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# EFFECT OF STORAGE CONTAINER ON SEED QUALITY OF JUTE AND ONION

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## Abstract

An experiment was conducted to evaluate the effect of storage containers (tin container, polythene bag and gunny bag) on the quality (Moisture content, 1000-seed weight and germination percent) of tossa jute seed for two months storage at the Plant Pathology Laboratory, Hajee Mohammad Danesh Science and Technology Universy, Dinajpur during the period from April to July, 2010. Tossa jute seeds were stored with moisture level of 12.2% in ambient condition. Moisture content of the seeds of tin container was found increased significantly to 12.9% from initial moisture content 12.2%. Seed moisture content of polythene bag and gunny bag also increased very significantly from 12.2 to 13.2% and 12.2 to 14.5%, respectively. Germination percentage decrease gradually from 82.00% to 70.00% in the seeds of polythene bag and 82.00% to 62.00% in gunny bag with high moisture content. However, slowly decreasing of germination from 82.00% to 75.00% was observed in the seeds of tin container with lower initial moisture content of 12.9% than that of gunny bag and polythene bag. Interaction effects were showed better performance with tin container than the others i.e. gunny bag and polythene bag.

**Key words:** Storage container, seed quality, jute, onion

## Introduction

Onion (*Allium cepa*), family Alliaceae is a biennial herb and one of the five most important fresh market vegetables worldwide (Cramer, 2000). In Bangladesh it is considered as the most important spice crop. Onions contain sulphur, fibres, potassium, iron, calcium, vitamin B, vitamin C with potential anticholesterol, anticancer and antioxidant property (Slimestad*et al.,* 2007). Like other crops onion suffers from diseases including seed borne fungi like *Alternariaporri*, *Fusarium*spp. (Maude and Presly, 1977). Jute (*Corchoruscapsularis*L. and *C. olitorius*L.), the main cash crop of Bangladesh has great impact on socio economic condition of the country. Bangladesh supplies about 70% jute to global market (Hossain and Abdulla, 2015). However, jute suffers from more than a dozen of diseases of which 10 are known to be seed borne (Rashid *et al.,* 1995).

Among the factors that reduce crop yield, quality seed is the most important one (Ahmad, 2001). In order to obtain high yield, seed quality should be maintained properly. Good seeds alone can give an increased production of 5-50% compared to the seeds of a poor stock (Huda, 2001). Seed quality is mainly controlled by genetic makeup but it is

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commonly deteriorated during storage. During storage period seeds may lose their quality due to the effect of several biotic and abiotic factors (Harrington, 1972). Poor storage condition greatly affects seed vigor that decreases seed longevity(Heydecker, 1979). The decreasing rate depends on storage condition that is temperature, relative humidity, seed moisture content, storage container (Usberti*et al.,* 1998). Seed quality has also been found to be influenced by mycoflora during storage (Fakir, 1989). Storage fungi are mostly saprophytes and have some advantage that they can grow without free water. For every 5% reduction in storage temperature *Aspergillus* sp. and *Penicillium*sp.are reported to be cable of growing more in seeds (Christensen and Kaufmann, 1969). Thus maintenance of seed quality during storage period is important for next year crop production as well as for the maintenance of integrity of seeds. Storage containers are one of the deciding factors for maintaining seed quality during storage. Type of container regulates temperature, relative humidity, seed moisture content. The suitability of air tight metal container has been observed by Islam (2008) in durum wheat seed, Hasan*et al.* (2017) in lentil seed, Islam *et al.* (2018) in blackgram seed. To maintain the quality of stored seed selection of proper storage container should be an important consideration to reduce seed loss and increase crop production (Samajpati*et al.,* 1978). In view of the above facts, the present research work was undertaken to evaluate the effect of different containers on moisture content, germination and mycoflora during the storage period in jute and onion seeds.

