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EFFECT OF CONTAINERS ON STORABILITY OF TRUE SEEDS OF ONION

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ABSTRACT
Production of true seeds of onion is a very highly technical approach. Technical information on different aspects of production of true seeds of onion is very limited in Bangladesh. Germination failure due to improper storage of true seeds of onion is one of the problems for the farmers to produce true seeds of onion. The experiment was laid out in a completely randomized design with four replications to select suitable container for storage of true seeds of onion. Five treatments viz. C_1= Tin container C_2= Polythene bag, C_3= Gunny bag, C_4= Plastic container and C_5= Earthen pot were consisted to achieve the objective. The experiment was conducted at the Department of Plant Pathology, Bangladesh Agricultural University, Mymensingh during 2011-2012. The results revealed that the percentage of germination, moisture content of seed and prevalence of seed borne fungi were significantly influenced by the different treatments. Results showed that among different containers, plastic pot is the best practice for storing of onion seed for a period of 6-7 months followed by tin container.

KEYWORD: Container, storability, true seeds, onion.

INTRODUCTION
Onion (*Allium cepa* L.) is one of the most important spice crops in Bangladesh. It was introduced into the Asian sub-continent from Palestine (MacGillivary, 1961). Onion has great economic importance due to its medicinal and dietetic values. It is widely used as condiment, salad and dressing of food. The average consumption of onion in Bangladesh is 25 g/head/day (BBS, 2010). It is grown in almost all the districts of Bangladesh; its commercial cultivation is concentrated in Faridpur, Dhaka, Rajshahi, Comilla, Mymensingh, Jessore, Rangpur and Pabna (BBS, 2010). Onion is grown in about 128745 ha of land. The annual production is 894,000 tons of onion bulbs (BBS, 2010). The demands of quality true seeds are increasing day by day. The price of true seeds is also high. The seeds available in the market are poor in quality. The total production of onion seed in Bangladesh is about 150 tons/year but the requirement is more than 900 tons (BBS, 2010). True seeds of onion are hygroscopic in nature. It can absorb moisture from air at high relative humidity and its moisture content become equilibrium to the air moisture. High moisture content of seeds encourage respiration causing raise in heat which favour storage moulds and storage pests to multiply quickly resulting deterioration of quality of stored true seeds of onion (Sharma *et al.* 2002). The farmers store seeds in various types of traditional containers such as gunny bag, dole, motka, etc. Seed stored under poor storage conditions are prone to invasion by storage fungi and infestation by storage pests. Germination failure due to improper storage of true seeds of onion is major problem for the farmers to produce true seeds of onion. Keeping all the above mentioned facts in view, the present study was undertaken to select suitable container for storage of true seeds of onion.

MATERIALS AND METHODS
The experiment was conducted at the Department of Plant Pathology, Bangladesh Agricultural University, Mymensingh during 2011-2012. The experiment was laid out in a completely randomized design (CRD) with four replications. True seed of BARI-piaj-1 were used as test material. Five types of storage container were used in this study and were considered as treatment. The treatments were such as C_1= Tin container, C_2= Polythene bag, C_3= Gunny bag, C_4= Plastic container and C_5= Earthen pot. Data on Purity analysis, % germination, % moisture and % seed borne fungi were recorded and analyzed statistically following Duncans Multiple Range Rest (DMRT).

Purity analysis
The purity analysis of seed samples were conducted following International Roles for Seed Testing (ISTA,

1996). Each sample was mixed and divided by seed divider. In each case 5 g working sample was taken. The working sample was separated into three components viz. pure seed, other seed and inert matter and the percentage of each component was calculated by weight basis.

Seed germination

Germination test was carried out in a plastic tray at the Department of Plant Pathology, Bangladesh Agricultural University, Mymensingh according to the International Rules for Seed Testing (ISTA, 1996). Sand was used as substrate for germination test. The plastic tray was filled with moist sand. Adequate moisture was maintained in the substrate. Four hundred pure seeds were taken at random from each treatment (sample). One hundred seeds were placed in each tray and were considered as a replication. There were four replications for each treatment. Number of normal seedlings, abnormal seedlings, dead seeds and ungerminated seeds were counted. The first counting was done on the 6th and the second counting on the 12th day after placing the seeds on the substrate. Germination percentage was determined by the following formula.

$$\text{Germination (\%)} = \frac{\text{Number of normal seedlings}}{\text{Number of seeds tested}} \times 100$$

