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Research Article

EFFECT OF SEED TREATMENT, CONTAINER AND STORAGE PERIOD ON LONGEVITY OF FOXTAIL MILLET

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Abstract- An experiment was conducted in the laboratory of the Department of Seed Science and Technology, UAS, Bangalore to find out the effect of different chemicals, botanicals and different containers on storability of foxtail millet. The study was conducted with two seed dressing chemicals *viz*., Thiram and Neem seed kernel and three different containers *viz*., cloth bags, polythene bags (700 gauge) and gunny bag. Highly significant differences were observed for treatment with different seed dressing chemicals and type of container irrespective of per cent germination, seedling length, seedling dry weight, seedling vigour index, electrical conductivity, seed infection and moisture content of stored seeds. The present study on storage revealed that foxtail millet seeds can be stored in polythene bags (700 gauge) after treating with thiram (3g/kg) for extending the storage life.

Keywords- *Treatment, Container, Storage Period, Thiram*

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Introduction

Seed deterioration starts after physiological maturity and continue during storage period. The rate of deterioration can be slowed down by providing optimal storage conditions. Besides good storage conditions, several other factors like moisture content of seed at the time of storage and packaging material also affect longevity. Treatment of seeds with chemicals [1] reported to offer certain amount of protection to seed from microorganisms and maintains longevity during storage. The present investigation was designated to depict the effect of different chemical and botanical treatments, containers and storage period on longevity of foxtail millet seed stored for eight months.

Materials and Methods

Freshly harvested seeds of foxtail millet genotypes SIA326 and PS-4 were used for the study. 100g of seeds were used for each treatment and seeds were treated with fungicide (Thiram @ 3 g/kg) and botanical (Neem seed kernel powder @5g/kg) with one control. For the seed treatment gum arabica was used as adhesive and then seeds were dried under shade. The treated and untreated control seeds were placed in cloth bag, polythene bag (700 gauge) and gunny bag as per the treatment combinations and seeds stored under ambient conditions in the laboratory of Department of Seed Science and Technology, College of Agriculture, GKVK, Bengaluru for eight months. Monthly observations were recorded on germination, seedling length, seedling dry weight, seedling vigour index, electrical conductivity, seed infection and moisture content.

Results

Genotypes: The effect of genotypes were significant for moisture content [Table-1], germination [Table-2], seedling vigour index [Table-3], electrical conductivity [Table-4] and seed infection [Table-5]. The lowest moisture content (11.12%) was recorded in SIA 326 followed by PS-4 (11.15%). highest germination (95%), vigour index I (1657) with lowest seed infection (4.65%) compare to SIA 326 except for electrical conductivity.

Treatment: The results of different seed treatments were found significant for all quality parameters *viz*., moisture content [Table-1], germination [Table-2], seedling vigour index [Table-3], electrical conductivity [Table-4] and seed infection [Table-5]. Thiram (2g/kg seed) recorded lower moisture content (10.97%), highest germination (96%) which was on par with Neem seed kernal (2g/kg seed) (96%), higher seedling vigour index (1681) with lower lowest electrical conductivity (12.64dSm-1) and seed infection (3.37%) and compare to control.

Containers: The results found that significant differences were observed over eight months of storage for all quality parameters with respect to containers. Lowest moisture content (10.72%) was recorded in 700 gauge polythene bag followed by cloth bag (11.26%) and higher moisture content was recorded in gunny bag (11.42%). 700 gauge polythene bag was recorded lowest electrical conductivity (11.48dSm^{-1}) and seed infection (4.49%) compare to cloth bag (13.62dSm^{-1}).

Storage period: effect of storage period was found significant for all the characters. Germination, seedling vigour index showed gradual significant reduction as storage period advanced. Highest value of moisture content, electrical conductivity and seed infection was found in eight months of storage.

