EFFECT OF STORAGE CONTAINERS ENVIRONMENT AT DIFFERENT STORAGE PERIOD ON THE QUALITY OF CHILLI SEED

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ABSTRACT

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The study was conducted at the Department of Agronomy, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Salna, Gazipur from October to December 2008, to study the effect of storage containers environment at different storage period on the Quality of Chilli (*Capsicum annum* L.) seed. The seed moisture, abnormal seedling and dead seed were studied in this study. Those were increased with increasing of storage time in Tin container, Polythene bag and Cloth bag. The increasing rate was higher in seeds of Cloth bag. On the other hand, germination, root, shoot length and, root and shoot dry matter after storage was declined. The decline rate was higher in seed of Cloth bags container.

Keywords: Chilli seed, storage containers, storage period

INTRODUCTION

Chilli (Capsicum *annum L.)* is an important spice in Bangladesh. It belongs to the genus *Capsicum* and the family Solanaceae. There are four commercial species of chilli and these are *Capsicum annum, Capsicum frutescens, Capsicum pendulum* and *Capsicum pubescent.* The last two species are mostly cultivated in South and East America. As an important spice, chilli is grown in the tropical, Sub-tropical and temperate regions of the world, -A large number of commercial varieties are found in C *annum,* some of which are sweet and used as vegetable in salad while the others are slightly or moderately pungent giving variable tastes and used in preparation of meat-, fish-, and vegetable curry. The size of fruits varies from 1 cm to 30 cm in length and 3 mm to 50 mm in diameter. Large fruited varieties of C. *annum* are grown in the temperate and sub-tropical regions of the world. The varieties of C. *frutescens* are mostly cultivated in the tropical and sub tropical zones of Mexico, Central and South America, India and Pakistan. A few cultivars are found in Bangladesh. As the fruits are small and very hot they are popularly known as red peppers, hot peppers, bird peppers etc. The fruits are one of the richest known sources of vitamin C, as noted, and, important source of vitamin A (Howard *et al.,* 2000). In Bangladesh, this crop is grown in kitchen garden for kitchen purpose use as well as it is grown commercially in the field. The total area under chilli cultivation in Bangladesh was recorded as 166 ha with a total production of 141 metric tons in 2000-2001 (Anon. 2001),

There are many factors that can narrow down the gap between potential and farm level yield. Among them, use of quality seed is the most important one (Ahmad, 2001). As quality seeds ensure better germination as well as better yield. But if the seed is inferior quality crop failure is unavoidable. To the farmers, for satisfaction crop production, a high quality seed is not only desirable but is also a satisfactory requirement in developed countries. Although seed quality is governed by genetic make-up, but commonly the quality of seeds is deteriorated during storage period. Seed storage and retention of seed viability always and important consideration in agricultural practice. Poor storage condition gives rise to deterioration of seed quality and the resultant loss of viability. Poor storage conditions greatly affect seed vigor, Vigor of seed at the time of storage is important factors that affects storage live.The most important biotic and abiotic factors that effect seed quality are relative humidity, temperature insect and fungus. Due to high relative humidity seed sets equilibrium at high percentage of moisture. Higher temperature and higher moisture percentage increase respiration. Staying in this condition the seed lose germination. As a result the quality of the seed becomes bad and the seed is unusable for crop production. High relative humidity and high temperature cause high moisture content in chilli seed and results in low germination with low vigor seedlings at the end of storage.

Safe condition was defined as those, which maintain seed quality without loss of vigor for three years. Such conditions are favorable but not always possible or not economically justified. It is practically true in humid tropical and sub-tropical areas such as Bangladesh where high temperature (annual average 25^0 C + 6-8° C) and high relative humidity (annual average 85% + 5-10%) are recorded. Such ambient conditions may lead to a relatively rapid increase of temperature and rapid loss of germination and vigor with consequently serious damage to the agriculture economy. Several authors have demonstrate that safe storage conditions for a short term period, i.e. from harvest to

the next planting season (1-9 months) are those in which the seed equilibrium moisture is lower than 14% for cereal seeds and 11% in oil seeds (Harrington, 1972) or, more properly, ranges from 12% to 13% and from 8% to 9.5% respectively and From 7% to 8% for most of the vegetables seeds. This means a seed moisture in "equilibrium" with 50% RH at 30°C or 60% RH at 20°C (Delouche *et al.*, 1973), or with 65% RH but with a temperature higher than 33°C for only a few hours (Harrington, 1972). Therefore, proper control of seed moisture content and seed storage conditions becomes essential for the maintenance of seed viability and vigor, especially in humid tropical regions.

