conductivity of the leachiest was determined using a conductivity meter. The mean values were expressed in  $\mu\text{S cm}^{-1}\text{g}^{-1}$  seed weight.

**Accelerated ageing (AA):** The seeds were kept in an ageing chamber at  $45^{\circ}\text{C}$  and 100 % relative humidity for 3 days. After ageing, the seeds were air-dried and the mean normal seedling percentage was calculated by standard germination test at  $20^{\circ}\text{C}$  (AOSA, 1983).

**Seedling Characters:** Seedling characters were assessed by measuring its radical, shoot lengths and dry matter weight. Four replicates of 50 treated seeds of each treatment were sown in transparent plastic boxes (40, 20 and 15 cm) containing clean, sterilized sand. The boxes were then watered and incubated at  $20\pm 1^{\circ}\text{C}$  for 12 days. Radical length and shoot length of each normal seedling were measured in (mm), and seedling dry matter (mg) was determined after removal of the attached seed and then dried for 24 h. at  $80^{\circ}\text{C}$  (A.O.S.A, 1983).

In addition, samples of about 50 g of air-dried seeds were chosen randomly and were fine ground for the following chemical determinations of total nitrogen percent was determined using Kjeldahl apparatus crude protein percent was calculated by multiplying the total nitrogen % by 6.25, total carbohydrates percent was evaluated according to crude oil percent was determined using Soxhlet apparatus and hexane as a solvent, Moisture percent was determined according to the methods of (A.O.A.C., 2000).

All data were statistically analyzed as completely randomized design according to Panes and Sukhatme (1985) and the differences among treatment means (storage period and package material) were compared using the test for least significant difference (L.S.D.) and T test was used for comparison among means of location as significant or not significant.

## RESULTS AND DISCUSSION

Table (2) showed significant differences among all studied traits according their storage location. The higher mean values for all traits were detected at Mallawy location, while the lowest mean values were detected at Giza location.

Table (2): Effect of location, storage period and package material on onion seed viability and seedling characters of Giza 6 variety.

Trait	Germination %	Accelerated Ageing %	Electrical Conductivity ( $\mu$ mhos)	Radical length (mm)	Shoot length (mm)	Seedling dry weight (mg)
<b>Location (L)</b>						
Giza (L1)	77.07	58.55	41.76	27.80	53.80	79.91
Mallawy (L2)	79.73	60.63	40.42	27.90	55.01	83.06
F-test 0.05	*	*	*	*	*	*
<b>Storage period (A)</b>						
After 4 months (A1)	95.87	83.17	21.71	31.96	69.37	89.46
After 8 months (A2)	86.62	71.12	31.21	30.53	64.89	85.71
After 12 months A3	76.47	58.77	39.20	27.83	54.69	81.89
After 16 months (A4)	69.32	47.02	49.00	25.16	45.23	77.58
After 20 months (A5)	63.83	37.88	64.34	23.79	37.84	72.80
L.S.D. 0.05	0.28	0.28	0.32	0.15	0.35	0.53
<b>Package (P)</b>						
Paper bag (P1)	77.98	59.17	40.88	27.71	54.27	81.31
Plastic bag (P2)	79.70	60.86	39.74	28.66	55.39	83.50
Cloth bag (P3)	77.52	58.71	42.66	27.20	53.56	79.65
L.S.D. 0.05	0.22	0.22	0.25	0.12	0.27	0.41

Table (2) showed also significant differences among studied traits of onion seed Giza 6 cv according their storage period. The standard germination % was ranged between 95.9 to 63.8%. Germination % after 4 months was the highest germination (95.9%), while germination after 20 months was the lowest one (63.83%). There were considerable decline in germination after accelerated ageing (AA) of onion seed Giza 6 variety. The accelerated ageing germination was ranged from 83.2 to 37.9%, the highest germination percentage was obtained after 4 months (83.2%) and the lowest one (37.9) was realized after 20 months. The lowest value of electrical conductivity (21.7  $\mu$ mhos/gm seed) were recorded at the first storage period. On contrast, the highest value of Ec was recorded after storage 20 months. The tallest radical and shoot length (31.9 and 69.4 mm) respectively, were obtained at the first storage period, while the shortest length (23.8 and 37.8 mm) of radical and shoot were recorded after 20 months from storage. The results of the seedling dry weight showed the same trend.

Table (2) shows also that the effect of package material was significant for studied traits of onion seed Giza 6 cv. Germination %, AA, radical and shoot

length and seedling dry weight they reached its highest means (79.7, 60.9, 28.7, 55.4 and 83.5 respectively) when stored at plastic package. Meanwhile, these means reduced to 77.5, 58.7, 27.2, 53.6 and 79.6, respectively) when onion seed stored in cloth bags. The lowest value of Ec (39.7  $\mu\text{mhos/gm seed}$ ) was recorded when onion seed stored in plastic bags while the highest value (42.66  $\mu\text{mhos/gm seed}$ ) was detected when onion seed stored at cloth bag.