Discussion

During storage, the viability of seed is affected by various factors such as genetics, pre-harvest climatic conditions, seed characters, seed health, temperature, relative humidity, packaging materials and seed moisture content. Out of these factors packaging materials and seed treatment are consider to be important in ensuring seed health. The results were showing seed storability is considerably influenced by the kind / variety of seeds. Similarly, the genetic make-up of the lines/ varieties in the same kind also influences storability. In the present storage experiment, a progressive decline in seed quality attributes in cloth and gunny bag was noticed whereas it was maintained in 700 gauge polythene bag. This could be attributed to air tight conditions maintained by polythene bag which helped in preventing absorption of moisture from the surrounding air.

Table-1 *Moisture (%) as influenced by genotypes, containers and seed treatments during storage of foxtail millet*

Particulars	Storage period (Months)								
	1	2	3	4	5	6	7	8	Mean
Genotypes (G)									
G1	10.42	10.55	10.60	10.73	10.75	10.92	11.04	11.15	10.77
G2	10.43	10.52	10.60	10.70	10.80	10.86	11.01	11.12	10.75
Mean	10.42	10.53	10.6	10.71	10.77	10.89	11.02	11.13	10.76
SEm ±	0.008	0.034	0.028	0.010	0.030	0.030	0.011	0.012	
CD (0.05P)	NS	NS	NS	NS	NS	NS	NS	NS	
Treatments (T)									
T1	10.54	10.64	10.71	10.85	10.93	11.00	11.17	11.28	10.87
T2	10.34	10.45	10.49	10.55	10.67	10.76	10.85	10.97	10.63
T3	10.41	10.47	10.61	10.72	10.81	10.91	11.05	11.15	10.78
Mean	10.43	10.52	10.60	10.76	10.77	10.89	11.02	11.13	10.76
SEm ±	0.010	0.042	0.034	0.012	0.037	0.037	0.013	0.014	
CD (0.05P)	0.027	0.119	0.098	0.033	0.107	0.105	0.03	0.041	
Packaging material (P)									
P1	10.50	10.64	10.71	10.82	10.91	11.02	11.14	11.26	10.87
P2	10.28	10.39	10.45	10.45	10.52	10.58	10.65	10.72	10.50
P3	10.46	10.52	10.71	10.88	10.90	11.08	11.28	11.42	10.90
Mean	10.41	10.51	10.62	10.71	10.77	10.89	11.02	11.13	10.76
SEm ±	0.010	0.042	0.034	0.012	0.037	0.037	0.013	0.014	
CD (0.05P)	NS	NS	NS	0.033	0.107	0.105	0.038	0.041	

Table-2 *Germination (%) as influenced by genotypes, containers and seed treatments during storage in foxtail millet*

Particulars	Storage period (Months)								
	1	2	3	4	5	6	7	8	Mean
Genotypes (G)									
G1	98 (83)	98(83)	98(83)	98(83)	97(81)	97(81)	96(79)	95(78)	97
G2	97(81)	97(81)	96(79)	96(79)	96(79)	96(79)	96(79)	95(78)	96
Mean	97	97	96	96	96	96	96	95	96
SEm ±	0.206	0.203	0.168	0.252	0.172	0.108	0.136	0.134	
CD (0.05P)	NS	NS	NS	NS	NS	0.205	0.309	0.210	
Treatments (T)									
T1	97(81)	97(81)	97(81)	97(81)	97(81)	96(79)	95(78)	95(78)	96
T2	97(81)	97(81)	97(81)	97(81)	97(81)	97(80)	96(79)	96(79)	96
T3	98(83)	98(83)	97(81)	97(81)	97(81)	97(81)	96(79)	96(79)	97
Mean	97	97	97	97	97	96	95	95	96
SEm±	0.252	0.248	0.205	0.309	0.210	0.132	0.167	0.164	
CD (0.05P)	0.410	0.336	0.23	0.23	0.47	0.22	0.20	0. 23	
Packaging material (P)									
P1	97(81)	97(81)	97(81)	97(81)	97(81)	96(79)	95(78)	94(77)	96
P2	98(83)	98(83)	98(83)	98(83)	98(83)	98(83)	97(81)	97(81)	97
P3	98(83)	98(83)	97(81)	97(81)	97(80)	96(79)	95(78)	94(77)	96
Mean	97	97	97	97	97	96	95	94	96
SEm±	0.252	0.248	0.205	0.309	0.210	0.132	0.167	0.164	
CD (0.05P)	NS	NS	NS	NS	0.603	0.379	0.478	0.469	

