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Simple Storage Method for Jute and Allied Fibers Seeds

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Abstract

In the presented study, efforts were made to find out simple storage method for small quantity of jute and allied fibers seeds. Sun dried seeds (5 consecutive days) of jute, mesta and sunnhemp were stored under ambient conditions in cloth bags, earthen pots, metallic and plastic containers and dried intermittently. Germination and seedling vigor were not maintained for a long time when the seeds were stored in cloth bags and earthen pots due to movement of moisture and oxygen into the containers from the atmosphere. However, germination and vigor were maintained sufficiently up to 24 months when stored in airtight metallic and plastic containers.

Key words : Jute and allied fibers, Seed storage, Containers.

In orthodox seeds, moisture content and temperature are the most important factors in determining seed longevity and both are negatively correlated with it (1—3). The optimum condition for storing all seeds that withstand considerable desiccation is, probably, adequate drying (4—8% moisture content) followed by sealed storage in the absence of oxygen and at low temperature (4). However, in ambient conditions reduction of oxygen supply may favor retention of germinative capacity of seeds. Complete exclusion of oxygen from the storage atmosphere appears beneficial to most dry orthodox seeds however, some oxygen is necessary for recalcitrant seeds (5, 6). Containers like hessian or burlap sacks, cotton bags and containers of paper, cardboard and fiber board are freely permeable to moisture and gases when seeds are stored (7). Tin or aluminium cans and drums, glass jars, plastic vials and laminated aluminium foil packages are the moisture proof containers most suitable for long term storage of seeds. Jute seeds contain about 11% moisture at harvest. Under ambient conditions, jute seeds stored in cloth bags after harvest in November-December when pass through the hot and humid monsoon, start physiological deterioration and loose significant vigor and viability, mesta looses even rapidly (8). The annual domestic requirement of jute and mesta seeds is around 5,000 tons and 2,500 tons respectively (9). Since the temperature and relative humidity in the jute growing states in India remain high and due to lack of simple storage techniques, framers have to purchase fresh seeds every season at a premium price and are dependant on the traders. Thus, efforts were made to find out simple and low cost storage container and suitable drying interval for storage of farm saved jute and allied fibers seeds.

Methods

Experiment was conducted at Central Seed Research Station for Jute and Allied Fibers, Bud Bud, Burdwan, West Bengal during April 2006—March 2008. Temperature during the experimentation period varied from 6.73—39.5 C and relative humidity ranged from 45–92%. Jute (JRO-524 and JRC-212), mesta (HS-7910 and HC-583) and sunnhemp (K-12 Yellow) seeds were collected from the institute research farm. Metallic container, plastic container, earthen pot with lid and cloth bag each of 2.5 kg capacity were used for storing seeds.

Physiologically matured seeds after harvesting and cleaning were dried for five consecutive days (8 h a day) to bring down the moisture to about 7%. Sun dried seeds were filled in the containers up to the capacity. The metallic and plastic containers were sealed air-tight. The lid was placed in the mouth of the earthen pot and sealed with mud to make it air-tight. The cloth bag after filling with seeds was stitched. Containers filled with seeds were kept in

Table 1. Germination of jute and allied fibers seeds after two years of storage in different containers with (D_1) or without (D_2) intermittent drying.

		Mean germination (%)									
		JRO-524		JRC-212		HS-7910		HC-583		K-12(Y)	
	Treatments	1st Yr	2nd Yr	1st Yr	2nd Yr	1st Yr	2nd Yr	1st Yr	2nd Yr	1st Yr	2nd Yr
	Initial	98.0	98.0	97.3	97.3	97.3	97.3	97.3	97.3	98.4	98.4
D_1	Earthen Pot	93.3	15.6	89.8	32.5	82.1	30.1	80.3	9.7	95.5	91.7
	Metallic Cont.	97.0	95.0	92.7	91.3	91.0	91.3	75.0	72.3	97.0	94.3
	Plastic Cont	97.0	96.0	90.3	89.6	92.3	92.0	76.0	67.6	95.9	93.8
	Cloth Bag	71.2	22.5	83.7	24.6	67.3	30.3	75.2	32.2	88.0	87.7
D_2	Earth Pot	90.0	2.0	73.3	16.3	55.0	1.3	66	1.3	94.7	90.7
	Metallic Cont.	97.3	97.0	94.0	93.3	95.2	91.3	82.0	72.6	97.0	95.5
	Plastic Cont.	97.0	97.0	94.7	92.2	96.0	92.1	80.7	68.7	97.0	94.6
	Cloth Bag	65.0	1.7	71.7	5.7	49.0	1.7	62.7	1.7	88.0	85.9
	CD (5%)	3.7	1.4	6.0	1.5	2.9	2.1	2.3	2.0	2.1	2.5

ambient conditions. Seeds stored in one set of the containers were dried intermittently (6 months interval) while the other set remained intact.