Maintenance of seed quality during storage period is important not only for crop production in the following year but also for the maintenance integrity of the seeds because of their constant threat and of genetic erosion. The present research is conducted with the specific objective to find out the effect of Temperature, Relative Humidity and. Storage conditions of chilli seed on seed quality, germination capacity and viability of chilli seeds and seed quality improvement in trade.

MATERIALS AND METHODS

The investigation was carried out at the outreach building, at the Bangabandhu Sheikh Mujibur Rahman Agricultural University, Salna, Gazipur during 29 October 2008 to December 2008. Chilli seeds used in this experiment were suppliantly the Agronomy department of Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU). Seeds were kept in following three containers: i. tin container, ii. polythene bag (Transparent) and iii. cloth bag. Seeds were stored at room temperature for 2 months. The tin container was, covered tightly and the Polythene bag and Cloth bag were tight with rope.

Testing of Seed

During the storage period Seeds samples were taken every 15 days from the containers for determination of moisture content of seeds and germination percentage.

Moisture Test

Moisture content was determined by using high constant temperature oven method following International Rules for Seed Testing (Anonymous, 1999) in the Agronomy laboratory of BSMRAU. Four grams of seeds rom containers were taken and poured in a small container with cover and kept in an oven maintained at a temperature of 103°C ± 2 for a period of 17 hours. The moisture content of seeds (wet basis) was determined by the following formula (Anonymous, 1999).

$$MC\ (\%) = \frac{M_1 - M_3}{M_2 - M_1} \times 100$$

Here, M_1 = weight of container + cover
M_2 = weight of container + cover + chilli seed before drying
M_3 = weight of container + cover + chilli seed after drying.

Similar procedure was performed every fortnight from beginning of storage.

Germination Test

Germination test 100 seeds of each sample of Chilli seed were placed top of the paper in plastic box. For each test, four plastic boxes were used. The four plastic were placed in room temperature for 15 days for germination. Seedlings were counted every day up to the completion of germination at 15 day, a seed was considered to be geminated as seed coat ruptured; plumule came out up to 5 mm in length. Germination percentage was calculated using the following formula (Krishnasarny and Seshu, 1990).

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

Seeds were stored at room condition in different containers and germination test: was performed every 15 days. Seedlings obtained from standard germination test were used for seedling evaluation. Normal or abnormal seedlings were classified according to the rules of ISTA (1993). Germination rate (GR) was calculated from a daily count of germinated seeds until it reached a constant value, using the following formula given by Maguire (1962).

$$GR = \frac{\text{Number of normal seedlings}}{\text{Number of normal seedlings}} + \frac{\text{Number of normal seedlings}}{\text{Days to final count}}$$

RESULT AND DISCUSSION

The present experiment was conducted to study the effect of storage containers environment at different storage period on the quality of Chilli Seed. In this study, it was found that some quality components affect others. These effects are also not clearly distinguishable component wise. On the other hand, effect of most of the components was interrelated. Related tables are presented in this chapter. The results of the experiment have been presented under the following heads.

Seed Moisture Content

Three types of container, i.e. tin container, polythene bag and Cloth bag were used to preserve the seeds. Seed preserved in these containers had different moisture restricting ability. Moisture content of seed is an important factor, which affect the Seed Quality. So moisture content of Chilli Seeds was observed in this study.