Table-3 *Seedling vigour index as influenced by genotypes, containers and seed treatments during storage in foxtail millet*

Particulars	Storage period (months)								Mean
	1	2	3	4	5	6	7	8	
Genotypes (G)									
G1	1503	1620	1629	1655	1669	1679	1655	1657	1633
G2	1486	1565	1622	1624	1625	1645	1654	1649	1608
Mean	1494	1592	1625	1639	1647	1662	1654	1653	1621
SEm ±	35.436	20.745	17.805	15.252	3.685	1.988	2.104	2.158	
CD (0.05P)	NS	NS	NS	NS	10.567	5.700	6.034	6.189	
Treatments (T)									
T1	1416	1538	1548	1558	1638	1638	1596	1573	1563
T2	1499	1615	1637	1651	1654	1663	1698	1681	1637
T3	1507	1646	1675	1678	1680	1705	1696	1680	1658
Mean	1474	1599	1620	1629	1657	1668	1663	1644	1619
SEm ±	43.400	25.408	21.806	18.679	4.513	2.434	2.577	2.643	
CD (0.05P)	NS	NS	NS	NS	12.942	6.981	7.390	7.580	
Packaging material (P)									
P1	1415	1550	1597	1623	1637	1611	1582	1571	1573
P2	1564	1686	1687	1691	1727	1729	1722	1719	1690
P3	1505	1610	1610	1636	1637	1650	1597	1573	1599
Mean	1494	1615	1631	1650	1667	1663	1627	1621	1621
SEm ±	43.000	25.408	21.806	18.679	4.513	2.434	2.577	2.643	
CD (0.05P)	NS	NS	NS	NS	12.942	6.981	7.390	7.580	

Table-4 *Electrical conductivity (dSm-1) as influenced by genotypes, containers and seed treatments during storage in foxtail millet*

Particulars	Storage period (Months)								Mean
	1	2	3	4	5	6	7	8	
Genotypes (G)									
G1	12.22	12.49	12.66	12.83	13.05	13.23	13.32	13.46	12.90
G2	11.37	11.61	11.74	11.89	11.99	12.09	12.20	12.32	11.90
Mean	11.79	12.05	12.2	12.36	12.52	12.66	12.76	12.89	12.40
SEm ±	0.045	0.046	0.036	0.035	0.054	0.055	0.056	0.061	
CD (0.05P)	0.128	0.132	0.104	0.100	0.154	0.159	0.161	0.174	
Treatments (T)									
T1	12.03	12.38	12.46	12.64	12.78	12.88	12.99	13.12	12.42
T2	11.55	11.68	11.93	12.07	12.24	12.42	12.53	12.64	12.66
T3	11.81	12.08	12.21	12.37	12.55	12.68	12.76	12.90	12.13
Mean	11.79	12.04	12.2	12.36	12.52	12.66	12.76	12.88	12.40
SEm±	0.055	0.056	0.044	0.043	0.066	0.068	0.069	0.074	
CD (0.05P)	0.157	0.162	0.127	0.123	0.186	0.194	0.198	0.213	
Packaging material (P)									
P1	12.28	12.61	12.69	12.92	13.14	13.36	13.48	13.62	13.01
P2	10.52	10.80	10.95	11.05	11.21	11.29	11.38	11.48	11.08
P3	12.59	12.73	12.95	13.11	13.22	13.32	13.43	13.57	13.11
Mean	11.79	12.04	12.19	12.36	12.52	12.65	12.76	12.89	12.40
SEm±	0.055	0.056	0.044	0.043	0.066	0.068	0.069	0.074	
CD (0.05P)	0.157	0.162	0.127	0.123	0.189	0.194	0.198	0.213	