## Materials and Methods

The experiment was carried at in the laboratory of Plant Pathology Division, Bangladesh Institute of Nuclear Agriculture, Mymensingh during October, 2017 to May, 2018. Seed samples of tosha jute (*Corchorusolitorious*, var. O-9897) was collected from Bangladesh Jute Research Institute, Dhaka. Seed samples of onion (*Allium cepa*, var. BARI Piaj-1) were collected from Bangladesh Agricultural Research Institute, Gazipur. The experiment was laid out in Completely Randomized Design (CRD) with four replications. Seeds were stored in four different types of container:(i) tin container, (ii) cotton cloth bag, (iii) polythene bag (transparent) and (iv) plastic container. Tin and plastic containers were covered tightly and cotton cloth bag and polythene bags were tight with rope. The containers were kept in the laboratory under ambient room condition for 75 days.Seeds were observed at sixstage: before storage, at 15, 30, 45, 60 and 75 days after storage. Each time moisture percentage (%), germination percentage (%) of sample seeds and prevalence of seed associated fungi were recorded.

### *Determination of moisture percentage*

Moisture content was determined by using high constant temperature oven method following International Rules for Seed Testing (ISTA, 1999). Four grams of seeds from each container were taken and poured in a small container with cover and kept in an oven at a temperature of 103ºC for a period of 17 hours. The moisture content of seeds was measured

by the following formula (ISTA, 1999). The procedure was followed for five storage period. Moisture content (%) = $[(M_2-M_3) \times 100]/ (M_2-M_1)$ where $M_1$= weight of container + cover; $M_2$ = weight of container + cover + seeds before drying and $M_3$= weight of container + cover + seeds after drying

***Determination of germination percentage***

The germination test was done in petridish with moist blotter paper taking 400 seeds for each storage container with four replications. The plates were kept at room temperature for 15 days. Germination percentage was calculated using the following formula (Krishnasamy and Seshu, 1990). The germination percentage was measured for five storage period with the following formula.

Germination (%) = (Number of seed germinated × 100)/ Number of seeds tested

***Determination of fungal flora infection***

To detect seed borne pathogens associated with seeds, four hundred seeds of each sample were assayed for the presence of fungal flora following standard blotter method (ISTA, 1996). In this method three layers of moist filter paper (Whatman No. 1) were placed in petridishes. The plates were incubated at 22±2ºC under 12/12 h alternating of light and darkness for eight days. The seeds were examined under stereo microscope at 25x magnification to observe the presence of seed borne fungi. Most of the associated fungi were identified by observing the growth characters on the incubated seeds on blotter paper. For proper identification of fungi temporary slides were prepared from the fungal colony and were observed under compound microscope. The fungi were identified following the key outlined by Sing (1982).

**Result and Discussion**

***Effect on moisture content***

The initial moisture was 12.3% in jute seeds and 10.1% in onion seeds but it increased with increasing of storage time (Tables 1 and 2). After 75 days, the amount of moisture content was higher in cloth bag (18.0% in jute seeds and 15.9% in onion seeds) and was lower in tin container (14.2% in jute seeds and 11.7% in onion seeds) and plastic container (14.2% in jute seeds and 11.6% in onion seeds) followed by polythene bag (14.6% in jute seeds and 11.8% in onion seeds).Our result is supported by other workers who reported that moisture absorption by seeds increased with increasing storage period (Barua*et al.,* 2009; Ansari *et al.,*1996). If the relative humidity of the storage is higher than the seed moisture then it absorbs moisture from the air as seed is a hygroscopic living material (Copeland and McDonald, 2001). The moisture content of seeds in cloth bag was higher compared to other containers. As cloth bag was not air tight, during the experimental period the seeds in cloth bag might absorb moisture from the air to keep equilibrium with relative humidity of the surrounding.

