

EFFECT OF STORAGE METHODS AND PERIODS ON GERMINATION OF ONION SEED

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ABSTRACT

Two laboratory experiments were conducted at Gemmeiza Agriculture Research Station (Gharbeia Governorate) to study the effect of both storage and methods of storage on viability of onion seed during the period from August 2006 to August 2008. Randomize Complete Blocks Design with three replications was used.

The results clearly showed that :

- 1- There was a progressive decline in germination percentage with each increase in the storage period. The decline in germination percentage after 12 months was 10.36 % and 21.42 % after 24 months. Seed germination percentage was markedly affected by methods of storage. Utilizing of polyethylene bags under Frigidaire at 5-8 °C or freezing resulted in higher seed germination percentage. There was a significant interaction effect of period and method of storage. The higher percentage of germination was observed under the treatment of storage period for 4 months in paper bags without and additions under normal room conditions.
- 2- Germination rate (days) was markedly affected by storage period, but differences between treatments were not always significant. There are a progressive increase in number of days to complete germination with each increase in storage period. Germination rate was significantly affected by storage method. The fastest rates of germination were observed with storage of onion seed in polyethylene in normal room conditions.
- 3- Seedling length was markedly affected by storage period. Storage at 4 and 8 months were associated with highest length of seedlings i.e . 3.85 and 3.84 cm), respectively. Seedling length was markedly affected by storage method. The maximum seed length (3.84 cm) was observed with storage of seed in polyethylene bags without any additions under normal room conditions

It can be concluded that storage onion seed for four months in paper bags in normal room conditions followed by burlap bags in normal room conditions gave the best results in germination percentage and other seedling parameters.

INTRODUCTION

Onion is biennial crop, in the first growing season, bulbs are formed, but in the second season, bulbs are utilized to produce seeds.

In Egypt, onion seed is more adequate in some years and inadequate in another. Farmers, almost need to store onion seeds from adequate to inadequate years.

The main objective of this work is to study the effect of different methods of store onion seed one year to another and its effect on viability of seed.

Onion growers have believe that onion seeds have a very short storage life, losing their viability within two years. Several workers recommended that the importance of storage period and methods of storage

on onion seed viability measured as germination percentage, germination rate and seedling length. In India, Doijode (1988) reported that no germination was recorded after 30 months, after 18 months the vacuum packed and paper bags onion seeds gave 54 and 27 % germination percentage, respectively. Singh and Singh (1990) added that germination of seeds stored in polyethylene pouches decreased 21 months after storage and there was no advantage in the use of more than 1 layer of polyethylene. Another author, Doijode (1990) showed that germination percentage was highest (> 80 %) in seeds stored at -18 °C after 5 years. While, none of the seeds stored under ambient conditions (16-35 °C) germinated. In India, Vijayakumar et al. (1991) showed that percentage of germination determined at bimonthly intervals, decreased with increasing period of storage irrespective of type of container and chemical treatment. In untreated seeds stored in cloth bags, the percentage of germination (77 % initially) was reduced to 35 % after 10 months. Shelar et al. (1992) and Currah and Msika (1994) added that percentage of germination was maintained above 70 % after 360 days. Storage in the 2 moisture – impermeable containers, i.e. the plastic bags and the aluminum foil packets, whereas > 70 % germination was only maintained for 300 days in cloth bags and paper bags. Doijode (1995) in India, showed that percentage of germination was lower in seeds stored at 5 °C than in those at -20 °C. However, germination was greater in seeds stored in glass or aluminum foil laminated pouches than in polyethylene or paper bags at 5 °C. High seed germinability was retained during storage at -20 °C in aluminum foil laminated pouches, glass or the polyethylene bags. Dong et al. (1998) and Pamda and Reddy (2000) showed that significant differences in seed germination and viability were observed between different moisture levels and containers. i.e. different storage method influenced seed viability, higher seed viability was observed after cold temperature storage. Another author, Yin-Yanping et al. (1999) reported that storage temperature had a greater effect on seed vigour than container types, and the effect of the latter was subjected to the storage temperature. When the seeds were stored in the same type of container several indices of the seed vigour declined as the storage temperature increased.