The differences between the averages were significant for all studied traits due to the interaction effect between storage period, location and package material (Table 3). All studied traits except electrical conductivity (Ec) reached of the lowest values (60.8 %, 35.2 %, 22.8 mm, 36.5 mm and 70.1 g) for germination%, AA, radical length, shoot length and seedling dry weight and the highest value of Ec (66.4  $\mu\text{mhos/gm seed}$ ) was obtained when onion seed stored for 20 months in plastic bags at Giza location, while the lowest mean value of Ec (19.47  $\mu\text{mhos/gm seed}$ ) was recorded when onion seed stored for 4 month in paper at Mallawy. Also, it gave the highest mean values of studied traits were (96.6, 83.5, 32.6, 70.3 and 91.8 for germination, AA, Ec, shoot length, radical length and seedling dry weight, respectively.

Data in Table (4) show that significant location effect existed for all traits except 1000-seed weight. Higher mean values for oil and moisture content (23.7 and 9.7 %) were detected at Giza location and higher mean values for protein and carbohydrates (22.9 and 34.6%) were detected at Mallway location.

Long term storage of onion seed from 4 up to 20 months decreased significantly protein and oil % while 1000-seed weight, moisture content and total carbohydrate were significantly increased. The highest mean values for protein and oil were 23.4 and 24.2 respectively, recorded when onion seed stored 4 months while the lowest mean values for protein and oil (22.5 and 23.3 %) obtained when onion seed stored for 20 months. On contrast, the higher 1000-seed weight, carbohydrate and moisture content (4.8, 35.8 and 9.8 %) recorded when onion seed stored for 20 months while the lowest means values (4.2 and 33.4) obtained when onion seed stored for 4 months but the lowest moisture content (9.2) was recorded when onion seed stored for one year . The increasing of 1000-seed weight may be due to the increasing of moisture content during storage periods.

Data presented in table (4) indicated that all chemical components except 1000-seed weight affected significantly due to the package kind. The higher protein and oil % (22.9 and 23.8%) were obtained when onion seed in plastic bag while the lowest protein (22.8%) and oil (23.7%) obtained when onion seed stored in paper and cloth respectively without significant differences between paper and cloth bags. The highest carbohydrates (35%) obtained by using cloth bag and the lowest mean values for carbohydrates obtained by using plastic (34.5%) and paper (34.6%) without significant differences between using paper or cloth bags. The highest lowest moisture content (9.6%) obtained by using paper bag without significant differences with plastic bag (9.6) the lowest moisture content (9.2%) recorded by using cloth bag.

Table (3): Interaction effect of storage period (A), location (L) and package (P) on seed viability and seedling characters of Giza 6 variety.

Treatment \ Trait	Germi- nation %	Accele- rated ageing %	Electrical conduc- tivity ( $\mu$ mhos)	Radical length (mm)	Shoot length (mm)	Seedling dry weight (mg)
A <sub>1</sub> L <sub>1</sub> P <sub>1</sub>	95.33	83.03	22.13	32.43	69.17	88.37
A <sub>1</sub> L <sub>1</sub> P <sub>2</sub>	95.50	83.20	21.37	32.57	70.20	90.33
A <sub>1</sub> L <sub>1</sub> P <sub>3</sub>	94.80	82.50	23.30	31.63	68.63	85.63
A <sub>1</sub> L <sub>2</sub> P <sub>1</sub>	96.37	83.27	21.53	31.50	69.33	91.00
A <sub>1</sub> L <sub>2</sub> P <sub>2</sub>	96.63	83.53	19.47	32.33	70.30	91.77
A <sub>1</sub> L <sub>2</sub> P <sub>3</sub>	96.57	83.47	22.47	31.27	68.57	89.63
A <sub>2</sub> L <sub>1</sub> P <sub>1</sub>	84.23	69.03	31.73	30.27	64.17	84.47
A <sub>2</sub> L <sub>1</sub> P <sub>2</sub>	86.23	71.03	30.93	31.27	65.00	86.47
A <sub>2</sub> L <sub>1</sub> P <sub>3</sub>	83.43	68.23	32.60	30.47	64.17	81.57
A <sub>2</sub> L <sub>2</sub> P <sub>1</sub>	87.73	72.13	30.47	30.37	65.87	87.33
A <sub>2</sub> L <sub>2</sub> P <sub>2</sub>	89.93	74.33	29.70	31.20	65.93	89.10
A <sub>2</sub> L <sub>2</sub> P <sub>3</sub>	87.57	71.97	31.83	29.63	64.20	85.33
A <sub>3</sub> L <sub>1</sub> P <sub>1</sub>	75.13	56.93	39.63	27.63	53.73	79.33
A <sub>3</sub> L <sub>1</sub> P <sub>2</sub>	76.83	58.63	38.50	28.37	54.97	81.50
A <sub>3</sub> L <sub>1</sub> P <sub>3</sub>	74.20	56.00	41.50	27.33	53.77	79.37
A <sub>3</sub> L <sub>2</sub> P <sub>1</sub>	76.50	59.30	38.00	27.37	55.37	83.37
A <sub>3</sub> L <sub>2</sub> P <sub>2</sub>	80.60	63.40	37.53	29.67	56.03	86.37
A <sub>3</sub> L <sub>2</sub> P <sub>3</sub>	75.53	58.33	40.03	26.60	54.27	81.43
A <sub>4</sub> L <sub>1</sub> P <sub>1</sub>	67.60	46.30	49.50	24.73	43.57	75.53
A <sub>4</sub> L <sub>1</sub> P <sub>2</sub>	69.80	48.50	48.27	25.73	44.87	76.97
A <sub>4</sub> L <sub>1</sub> P <sub>3</sub>	68.03	46.73	52.73	24.27	43.17	75.40
A <sub>4</sub> L <sub>2</sub> P <sub>1</sub>	70.20	46.90	47.77	25.27	46.30	78.47
A <sub>4</sub> L <sub>2</sub> P <sub>2</sub>	70.80	47.50	46.23	26.33	48.60	81.70
A <sub>4</sub> L <sub>2</sub> P <sub>3</sub>	69.47	46.17	49.50	24.63	44.90	77.40
A <sub>5</sub> L <sub>1</sub> P <sub>1</sub>	61.57	35.97	64.77	23.23	36.93	70.83
A <sub>5</sub> L <sub>1</sub> P <sub>2</sub>	62.50	36.90	63.00	24.27	38.13	72.77
A <sub>5</sub> L <sub>1</sub> P <sub>3</sub>	60.83	35.23	66.43	22.83	36.50	70.13
A <sub>5</sub> L <sub>2</sub> P <sub>1</sub>	65.13	38.83	63.23	24.27	38.23	74.37
A <sub>5</sub> L <sub>2</sub> P <sub>2</sub>	68.13	41.83	62.40	24.83	39.87	78.07
A <sub>5</sub> L <sub>2</sub> P <sub>3</sub>	64.80	38.50	66.20	23.30	37.40	70.63
L.S.D. 0.05%	0.70	0.70	0.78	0.38	0.86	1.30