Effect of storage techniques on the moisture content of Chilli Seed

The initial moisture content of seeds in tin container, polythene bag and Cloth bag were 9.40%, 9.25% and 9.70% (Table 1) but it was increased with increasing storage time. At the end of 2 months the moisture content of Chilli seed was increase to 12.30%, 12.10%, and 12.83% (Table 1). The increasing rate was higher in seeds of Cloth bag. Significant moisture increase was observed only at 45 days after storage. As seed is highly hygroscopic living material; it absorbs moisture from air if it is stored in an environment where relative humidity is higher than seed moisture content (Copeland, The rate of absorbance was higher in Cloth bag because of Cloth bag is not air tight container but tin and polythene bag are moisture proof so, increasing rate was lower in air tight polythene bag.

Germination of Seeds

Three types of containers mentioned earlier were used to preserve the seeds. Seed preserved in these containers had different moisture restricting ability. Germination is the most important function of a seed as an indicator of its viability and growth as seed. The life process of seed within a certain life system as affected by moisture content, pathogen, insects, weather conditions etc. The germination capacity of Chilli seeds was observed in this study.

Effect of storage techniques on the germination of Chilli Seeds

Seed germination test provides to the ability of seeds to germinate and produce a seedling that will emerge and develop onto a healthy vigorous plant. The initial germination percentage of seeds in tin container, polythene bag and Cloth bag seeds was 72.55%, 76.76% and 62.10% but after storage it was declined (Table 2). Germination percentage was reduced up to 62.25%, 63.11% and 55.54% respectively (Table 2).. The decline rate is higher in seeds of Cloth bag. Seed deterioration is natural phenomena and life span of seeds decrease with the passing of time. Seed deterioration processes however depend on a large number of genetical and environmental factors. As seed is highly hygroscopic living materials and it absorbs moisture from the surrounding atmosphere. This higher moisture in the seed may be the main reason of quick quality deterioration in the seeds of Cloth bag. The present experiment was conducted to study the effect of initial moisture content and storage containers at different storage period on the Quality of Chilli seed.

Table 1. Moisture content of Chilli Seeds stored in different container at different storage period

Containers	Storage Period (Days)			
	15	30	45	60
Tin Container	9.40	10.35	12.22	12.30
Polythene Bag	9.25	10.80	11.90	12.10
Cloth Bag	9.70	10.98	12.40	12.83

Table 2. Germination percentage of Chilli Seeds stored in different container at different storage period

Containers	Storage Period (Days)			
	15	30	45	60
Tin Container	72.55	70.10	66.15	62.25
Polythene Bag	76.76	72.75	68.30	63.11
Cloth Bag	62.10	60.00	58.78	55.54

Effect of storage technique on the Abnormal seedling of chilli seeds

The intial abnormal seedling percentage of chilli seeds in tin container, potythene bag and cloth bag were 2.82%, 2.76% and 3.15% (Table-3) but it was increased with increasing storage time. At the end of above, 2 monthes the abnormal seedlying percentage to chilli seed was increase to 5.85%, 5.11% and 10.25% (Table 3). The increasing rate was higher in seeds of gunny bag (Table 3).

Effect of storage technique on the Disease incidence percentage of chilli seeds

The intial desease insidence percentage of chilli seeds in tin container, potythene bag and cloth bag were 3.20%, 3.51% and 3.90% (Table-4) but it was increased with increasing storage time. At the end of above, 2 monthes the desease insidence percentage to chilli seed was increase to 9.55%, 9.26% and 15.05% (Table 4). The increasing rate was higher in seeds of gunny bag (Table 4).

Table 3: Abnormal Seedling percentage of Chilli Seeds stored in different container at different storage period

Containers	**Storage Period (Days)**			
	15	**30**	**45**	**60**
Tin Container	2.82	3.62	4.40	5.85
Polythene Bag	2.76	3.83	4.26	5.11
Cloth Bag	3.15	4.22	6.49	10.25

Effect of storage techniques on the Root and Shoot length of Chilli seeds

The initial Root and Shoot length of Chilli seeds in tin container, polythene bag and Cloth bag seeds was 8.82 cm & 7.90 cm, 8.86 cm & 7.82 cm and 8.93 cm & 7.83 cm but after storage it was declined (Table 5). Root and Shoot length was reduced up to 7.32cm & 6.26 cm, 7.74 cm & 6.37 cm and 6.15 cm & 6.15 cm respectively (Table 5). The decline rate is higher in seeds of Cloth bag. Seedling characters like shoot length, root length varied over storage containers and sotrage period (Table 5).