Seed borne infection

Seed samples from each treatment were subjected to seed health test by Blotter incubation method following the procedure of International Rules for Seed Testing (ISTA, 1996). Three pieces of 9 cm diameter filter papers (Whatman No. 1) were soaked in distilled water and placed at the bottom of a plastic Petri dish. Four hundred seeds were taken at random from each treatment. Twenty five seeds (25) were placed on filter paper in each petri dish. Sixteen petri-dishes were used for each treatment. The petri-dishes were incubated for 7 days. Seed borne infection was recorded. Temporary slides were prepared and examined under the compound electric microscope and identified with the help of appropriate keys. The numbers of infected seeds with fungal pathogen were recorded. The results were expressed in percentage as follows:

$$\text{Seed borne infection (\%)} = \frac{\text{Number of infected seeds}}{\text{Number of seeds tested}} \times 100$$

RESULTS AND DISCUSSION

The effect of different storage containers on the germination of onion seeds are presented in Table 1. Initial germination was similar in all storage containers. The final germination tests were done after 180 days after storage (DAS). The result showed that the germination percentage decreased gradually with the increase in storage time. After 30 DAS, the highest germination (77%) was recorded in plastic container. Seed germination was the lowest (65%) in case of gunny bag. Germination was 68% in case of earthen pot. The seed stored in plastic container had 76% germination at 60 DAS as compared to 62% in case of earthen pot. The highest germination was 73% in plastic container at 90 DAS. Germination was low (49%) both in gunny bag and earthen pot at 90 DAS. Germination was the highest (69%) in plastic container at 120 DAS as compared to 45 and 46% in gunny bag and earthen pot, respectively. The highest germination was 63% in plastic container at 150 DAS. The germination was 38% in gunny bag at 150 DAS. It was identical in earthen pot. The highest germination was 59% at 180 days after storage when the seeds were stored in plastic containers. It was 51% in tin container. Polythene bag showed intermediate performance. The germination was 33% in gunny bag, 34% in earthen pot and 44% in polythene bag. Similar results were reported by many researchers (Karim, 2004; Mia *et al*., 2003; Rahman, 2002; Purushattam *et al*., 1996 and Harrington, 1972). Karim (2004) reported the highest germination (46%) at 180 days after storage when the seeds were stored in plastic containers and sealed aluminum foil bag where as the lowest germination (39%) was recorded in earthen pot. Germination was 43% in polythene bag at 180 days after storage. Shinda and Spatkki (1986) strongly supported the result of the study. They mentioned that the highest germination (51%) at 180 days after storage when the seeds were stored in plastic container.

Table 1. Effect of different storage containers on the germination of true seeds of onion at different period of storage.

Treatment	Germination (%)						
	Initial	30 DAS	60 DAS	90 DAS	120 DAS	150 DAS	180 DAS
Tin container	80	72 b	71 b	68 b	67 b	56 b	51 b
Polythene bag	80	69 c	67 c	59 c	56 c	50 c	44 c
Gunny bag	80	65 d	60 e	49 d	45 d	38 d	33 d
Plastic container	80	77 a	76 a	72 a	69 a	63 a	59 a
Earthen pot	80	68 c	62 d	49 d	46 d	39 d	34 d
LSD $_{(0.05)}$	NS	2.04	1.62	2.19	1.84	1.79	1.70
CV (%)	5.08	6.12	5.52	5.46	5.96	5.41	5.21

Means followed by the same letter in a column did not differ significantly at 5% level by DMRT. NS= Not significant. DAS= Days after storage.

The results of different storage container on moisture content of onion seeds are presented in Table 2. The moisture content of seeds influenced by different types of containers. The moisture content of seed was similar at initial stage of all the containers. The initial moisture content was 7.43-7.46%. Moisture content increased to 8.08% in gunny bag at 30 DAS, remained 7.63% in tin container, 7.51% in plastic container but 8.05% in earthen pot. The higher moisture content was 11.13% in gunny bag while 7.99% in plastic container at 60 DAS. The moisture content was 11.35% in gunny bag while 7.72% in plastic container, 8.26% in tin container, 8.58% in polythene bag and 10.85% in earthen pot at 90 DAS. Increased moisture content was 12.80% in gunny bag at 120 DAS remained 8.o4% in plastic container, 8.56% in tin container, 8.85% in polythene bag but 11.37% in earthen pot. The lower moisture content was 6.85% in plastic container, 7.27% in tin container, 7.45% in polythene bag, 10.70% in earthen pot and 11.54% in gunny bag due to intermittent sun drying at 150 DAS. The final moisture content tests were done after 180 days of storage. The lowest moisture content was7.62% in plastic container at 180 DAS. Moisture content was 8.26% in tin container, 8.61% in polythene bag and 12.42% in earthen pot at 180 DAS. The highest moisture content was 13.15% in gunny bag at 180 DAS.