A<sub>1</sub>, A<sub>2</sub>, A<sub>3</sub>, A<sub>4</sub> and A<sub>5</sub> denote storage periods of 4, 8, 12, 16 and 20 months respectively.

L<sub>1</sub> and L<sub>2</sub> denote location of Giza and Mallawy respectively.

P<sub>1</sub>, P<sub>2</sub> and P<sub>3</sub> denote package material cloth bag, paper bag and plastic bag respectively.

**Table (4): Effect of location, storage period and package material on 1000-Seed weight and some chemical composition of Giza 6 variety.**

Trait \ Treatment	1000-Seed weight (gm)	Protein %	Oil %	Total Carbohydrates %	Moisture %
<b>Location</b>					
Giza	4.51	22.77	23.72	34.55	9.66
Mallawy	4.41	22.90	23.67	34.86	9.27
F-test. 0.05	n.s	*	*	*	*
<b>Storage period (A)</b>					
After 4 months A1	4.24	23.35	24.15	33.35	9.45
After 8 months A2	4.29	22.95	23.89	34.29	9.37
After 12 months A3	4.37	22.76	23.68	35.08	9.18
After 16 months A4	4.60	22.64	23.44	35.07	9.75
After 20 months A5	4.80	22.48	23.31	35.75	9.57
L.S.D. 0.05	0.22	0.03	0.03	0.23	0.22
<b>Package</b>					
Paper bag	4.40	22.81	23.66	34.60	9.62
Plastic bag	4.53	22.88	23.75	34.46	9.60
Cloth bag	4.45	22.82	23.66	35.05	9.17
L.S.D. 0.05	n.s	0.02	0.02	0.18	0.18

All traits under study were significantly differences due to the interaction effect between location, storage period and packages (Table 5). The heaviest 1000-seed weight (5.8 g) was recorded when onion seed stored for 20 months in paper bag at Giza location, while the lowest weight of 1000-seed (4.2 g) obtained when onion seed stored for 4 month in cloth bag at Giza location. The highest mean values for protein and oil (23.5 and 24.2) recorded when onion seed stored for 8 months in paper bag at Giza location on contrast the lowest mean value for protein (22.3 %) obtained when using cloth bag to storage seed for 20 month at Giza location, while the lowest mean value for oil (23.2%) recorded when onion seed stored for 20 months at plastic bag at Mallawy location. Concerning total carbohydrate the higher mean value was 36.2% obtained by using cloth bag to storage onion seed for 10 months at Giza or cloth bag to storage for 20 months at Mallawy location. While the lowest carbohydrate % recorded when onion seed stored for 4 month in cloth bag at Giza location. The highest moisture % (10.7) obtained when onion seed stored for 16 month in cloth bag at Giza location. The lowest moisture content (9%) recorded when using plastic bag to storage onion seed for 8 months at Mallawy location.

