

EFFECT OF DIFFERENT CONTAINERS ON MOISTURE CONTENT AND GERMINATION OF MUSTARD SEED

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ABSTRACT

The study was conducted to evaluate the quality of mustard, *Brassica juncea* var. BARI-9 seed stored for two months in air tight container, poly bag and gunny bag at room temperature and RH. The initial moisture content of the seed was 12.17% but after two months it was increased to 15.55%. This increase of seed moisture content was closely related to room temperature and humidity. The initial germination percentage of seed was 85.83% however, after storage for 2 months in air tight container, gunny bag and poly bag it was declined to 77.33, 73.00 and 67.50%, respectively. Storage condition affects the production of normal and dead seedlings, and the study revealed that seed storage in air tight container was better than gunny and poly bag for mustard seed.

Keywords: Mustard, seed quality, storing

INTRODUCTION

Mustard is the most important edible oil crops of Bangladesh and it is an economic cash crop that has a distinct place in rotation with small grains (BARI, 2000). For satisfactory crop production, a high quality seed is not only desirable but is also a prime requirement. Seed quality is highest at the time of physiological maturity, which gradually decreases with the advent of time (Kurdikeri *et al.*, 1994). Quality of seed is dependent on biotic and abiotic factors during storage period. Quality seeds ensure better germination as well as better yield. Although seed quality is governed by genetic make-up, but commonly the quality of seeds is deteriorated during storage period. Narian and Khosla (1983) stated that oil crops seed quality losses during storage and these losses occurred mainly due to use of traditional storage containers, which lacked moisture proof and could not protect the stored grain from insect attacks.

Poor storage condition gives rise to deterioration of seed quality and the resultant loss of viability. Heydecker (1979) reported that poor storage conditions greatly affect seed vigor. Seed longevity decreased with increasing storage temperature and moisture content and the deterioration rate depends on storage condition that is temperature, relative humidity, seed moisture contents, storage container (Usberti *et al.*, 1998). Types of container also regulate temperature, relative humidity and seed moisture contents. High temperature, relative humidity and moisture in the storage environment appear to be key factors involved in deterioration of seed quality. Loss of germination capacity is the final manifestation of seed deterioration. So, the present study was undertaken to identify the best container for storing mustard seed, *Brassica juncea* var. BARI-9.

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MATERIALS AND METHODS

The experiment was conducted in Entomology Laboratory, Hajee Mohammad Danesh Science and Technology University (HSTU), Dinajpur, during the period from April to July 2008. *B. juncia* var. BARI-9 seeds were collected from the Agronomy Department of HSTU. The experiment was laid out in Completely Randomized Design with three replications. Seeds were stored in three different types of container viz. storage container, air tight container, poly bag and gunny bag. The initial tight with rope. During the storage period, seed samples were taken every 15 days from each container for determination of moisture and germination percentage.

Determination of moisture percentage

Moisture content was determined by using high constant temperature oven method following International Rules for Seed Testing in the Agronomy laboratory of HSTU. From each container 3g seeds were taken. After grinding the seeds in grinding mill the weighed ground materials were poured separately in a small container with cover and kept in an oven maintained at a temperature of 125-130°C for a period of 2 hours. The moisture content of seeds (wet basis) was determined by the following formula (Anonymous, 2000).

$$\% \text{ MC} = \frac{(X_2 - X_3)}{(X_2 - X_1)} \times 100$$

X_1 = Weight of container, X_2 = Weight of container + ground materials before drying, X_3 = Weight of container + ground materials after drying

Determination of germination percentage

Germination test was conducted using sand as substratum. The sand was sieved to discard particles bigger than 0.8 mm and smaller than 0.05 mm in diameter. Rectangular plastic boxes were used to put the sand. For every test new sand was used. Seed was placed on a uniform layer on moist sand and then covered to a depth of 10 mm with sand, which was left loose. 200 seeds were planted in each plastic tray and replicated three times. The plastic trays with seed were incubated at room temperature and irrigated at every odd day. After 5 days, germination percentage was recorded. The normal seedlings, abnormal seedlings and ungerminated seed were classified according to the prescribe rules of ISTA.