For records on germination and seedling vigor, hundred seeds of the plants were placed in petri plates containing three layers of Whatman No. 1 filter paper saturated with sterilized water. Moisture in the petriplates was maintained by adding water as and when required. Total number of seeds germinated, root and shoot length of the seedlings (average of ten plants) after seven days were recorded. Vigour index was calculated by multiplying seedling length (cm) with per cent germination (10). Germination percentage and vigor index of the seeds at the time of initiation of the experiment were recorded for future comparison.

Seeds retaining good germination and seedling vigor in petri-plate study after 2 years of storage were tested for field emergence in replicated micro plots (2 m × 2 m). After sowing, soil was irrigated to field capacity. Total number of seeds germinated after seven days were counted. Seedlings were uprooted from the soil to measure root and shoot length. Freshly harvested healthy seeds (97—98% germination) after proper drying were also sown in the field for germination count and root and shoot length measurement. Vigor index of seedlings obtained from stored seeds were compared with vigour index obtained from freshly harvested seeds.

Results and Discussion

Seed Germination

Jute, mesta and sunnhemp seeds tried for the storage experiment recorded 97.3—98% germination initially. Seeds in earthen pot, metallic and plastic containers maintained better germination as compared to cloth bag after one year of storage (Table 1). Intermittent drying did not exhibit any effect on germination of JRO-524 when seeds were stored in metallic and plastic containers. When the seeds were stored in earthen pots and dried after six months of storage, about 5% loss in germination was recorded. However, loss of germination was slightly more (8.16%) when the seeds were not dried intermittently. In cloth bags, seeds lost germination by 27.34% (with drying) and 33.67% (with out drying) after one year of storage.

In JRC-212 seeds 7.7%(with drying) and 24.66% (with out drying) loss in germination was recorded when stored in earthen pots. No significant loss in germination of seeds stored in metallic and plastic containers was recorded and intermittent drying did not have any impact on germination of the seeds. When seeds were stored in cloth bags, 13.87%(with drying) and 26.31% (with out drying) germination loss was recorded.

After second year of storage, JRO-524 seeds stored in metallic and plastic containers recorded good germination (95—97%). But when seeds were stored in earthen pots and cloth bags and dried intermittently, germination reduced to only 15.6—22.5% and when no drying was done, germination reduced further. Similar trend was recorded in JRC-212 seeds.

In mesta seeds after one year of storage no significant loss in germination was recorded in both the varieties when stored in metallic and plastic contain-

Table 2. Vigor index of jute and allied fibers seedlings after two years of storage in different containers with (D_1) or without (D_2) intermittent drying.

		Vigor index									
		JRO-524		JRC-212		HS-7910		HC-583		K-12 (Y)	
	Treatments	1st Yr	2nd Yr	1st Yr	2nd Yr	1st Yr	2nd Yr	1st Yr	2nd Yr	1st Yr	2nd Yr
	Initial	639.5	639.5	756.3	756.3	756.3	689.0	701.7	701.7	930.7	930.7
D_1	Earthen pot	434.3	36.7	652.7	115.7	380.3	37.8	444.0	45.2	796.0	716.0
	Metallic cont	630.3	485.3	746.0	656.7	665.3	381.3	699.7	581.7	925.3	924.7
	Plastic cont	632.7	575.0	706.3	672.0	675.7	397.7	698.3	469.7	919.0	917.7
	Cloth bag	424.3	39.3	555.7	50.7	383.3	42.3	344.3	21.3	679.0	675.0
D_2	Earthen pot	432.7	24.7	631.0	96.3	370.0	12.0	426.0	13.0	796.0	715.7
	Metallic cont	633.3	487.3	746.7	657.3	666.7	382.0	700.7	584.3	925.7	926.3
	Plastic cont	634.3	580.3	712.0	674.0	683.0	400.7	698.7	472.3	921.0	917.7
	Cloth bag	415.7	21.7	544.7	32.3	364.0	14.9	335.0	13.3	676.3	674.3
	CD (5%)	18.2	13.7	10.4	11.6	7.5	7.6	11.4	5.7	9.6	4.1

ers. However, the loss was significant when stored in earthen pot (15.53 and 15.81% in HS-7910 and HC-583 respectively) and doth bag (30.76 and 22.99%) even with intermittent drying, the loss was more when drying was not done.