***Effect on seed germination***

The germination rate (%) of jute and onion seeds varied in different containers (Table 3 and 4). The initial rate of germination was similar for all containers and it decreased with increase of storage period. After 75 days, the seed germination rate was better in tin containers (87% in jute seed and 85% in onion seeds) followed by plastic

**Table 1. Moisture content (%) of jute seeds stored in different containers during the storage period**

| Containers | Moisture content (%) | | | | | |
|---|---|---|---|---|---|---|
| | Before storage | 15 DAS | 30 DAS | 45 DAS | 60 DAS | 75 DAS |
| Tin container | 12.3 | 12.5a | 13.0a | 13.4a | 13.7a | 14.2a |
| Plastic container | 12.3 | 12.7a | 13.1a | 13.5a | 13.9a | 14.2a |
| Polythene bag | 12.3 | 12.9a | 13.3a | 13.9a | 14.3a | 14.6a |
| Cloth bag | 12.3 | 13.6a | 15.7b | 16.4b | 16.9b | 18.0b |
| Level of sig. | NS | NS | * | ** | ** | ** |

DAS= Days after storage, Figures followed by the same letter in a column do not differ significantly at P$0.05

**Table 2. Moisture content (%) of onion seeds stored in different containers during the storage period**

| Containers | Moisture content (%) | | | | | |
|---|---|---|---|---|---|---|
| | Before storage | 15 DAS | 30 DAS | 45 DAS | 60 DAS | 75 DAS |
| Tin container | 10.1 | 10.3a | 10.6a | 10.9a | 11.1a | 11.7a |
| Plastic container | 10.1 | 10.2a | 10.5a | 10.9a | 11.0a | 11.6a |
| Polythene bag | 10.1 | 10.3a | 10.6a | 10.8a | 11.3a | 11.8a |
| Cloth bag | 10.1 | 10.6a | 11.9b | 12.6b | 14.7b | 15.9b |
| Level of sig. | NS | NS | * | * | ** | ** |

DAS= Days after storage, Figures followed by the same letter in a column do not differ significantly at P$0.05

containers (84% in jute seed and 83% in onion seeds) compared to cloth bags (74% in jute seed and 71% in onion seeds). In storage, seed deterioration with the passage of time is a natural phenomenon and it depends on different environmental factors. Seed moisture content is the most important factor that regulates the viability of seeds and deterioration of seed quality through reduced germination percentage that increases with increasing moisture content in seed (Agrawal, 2003).The reduction of germination percentage of seeds in cloth bag might be due to the absorption of moisture from the surrounding atmosphere over the storage period as it was not air tight container. The respiratory activity and other physiological activities in seeds increased by increasing moisture content which decreased stored food in seeds and thus seeds stored in a high relative humidity lost their viability and vigor more quickly than those stored in dry air (Tithi*etal.,* 2010; Gorechi, 1982).

**Table 3. Germination (%) of jute seeds stored in different containers during the storage period**

| Containers | Germination (%) | | | | | |
|---|---|---|---|---|---|---|
| | Before storage | 15 DAS | 30 DAS | 45 DAS | 60 DAS | 75 DAS |
| Tin container | 91 | 90a | 89a | 88a | 88a | 87a |
| Plastic container | 91 | 88a | 86b | 86a | 85a | 84b |
| Polythene bag | 91 | 86a | 85b | 82b | 81b | 81c |
| Cloth bag | 91 | 82b | 80c | 77c | 75c | 74d |
| Level of sig. | NS | ** | ** | ** | ** | ** |

DAS= Days after storage, Figures followed by the same letter in a column do not differ significantly at P$0.05

**Table 4. Germination (%) of onion seeds stored in different containers during thestorage period**

| Containers | Germination (%) | | | | | |
|---|---|---|---|---|---|---|
| | Before storage | 15 DAS | 30 DAS | 45 DAS | 60 DAS | 75 DAS |
| Tin container | 88 | 87a | 87a | 86a | 86a | 85a |
| Plastic container | 88 | 85a | 85a | 84b | 84a | 83a |
| Polythene bag | 88 | 85a | 83a | 83b | 80b | 80b |
| Cloth bag | 88 | 78b | 76b | 74c | 73c | 71c |
| Level of sig. | NS | ** | ** | ** | ** | ** |