**Table (5): Interaction effect of storage period (A), location (L) and package (P) on 1000-seed weight and some chemical composition of Giza 6 onion**

Trait Treatment	1000-seed weight (g)	Protein %	Oil %	Total Carbohydrates %	Moisture %
A <sub>1</sub> L <sub>1</sub> P <sub>1</sub>	4.17	23.25	24.15	33.17	9.73
A <sub>1</sub> L <sub>1</sub> P <sub>2</sub>	4.21	23.46	24.20	33.18	9.46
A <sub>1</sub> L <sub>1</sub> P <sub>3</sub>	4.31	23.18	24.11	33.42	9.59
A <sub>1</sub> L <sub>2</sub> P <sub>1</sub>	4.27	23.44	24.17	33.31	9.39
A <sub>1</sub> L <sub>2</sub> P <sub>2</sub>	4.26	23.44	24.20	33.21	9.44
A <sub>1</sub> L <sub>2</sub> P <sub>3</sub>	4.25	23.34	24.09	33.80	9.07
A <sub>2</sub> L <sub>1</sub> P <sub>1</sub>	4.25	22.92	23.90	33.83	9.85
A <sub>2</sub> L <sub>1</sub> P <sub>2</sub>	4.24	23.00	24.01	33.80	9.69
A <sub>2</sub> L <sub>1</sub> P <sub>3</sub>	4.37	22.85	23.84	34.62	9.19
A <sub>2</sub> L <sub>2</sub> P <sub>1</sub>	4.32	22.95	23.85	34.45	9.25
A <sub>2</sub> L <sub>2</sub> P <sub>2</sub>	4.30	23.12	23.93	34.22	9.22
A <sub>2</sub> L <sub>2</sub> P <sub>3</sub>	4.25	22.88	23.80	34.80	9.02
A <sub>3</sub> L <sub>1</sub> P <sub>1</sub>	4.31	22.62	23.72	35.00	9.36
A <sub>3</sub> L <sub>1</sub> P <sub>2</sub>	4.39	22.67	23.82	35.00	9.21
A <sub>3</sub> L <sub>1</sub> P <sub>3</sub>	4.48	22.75	23.69	36.22	8.04
A <sub>3</sub> L <sub>2</sub> P <sub>1</sub>	4.41	22.85	23.66	34.77	9.43
A <sub>3</sub> L <sub>2</sub> P <sub>2</sub>	4.37	22.85	23.66	34.37	9.82
A <sub>3</sub> L <sub>2</sub> P <sub>3</sub>	4.28	22.82	23.54	35.10	9.24
A <sub>4</sub> L <sub>1</sub> P <sub>1</sub>	4.63	22.45	23.20	34.57	10.68
A <sub>4</sub> L <sub>1</sub> P <sub>2</sub>	4.68	22.58	23.50	34.30	10.52
A <sub>4</sub> L <sub>1</sub> P <sub>3</sub>	4.58	22.64	23.56	34.63	10.07
A <sub>4</sub> L <sub>2</sub> P <sub>1</sub>	4.45	22.71	23.48	35.55	9.16
A <sub>4</sub> L <sub>2</sub> P <sub>2</sub>	4.56	22.73	23.44	35.71	9.02
A <sub>4</sub> L <sub>2</sub> P <sub>3</sub>	4.69	22.72	23.44	35.63	9.11
A <sub>5</sub> L <sub>1</sub> P <sub>1</sub>	4.68	22.30	23.32	35.37	10.12
A <sub>5</sub> L <sub>1</sub> P <sub>2</sub>	5.77	22.42	23.43	35.03	10.21
A <sub>5</sub> L <sub>1</sub> P <sub>3</sub>	4.56	22.45	23.38	36.07	9.21
A <sub>5</sub> L <sub>2</sub> P <sub>1</sub>	4.49	22.60	23.20	36.03	9.27
A <sub>5</sub> L <sub>2</sub> P <sub>2</sub>	4.59	22.55	23.34	35.77	9.44
A <sub>5</sub> L <sub>2</sub> P <sub>3</sub>	4.72	22.55	23.18	36.22	9.15
<b>L.S.D.0.05%</b>	<b>0.54</b>	<b>0.07</b>	<b>0.07</b>	<b>0.57</b>	<b>0.56</b>

A<sub>1</sub>, A<sub>2</sub>, A<sub>3</sub>, A<sub>4</sub> and A<sub>5</sub> denote storing periods of 4, 8, 12, 16 and 20 months respectively.

L<sub>1</sub> and L<sub>2</sub> denote location of Giza and Mallawy, respectively.

P<sub>1</sub>, P<sub>2</sub> and P<sub>3</sub> denote package material, i.e. cloth bag, paper bag and plastic bag respectively

Table (6) indicated that significant differences were observed amongst all studied traits due to location effect, the higher mean values for germination % (89.5), AA (67.7) and shoot length (53.9) were detected at Kalubia while, the higher mean values for radical length (30.1) seedling dry weight (84.2) and Ec (43.6) were detected at Sakha location.

