PREDICTION OF STORAGE POTENTIAL OF SEED LOTS OF SUNFLOWER STORED AT DIFFERENT LOCATIONS IN KARNATAKA STATE

V.P. Kalappa, K.P.R. Prasanna, K. Somasekhara and P.J. Devaraj

University of Agricultural Sciences, GKVK, Bangalore - 560 065, India
FAX : 091-080-3330277

SUMMARY

Laboratory studies on the germination response of accelerated aged seeds before storage and the germination percentages of naturally aged seeds at different periods of storage were compared by working out simple correlations, with the objective of predicting the storage potential of sunflower seed lots. Ten commercial seed lots of sunflower (Cv. Morden) were stored under ambient conditions at three distinct storage locations viz., Raichur, Bangalore and Dharwad in Karnataka State. The samples of seed lots were aged for 1 to 10 days involving ageing temperature of 40°C and 100 per cent relative humidity. The results indicated that seed lots with low A.A. germination had reduced germination at different periods of storage in all the three locations indicating the low storage potential of the seed lots. Retention of germination varied in seed lots during commercial storage. These differences were evident after 6-8 months of storage. The initial laboratory germination was moderately and significantly correlated with seed germination at 8 and 10 months of natural storage at Raichur and Bangalore and only with 8th month under Dharwad conditions, but did not correlate with subsequent months.

A.A. germination after 4, 6 and 8 days of ageing was found to give significantly high correlation with germination after 8 to 16 months of storage at all the three storage locations. A.A. germination after 10 days of ageing failed to give significant correlations. However, either 4 or 6 days of ageing was found to be more ideal to predict the storage potential of seed lots as they have shown consistently high correlations with different periods of storage at all the three storage locations. Thus, results infer that the A.A. test results can be used in sunflower as an aid to make decisions about, which seed lots can be stored with least loss of viability and thereby avoiding use of costly storage facilities.

INTRODUCTION

Seed lots of sunflower varieties are stored normally in cloth bags and or gunny bags under ambient conditions of warehouses and in seed godowns up to next sowing season. Unsold carry over seed lots shall have to be stored for extended periods of time. The longevity of seed in storage is mainly influenced by quality of seed at the time it enters the storage and the storage environment. Many locations in the state where seed being stored in commercial scale differ considerably in respect of climatic factors like temperature and relative humidity. Differences in the retention of seed viability have occurred in the seed lots of a given variety with initially similar high germination (Powell and Mathews, 1983a) sometime referred to as differences in vigor. Thus, it is apparent that some important aspects of seed quality viz., storability and vigor may not be reflected in the initial germination prior to storage. Sunflower being oilseed crop, recognized as having poor storage potential. Delouche and Baskin (1973), through their extensive work on predicting the storage potential of seed lots, have suggested accelerated aging test, which distinguishes between seed lots by testing their germination following a period of accelerated aging. Seedsmen are often faced with the decision of which seed lots to market first and which can be hold for possible carry over, with least loss of viability in the event of weak market or to guard against shortage in the following year. Standard germination test does not predict the extent of deterioration that has occurred. Till date there is no universally accepted method for predicting the storage potential of the seed lots. In the present study, AA test has been employed to predict the storage potential of seed lots of sunflower var. Morden.

MATERIAL AND METHODS

The commercial seed lots of sunflower var. Morden produced in *kharif* were obtained from Karnataka State Seeds Corporation Ltd., Bangalore. The seeds have been harvested two months before the commencement of the storage studies. Seed lots were uniformly dried to 5.0 ± 0.2 per cent moisture content. Long term storage was carried out in commercial seed stores facility provided by State Seed Corporation at three different locations in the state viz., Bangalore, Dharwad and Raichur in Karnataka State. Twenty four subsamples of 250 g each were drawn from each of the seed lot and were packed in cloth bags. Eight subsamples representing each lot were stored under ambient storage conditions of three storage locations.

