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EFFECT OF STORAGE CONTAINER ON SEED QUALITIES OF MESTA

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ABSTRACT
Mesta seed viability declines during storage, leading to a shortage of high-quality seeds for planting. This shortage acts as a barrier to expanding mesta cultivation in Bangladesh. The effect of different storage containers on germination, field emergence, vigor index and 100-seed weight of mesta seeds of three varieties were studied during the six months storage period beginning from mid-February 2022 to mid-August in 2022 at seed laboratory, Jute Agriculture Experimental Station, Jagir, Manikganj. Four different seed storage containers viz. aluminum foil, plastic pot, earthen pot and gunny bag were used to store mesta seeds. Three varieties viz., SAMU-93, VM-1 and HS-24 were used as experimental materials. Highest seed germination, field emergence, vigor index was recorded in aluminum foil container (72.25%, 65.12% and 35.57%) at 180 days after storage (DAS) and lowest were (38.46%, 32.94% and 25.87%) in gunny bag at the same storage period. Highest 100-seed weight was recorded (3.86g) in gunny bag and lowest was (3.06g) in aluminum foil followed by (3.10g) in plastic pot at 180 DAS. Highest seed germination (71.12%), field emergence (62.58%) and vigor index (35.57%) were recorded in the variety SAMU-93 and lowest (68.08%, 59.12% and 31.12%, respectively) were recorded in HS-24 variety at 180 DAS. On the other hand, the highest and the lowest 100-seed weight was recorded (4.02g and 3.65g, respectively) in HS-24 and SAMU-93 varieties respectively at 180 days storage period. Results revealed that increasing storage period is the cause of decreasing seed quality.
Key words: Mesta, seed quality, vigor, storage containers.

Introduction

The roselle plant, also known as mesta (Hibiscus sabdariffa L.), belongs to the mallow family (Malvaceae). In Bangladesh and other parts of South Asia, it's commonly called "mesta" or "chukur." (Halimatul et al., 2007 and Ismail *et al*., 2008). It is widely cultivated crop in tropical countries, Sudan, Egypt, Mali, Nigeria, India, Indonesia, Malaysia, Brazil, Australia and Mexico. Roselle leaves and flower calyx are consumed as vegetable (Islam *et al*., 2016). Roselle flower has a solid fleshy calyx at the base, 1 cm to 2 cm wide, enlarging to 3 cm to 3.5 cm. The calyx (red and dark red) are used to extract juice for fresh drink and the leaves (green colored calyx) are used as vegetables (Babalola, 2000). The fiber is used as a substitute for jute in making burlap. The red calyx of the plant is used as food colorings and dyes (Islam, 2019). The food and beverage manufacturers and pharmaceutical concerns have considered Roselle as an herbal medicine and an alternate source of colorant for synthetic dyes (Rao, 1996). The most important use of Roselle calyx as Roselle tea that regulates blood pressure, cholesterol and prevents cardiovascular diseases. Roselle tea acts as an anti-inflammatory agent, assists in digestion and reduces the risk of cancer (Rao, 1996). Roselle calyx tea is also rich in vitamin C, minerals and antioxidants. It has distinct maroon color along with sweet and tart flavor similar to that of cranberries (Islam *et al*., 2016). It can be enjoyed both hot and cold depending on consumer’s preferences (Rao, 1996). Farmers in Bangladesh have traditionally grown seeds and fibers simultaneously from the same jute, kenaf and mesta plant. Seeds are the basic input of agricultural production. Bangladesh requires about 5,500 to 6,000 tons of jute, kenaf and mesta seeds every year, of which only 10 to 15% is produced and distributed by BADC (Ali *et al*., 2003). If seeds aren't stored at the right temperature and humidity, they can go bad. This happens because they keep using oxygen (respiration), which can attract mold and speed up internal changes (enzyme activity). To keep seeds healthy and ready to sprout (viable and vigorous), it's crucial to control the temperature and humidity around them (Ellis and Hong, 2007). Light exposure can trick seeds into thinking it's time to sprout, causing them to age faster and lose their ability to grow (viability). That's why it's important to keep them in the dark during storage. Also, bad storage can attract insects and diseases (pests and pathogens) that can ruin the seeds (spoilage). To prevent this, you need to keep things clean and take steps to control pests (Navie and Adkins, 2006). Some materials can leak harmful chemicals or make it hard to control moisture. Mesta seeds, for example, are picky about moisture - they can't dry out too much or they'll die (lose viability). Poor storage can also make them grow mold or other microbes, which can spread disease and ruin the seeds. While freezing can be great for long-term storage, some seeds are like delicate snowflakes - they'll get hurt by ice crystals if you don't freeze them properly. So, make sure you know the right freezing tricks for your specific seeds. (Walters, 2015). To maintain crop quality, good seeds must be used. Considering the above facts, the present study was carried out to develop an environmentally friendly, inexpensive, readily available and safe preservation technique for quality mesta seeds.