Table-5 *Infection (%) as influenced by genotypes, containers and seed treatments during, storage in foxtail millet*

Particulars	Storage period (Months)								Mean
	1	2	3	4	5	6	7	8	
Genotypes (G)									
G1	1.73	2.02	3.61	4.60	4.60	4.61	4.61	4.65	3.80
G2	1.36	1.72	4.54	4.54	4.54	4.62	4.66	5.54	3.94
Mean	1.54	1.87	4.07	4.57	4.57	4.61	4.63	5.09	3.87
SEm ±	0.210	0.220	0.248	0.229	0.248	0.22	0.211	0.192	
CD (0.05P)	NS	NS	NS	NS	NS	NS	NS	NS	
Treatments (T)									
T1	1.69	2.11	5.04	5.04	5.49	5.57	6.11	6.11	4.64
T2	0.70	0.70	2.32	2.32	3.02	3.07	3.37	3.37	2.35
T3	2.25	2.80	4.35	4.66	4.87	4.87	5.80	5.80	4.42
Mean	1.54	1.87	3.90	4.00	4.46	4.50	5.09	5.09	3.80
SEm±	0.257	0.269	0.303	0.281	0.303	0.281	0.258	0.236	
CD (0.05P)	0.737	0.772	0.869	0.805	0.869	0.805	0.740	0.676	
Packaging material (P)									
P1	1.69	2.25	4.11	4.11	4.54	4.60	5.06	5.06	3.92
P2	1.41	1.41	3.29	3.50	3.50	3.69	4.49	4.49	3.22
P3	1.55	1.95	4.63	4.63	5.01	5.02	5.73	5.73	4.28
Mean	1.55	1.87	4.01	4.08	4.35	4.43	5.09	5.09	3.81
SEm±	0.257	0.269	0.303	0.281	0.303	0.281	0.258	0.236	
CD (0.05P)	NS	NS	NS	NS	NS	NS	NS	NS	

Seeds in gunny bag have gained relatively higher moisture than seeds in polythene bag and due to the higher vapour pressure gradient between the seeds and external environment. Polythene bag acted as moisture proof barrier. This evidence by lower moisture content in the seeds packed polythene bag [2]. Highest germination and vigour was maintained by 700 gauge polythene bag followed by gunny bag and cloth bag which could be attributed to maintenance of lower moisture content during the storage period. Since polythene bag acted as moisture proof barrier. This lower moisture content resulted in lower respiration rate, lower metabolic activity and maintenance of higher seed germination and vigour during storage [3]. With respect to electrical conductivity, 700-gauge polythene bag was recorded lowest electrical conductivity and seed infection compare to cloth bag. This may be ascribed to less fluctuation of moisture in polythene bag which might have reduced the deterioration rate by maintaining membrane integrity. The various factors acting on seeds such as fluctuation in relative humidity and temperature in cloth bag including fungal invasion might have enhanced the process of degradation of membrane integrity leading to higher quantity of electrolytes to leach out which might have attracted microorganisms. Treatments have played significant role in growth inhibition of storage fungi and attributed to higher germination and seedling vigour [4, 5, 6]. Seeds treated with thiram as dry powder and neem seed kernel might have hindered in contact of vapour proof from the surrounding air compared to untreated seeds [7]. Effective control of pathogens by these chemical and botanical maight improved all the quality parameters. Since they acts as antifungal agents [8].

Conclusion

Overall results that, foxtail millet seeds can be stored in polythene bags (700 gauge) after treating with thiram (3g/kg) for extending the storage life.

Application of research: Study of Effective control of pathogens

Research Category: Seed Science and Technology

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