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IMPACT ON STORABILITY IN FINGER MILLET (*ELEUSINE CORACANA* L. GAERTN) UNDER DIFFERENT PACKAGING MATERIALS

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ABSTRACT

The present investigation was conducted at Seed Testing Laboratory, Seed Unit, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli during *Kharif*, 2023 to study the impact on storability of finger millet (*Eleusine coracana* L. Gaertn) seed under different packaging materials. In this experiment freshly harvested seed of one variety (seed lots of 2021-22 harvest) Maruthi and it was stored in two packing material i.e. HDPE bag and Cloth bag with three replications in FCRD design. Monthly observations after storage in HDPE & Cloth Bags were recorded on various parameters like first count (%), germination (%), vigour index-I & vigour index-II and seedling emergence (Pro-trays). From the above study it was observed that, seed quality parameters of Rabi finger millet seed lots, irrespective of variety and HDPE/Cloth bag storage, were found to decline successively below IMSCS over storage periods under ambient storage conditions during rainy season in Konkan region. This may be due to fast deterioration of seed quality of seed lots due to higher moisture gain (> 9% of IMSCS) and fungal contamination. Finger millet variety stored in HDPE bag maintained germination above IMSCS (75%) up to nine months of storage period from the date of first test at Konkan condition.
Keywords **:** Finger millet, Storability, Seed quality, seed testing.

Introduction

Millets are in the family of cereals grown globally with differential importance across continents and within regions of the world. Cereals are staple foods for a large proportion of the world population. Cereal grains contribute a significant amount of energy, protein, selected micronutrients and non-nutrients in the diet of populations all over the world in both developed and developing countries. Cereal and cereal-based food products provide more than 58% of the energy and 55% of the protein consumed worldwide. Economically important millets in the world are pearl millet, finger millet, foxtail millet, proso millet, kodo millet and little millet (Shahidi and Chandrasekara, 2013).

Finger millet (Ragi) holds immense significance as a subsistence crop in Eastern Africa and Asia. This gluten-free cereal has gained recognition for its exceptional nutritional value, making it a vital weapon in the fight against malnutrition. Beyond its nutritional benefits, finger millet cultivation serves a dual purpose by not only fulfilling the dietary requirements of rural households but also contributing to their livelihoods.

Storage of seed is an essential component of the whole production system, which primarily aims at maintaining the high-quality standards of the seed from harvest till the time of sowing the crop in the next

seasons (Dadlani *et al*., 2023). The prime objective of seed producer, namely, availing food for the future and avoiding food shortage by providing best quality seed for the successive season. One of the most noteworthy attributes of finger millet is its exceptional storage capabilities. Though, the seeds of finger millet are more sensitive to temperature, moisture content, humidity and light intensity during storage condition. The qualitative loss of seed can be attributed to biochemical changes in protein, carbohydrates, minerals and vitamins. The rate of ageing is mainly depends on genotype, moisture and temperature. In rapid and slow ageing (natural ageing), the pattern of deterioration proceeding the death is the same whether seed survives for few hours or decades. Therefore, storage of seeds from harvesting to sowing in next season without deteriorating its quality is important for successful seed production. Hence, in present investigation was undertaken to know the planting values of seeds to examine the prescribed storage periods of validity of seed lots of finger millet under various packaging materials.

Materials and Methods

The present experiment was conducted at Seed Testing Laboratory, Seed Unit, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli during *Kharif*, 2023 to study the effect of different packaging material on storability of seed of finger millet. In this experiment freshly harvested seed of finger millet variety i.e., Maruthi (seed lots of 2021-22 harvest) and it was stored in two packing material i.e. HDPE bag (B1) and Cloth bag (B2) with three replications in FCRD design. Monthly observations after storage in HDPE & cloth bags were recorded on various parameters like first count (%), germination (%), vigour index-I & vigour index-II, seedling emergence (Pro-trays). All the seed quality parameters were observed at monthly interval up to 9 months from the starting period of storage. This experiment consisted of eight treatment combinations involving two different packaging materials viz., B1: HDPE bag, B2: cloth bag and three storage periods viz., SP1: October, SP2: November, SP3: December and SP4: January is stored as seed. The observations on germination test were recorded as per the standard procedures. The mean data of the experiment were statistically analyzed by adopting appropriate statistical methods as outlined by Panse and Sukhatme (1978). The vigour index (I) and (II) were computed by following the formula:

$$\text{Vigour index (I)} = \text{Germination percentage} \times \text{Seedling length (Shoot length + Root length)}$$

Vigour index (II) = Germination percentage × dry matter production (g 10 seedlings-1) (Abdul Baki and Anderson, 1973).