Materials and Methods

The experiment was conducted at the seed laboratory of Jute Agriculture Experimental Station, Bangladesh Jute Research Institute (BJRI), Jagir, Manikganj during the period from 15 February/2022 to 15 August/2022. The experiment was laid out in completely randomized design (CRD) with four replications. Three types of mesta seeds, viz. SAMU-93 (V_1), VM-1(V_2) and HS-24 (V_3) were used in the experiment. Seeds were collected from Jute Agriculture Experimental Station, Jagir, Manikganj farm with proper agronomic management. Land was prepared accordingly; crops were sown at mid-August 2021 and harvested at mid-January in 2012. Seeds were harvested at about 80% of pod maturity. After harvesting the crops were dried for three days and then threshed by beating with a stick. Seeds were then cleaned and dried for another five days in the sun to bring seed moisture content around 8%. Four types of storage containers viz., aluminum foil (C_1), plastic pot (C_2), earthen pot (C_3) and gunny bag (C_4) were used in the experiment. The seed was stored in the respective containers on 15 February 2022. Each container was completely filled with seed as per experimental specification and then made air tight. Initial germination, field emergence, vigor index and 100-seed weight were recorded 90%, 86%, 46% and 2.65g, respectively. The seeds were stored at room temperature and normal relative humidity. Data on germination, field emergence, vigor index and 100-seed weight content were recorded two-month interval upto six months. Germination, field emergence, vigor index and 100-seed weight data were collected according to Mollah (2014). Data analysis was done statistically following the analysis of variance (ANOVA) technique and the means were compared by Duncan's Multiple Range Test (Gomez and Gomez, 1984).

Results and Discussion

Germination: Seed germination varied significantly at 60, 120 and 180 days after storage (DAS) in different mesta varieties (Table 1). In the study it was observed that seed germination was higher at 60 DAS than that of 120 and 180 DAS i.e. germination % was reduced with passing the time after storing. The study also revealed that the highest seed germination (84.12%) was recorded for V_1 and the lowest (80.88%) was recorded for V_3 whereas V_2 remained in the middle position at 60 DAS. At 180DAS, highest seed germination (71.12%) was recorded for V_1, whereas lowest seed germination (68.08%) for V_3. V_2 remained in the middle position. Result revealed that from the above three varieties V_1 performed better compared to two other (V_2 and V_3) varieties at 180 DAS. The effect of container on seed germination of mesta was found significant at 60, 120 and 180 days after storage (Table 2). In the study it was observed that seed germination was higher at 60 DAS than that of 120 and 180DAS i.e. germination % was reduced with passing the time after storing. The study also revealed that that the highest seed germination (81.67%) was recorded for C1, on the other hand C4 showed the lowest seed germination (76.12%) at 60 DAS. At 180DAS, highest seed germination (72.25%) was recorded for C_1, whereas lowest seed germination (38.46%) was recorded for C_4. Result revealed that C_1 container performed better compared other three (C_2, C_3 and C_4) containers at 180 DAS. Fakir and Alam (1999) reported that polythene bag and plastic pot maintained better seed quality in terms of final germination up to 12 month of storage period. It also reported by Haque *et al.* (2014) that air tight containers were superior in maintaining viability of jute seed during storage. Similar results have also been found by Mollah (2014) and Islam *et al*., 2023 in kenaf.

Table 1. Effect of variety on quality of mesta seed at different days after storage (DAS)

Var.	Germination (%)			Field emergence (%)			Vigor index (%)			100-seed weight (g)		
	60	120	180	60	120	180	60	120	180	60	120	180
V_1	84.12a	78.12a	71.12a	75.65a	67.58a	62.58a	44.54a	41.38a	35.57a	2.78b	3.07c	3.65c
V_2	82.56b	77.76ab	69.54b	74.11b	65.89b	60.78b	44.12a	40.27b	33.26b	2.98ab	3.39b	3.91b
V_3	80.88c	74.87c	68.08c	72.87c	64.08c	59.12c	42.34b	38.56c	31.12c	3.09a	3.56a	4.02a
CV%	2.19	1.85	2.34	3.11	5.58	3.57	2.45	2.18	3.12	2.67	2.11	2.62

Table 2. Effect of container on quality of mesta seed

Con.	Germination (%)			Field emergence (%)			Vigor index (%)			100-seed weight (g)		
	60	120	180	60	120	180	60	120	180	60	120	180
C_1	81.67a	76.12a	72.25a	75.55a	70.24a	65.12a	43.84a	40.87a	38.12a	2.75b	2.87bc	3.06b
C_2	80.58ab	73.59b	69.54b	73.89b	69.08b	63.47b	43.35a	39.24b	36.53b	2.76b	2.95b	3.10b
C_3	78.45b	65.46c	42.63c	72.11c	60.76c	35.89c	42.12b	35.12c	28.45c	2.84ab	3.08ab	3.75ab
C_4	76.12c	62.11d	38.46d	70.76d	58.64d	32.94d	41.56b	34.08d	25.87d	2.91a	3.12a	3.86a
CV%	3.12	2.19	2.89	2.54	3.56	2.54	3.58	3.25	3.48	3.18	2.18	2.42