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

Statistical analysis

The data were analyzed by analysis of variance using a MSTAT-C statistical computer programme and the mean values were separated by Duncun's Multiple Range test (DMRT).

RESULTS AND DISCUSSION

Moisture contents of mustard seed stored in different containers have presented in Figure 1. Result showed that moisture percentage increased with increase in time and seed moisture appeared significant difference after 45 days of storage. At the end of 2 months the moisture content of mustard seeds stored in air tight container, poly bag and gunny bag were increased to 13.42, 14.33 and 15.55%, respectively.

Figure 2 showed that germination percentage of mustard seeds stored in different containers were decreased with increase in time. The initial germination rate in air tight container, poly bag and gunny

bag was 85.83, 82.00 and 74.67%, respectively. After two months, it was declined to 77.33, 73.00 and 67.50% respectively. The decline rate was higher in seeds of gunny bag.

Table 1 showed that storing of mustard seeds in different containers effect on the production of abnormal seedlings. All the storing containers showed higher percentage of abnormal seedlings with duration of storing. However, the minimum percentage (9.16 %) of abnormal seedling was produced from the seeds that were stored in air tight containers for 30 days and the maximum percentage (23%) was found from the seeds that were stored in gunny bag for 60 days.

Storing of mustard seeds in different containers and duration of storing showed significant effect