MATERIALS AND METHODS

Two laboratory experiments were conducted at Gemmeiza Agriculture Research Station Gharbeia Governorate to study the effect of 24 months period and methods storage on viability of onion seed during the period from August 2006 to August 2008.

Onion seed cultivar used was Giza 20 which obtained from Onion Research Section, ARC, Egypt. Samples of 200 g was used for every method of storage. Storage period of 24 months was classified into six periods i.e. every 4 months the seed was examined for germination percentage, germination rate (days) and seedling length (cm).

• **Seed storage methods were:**

1. Storage in polyethylene bags without any additions in normal room conditions. (Poly. N.)
2. Storage in polyethylene bags without any additions in Frigidaire 5-8 °C. (Poly. F.)
3. Storage in polyethylene bags without any additions under freezing. (Poly.Fre.)
4. Storage in polyethylene bags mixing with 5 % calcium chloride under normal room conditions. (Poly . CA.)
5. Storage in polyethylene bags mixing with 10 % fire dust under normal room conditions. (Poly.D.)
6. Storage in burlap bags without any addition under normal room conditions. (Bur. N.)
7. Storage in burlap bags mixing with 5 % calcium chloride under normal room conditions. (Bur. CA.)
8. Storage in burlap bags mixing with 10 % fire dust under normal room conditions. (Bur. D.)
9. Storage in paper bags without any addition under normal room conditions. (Paper. N.)
10. Storage in paper bags mixing with 5 % calcium chloride under normal room conditions. (Paper. CA.)
11. Storage in paper bags mixing with 10 % fire dust under normal room conditions. (Paper. D.)

Giza 20 onion seed were obtained from Onion Research Section, Field Crop Research Institute was used in this study.

Randomize Complete Blocks Design with three replications was used. Each replicate include 11 treatments. Each treatment was 200 g onion seed. Store seed were examined every four months and the following data were recorded:

1- Germination percentage:

It was measured according to ISTA (1985) recommendations, seeds were germinated between two filter paper at 7, 9 and 12 days from beginning of germination test, then the following equation was used:

$$\text{Germination \%} = \frac{\text{Number of normal seedlings after 12 days}}{\text{Initial number of seeds}} \times 100$$

2- Rate of germination:

It was measured according to Bartlett (1937) :

$$\text{Germination rate} = \frac{A_1T_1 + A_2T_2 + A_3T_3 + \dots + A_nT_n}{A_1 + A_2 + A_3 + \dots + A_n}$$

• Where:

A_1 = Number of seedling at the first count.

A_n = Number of seedling at the last count.

T_1 = Number of days to the first count.

T_n = Number of days to the last count.

3- Seedling length (cm): It was measured at 10 days after start of germination test.

RESULTS AND DISCUSSION

1- Germination percentage

There was a progressive decline in germination percentage of onion seed with each increase in the period of storage during 24 months. In the first year, the decline in percentage of germination was about 10.36 %. Whereas, increasing the period of storage to 24 months resulted in a sharp decline in seed germination percentage (21.42 %). These results are very important from economic view, so farmers which believe that storage onion seed to one year lost its viability. This believe is not always correct, specially when seed are good quality. The progressive decline in seed germination during the storage period of 24 months may be attributed to the metabolic processes in seeds and growth of fungous during storage. These results are in accordance with those obtained by Doijode (1988), Singh and Singh (1990) and Vijayakumar *et al.* (1991).

Storage of onion seed in polyethylene bags without and addition and keep it in Frigidaire at 5-8 °C or freezing resulted in higher seed germination percentage (80.22 and 80.94 %), respectively. The least germination percentage (66.67 %) was recorded with storage of seed in burlap bags mixing by fire dust in normal conditions. These results are in confidence with those of Doijode (1988), Thamozeili *et al.* (1990) and Vijayakumar *et al.* (1991).