After second year of storage, in both the varieties of mesta seeds, above 90% germination was recorded when stored in metallic and plastic containers but seeds stored in earthen pot and cloth bag lost germination much below the acceptable limit.

In sunnhemp seeds loss of germination was less as compared to jute and mesta seeds. About 85.9% germination was recorded even after second year of storage in cloth bag. Intermittent drying did not have significant effect on storage.

Seedling Vigor

In JRO-524 seeds, after one year of storage in metallic and plastic containers no significant vigor loss over initial value was recorded and after second year of storage about 10–24% vigor loss was recorded (Table 2). In earthen pot and cloth bag the vigor loss was 32–35% after one year of storage but the loss above 90% after second year of storage. Seedling vigor of JRC-212 was similarly affected due to storage.

When mesta seeds were stored in metalllic and plastic containers, little loss in vigor was recorded but vigor loss was more when stored in earthen pots and cloth bags. Unlike jute seeds, mesta seeds after second year of storage in plastic and metallic containers lost seedling vigor considerably (42–44% in HS-7910 and 17–33% in HC-583). Vigor loss was more than 90% when stored in earthen pots and cloth bags.

Vigor loss of sunnhemp seeds due to storage was less as compared to just and mesta seeds. After second year of storage, 23–27% loss in seedling vigor was recorded when stored in earthen pots and cloth bags. Intermittent drying did not exhibit any significant effect on seedling vigor.

Field Emergence

Vigor index of the seedling obtained from freshly harvested seeds were observed as 681.5, 938.5, 1231.5, 1399.2 and 1913.5 in JRO-524, JRC-212, HS-7910, HC-583 and K12 (yellow) seeds respectively. When the vigor index of seedlings obtained from JRO-524 seeds stored in metallic and plastic containers for two years were compared with vigor index of seedlings obtained from freshly harvested JRO-524 seeds, no significant vigor loss due to storage was recorded (Table 3).

Some loss in vigor after second year of storage in metallic and plastic containers was recorded in JRC-212 (8%), HS-7910 (19%) and HC-583 (15%) seeds when dried intermittently. However, loss was little less when the seeds were not dried intermittently.

In sunnhemp seeds, no significant difference in seedling vigor of stored seeds and fresh seeds was recorded.

Sunnhemp seeds due to hard and oily coating when stored in ambient condition, presence of moisture and oxygen did not cause much loss in germination and vigor even after two years of storage. But in jute and mesta seeds, after first year of storage sig-

Table 3. Vigor index of jute and allied fibers seedlings under field condition after two years of storage.

	Treatments	JRO-524	JRC-212	HS-7910	HC-583	K12 (Y)
	Fresh seeds	681.75	938.5	1231.5	1399.2	1913.5
D_1	Metallic cont	649.75	859.5	995.0	1182.25	1798.7
	Plastic cont	660.00	871.2	999.5	1182.50	1804.2
D_2	Metallic cont	680.00	916.5	1060.0	1201.0	1840.0
	Plastic cont	664.00	922.0	1064.2	1189.5	1842.5
	CD (5%)	53.83	51.83	47.43	79.56	146.36

nificant loss in germination and vigor was recorded when stored in cloth bags in ambient condition due to free movement of moisture and oxygen. When seeds were stored in earthen pots, loss was less as compared to cloth bags but loss was more in comparison to plastic and metallic containers. The micro pores present in the wall of the earthen pots or the micro cracks developed in the earthen pest applied on the lids placed on the mouth of the pot to make it airtight, perhaps allowed some movement of moisture and oxygen. Intermittent drying in some cases when seeds were stored in cloth bags/earthen pots helped to reduce slightly the loss by reducing the absorbed moisture level in the seeds. When the seeds were stored in plastic and metallic containers, even after two years of storage, the seeds maintained germination and vigor to a high degree since no movement of moisture and oxygen was allowed. This observation is in accordance with findings of other workers (11—13). But the seeds stored in the above containers when dried intermittently, exposure to oxygen during drying period perhaps reduced germination and vigor slightly in some cases.

Evidently jute and allied fibers seeds cannot be stored as healthy one in ambient conditions for a long time when exposed to moisture and oxygen. However, after sun drying of seeds for at least 5 days and if stored in airtight containers can proling viability of the seeds even up to 24 months.

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