**Table (6): Effect of location, storage period and package material on onion seed viability and seedling characters of Giza 20 .**

Trait	Germination %	Accelerated Ageing %	Electrical Conductivity (μ mhos)	Radical length (mm)	Shoot length (mm)	Seedling dry weight (mg)
<b>Location</b>						
Kaluobia	89.48	67.72	41.65	29.18	53.95	83.43
Sakaha	79.03	61.60	43.63	30.06	52.74	84.22
<b>F-test 0.05</b>	*	*	*	*	*	*
<b>Storage period (A)</b>						
After 4 months (A1)	96.07	84.27	23.09	33.43	71.17	91.18
After 8 months (A2)	90.54	78.14	31.58	32.22	62.87	88.04
After 12 months A3	82.34	65.44	40.12	29.77	51.19	83.96
After 16 months (A4)	75.35	54.95	51.74	28.03	42.79	79.70
After 20 months (A5)	64.47	40.48	66.67	24.65	38.71	76.29
<b>L.S.D. 0.05</b>	<b>1.23</b>	<b>1.23</b>	<b>0.46</b>	<b>0.21</b>	<b>0.30</b>	<b>0.67</b>
<b>Package</b>						
Paper bag	81.49	64.40	42.68	29.47	53.03	83.86
Plastic bag	83.48	66.39	41.41	30.23	54.42	85.16
Cloth bag	80.29	63.18	43.82	29.16	52.59	82.46
<b>L.S.D. 0.05</b>	<b>0.96</b>	<b>0.95</b>	<b>0.35</b>	<b>0.16</b>	<b>0.52</b>	<b>0.52</b>

The results of germination % indicated that the mean of the initial value at the beginning of the room temperature storage was 96.07% after 4 months storage. The germination % was continuously decreased through the storage periods being 64.5% after 20 months of the storage. The reduction in seed germination was about 32 % within 20 months of storage concerning of AA, the highest mean values was 84.3 after 4 months of storage and after 20 months become 40.5%. Regarding Ec reading, it was clear that the best mean values was 23.1 (μmhos/gm seed) recorded after 4 months of storage and it became 66.7(μmhos/gm seed) after 20 months of storage.

Data in table (6) show that seedling characteristics (radical, shoot length and seedling dry weight) were significantly affected by increasing the period of storage. The highest mean values were obtained after 4 months of storage. While the lowest mean values of seedling characteristics were detected after 20 months of storage.

The differences between the averages were significant for all studied traits due to the kind package material (Table 6).

Storing onion seed Giza 20 cv in plastic bag gave the highest mean values for germination % (83.5), AA (66.4 %), radical length (30.2 mm), shoot length (54.4mm), seedling dry weight (85.2 mg) and the best mean value of Ec (41.4 μmhos/gm seed), Meanwhile using cloth bag gave the lowest mean values of these traits and the worth value of Ec (43.8 μmhos/gm seed).

Table (7) shows that the effects of interaction among location, storage period and package materials were significant in all studied traits. The highest mean values for all studied traits were detected when onion seed stored for 4 months in paper bag at Kalubia location while, the lowest mean values were obtained when onion seed stored for 20 months in plastic bag at Sakha location. The reduction in germination, AA, radical length, shoot and seedling dry weight were 39.4, 60.1, 31.3, 47.8 and 22.4% respectively, when onion seed stored for 20 months in plastic bag at Sakha location. The best mean value of Ec (20.97  $\mu$ mhos/gm seed) obtained when onion seed stored for 4 months in paper bag at Kalubia location.

**Table (7): Interaction effect of storage period (A), location (L) and package (P) on onion seed viability and seedling characters of Giza 20 variety.**