There was a significant interaction effect of period and method of storage as shown in Table (2). The higher percentage of germination was observed under the treatment of storage period for 4 months in paper bags without and additions under normal room conditions. The least percentages of germination was recorded under the treatment including storage period of 24 months in burlap without any additions and burlap mixing by fire dust. Singh and Singh (1990), Shelar *et al.* (1992) came to the same conclusion.

2- Germination rate (days):

There are a progressive increase in number of days to complete germination with each increase in storage period. So, the maximum number of days to full germination was observed after storage period of 24 months, whereas the faster germination was observed with storage period of 4 months. These results may be attributed to the effect of length of storage period on initial metabolic processes in seed. These results are in agreement with those obtained by Singh and Singh (1990) and Thamozeili *et al.* (1990).

Regarding to the effect of method of storage on germination rate, it evident from Table (1) that germination rate was significantly affected by storage method. The fastest rates of germination were observed with storage of onion seed in polyethylene in normal room conditions followed by polyethylene under freezing. These results may be attributed to good aeration with using of polyethylene bags. These results are in accordance with those

obtained by Singh and Singh (1990), Thamozeili *et al.* (1990) and Vijayakumar *et al.* (1991).

3- Seedling length (cm):

Seedling vigour is measured as seedling length (cm). It is evident from Table (1) that seedling length was markedly affected by storage period. Storage of 4 and 8 months were associated with highest length of seedlings (3.85 and 3.84 cm), respectively. The least length of seedling was observed with storage onion seed for 24 months. These results are in harmony with those obtained by Vijayakumar *et al.* (1991) and Dourado and Carson (1994).

Seedling length was markedly affected by storage method as shown in Table (1). The maximum seed length (3.84 cm) was observed with storage of seed in polyethylene bags without any additions under normal room conditions, whereas the minimum seedling length (3.64 cm) was associated with storage of seed in burlap bags with 5 % calcium chloride in normal room condition. These results are in harmony with those obtained by Singh and Singh (1990), Thamozeili *et al.* (1990) and Vijayakumar *et al.* (1991).

Table 1: Average germination percentage, germination rate (days) and seedling length (cm) as affected by period and methods of storage.

Characters Treatments	Germination %	Germination rate(days)	Seedling length (cm)
A: Storage period.			
S1 (4 months)	86.27	6.01	3.85
S2 (8 months)	80.18	6.14	3.84
S3 (12 months)	75.79	6.29	3.79
S4 (16 months)	71.45	6.40	3.74
S5 (20 months)	67.48	6.49	3.68
S6 (24 months)	64.85	6.70	3.65
F. test	*	*	*
B LSD	2.61	0.29	0.19
B: Method of storage.			
Poly. N.	76.60	6.10	3.84
Poly. F.	80.22	6.38	3.82
Poly. Fre.	80.94	6.12	3.81
Poly. CA.	76.50	6.18	3.80
Poly. D.	78.06	6.18	3.81
Bur. N.	68.56	6.70	3.66
Bur. CA.	68.00	6.50	3.64
Bur. D.	66.67	6.50	3.69
Paper. N.	74.50	6.22	3.77
Paper. CA.	73.83	6.40	3.73
Paper. D.	73.83	6.43	3.79
F. test	*	*	*
B LSD	1.93	0.22	0.15
C: Interaction.			
	*	N.S.	N.S.

Table 2: Germination percentage as affected by the interaction between period and methods of storage.

