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ASSESSMENT OF KENAF SEED QUALITIES INFLUENCED BY DIFFERENT STORAGE CONTAINER

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ABSTRACT

Kenaf seeds lose their ability to germinate during storage, leading to a lack of quality seeds compared to planting requirements, hindering the expansion of kenaf cultivation in Bangladesh. The effects of different storage containers on the germination, electrical conductivity, vigor index and accelerated aging of kenaf seeds of three varieties were studied during a 6-month storage period from 20th February 2020 to 20th August 2020 in a room. Four different containers viz. C_1= aluminum foil, C_2= plastic pot, C_3= earthen pot and C_4= gunny bag was used to store kenaf seeds. Three varieties, V_1=HC-95, V_2=HC-2 and V_3=BJRI Kenaf-3 were used in this experiment. This experiment revealed that the percentage of germination, vigor index and accelerated aging of all three varieties were reduced with increasing the storage time. On the other hand, electrical conductivity percent of all varieties were increased with increasing the storage period. Among the four containers it was observed that after 180 days of storage germination percentage, vigor index percent and accelerated aging percent were maximum for aluminum foil and the lowest were found in gunny bag whereas plastic pot and earthen pot remained in the middle position. On the other hand, at 180 days after storage the highest electrical conductivity was found in gunny bag (65.22%) and the lowest was found (39.89%) in aluminum foil. Germination rate at 180 DAS was recorded maximum in HC-95 (65.2%) and minimum in BJRI Kenaf-3 (57.3%). The highest electrical conductivity at 180 DAS was found in BJRI Kenaf-3 (42.78%) and the lowest was found in HC-2 (36.46%). The highest vigor index and accelerated aging was found (39.55% and 59.89%), respectively at 180 DAS were obtained in HC-95 (15.8%) and the lowest was found (34.24% and 56.88%, respectively) in BJRI Kenaf-3 at 180 DAS. The results reveal that the quality of kenaf seeds decrease with increase the storage time.

Key words: Kenaf, seed quality, vigor, germination

Introduction

Kenaf is a natural fiber that is biodegradable and renewable. Kenaf plays an important role in the global economy, especially in countries such as Bangladesh and India, where they are major producers and exporters of jute and kenaf. Kenaf fiber is used in many different industries including textiles, packaging and agriculture. The jute and kenaf industry provide employment to millions of people and contributes to the GDP of these countries (Miah and Uddin, 2017). Jute and kenaf contribute to environmental sustainability by reducing the use of synthetic materials. Jute and kenaf cultivation also contribute to carbon sequestration, which can mitigate the impact of climate change (Islam *et al*., 2014). Jute and kenaf fibre cultivation provide farmers with an additional farming option and diversifies their sources of income. In areas where fibre crop is grown alongside other crops, it can help reduce risks associated with monoculture and increase resilience to pests (Sarker and Alam, 2015). Farmers in Bangladesh have traditionally grown seeds and fibers simultaneously from the same jute and kenaf plant. Seeds are the basic input of agricultural production. Bangladesh requires about 5,500 to 6,000 tons of jute and kenaf seeds every year, of which only 10 to 15% is produced and distributed by BADC (Pulok *et al*., 2014). Quality seeds of improved varieties themselves have increased crop productivity by 20% (Hossen, 2008). Bangladesh supplies about 70% of jute to the world market (Hossain and Abdulla, 2015). However, jute suffers from more than a dozen diseases, of which 10 are seed-transmitted. To achieve high yields, seed quality must be properly maintained. Good seeds alone can increase yields by 5 to 50% compared to seeds

from poor origins (Huda, 2001). Seeds are typically stored in dry, low-humidity conditions to prevent mold growth and maintain viability. Here, moisture is also one of the major factors contributing to the deterioration during storage especially in the tropics and sub-tropics. The lower ranges of moisture probably help to maintain the seed quality during the storage period. Moisture percent, germination and vigor were differed significantly due to storage container and storage condition applied except 1000-seed weight (Islam *et al*., 2002). Storage of seed is an important factor on which the seed quality greatly depends (Islam, 2009). Healthy seeds can produce good crop. Good seeds alone can give an increased production (10-15%) compare to the seeds of a poor seed stock. In order to maintain crop quality good seeds should be used. Considering the importance of proper storage for kenaf seed quality, this research aimed to develop a method for storing these seeds.