Trait Treatment	Germination %	Accelerated ageing %	Electrical conductivity ( $\mu$ mhos)	Radical length (mm)	Shoot length (mm)	Seedling dry weight (mg)
A <sub>1</sub> L <sub>1</sub> P <sub>1</sub>	97.30	85.70	22.33	33.40	70.30	90.97
A <sub>1</sub> L <sub>1</sub> P <sub>2</sub>	97.63	86.03	20.97	34.20	71.53	93.53
A <sub>1</sub> L <sub>1</sub> P <sub>3</sub>	96.77	85.17	23.10	33.10	71.50	90.70
A <sub>1</sub> L <sub>2</sub> P <sub>1</sub>	95.20	83.20	24.40	32.53	70.90	90.37
A <sub>1</sub> L <sub>2</sub> P <sub>2</sub>	95.63	83.63	23.47	33.77	72.40	91.63
A <sub>1</sub> L <sub>2</sub> P <sub>3</sub>	93.90	81.90	24.27	33.47	70.37	90.00
A <sub>2</sub> L <sub>1</sub> P <sub>1</sub>	90.13	77.83	30.87	32.43	61.27	88.93
A <sub>2</sub> L <sub>1</sub> P <sub>2</sub>	92.03	79.73	29.73	32.40	63.60	88.03
A <sub>2</sub> L <sub>1</sub> P <sub>3</sub>	89.43	77.13	31.93	31.33	64.20	86.80
A <sub>2</sub> L <sub>2</sub> P <sub>1</sub>	90.29	77.79	32.77	31.53	63.23	88.40
A <sub>2</sub> L <sub>2</sub> P <sub>2</sub>	92.00	79.50	31.00	33.27	63.53	88.57
A <sub>2</sub> L <sub>2</sub> P <sub>3</sub>	89.35	76.85	33.17	32.37	61.37	87.53
A <sub>3</sub> L <sub>1</sub> P <sub>1</sub>	86.43	69.63	39.67	28.57	51.97	81.53
A <sub>3</sub> L <sub>1</sub> P <sub>2</sub>	88.30	71.50	38.00	30.53	53.87	85.53
A <sub>3</sub> L <sub>1</sub> P <sub>3</sub>	84.80	68.00	41.20	28.57	50.63	80.63
A <sub>3</sub> L <sub>2</sub> P <sub>1</sub>	78.63	61.63	40.93	30.40	50.30	87.73
A <sub>3</sub> L <sub>2</sub> P <sub>2</sub>	80.27	63.27	39.33	30.57	51.37	84.67
A <sub>3</sub> L <sub>2</sub> P <sub>3</sub>	75.60	58.60	41.60	30.00	49.03	83.67
A <sub>4</sub> L <sub>1</sub> P <sub>1</sub>	78.83	59.03	50.33	26.60	44.50	78.40
A <sub>4</sub> L <sub>1</sub> P <sub>2</sub>	79.93	60.13	49.45	27.63	45.00	81.67
A <sub>4</sub> L <sub>1</sub> P <sub>3</sub>	78.20	58.40	52.57	26.50	42.80	77.67
A <sub>4</sub> L <sub>2</sub> P <sub>1</sub>	71.30	50.30	52.60	29.47	40.67	80.40
A <sub>4</sub> L <sub>2</sub> P <sub>2</sub>	73.17	52.17	51.50	29.63	43.17	80.57
A <sub>4</sub> L <sub>2</sub> P <sub>3</sub>	70.67	49.67	54.00	28.33	40.63	79.50
A <sub>5</sub> L <sub>1</sub> P <sub>1</sub>	67.60	44.30	64.80	24.27	39.37	75.33
A <sub>5</sub> L <sub>1</sub> P <sub>2</sub>	74.67	51.37	63.33	24.53	40.67	79.17
A <sub>5</sub> L <sub>1</sub> P <sub>3</sub>	65.07	41.77	66.43	23.50	38.10	72.60
A <sub>5</sub> L <sub>2</sub> P <sub>1</sub>	59.20	34.60	68.13	25.47	37.80	76.50
A <sub>5</sub> L <sub>2</sub> P <sub>2</sub>	61.13	36.53	67.37	25.70	39.03	78.37
A <sub>5</sub> L <sub>2</sub> P <sub>3</sub>	59.17	34.30	69.97	24.43	37.30	75.50
<b>L.S.D. 0.05%</b>	<b>3.02</b>	<b>3.02</b>	<b>1.12</b>	<b>0.51</b>	<b>0.74</b>	<b>1.65</b>

A<sub>1</sub>, A<sub>2</sub>, A<sub>3</sub>, A<sub>4</sub> and A<sub>5</sub> denote storing periods of 4, 8, 12, 16 and 20 months respectively.

L<sub>1</sub> and L<sub>2</sub> denote location of Kalubia and Sakha respectively.

P<sub>1</sub>, P<sub>2</sub> and P<sub>3</sub> denote package material, i.e. cloth bag, paper bag and plastic bag respectively.

Data presented in table (8) showed that insignificant differences between locations for all traits except protein %. The higher mean value for protein was 22.9% detected at Kalubia location while, the lowest mean value was 22.8 detected at Sakha location.

Regarding protein % and oil% of onion seed Giza 20 cv it were significantly decreased by increasing storage period from 4 months up to 20 months, on the other hand, 1000-seed weight, total carbohydrate % and moisture content were significantly increased by increasing storage period. The highest mean values for protein (23.4%) and oil (21.3%) were obtained after 4 months of storage while the lowest mean values were 22.5% and 20.3% respectively, recorded after 20 months of storage under room conduction. The highest mean values for 1000-seed weight (4.7g), total carbohydrate (37.7%) and moisture content (10.5%) were detected after 20 months of storage while, the lowest mean values (4.0, 35.9 and 9.4) respectively, were obtained after 4 months of storage.