Table 4. Disease incidence percentage of Chilli Seeds stored in different container at different storage period

Containers	**Storage Period (Days)**			
	15	**0**	**45**	**60**
Tin Container	3.20	5.12	7.82	9.55
Polythene Bag	3.51	5.21	8.24	9.26
Cloth Bag	3.90	5.62	10.51	15.05

Effect of storage techniques on the Root and Shoot Dry matter (DM) of Chilli Seeds

The initial Root and Shoot Dry matter of Chilli seeds in tin container, polythene bag and Cloth bag seeds was 0.77mg & 0.84mg, 0.88mg & 0.95mg and 0.74mg & 0.88 mg but after storage it was declined (Table 6). Root and Shoot dry matter was reduced up to 0.73 mg & 0.80mg, 0.73mg & 0.90mg and 0.64mg & 0.63mg respectively (Table 6). The decline rate is higher in seeds of Cloth bag. It might be due to faster rate of moisture increase and high respiratory activity resultant to shorten the sotrage food materials.

Table 5. Root and Shoot Length of Chilli Seeds stored in different container at different storage period

Container	**15**		**30**		**45**		**60**	
	Root length (cm)	**Shoot length (cm)**	**Root length (cm)**	**Shoot length (cm)**	**Root length (cm)**	**Shoot length (cm)**	**Root length (cm)**	**Shoot length (cm)**
Tin	8.82	7.90	7.62	6.45	7.23	6.33	7.32	6.26
Polythene Bag	8.86	7.82	7.85	6.94	7.46	6.50	7.74	6.37
Cloth Bag	8.93	7.83	7.67	6.91	6.93	6.21	6.15	6.15

Table 6: Root and shoot Dry matter (DM) of Chilli Seeds stored in different container at different storage period

Container	**15**		**30**		**45**		**60**	
	Root DM (mg)	**Shoot DM (mg)**	**Root DM (mg)**	**Shoot DM (mg)**	**Root DM (mg)**	**Shoot DM (mg)**	**Root DM (mg)**	**Shoot DM (mg)**
Tin Container	0.77	0.84	0.53	0.88	0.83	0.88	0.73	0.80
Polythene Bag	0.88	0.95	0.87	0.94	0.87	0.95	0.73	0.90
Cloth Bag	0.74	0.88	0.84	0.85	0.65	0.67	0.64	0.63

CONCLUSION

From the above study we may conclude that Cloth bag is not safe for Chilli Seed storage for long time than the tin container and polythene bag. Because the rate of moisture absorbance was higher in Cloth bag in compare with the tin container and Polythene bag.

R E F E R E N C E

Ahmad, S,2001. Environmental effects on seed characteristics of sunflower (Tletiauthus annues L.) J. Agron. crop sci. 187:213-216.

Annonymous. 2001. Yeasbook of Agricultural Statisties of Bangladesh. Bangladesh Bureau of statistics, statistical Division, Ministry of planning. Government of Bangladesh.

Anonymous, 1999. International Rules for Seed Testing. International Seed Testing Association. Seed Sci. and Technol., 4:3-177.

Delouche, J.C., Matthes,R. K., Dougherty, G. M. and Boyd, A. H. 1973. Storage of seeds in sub tropical and tropical regions. Seed science and Technology, 1:671-700.

Harrington, J.F., 1972, Seed storage and longevity, Seed Biology, (ed.T.T.Kozlosky), New York. pp 145-245.

Heydecker, W, (1979). The vigor of seeds a Meview, Proc, Int. Seed Test assoe, 34, 201-209.

Howard, L. R. (2000) Changes in phyrochemical antioxidant activity of selected pepper species as influenced by maturity. Journal of Agricultural and Food Chemistry 48 (5): 1713-1720.

Maguire, J.D. 1962. Speed of germination aid in selection and calculation of seedling emergence and vigour. Crop Sci. 2: 176-177.