In the storage locations the atmospheric conditions over the storage period showed fluctuations in monthly mean temperature from 19.6°C to 27.6°C (Bangalore) from 21.4°C to 28.2°C (Dharwad) and from 23.4°C to 33.1°C to (Raichur). The critical relative humidity of 70 per cent and above was observed for three months in a year at Bangalore, eight months at Dharwad and one month at Raichur, respectively. The seeds of a subsample representing a lot was drawn bimonthly from the storage locations for testing per cent germination (Anon., 1985) for a period of 16 months.

Seed vigor was assessed using accelerated aging technique by subjecting the seeds to 40°C, 100 per cent relative humidity for one to ten days before initiating the storage experiment. About 20 g seeds from each of the lot were removed from the aging chamber every day and day under shade for 24 hrs. A germination test was carried out on 100 seeds of four replications after

accelerated aging by relaxing the definition of normal and abnormal seedlings. A seed which produces the identifiable seedling regardless of their size is counted as germinal one (Delouche and Baskin, 1973). Germination response of accelerated aged seeds and the germination percentage of naturally aged seeds at different periods of storage were compared by working out simple correlation between selected aging regimes and certain periods of natural aging (8, 10, 12, 14 and 16 months) with the objective of predicting the differences in the storage potential of seed lots.

RESULTS AND DISCUSSION

The results of the study are presented in Table 1 and 2. The differences in the retention of germination in commercial storage have been shown to occur in seed lots of sunflower var. Morden. These differences were more evident after 6 to 8 months of storage. Seed lots storage potential was predicted by differences in seed lots vigor as revealed by AA test. Seed lots with similar initial germination as in L_9 and L_3 (96%) and L_8 and L_2 (93%) differed widely in germination ranging from 80-87 per cent and 69-80 per cent, respectively after 16 months of storage in Raichur locations. Similar differences between the lots were also observed in other locations. Germination after four days aging between these lots also differed ranging from 92-89 per cent and 82-86 per cent, respectively. While low germinable lots L_6 and L_5 showed faster decline in accelerated and natural aging conditions in all the three locations. Thus seed lots with high AA germination retained high germination in storage, while lots with low AA germination had reduced germination at different periods of storage in all the locations. Some seed lots not closely associated after severe aging beyond 8 days for example lot L_1 and L_4 with wide differences up to 8 days of aging did not respond in the similar way at 10 days of aging.

The initial laboratory germination of seed lots ranged from 80-96 per cent, was moderately and significantly correlated with germination at 8 and 10 months of natural storage in Raichur (0.760 and 0.716) and Bangalore (0.725 and 0.664) and only 8 months in Dharwad (0.766). But did not correlated with subsequent months of storage. However, the prediction of storage potential from laboratory germination was not always possible due to the relatively small differences in seed lot germination before storage. Earlier studies by Roberts (1984), Powell and Mathews (1984) also highlighted the major limitation of the germination test as an assessment of seed lot potential. Germination after 4, 6 and 8 days of accelerated aging (AA) was found to give significant correlation with germination after 8 to 16 months of storage in all the three storage locations. AA germination after 10 days of aging failed to give significant correlation, could be due to severe aging accompanied by mold growth. However, either 4 or 6 days of aging have shown consistently higher correlation with germination at different periods of storage. Thomas *et al.* (1985) stated that aging for three days at 41°C proved an excellent separation in vigor across seed lots in soybean.

With some exceptions germination response after AA and germination per cent at different aged period are closely associated. Those lots that had high AA germination before storage retained high germination during storage. While lot that was reduced in germination by accelerated aging declined rapidly in storage indicating low storage potential. Hampton (1992) related storage potential of high germinating seeds to their vigor status on entering storage. The

results also revealed that those seed lots which resisted six days of aging and retained AA germination of 70 per cent and above can be stored safely more or less equal to 16 months (69%) in Raichur, 12 months (71%) in Bangalore and 8 months (92%) in Dharwad. Similar attempt to predict the longevity of the seed was made by Kurdikeri (1991) in maize. Germination after six days of aging (40°C with 60% RH) in non-dormant fresh sunflower seeds not only had the higher correlation with the germination after storage but also spread over wide range of AA germination differentiating more clearly between the seed lots.