Ellis and Roberts (1981) suggested that commercial onion seed may be dried to about 6.3% moisture content and sealed into moisture proof containers. They also observed that in this condition onion seed could remain viable at least three years. Mian and Fakir (1989) stated that poor storage condition is the principal cause of deterioration of seed quality. The findings of Padma and Reddy (2000) and Prolima *et al*. (2001) are in support of the present findings.

Table 2. Effect of different storage containers on the moisture content of true seeds of onion at different period of storage.

Treatment	Moisture content (%)							
	Initial	30 DAS	60 DAS	75 DAS	90 DAS	120 DAS	150 DAS	180 DAS
Tin container	7.43	7.63 b	8.10 d	7.43 d	8.26 d	8.56 d	7.27 d	8.26 d
Polythene bag	7.45	7.68 b	8.72 c	7.64 c	8.58 c	8.85 c	7.45 c	8.61 c
Gunny bag	7.46	8.08 a	11.13 a	9.64 a	11.35 a	12.80 a	11.54 a	13.15 a
Plastic container	7.43	7.51 c	7.99 e	6.98 e	7.72 e	8.04 e	6.85 e	7.62 e
Earthen pot	7.45	8.05 a	10.69 b	9.10 b	10.85 b	11.37 b	10.70 b	12.42 b
$LSD_{(0.05)}$	NS	0.08	0.08	0.09	0.12	0.14	0.18	0.12
CV (%)	5.33	5.26	5.02	5.38	5.50	5.75	6.44	6.52

Means followed by the same letter in a column did not differ significantly at 5% level by DMRT. NS= Not significant. DAS= Days after storage.

The effect of storage container on prevalence (%) of seed borne fungi of onion seeds are presented in Table 3.There were significant variations among the containers at different days after storage. The fungus population in seeds increased with the increase in storage time. The lowest population of fungi was 1.00% in plastic container at 30 DAS. The fungi population was 2.00% in both tin container and polythene bag at 30 DAS. The highest population of fungi was 3.00% in gunny bag and earthen pot at 30 DAS. At 60 DAS, the minimum population of fungi was 3.50% in plastic container and maximum 7.92% in gunny bag. Minimum fungi population was 4.33% in plastic container while 8.67% in gunny bag and 8.25% in earthen pot at 90 DAS. Similar trend was observed at 120, 150 and 180 DAS. The lowest populations of fungi (6.50%) at 180 DAS were observed when the seeds stored in plastic container. It was 7.58% in tin container. The highest fungi population (17.83%) at 180 DAS was recorded in seed samples which were stored in gunny bag. It was 16.75% in earthen pot. Several researchers (Roberts, 1972 a, 1972 b and Thompson, 1979) observed loss of viability due to fungal invasion. Huda (1992) reported that high fungal infection resulted in less germination. Karim *et al*. (2006) reported that the maximum fungal population was found at 7-10% moisture content of seeds under normal atmospheric condition in jute bag, polythene bag, unsealed metal container and earthen pot. Similar observations were documented by Mettananda (2005); Humeau *et al*. (2006) and Rao *et al*. (2006).

Table 3. Effect of different storage containers on prevalence (%) of seed borne fungi on true seeds of onion at different period of storage.

Treatment	Prevalence of seed borne fungi (%)					
	30 DAS	60 DAS	90 DAS	120 DAS	150 DAS	180 DAS
Tin container	2.00 b	4.67 c	4.92 d	5.75 bc	6.67 d	7.58 d
Polythene bag	2.00 b	4.75 c	5.50 c	6.00 b	9.00 c	10.42 c
Gunny bag	3.00 a	7.92 a	8.67 a	9.75 a	13.83 a	17.83 a

Plastic container	1.00 c	3.50 d	4.33 e	5.33 c	5.67 e	6.50 e
Earthen pot	3.00 a	7.17 b	8.25 b	9.17 a	12.50 b	16.75 b
$LSD_{(0.05)}$	0.43	0.25	0.34	0.63	0.93	0.83
CV (%)	9.15	9.24	4.77	5.75	7.99	9.58

Means followed by the same letter in a column did not differ significantly at 5% level by DMRT. DAS= Days after storage.

CONCLUSION

Based on the results of the experiment, Plastic container is the best for storing of onion seed for a period of 6-7 months.

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