Results and Discussion

Results of the present investigation conducted during Kharif-2023 are reported in Table 1 to Table 4. The analysis of variance of different traits and effects of seed lots viz., Maruthi, storage bags *viz*., HDPE (B1) and Cloth (B2), Storage Periods viz., SP1 (October-1 MAS), SP2 (November-2 MAS), SP3 (December-3 MAS), SP4 (January-4 MAS) and their interactions on different seed quality parameters in finger millet are given in Table 1 to Table 3. The storage bags (SB) and storage periods (SP) revealed significant variation for all the seed quality parameters *viz*., first count (%), germination (%), vigour index-I and vigour index-II (Table 2).

Moisture Content (%): Seed Testing Laboratory (STL) seed test carried in March 2023 revealed moisture content of seed lot within permissible limit of IMSCS and found to be 13.20 % for Maruthi finger millet variety. While, moisture content of the seed lot tested after receipt of seed lots in September was above IMSCS standard and found to be 13.10% (Table 1). Moisture % was recorded once in a three month. The storage bag HDPE bag is a moisture resistant bag showed less fluctuation of moisture content of finger millet seed during entire storage period.

First Count%: There was significant difference was recorded for storage bags during entire storage period. At initial significantly highest first count % (germination %) observed for Maruthi (94.00%) (Table 1), whereas, in storage bag, HDPE bag recorded highest count % (84.336) over cloth bag while decreasing trend of first count (%) was found 85.725, 80.075, 75.163 & 64.035 at SP_1 SP_2, SP_3 and SP_4, respectively (Table 2). Among two way interactions, B1SP1 (93.200%), B1SP2 (87.275%), B1SP3 (83.950%) and B2SP1 (79.250%) recorded more count as per IMSCS (Table 3).

Germination (%): There was significant difference recoded of finger millet variety Maruthi in storage bags throughout storage period. The germination percentage was found to decline after receipt of seed lots than STL report. Germination of seed lot found to be 94.50 % after receipt of seed lots as against to that of 94.00 % (Table 1) was observed in STL report. The seed lots after receipt were stored at ambient storage condition in ½ kg packing size in HDPE bag (B1) and Cloth bag (B2) for monthly laboratory tests on seed quality parameters after storage till germination of seed lots goes below IMSCS. The variety Maruthi stored in

HDPE bag maintained germination (83.878%) above IMSCS (75%) as compared to cloth bag (69.100%) (Table 2) while decreasing trend of germination was observed as storage period extended 86.625 (SP1) to 64.956 (SP4). Among interactions, B1SP1 (92.750%), B1SP2 (86.500%), B1SP3 (83.250%) and B2SP1 (80.500%) recorded maximum germination percentage as per IMSCS (Table 3). The field emergence data for 7 and 14 day after sowing in HDPE and cloth bags were given in table 4. Field emergence in 7 DAS of HDPE and cloth bag was observed 64.25% and 30.00%, respectively as well as 14 DAS in HDPE and cloth bag was observed 66.65% and 40.15%, respectively.

Vigour Index-I and II: There was significant difference was recorded in storage bags during entire storage period. The same trend was observed i.e. decrease in vigour index-I & vigour index-II during the advancement of storage periods (622.817-270.417) and (1.458-0.727), respectively. Among interaction effects, decreasing trend (719.913-190.804) and (1.854-0.481) was recorded for vigour index-I and vigour index-II, respectively (Table 3).

It was observed that, finger millet seeds stored in HDPE bag storage acted as a hermatic storage which works on the principle of creating airtight conditions in which oxygen level was lowered due to insect, fungal and seed respiration, which maintained the seed quality parameters. While the seeds stored in cloth bag recorded lower values that may be attributed to fluctuation of moisture content, leading to a faster deterioration in seeds stored in cloth bag. These findings are in agreement with Chauhan (2018) in finger millet, Pooran *et al.* (2018) in foxtail millet, S Ganga Shree (2021) in pearl millet and Zheng *et al.* (2023), Mohammad *et al.* (2016) and Bhanu *et al.* (2021) in rice.

Conclusion

Seed quality parameters of Rabi finger millet seed lot, irrespective of variety and HDPE/Cloth bag storage, were found to decline successively below IMSCS over storage periods under ambient storage conditions during rainy season in Konkan coastal region. This may be due to fast deterioration of seed quality of seed lots due to higher moisture gain (> 9% of IMSCS) and fungal contamination. December onwards germination goes down below IMSCS and seed lot does not remain viable within validity period itself. Finger millet variety stored in HDPE bag maintained germination above IMSCS (75%) up to nine months of storage period from the date of first test at Konkan condition.

Table 1: Initial Seed moisture content and germination of Finger millet seed lot.