Note: SAMU-93 (V_1), VM-1(V_2) and HS-24 (V_3), Var. = Variety
Aluminum foil (C_1), plastic pot (C_2), earthen pot (C_3) and gunny bag (C_4)**;** CV= Coefficient of variation,
In a column, figures having similar letter(s) do not differ significantly at 5% level as per DMRT

Field emergence: Seed field emergence varied significantly at 60, 120 and 180 days after storage (DAS) in different mesta varieties (Table 1). The study revealed that the highest seed field emergence (75.65%) was recorded for V_1 and the lowest (72.87%) was recorded for V_3 whereas V_2 remained in the middle position at 60 DAS. At 180DAS, highest seed field emergence (62.58%) was recorded for V_1, whereas lowest seed field emergence (59.12%) for V_3. V_2 remained in the middle position. Result revealed that from the above three varieties V_1 performed better compared to two other (V_2 and V_3) varieties at 180 DAS. The effect of container on seed field emergence of mesta was found significant at 60, 120 and 180 days after storage (Table 2). In the study it was observed that seed field emergence was higher at 60 DAS than that of 120 and 180DAS i.e. field emergence% was reduced with passing the time after storing. The study also revealed that that the highest seed field emergence (75.55%) was recorded for C_1, on the other hand C4 showed the lowest seed field emergence (70.76%) at 60 DAS. At 180DAS, highest seed field emergence (65.12%) was recorded for C_1, whereas lowest seed field emergence (32.94%) was recorded for C_4. Result revealed that C_1 container performed better compared other three (C_2, C_3 & C_4) containers at 180 DAS. The result is in agreement with the report of Mollah (2014), Mollah *et al*. (2015) and Islam et al., 2023 in kenaf.

Vigor index: Seed vigor index varied significantly at 60, 120 and 180 days after storage (DAS) in different mesta varieties (Table 1). In the study it was observed that seed vigor index was higher at 60 DAS than that of 120 and 180 DAS i.e. vigor index was reduced with passing the time after storing. Result revealed that from the above three varieties V_1 performed better compared to two other (V_2 and V_3) varieties at 180 DAS. The effect of container on seed vigor index of mesta was found significant at 60, 120 and 180 days after storage (Table 2). In the study it was observed that seed vigor index was higher at 60 DAS than that of 120 and 180DAS i.e. vigor index% was reduced with passing the time after storing. The study also revealed that that the highest seed vigor index (43.84%) was recorded for C_1 which was statistically identical with C_2, on the other hand C_4 showed the lowest seed vigor index (41.56%) which was statistically identical with C_3 at 60 DAS. At 180DAS, highest seed vigor index (38.12%) was recorded for C_1, whereas lowest seed vigor index (25.87%) was recorded for C_4. Result revealed that C_1 container performed better compared other three (C_2, C_3 & C_4) containers at 180 DAS. Similar results were reported by Mollah (2014), Mollah *et al*. (2015) in kenaf.

100-seed weight: 100-seed weight varied significantly at 60, 120 and 180 days after storage (DAS) in different mesta varieties (Table 1). The study revealed that the highest 100-seed weight (3.09g) was recorded for V_3 and the lowest (2.78g) was recorded for V_1 whereas V_2 remained in the middle position at 60 DAS. At 180DAS, highest 100-seed weight (4.02g) was recorded for V_3, whereas lowest 100-seed weight (3.65g) for V_1 and V_2 remained in the middle position. Result revealed that from the above three varieties V_1 performed better compared to two other (V_2 and V_3) varieties at 180 DAS. The study also revealed that the highest 100-seed weight (2.91g) was recorded for C_4 and the lowest (2.75g) was recorded for C_1 which was statistically identical with C_2 at 60 DAS. At 180DAS, highest 100-seed weight (3.86g) was recorded for C_4, whereas lowest 100-seed weight (3.06g) was recorded for C_1 which was statistically identical with C_2. Result revealed that C_1 container performed better compared other three (C_2, C_3 & C_4) containers at 180 DAS. Similar result was reported by Mollah, (2014) and Islam *et al*., 2023.

Conclusion

Tests showed that mesta variety V_1 excelled in various seed quality measures. Additionally, aluminum foil and plastic containers outperformed earthen pots and gunny bags for storing seeds for six months. This is because aluminum foil and plastic are more airtight and better at keeping out moisture.

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