DAS= Days after storage, Figures followed by the same letter in a column do not differ significantly at P$0.05

***Effect on prevalence of fungi***

The fungi *Colletotrichumcorchori, Macrophominaphaseolina, Fusarium*sp.*, Aspergillus*sp. were found to be associated with jute seed (Table 5) and in onion the associated fungi were *Alternariaporri, Fusarium*sp., *Aspergillus*sp. and *Curvularia*sp. (Table 6). However, the prevalence of fungi varied with different containers. At initial stage the range of different fungi was 9.1-12.3% in jute seed and 5.5-12.7% in onion seed. Then the prevalence of all type of fungi in jute and onion seeds increased with storage time. In jute seed, after 75 days of storage the range of seed associated fungi increased to 10.7-13.9% in tin container, 11.6-14.2% in plastic container, 11.8-14.0% in polythene bag and 14.2-16.7% in cloth bag. In onion seed, after 75 days of storage the range of fungi increased to 6.0-13.3% in tin container, 6.8-14.0% in plastic container, 6.9-14.1% in polythene bag and 8.8-16.3% in cloth bag. The prevalence of fungi was the lowest in tin container followed by plastic container whereas the highest one was recorded in cloth bag. Moisture content plays a vital role in amplifying fungal biomass during storage period (Malaker*et al.,* 2008; Begum *et al.,* 2005). In the present study moisture content of seed was found to be higher in cloth bag than that of in tin container and polythene bag and this excess moisture might enhance the fungal population. The result of our study is in accordance with Manira (2012) who observed that cloth bag was not safe for storage of soybean seed compared to tin container and polythene bag as the prevalence of seed associated fungi was found to be more in cloth bags than other containers.

**Table 5. Prevalence of fungi associated with jute seeds stored in different containerduring the storage period**

| Containers | Days | Prevalence of fungi (%) | | | |
|---|---|---|---|---|---|
| | | *Colletotrichumcorchori* | *Macrophominaphaseolina* | *Fusarium* sp. | *Aspergillus* sp. |
| Tin container | Before storage | 9.1 | 10.3 | 11.6 | 12.3 |
| | 15 DAS | 10.0 | 10.8 | 11.9 | 12.9 |
| | 30 DAS | 10.3 | 10.6 | 12.4 | 13.0 |
| | 45 DAS | 10.3 | 10.8 | 12.4 | 13.5 |
| | 60 DAS | 11.5 | 11.0 | 12.6 | 13.7 |
| | **75 DAS** | **10.7** | **11.2** | **12.0** | **13.9** |
| | LSD (P$0.05) | 0.61 | 0.57 | 0.53 | 0.45 |
| Plastic container | Before storage | 9.1 | 10.3 | 11.6 | 12.3 |
| | 15 DAS | 10.0 | 10.8 | 11.9 | 12.8 |
| | 30 DAS | 10.0 | 11.3 | 11.8 | 13.2 |
| | 45 DAS | 10.5 | 11.6 | 12.5 | 13.3 |
| | 60 DAS | 10.8 | 11.5 | 12.7 | 13.5 |
| | **75 DAS** | **11.6** | **11.8** | **13.0** | **14.2** |
| | LSD (P$0.05) | 0.82 | 0.63 | 0.71 | 0.70 |
| Polythene bag | Before storage | 9.1 | 10.3 | 11.6 | 12.3 |
| | 15 DAS | 10.5 | 10.8 | 12.0 | 12.7 |
| | 30 DAS | 10.7 | 11.3 | 12.1 | 12.9 |
| | 45 DAS | 10.7 | 11.5 | 12.5 | 12.9 |
| | 60 DAS | 10.4 | 11.8 | 12.4 | 13.3 |
| | **75 DAS** | **11.8** | **11.9** | **12.8** | **14.0** |
| | LSD (P$0.05) | 0.52 | 0.46 | 0.51 | 0.61 |
| Cloth bag | Before storage | 9.1 | 10.3 | 11.6 | 12.3 |
| | 15 DAS | 10.1 | 11.9 | 12.3 | 13.2 |
| | 30 DAS | 11.4 | 12.5 | 13.5 | 14.7 |
| | 45 DAS | 12.2 | 13.8 | 42.7 | 15.6 |
| | 60 DAS | 12.9 | 14.3 | 14.0 | 16.3 |
| | **75 DAS** | **14.2** | **14.9** | **15.5** | **16.7** |
| | LSD (P$0.05) | 0.57 | 0.52 | 0.74 | 0.69 |