**Table (8): Effect of location, storage period and package material on 1000-Seed weight and chemical composition Giza 20**

Trait \ Treatment	1000-Seed weight (gm)	Protein %	Oil %	Total Carbohydrates %	Moisture %
<b>Location</b>					
Kaluobia	4.43	22.84	20.78	36.87	10.01
Sakha	4.44	22.88	20.76	36.80	10.05
F-test 0.05	n.s	0.02	n.s	n.s	n.s
<b>Storage period (A)</b>					
After 4 months A1	4.02	23.37	21.28	35.92	9.41
After 8 months A2	4.21	23.17	21.01	36.50	9.62
After 12 months A3	4.53	22.75	20.72	37.03	10.0
After 16 months A4	4.67	22.55	20.50	37.07	10.58
After 20 months A5	4.73	22.47	20.33	37.66	10.54
L.S.D. 0.05	0.09	0.03	0.05	0.17	0.17
<b>Package</b>					
Paper bag	4.59	22.85	20.75	36.82	10.06
Plastic bag	4.36	22.90	20.87	36.72	10.01
Cloth bag	4.36	22.83	20.68	36.97	10.02
L.S.D. 0.05	0.07	0.02	0.04	0.13	n.s

Table (8) shows that the kind of package martial was significantly affected in all studied chemical component except moisture content. The heavier 1000-seed weight (4.6 g) obtained when using paper bag to storage onion seed while, the lightest mean values (4.4 g) recorded when using plastic or cloth bags. The highest mean values of protein (22.9%) and oil (20.9%) were obtained when using plastic bags for storage onion seed while, the lowest mean values (22.8% and 20.7%) respectively, detected when using cloth bag for storage onion seeds. Total carbohydrate % was 36.9 when using cloth bag for storage onion seed but it decreased to 36.8% when using paper bags for storage onion seed without significant differences between using paper and plastic bags.

Table (9) shows that the heavier 1000-seed weight (5.0 g) was obtained when using cloth bag to storage onion seed for 20 months at Kalubia location, while the lightest mean value (4.1 g) recorded when using plastic bag to storage onion seed for 4 months at Sakha or 8 months at Kalubia location.

Table (9): Interaction effect of storage period (A), location (L) and package (P) on 1000-seed weight and some chemical composition of Giza 20 onion.

Treatments	1000-seed weight (g)	Protein %	Oil %	Total carbohydrates %	Moisture %
A <sub>1</sub> L <sub>1</sub> P <sub>1</sub>	4.23	23.32	21.16	35.77	9.75
A <sub>1</sub> L <sub>1</sub> P <sub>2</sub>	4.17	23.37	21.28	36.25	9.11
A <sub>1</sub> L <sub>1</sub> P <sub>3</sub>	4.11	23.30	21.14	35.70	9.85
A <sub>1</sub> L <sub>2</sub> P <sub>1</sub>	4.42	23.38	21.40	35.78	9.30
A <sub>1</sub> L <sub>2</sub> P <sub>2</sub>	4.20	23.44	21.52	36.27	8.78
A <sub>1</sub> L <sub>2</sub> P <sub>3</sub>	4.08	23.41	21.19	35.73	9.68
A <sub>2</sub> L <sub>1</sub> P <sub>1</sub>	4.20	23.09	21.03	36.38	9.80
A <sub>2</sub> L <sub>1</sub> P <sub>2</sub>	4.11	23.17	21.16	36.08	9.88
A <sub>2</sub> L <sub>1</sub> P <sub>3</sub>	4.08	23.15	20.96	36.40	9.79
A <sub>2</sub> L <sub>2</sub> P <sub>1</sub>	4.55	23.22	20.83	36.63	9.62
A <sub>2</sub> L <sub>2</sub> P <sub>2</sub>	4.17	23.27	21.26	36.55	9.22
A <sub>2</sub> L <sub>2</sub> P <sub>3</sub>	4.13	23.14	20.82	36.93	9.41
A <sub>3</sub> L <sub>1</sub> P <sub>1</sub>	4.56	22.72	20.78	37.15	9.85
A <sub>3</sub> L <sub>1</sub> P <sub>2</sub>	4.25	22.85	20.94	36.66	10.05
A <sub>3</sub> L <sub>1</sub> P <sub>3</sub>	4.22	22.75	20.71	37.45	9.59
A <sub>3</sub> L <sub>2</sub> P <sub>1</sub>	4.56	22.79	20.65	36.80	10.25
A <sub>3</sub> L <sub>2</sub> P <sub>2</sub>	4.25	22.72	20.70	36.93	10.15
A <sub>3</sub> L <sub>2</sub> P <sub>3</sub>	4.26	22.64	20.56	37.22	10.08
A <sub>4</sub> L <sub>1</sub> P <sub>1</sub>	4.92	22.49	20.54	37.30	10.37
A <sub>4</sub> L <sub>1</sub> P <sub>2</sub>	4.51	22.48	20.59	37.07	10.56
A <sub>4</sub> L <sub>1</sub> P <sub>3</sub>	4.68	22.44	20.43	37.33	10.50
A <sub>4</sub> L <sub>2</sub> P <sub>1</sub>	4.64	22.55	20.46	36.76	10.94
A <sub>4</sub> L <sub>2</sub> P <sub>2</sub>	4.57	22.70	20.54	36.98	10.48
A <sub>4</sub> L <sub>2</sub> P <sub>3</sub>	4.69	22.65	20.42	36.97	10.66
A <sub>5</sub> L <sub>1</sub> P <sub>1</sub>	5.03	22.47	20.30	37.86	10.37
A <sub>5</sub> L <sub>1</sub> P <sub>2</sub>	4.62	22.52	20.37	37.45	10.66
A <sub>5</sub> L <sub>1</sub> P <sub>3</sub>	4.77	22.48	20.26	38.17	10.10
A <sub>5</sub> L <sub>2</sub> P <sub>1</sub>	4.763	22.50	20.37	37.75	10.38
A <sub>5</sub> L <sub>2</sub> P <sub>2</sub>	4.70	22.49	20.40	36.94	11.18
A <sub>5</sub> L <sub>2</sub> P <sub>3</sub>	4.57	22.35	20.29	37.80	10.56
L.S.D. 0.05%	0.22	0.07	0.12	0.42	0.41