Variety	STL Report				After Receipt of Samples (September)	
	Date of Harvest	Date of Test	MC (%)	GP (%)	MC (%)	GP (%)
V_1: Maruthi	March 2023	31.03.2023	13.20	94.50	13.10	94.00

Table 2 : Effects of seed lots on storage bags and storage periods on seed quality parameters in Finger millet.

Treatment	First Count (%)	Germination (%)	Vigour Index-I	Vigour Index-II
Storage Bag				
B_1	84.336	83.878	536.873	1.333
B_2	68.413	69.100	321.817	0.750
CD (0.05)	**2.088**	**1.733**	**15.530**	**0.090**
Storage Period				
SP_1 (Oct.)	85.725	86.625	622.817	1.458
SP_2 (Nov.)	80.075	79.000	491.086	1.175
SP_3 (Dec.)	75.163	75.375	333.060	0.805
SP_4 (Jan.)	64.035	64.956	270.417	0.727
CD (0.05)	**2.558**	**2.123**	**19.020**	**0.111**

Table 3 : Interaction effects of storage bags and storage periods on seed quality parameters in Finger millet.

Interaction	First Count (%)	Germination (%)	Vigour Index-I	Vigour Index-II
B1 SP1	93.200	92.750	719.913	1.854
B1 SP2	87.275	86.500	617.700	1.421
B1 SP3	83.950	83.250	459.850	1.082
B1 SP4	72.920	73.010	350.029	0.973

B2 SP1	79.250	80.500	525.720	1.061
B2 SP2	72.875	71.500	364.472	0.928
B2 SP3	66.375	67.500	206.270	0.528
B2 SP4	55.150	56.901	190.804	0.481
CD (0.05)	**NS**	**NS**	**16.898**	**NS**

Table 4 : Field emergence data.

Storage bag	Germination (7 days)	Germination (14 days)
HDPE bag	64.25	66.65
Cloth bag	30.00	40.15

Fig. 1A: Finger Millet : Maruthi, Initial Germination Percentage

Fig. 1B:1 MAS Cloth Bag

Fig. 1C:1 MAS HDPE Bag

Fig. 1D:2 MAS Cloth Bag

Fig. 1E:2 MAS HDPE Bag

Fig. 1F:3 MAS Cloth Bag

Fig. 1G:3 MAS HDPE Bag

Fig. 1H:4 MAS Cloth Bag

Fig. 1I:4 MAS HDPE Bag

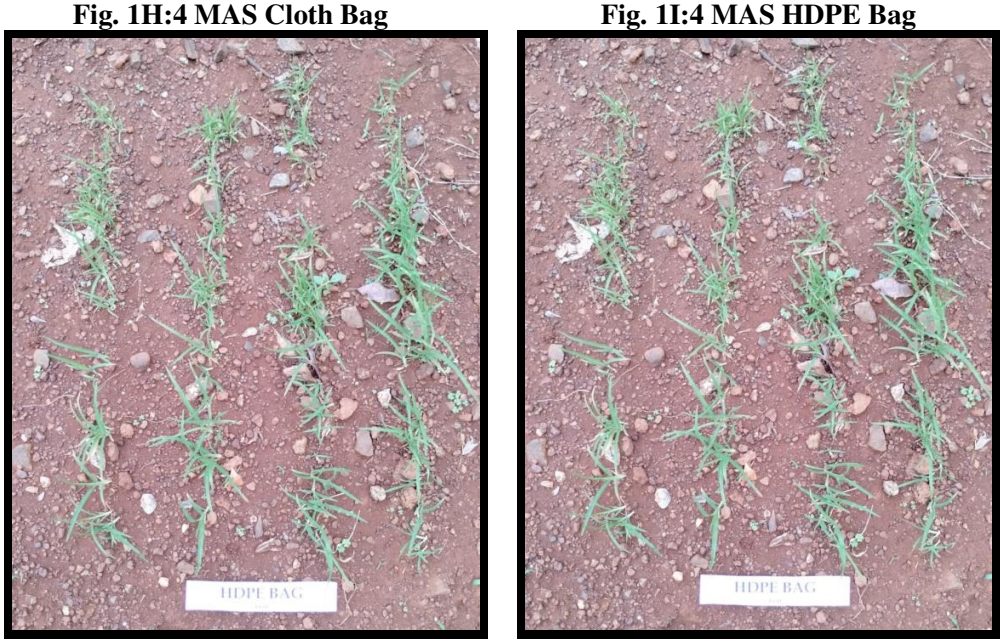

Fig. 2A:Field Emergence-HDPE Bag

Fig. 2B:Field Emergence-Cloth Bag

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