Storage period	S ₁ (4 months)	S ₂ (8 months)	S ₃ (12 months)	S ₄ (16 months)	S ₅ (20 months)	S ₆ (24 months)
Method of storage						
Poly. N.	84.0	78.3	77.3	76.0	74.0	70.0
Poly. F.	87.0	83.3	81.3	78.7	76.3	74.7
Poly. Fre.	87.0	85.0	82.0	79.3	77.3	75.0
Poly. CA.	83.0	79.0	77.0	74.3	73.3	72.3
Poly. D.	83.0	79.3	78.3	77.0	76.0	74.7
Bur. N.	87.7	80.3	72.0	63.0	56.3	52.0
Bur. CA.	86.3	79.3	70.7	62.3	55.3	54.0
Bur. D.	87.0	79.7	68.3	60.7	52.3	52.0
Paper. N.	89.3	80.7	76.0	72.7	67.3	61.0
Paper. CA.	87.3	79.0	75.7	70.7	66.7	63.7
Paper. D.	87.3	78.0	75.0	71.3	67.3	64.0
F. test	*					
B LSD	1.93					

It could be concluded that storage onion seed for four months in paper bags without any additions in normal room conditions gave the best results in germination percentage and other seedling parameters.

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تأثير طرق وفترات التخزين على إنبات بذور البصل

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أجريت هذه الدراسة فى مزرعة محطة البحوث الزراعية بالجيزة محافظة الغربية وقد اشتملت على تجربتان معملتان لدراسة تأثير فترات التخزين وطرق التخزين المختلفة على حيوية بذور البصل خلال الفترة من أغسطس ٢٠٠٦ حتى أغسطس ٢٠٠٨. كانت البذور المستعملة فى الدراسة للصنف جيزة ٢٠ ولقد استخدمت عينة ٢٠٠ جرام من البذرة لكل طريقة من طرق التخزين. وكانت فترة التخزين ٢٤ شهراً أجريت خلالها اختبارات نسبة الإنبات ومعدل الإنبات (باليوم) وطول البادرة (بالسم) وذلك كل ٤ أشهر. أجريت كل تجربة فى تصميم قطاعات كاملة العشوائية وذلك فى ثلاث مكررات.

وفيما يلى ملخص لأهم النتائج:

- ١- كان هناك إنخفاضاً معنوياً فى نسبة إنبات البذور مع زيادة فترة التخزين وكان الإنخفاض فى نسبة الإنبات بعد ١٢ شهر من التخزين ١٠,٣٦ % وزاد هذا الإنخفاض إلى ٢١,٤٢ % بعد ٢٤ شهراً من التخزين. كما تأثرت تأثرت نسبة الإنبات معنوياً بطرق التخزين ولقد حقق التخزين فى عبوات بلاستيك بإستخدام تراب الفرن وفى عبوات بلاستيك بإستخدام كلوريد الكالسيوم فى جو الغرفة أعلى نسبة إنبات وكانت ٨٠,٩٤ و ٨٠,٢٢ % على الترتيب. وكان هناك تأثير معنوى للتفاعل بين فترات التخزين وطرق التخزين. ولقد سجلت أعلى نسبة إنبات بعد ٤ أشهر عند التخزين فى عبوات ورقية فى جو الغرفة.
- ٢- تأثر معدل الإنبات (باليوم) معنوياً بفترة التخزين حيث سجلت زيادة فى عدد أيام الإنبات الكامل مع زيادة فترة التخزين. كما كان هناك تأثير معنوى لطرق التخزين المختلفة على معدل الإنبات حيث سجل أسرع معدل إنبات للتخزين فى عبوات بلاستيك شفافة فى جو الغرفة حيث كانت (٦,١٠ يوم).
- ٣- تأثر طول البادرة (بالسم) معنوياً بفترة التخزين ولقد سجل التخزين بعد ٤ ، ٨ أشهر أكبر طول للبادرة حيث كانت ٣,٨٥ ، ٣,٨٤ سم على الترتيب. كما تأثر طول البادرة معنوياً بطرق التخزين حيث سجلت البذور المخزنة فى عبوات بلاستيك شفافة فى جو الغرفة أكبر طول للبادرة ٣,٨٤ سم. من ذلك يمكن إستنتاج أن فترة التخزين لمدة أربعة أشهر فى عبوات ورقية فى جو الغرفة وفى عبوات خيش فى جو الغرفة أعطت أفضل النتائج لنسبة الإنبات وطول البادرة.