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Table 1. Comparison of germination percentages of Accelerated Aged (40°C, 100% RH) and natural aged seeds of sunflower seed lots of var. Modern stored at three stage locations.

Lots	Initial germination	Accelerated aging regimes (40°C,100% RH)										Natural storage conditions, months																			
		Days										Raichur								Bangalore								Dharwad					
		1	2	3	4	5	6	7	8	9	10	2	4	6	8	10	12	14	16	2	4	6	8	10	12	14	16	2	4	6	8	10	12	14	16
L_1	94	95	92	86	87	84	79	75	67	53	50	99	99	98	92	91	88	83	77	97	95	95	97	85	74	72	67	96	95	92	74	60	47	42	28
L_2	93	96	90	88	86	84	77	73	61	56	48	95	96	96	93	91	80	87	80	97	96	95	90	87	79	77	70	97	95	94	80	70	54	50	36
L_3	96	96	95	94	89	88	86	77	69	60	56	99	99	98	97	96	96	93	87	99	98	97	90	89	86	83	78	99	99	96	80	71	55	32	20
L_4	87	89	85	82	77	75	72	66	58	55	50	91	90	88	90	83	77	78	70	88	88	84	82	75	68	67	50	89	85	83	69	52	36	28	20
L_5	85	82	78	74	72	68	66	62	56	52	48	90	88	84	80	73	71	64	53	86	85	80	73	57	49	46	40	88	85	81	60	58	28	20	13
L_6	80	80	66	54	49	49	45	43	40	35	29	85	80	74	71	69	64	63	53	80	75	72	66	52	47	42	36	80	76	68	49	44	31	16	10
L_7	89	91	81	78	75	70	69	65	68	53	46	94	94	93	85	84	79	77	55	92	95	91	83	75	73	66	55	93	92	83	69	61	39	32	23
L_8	93	97	93	86	82	78	76	70	73	73	68	96	96	95	93	92	88	84	69	95	97	95	87	79	74	71	56	97	99	91	77	64	51	47	34
L_9	96	99	97	94	92	88	87	86	82	79	76	97	97	97	97	96	92	89	80	97	99	99	95	91	89	84	77	97	98	95	86	79	62	57	42
L_{10}	95	92	90	86	78	77	72	64	60	55	54	97	97	96	93	93	85	83	61	98	99	95	92	81	75	72	64	97	97	93	76	52	45	40	28
Mean	91	92	87	82	79	76	73	68	63	57	52	93	92	92	89	87	83	80	69	93	92	90	85	77	71	68	59	93	92	87	70	61	45	36	25

Table 2. Correlation co-efficients of germination after periods of storage in three stage locations with the initial laboratory germination and Accelerated Aging germination before storage for sunflower var. Morden.

	Storage locations (months)														
	Raichur					Bangalore					Dharwad				
	8	10	12	14	16	8	10	12	14	16	8	10	12	14	16
Initial germination	0.760*	0.716*	0.577	0.630	0.529	0.726*	0.664*	0.620	0.603	0.608	0.766*	0.622	0.602	0.599	0.555
AA 40°C,100% RH															
4 day	0.952*	0.901*	0.691*	0.882*	0.804*	0.911*	0.924*	0.880*	0.907*	0.882*	0.950*	0.823*	0.840*	0.794*	0.757*
6 day	0.954*	0.900*	0.679*	0.893*	0.824*	0.880*	0.916*	0.893*	0.915*	0.888*	0.944*	0.839*	0.821*	0.751*	0.712*
8 day	0.817*	0.815*	0.647*	0.765*	0.597	0.783*	0.801*	0.835*	0.811*	0.750*	0.866*	0.843*	0.786*	0.790*	0.779*
10 day	0.429	0.460	0.534	0.490	0.459	0.526	0.551	0.628	0.497	0.422	0.583	0.592	0.620	0.609	0.620

* = Significant, P = 0.05, r = 0.632