A<sub>1</sub>, A<sub>2</sub>, A<sub>3</sub>, A<sub>4</sub> and A<sub>5</sub> denote storing periods of 4, 8, 12, 16 and 20 months respectively.

L<sub>1</sub> and L<sub>2</sub> denote location of Kaluobia and Sakah respectively.

P<sub>1</sub>, P<sub>2</sub> and P<sub>3</sub> denote package material, i.e. cloth bag, paper bag and plastic bag respectively

Regarding protein and oil percentage, it is clear that the highest mean values (23.4 and 21.5%) respectively, were detected when onion seed stored for 4 months in paper bags at Sakha location. Meanwhile the highest mean value for total carbohydrate (38.2 %) was obtained when onion seed stored for 20 months in plastic bag at Kalubia location. The highest mean value for moisture content

was 10.9% detected when onion seed stored for 16 months in cloth bag at Sakha location Table (9).

In conclusion, onion seed may be stored under room temperature condition at their production locations for 20 months in paper bag (for Giza 6) or plastic bag (for Giza 20) with expecting loss in their germination % about 37 to 40 %.

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تأثير مناطق و فترات التخزين ونوع العبوة على الحيوية و بعض المكونات الكميائية لتقاوى البصل.

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أقيمت هذه التجربة بهدف دراسة تأثير مناطق و فترات التخزين ونوع العبوة على الحيوية و المكونات الكميائية لتقاوى البصل من الصنفين جيزة ٦ وجيزة ٢٠. حيث تم تخزين كل صنف لمدد زمنية هي ٤، ٨، ١٢، ١٦، ٢٠ شهرا تحت ظروف الغرفة العادية فى مناطق انتاجه (الوجه القبلى للصنف جيزة ٦ فى الجيزة وملوى والوجه البحرى للصنف جيزة ٢٠ فى القليوبية وسخا) وذلك فى ثلاث أنواع من العبوات هي أكياس من الورق والبلاستيك والقماش. أوضحت النتائج أن تخزين تقاوى الصنف جيزة ٦ ظروف الغرفة العادية بمنطقة الجيزة لمدة ٢٠ شهرا فى عبوات من الورق أدى الى انخفاض معنوى فى حيويتها المتمثلة فى نسب الإنبات تحت الظروف المثلى الموصى بها وتحت ظروف اختبار التدهور ودرجة التوصيل الكهربى لمنقوع البذرة فى الماء المقطر وقوة نمو البادرات المتمثلة فى طول الجذير والريشة والوزن الجاف وكانت نسب الإنخفاض كما يلى: ٣٠، ٤٨، ٣٧، ٥٦، ٧٠% على الترتيب. بينما كانت نسب الإنخفاض فى هذه القراءات للصنف جيزة ٢٠ عند تخزينها فى عبوات من البلاستيك تحت ظروف الغرفة بمنطقة سخا كما يلى: ٣٩، ٦٠، ٧١، ٣١، ٤٨، ٢٢% على الترتيب. وأدت زيادة مدة التخزين من ٤ الى ٢٠ شهرا الى إنخفاض نسب البروتين والزيت معنويا بينما زاد معنويا وزن ١٠٠٠- بذرة ومحتوى البذرة من الرطوبة ونسبة الكربوهيدرات الكلية لكلا الصنفين.

وتوصى الدراسة بإمكانية تخزين تقاوى البصل من الصنفين جيزة ٦ وجيزة ٢٠ على درجة حرارة الغرفة بمناطق انتاجهم فى عبوات من الورق او البلاستيك لمدة تصل الى ٢٠ شهرا مع الأخذ فى الإعتبار إمكانية إنخفاض نسبة الأنبات حوالى ٤٠%.