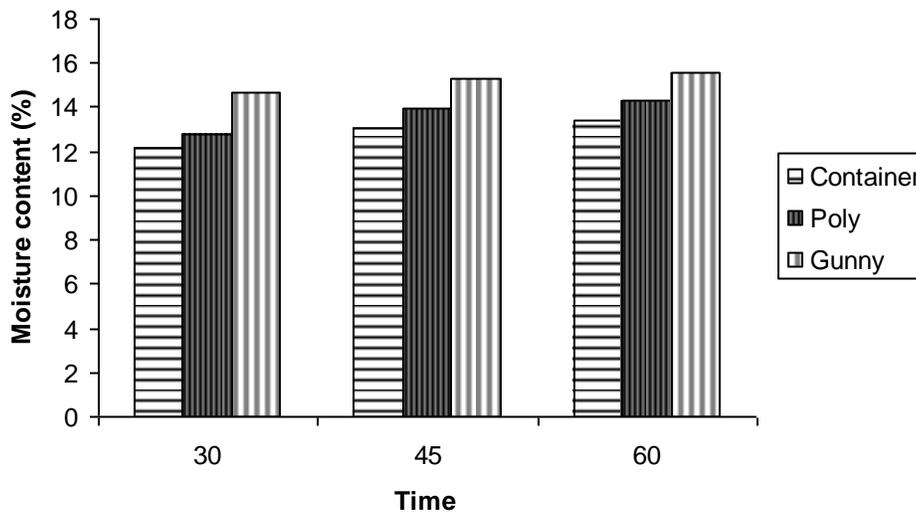


Figure 1. Moisture content of mustard seed stored in different containers

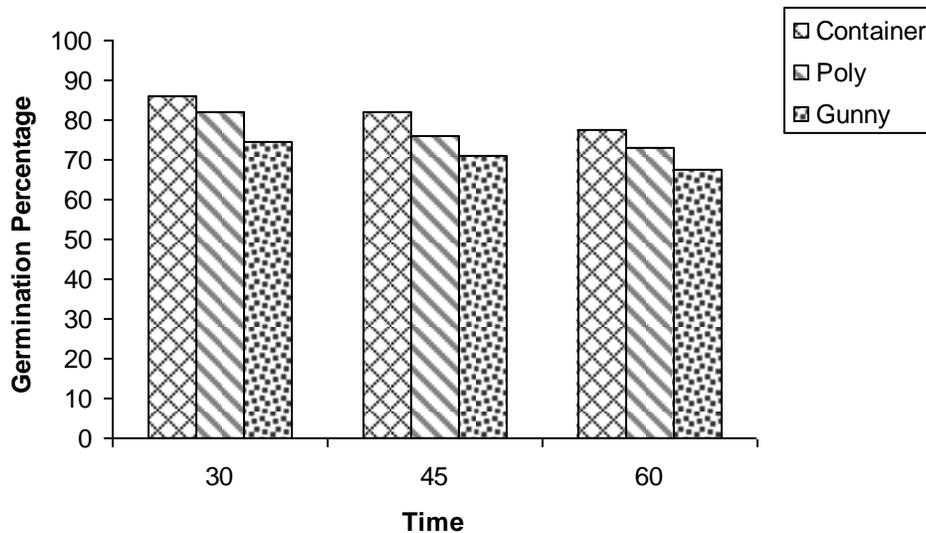


Figure 2. Germination percentage of mustard seed stored in different containers

Table 1. Production of abnormal seedling of mustard seed stored in different containers

Containers	Storage period (days)		
	30	45	60
Air tight containers	9.16 c	12.33 b	15.83 b
Poly bag	12.00 b	15.67 b	19.00 ab
Gunny bag	16.33 a	20.50 a	23.00 a

Means followed by different letter (s) within a column are statistically different ($p \leq 0.05$, DMRT)

on the production of dead seedlings (Table 2). Results showed that lowest percentage (4.0 %) of dead seedling was produced by the seeds that were kept in air tight containers for 30 days and the highest percentage (9.50 %) of dead seedling was produced by the seeds that were stored in gunny bags for 60 days.

Table 2. Production of dead seedling of mustard seed stored in different containers

Containers	Storage period (days)		
	30	45	60
Air tight containers	4.00 b	5.83 a	7.16 a
Poly bag	6.00 ab	8.16 a	8.00 a
Gunny bag	9.00 a	8.33 a	9.50 a

Means followed by different letter (s) within a column are statistically different ($p \leq 0.05$, DMRT)

The seeds are highly hygroscopic living materials so it absorb moisture from air if it is stored in an environment where relative humidity is higher than seed moisture content. Seed moisture content is the most important factor that regulates the longevity of the seeds. Gorechi (1982) observed that seeds stored in a high relative humidity lost their viability and vigor more quickly than those stored in dry air. Higher moisture in seeds enhances seed deterioration, which ultimately reduces the planting value of seeds in the field. In this study the initial moisture content of the seeds were 12.17% and the relative humidity was 70% or above through the storage period. For this reason, seeds absorbed moisture from the ambient air and tended to equilibrium with relative humidity. Paricha *et al.* (1977) found that viability of seed decreased with increasing relative humidity and storage time.

Container type is one of the factors that affect moisture absorbance and seed quality during storing of seeds. In this study, the rate of absorbance was higher in gunny bag. The gunny bag is not air tight container but tin and polythene bag are moisture proof. So, moisture increasing rate was lower in air tight polythene 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 genetic and environmental factors. This higher moisture in the seed may be the main reason of quick quality deterioration in the seeds of gunny bag. Doijode (1997) reported that the polyethylene bags are effective in maintaining high viability at 5°C and could be used for seed storage, while aluminium foil pouches are suitable for the long-term storage of seeds (germplasm) especially at sub-zero temperatures.

Seed germination test was provided to observe the ability of seeds to germinate and producing a seedling that will emerge and develop a healthy vigorous plant. In our study, the initial germination percentage of the seed was 85.83% but it declined with the duration of storing. The decline rate was higher in seeds of gunny bag. Barler *et al.* (1975) reported that humid summer tends to reduce the viability of seed stored for long periods. Germination indices of mustard seeds varied widely due to different moisture content of different containers. Copeland (1976) reported that storing of seeds in

gunny bags and other local storage environment may influence to increase moisture and deteriorate seed quality. Huda (2001) stated that seeds stored in metal container provided highest germination percentage. The experimental results of Barler *et al.* (1975), Copeland (1976) and Huda (2001) are in harmony with the results of the present study.

It was observed that germination rates were better in seeds of air tight container and poly bag compared to that of gunny bag. It is clear that high relative humidity prevailed during the storage period. By increasing moisture content of seeds respiratory activity and other physiological activities increased and stored food also decreased. Better germination indices of air tight containers were the resultant of absence of dead seeds as well as lower number of abnormal seedlings.

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