Materials and Methods

The experiment was conducted from 20th February 2020 to 20th August 2020 at Jute Agriculture Experimental Station (JAES), Manikganj. The experiment was designed according to completely randomized design with four replications. There were three kenaf (*Hibiscus cannabinus*) seed varieties viz. HC-95(V_1), HC-2(V_2) and BJRI kenaf-3(V_3) used in the experiment. Seeds were collected from the JAES, Mainkganj Farm, with appropriate agronomic management. The premises was properly prepared; Crops were sown in mid-August 2019 and harvested in the last week of January 2020. Seeds were harvested when the fruit was about 80% ripe. After harvesting, the crop was dried for three days and then threshed. After that, the seeds were cleaned and dried for another five days in the sun to bring the moisture content of the seeds to about 8%. Four types of containers: aluminum foil (C_1), plastic pot (C_2), earthen pot (C_3) and gunny bag (C_4) were used in the experiment. Seeds were stored in their respective containers on February 20, 2020. Each container was filled with seeds according to experimental requirements and then sealed. Initial germination, vigor index, electrical conductivity and accelerated aging were recorded as around 85%, 50%, 20% and 72%, respectively. Seeds were stored at room temperature and normal relative humidity. Germination, vigor index, electrical conductivity accelerated aging percent were calculated according to Mollah (2014). The collected data on different yield related characters and seed quality parameters were subjected statistical analysis following ANOVA technique. Differences among treatment means were adjusted by Duncan's Multiple Range Test with the help of a computer based statistical package program MSTAT-C.

Results and Discussion

Germination: Seed germination varied significantly at 60, 120 and 180 days after storage (DAS) in different jute 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 (76.0%) was recorded for V_1 which was statistically identical with V_2 whereas V_3 showed the lowest seed germination (72.0%) at 60 DAS. At 180DAS, highest seed germination (65.2%) was recorded for V_1, whereas lowest seed germination (57.3%) 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 120 DAS. The effect of container on seed germination of kenaf 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 (78.8%) was recorded for C_1, on the other hand C_4 showed the lowest seed germination (69.8%**)** at 60 DAS. At 180DAS, highest seed germination (69.7%) was recorded for C_1, whereas lowest seed germination (33.6%) 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. Polythene bag and plastic pot maintained better seed quality in terms of final germination up to 12 month of storage period (Tareq *et al*., 2015). Haque *et al.* (2014) also reported that air tight containers were superior in maintaining viability of jute seed during storage. Similar results have also been found by Mollah (2014) and Mollah *et al*. (2015) in kenaf.

Table 1. Effect of variety on quality of kenaf seed at different DAS

Var.	Germination (%)			EC (%)			Vigor index (%)			Accelerated aging (%)		
	60	120	180	60	120	180	60	120	180	60	120	180
V_1	76.0a	71.0a	65.2a	24.12b	29.15c	38.55b	48.21a	42.12a	39.55a	68.10a	64.44a	59.89a
V_2	75.3a	69.2b	59.7b	25.56a	31.62b	36.46c	47.48ab	40.07b	37.38b	65.51c	63.56ab	58.12b
V_3	72.0b	66.8.7c	57.3c	25.82a	34.47a	42.78a	43.78c	37.35c	34.24c	67.52b	62.35c	56.88c
CV%	1.91	1.83	2.28	3.09	5.58	5.57	4.55	2.98	3.75	2.53	2.09	2.01

Table 2. Effect of container on quality of kenaf seed

Con.	Germination (%)			EC (%)			Vigor index (%)			Accelerated aging (%)		
	60	120	180	60	120	180	60	120	180	60	120	180
C_1	78.8a	74.2a	69.7a	21.45d	31.58d	39.89d	46.58a	41.56a	38.66a	71.51a	69.18a	64.11a
C_2	76.5b	71.9b	66.4b	24.22c	34.43c	42.78c	46.21ab	39.12b	37.21b	70.11b	67.54b	61.78b
C_3	71.3c	64.6c	38.3c	29.12a	46.58b	63.88ab	42.56c	34.25c	25.54c	67.89c	59.51c	45.22c
C_4	69.8cd	61.7d	33.6d	26.26b	48.74a	65.22a	41.87cd	32.46d	22.88d	67.08d	57.89d	41.79d
CV%	2.15	1.98	3.11	2.54	3.21	1.79	2.58	3.25	3.14	2.85	2.68	3.11