## Conclusion

The present study indicates that seeds of onion and jute stored tin container was found better in aspect of germination. The prevalence of seed associated fungi was also lower in tincontainer at the end of storage period. Therefore, tin container is effective for storing seeds of jute and onion for 75 days than other containers like polythene bag, plastic container and cloth bag.

**Table 6. Prevalence of fungi associated with onion seeds stored in different container during the storage period.**

| Containers | Days | Prevalence of fungi (%) | | | |
|---|---|---|---|---|---|
| | | *Alternariaporrri* | *Fusarium* sp. | *Aspergillus* sp. | *Curvularia* sp. |
| Tin container | Before storage | 9.3 | 10.1 | 12.7 | 5.5 |
| | 15 DAS | 9.8 | 10.7 | 12.9 | 5.9 |
| | 30 DAS | 9.1 | 10.9 | 13.0 | 6.0 |
| | 45 DAS | 9.7 | 11.4 | 13.2 | 6.2 |
| | 60 DAS | 9.7 | 11.0 | 13.2 | 6.1 |
| | **75 DAS** | **9.8** | **11.4** | **13.3** | **6.0** |
| | LSD (P$0.05) | 1.02 | 0.83 | 1.10 | 0.91 |
| Plastic container | Before storage | 9.3 | 10.1 | 12.7 | 5.5 |
| | 15 DAS | 9.6 | 10.5 | 12.3 | 5.8 |
| | 30 DAS | 9.8 | 10.8 | 12.8 | 5.9 |
| | 45 DAS | 9.4 | 10.6 | 12.9 | 5.9 |
| | 60 DAS | 10.2 | 11.8 | 13.6 | 6.4 |
| | **75 DAS** | **10.5** | **12.5** | **14.0** | **6.8** |
| | LSD (P$0.05) | 0.10 | 0.95 | 0.82 | 0.77 |
| Polythene bag | Before storage | 9.3 | 10.1 | 12.7 | 5.5 |
| | 15 DAS | 9.7 | 10.7 | 12.8 | 5.9 |
| | 30 DAS | 9.4 | 10.9 | 12.7 | 6.0 |
| | 45 DAS | 10.3 | 11.6 | 13.0 | 6.5 |
| | 60 DAS | 10.0 | 11.9 | 13.5 | 6.6 |
| | **75 DAS** | **10.5** | **12.3** | **14.1** | **6.9** |
| | LSD (P$0.05) | 0.53 | 0.62 | 0.81 | 0.58 |
| Cloth bag | Before storage | 9.3 | 10.1 | 12.7 | 5.5 |
| | 15 DAS | 10.3 | 10.7 | 13.0 | 5.9 |
| | 30 DAS | 11.6 | 12.4 | 13.7 | 6.8 |
| | 45 DAS | 11.9 | 13.1 | 15.5 | 6.9 |
| | 60 DAS | 12.3 | 14.0 | 15.9 | 7.6 |
| | **75 DAS** | **13.7** | **15.3** | **16.3** | **8.8** |
| | LSD (P$0.05) | 0.90 | 0.84 | 0.96 | 0.89 |

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