Note: HC-95(V_1), HC-2(V_2) and BJRI kenaf-3(V_3), Var. = Variety, EC = Electrical conductivity
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

Electrical conductivity (EC): Electrical conductivity is an important storage seed quality testing parameter. Kenaf varieties have significant of on electrical conductivity of different periodical stored seeds (Table 1). The highest electrical conductivity was recorded for V_3 (25.82%) which was statistically identical with V_2 and the lowest was recorded for V_1 (24.12%) at 60 days after storage. At 180 DAS the highest electrical conductivity was recorded for V_3 (42.78%) and the lowest was recorded for V_2 (36.46%). V_1 remained in the middle position. Result revealed that, the electrical conductivity is increasing with increasing storage period. The effect of container on electrical conductivity of kenaf seed was found significant at 60, 120 and 180 days after storage (Table 2). The study also revealed that the highest electrical conductivity (26.26%) was recorded for C_4, on the other hand C_1 showed the lowest electrical conductivity (21.45%) at 60 DAS. At 180DAS, highest electrical conductivity (65.22%) was recorded for C_4, whereas lowest electrical conductivity (39.89%) was recorded for C_1. Result revealed that C_1 container performed better seed quality compared other three (C_2, C_3 & C_4) containers at 180 DAS. Similar results were reported by Mollah *et al.*, 2015.

Vigor index: Vigor Index varied significantly at 60, 120 and 180 days after storage (DAS) in different kenaf varieties (Table 1). The study revealed that the highest seed vigor index (48.21%) was recorded for V_1 and the lowest seed vigor index found in V_3 (43.78%) at 60 DAS whereas V_2 remained in the middle position. At 180DAS, highest seed vigor index was recorded for V_1 (39.55%), whereas lowest seed vigor index (34.24%) for V_3. V_2 remained in the middle position. The effect of container on seed vigor index of kenaf 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 the highest seed vigor index (46.58%) was recorded for C_1, on the other hand C_4 showed the lowest seed vigor index (41.87%) at 60 DAS. At 180DAS, highest seed vigor index (38.66%) was recorded for C_1, whereas lowest seed vigor index (22.88%) 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. Haque *et al.* (2014) also reported that air tight containers were superior in maintaining viability of jute seed during storage. Similar results have also been found by Mollah (2014) and Mollah *et al*. (2015) in kenaf.

Accelerated aging: Accelerated aging (AA) varied significantly at 60, 120 and 180 days after storage (DAS) in different kenaf varieties (Table 1). The study revealed that the highest accelerated aging (68.10%)

was recorded for V_1 and the lowest accelerated aging found in V_3 (67.52%) at 60 DAS whereas V_2 remained in the middle position. At 180DAS, highest accelerated aging was recorded for V_1 (59.89%), whereas lowest accelerated aging (56.88%) for V_3. V_2 remained in the middle position. The effect of container on accelerated aging of kenaf was found significant at 60, 120 and 180 DAS (Table 2). In the study it was observed that accelerated aging was higher at 60 DAS than that of 120 and 180DAS i.e. accelerated aging % was reduced with passing the time after storing. The study also revealed that the highest accelerated aging (71.51%) was recorded for C_1, on the other hand C_4 showed the lowest accelerated aging (67.08%) at 60 DAS. At 180DAS, highest accelerated aging (64.11%) was recorded for C_1, whereas lowest accelerated aging (41.79%) 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 have also been found by Mollah (2014) and Mollah et al. (2015) in kenaf.

Conclusion

From the results it might be concluded that among three kenaf varieties V_1 perform better for different seed quality parameters and the aluminum foil & plastic pot container were found better performance than earthen pot and gunny bag container for six months storage period. Aluminum foil and plastic pot are more air tight and impervious to moisture content in compared to earthen pot and gunny bag.

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