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Relative Storability of Wheat Seeds as Influenced by Varieties and Seed Treatments During Storage

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ABSTRACT

Sundried seeds of wheat varieties viz., Sonalika, Lok-1, Kalyan Sona and GW 496 having 10 per cent moisture were treated with four seed dressings viz., carbendazim, thiram, methyl parathion and castor oil alongwith control and stored in polythene bags under ambient conditions for twelve months. Seed moisture (%), germination rate and vigour increased with storage upto 5-6 months whereas, germination declined during storage. Variety GW 496 recorded the lowest seed moisture and higher germination, germination rate and vigour throughout the storage suggesting better storability. Seed treatment with thiram helped to record significantly lower seed moisture. While, germination (%), germination rate and vigour index were significantly higher under this treatment.

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INTRODUCTION

The viability of seed in storage is greatly dependent on the level of moisture content which is closely related to the surrounding relative humidity. An understanding of relationship between moisture content and relative humidity (RH) is useful for developing short or long term safe seed storage practice. The relationship between the storage environment and loss of seed viability has been studied by Singh (1987). In seeds of majority of important crop species, an increase in either temperature or relative humidity of storage environment increase the rate of loss of viability (Roberts, 1972). Due to scarcity of ideal moisture proof storage godowns in Indian conditions, emphasis on alternatives such as seed treatment is gaining importance. Very little information on such aspects is available in respect of wheat, hence this investigation was taken up.

MATERIALS AND METHODS

Cleaned seeds of four wheat varieties viz. Sonalika, Lok-1, Kalyan Sona and GW 496 were sundried to bring the moisture around 10 per cent (wet weight basis) and divided into the treatment units of 5 kg each. Seed treatment comprised of carbendazim (50%) and thiram (75% WDP) each @ 2 g/kg seed, methyl parathion (2% dust) and castor oil @ 10 g/kg seed and a control (without seed treatment). Treated seeds were stored in polythene bags in the Seed Technology Laboratory at Sardar

Krushinagar under ambient storage conditions for a period of twelve months from May, 1992. Observations on seed moisture, germination, root and shoot length and germination rate were recorded at monthly interval. The germination test was conducted following rolled paper towel method (Anonymous, 1985). Seed moisture was determined following the hot air oven method on wet weight basis by drying 5 g ground seed samples at 110 ± 1°C for 17 hours (Anonymous, 1985). The germination rate was determined by dividing the number of normal seedlings observed on each day by corresponding days and values obtained at each day from by very first day were summed at the end of germination test as described by Maguire (1962). The vigour index was determined by multiplying the germination (%) with the sum of root and shoot length in cm (Woodstock, 1969). The data obtained were processed on computer following completely randomized design.

RESULTS AND DISCUSSION

The seed moisture (%), germination percentage and rate as well as vigour index differed significantly during the storage (Table 1). Seed moisture fluctuated and followed the pattern of fluctuations of atmospheric relative humidity (Table 3). The highest seed moisture (11.72%) was observed when the seed samples were tested after 5 months of storage. Similarly, the lowest seed moisture (9.73%) was observed after twelve months possibly due to low RH. A similar trend with respect to seed moisture in sorghum was reported by Singh (1986). Continuous decline in seed germination and germination rate was observed during storage. This may be explained by the increased seed respiration and membrane leakage due to increased temperature and relative humidity (Abdul Baki and Anderson, 1972). Singh (1987) reported that decrease in germination was proportional to increasing time of storage.

TABLE 1

Seed moisture (%), germination (%), germination rate and vigour index as influenced by wheat varieties, storage period and seed treatments.

Treatments	*Seed moisture*	*Germination (%)*		*Germination rate*	*Vigour index*
Storage Period(s) (in months)					
1	10.16	79.80	(96.59)	15.62	2051
2	10.21	79.32	(96.24)	15.26	2103
3	10.82	79.09	(96.06)	14.87	2161
4	11.28	78.35	(95.75)	14.46	2207
5	11.72	76.71	(94.53)	14.08	2252
6	11.53	75.62	(93.66)	13.65	2253
7	11.28	73.65	(91.92)	13.21	2175
8	11.07	72.46	(90.82)	12.75	2076
9	10.75	71.11	(89.45)	12.32	1965
10	10.39	68.93	(87.35)	11.87	1815
11	9.95	67.63	(85.47)	11.48	1729
12	9.73	67.32	(85.07)	11.07	1644
S. Em. ±	0.009	0.18		0.04	5.74
C. D. (P=0.05)	0.026	0.49		0.12	15.92

1.	2.	3.	4.	5.	6.
Varieties (V)					
Sonalika	10.80	72.75	(90.60)	12.93	2040
Lok-1	10.78	73.39	(91.24)	13.18	1983
Kalyan Sona	10.71	74.61	(92.36)	13.52	1920
GW 496	10.67	75.92	(93.36)	13.92	2202
S. Em. ±	0.008	0.18		0.02	3.32
C. D. (p=0.05)	0.023	0.49		0.07	9.19
Seed Treatments (T)					
Carbendazim	10.68	74.88	(92.59)	13.73	2168
Thiram	10.64	76.70	(93.88)	13.97	2233
Methyl Parathion	10.74	73.90	(91.70)	13.32	1986
Castor Oil	10.82	71.34	(89.38)	12.67	1812
Control	10.82	74.01	(91.83)	13.23	1982
S. Em. ±	0.018	0.24		0.03	5.52
C. D. (p=0.05)	0.051	0.69		0.08	15.76
Interaction(V x T)					
S. Em. ±	0.019	0.23		0.06	8.92
C. D. (p=0.05)	0.052	0.64		0.19	24.73

Note : Figures in the parentheses are untransformed means.

Vigour index increased upto six months and thereafter, it decreased upon further storage. In the initial months of storage, seeds were vigorous which resulted into increased root and shoot lengths leading to higher vigour. The increase in root length and shoot length of seedling upto six months might be attributed to the increase in seed moisture content resulting into increased respiration rate in seed which enhanced enzymatic activity and metabolism in germinating seed and hence increasing the length of seedling (Coleman *et al.* 1928). Singh and Borikar (1985) reported that vigour of sorghum was good upto four months and then there was a gradual decrease.

Significant differences in seed moisture, germination per cent and rate as well as vigour due to varieties indicated genotypic variation for these characters. GW 496 having hard seed coat recorded significantly lower seed moisture (10.67%). However, the magnitude of difference in seed moisture between GW 496 and Sonalika was very small (0.13%). In contrast to seed moisture, GW 496 recorded significantly higher germination (93.36%), germination rate (13.92) and vigour (2202). The genotypic variation in the present study may be attributed to the inherent variation in the composition of different wheat varieties. Thus, it revealed that the genetic make-up of GW 496 was superior than other varieties in respect of seed viability, germination rate and vigour index. Present findings are in accordance with the findings of Singh (1986).

The effect of seed treatment was significant. The lowest seed moisture (10.64%) was recorded in the seeds treated with thiram. The beneficial effect of thiram in maintaining lower seed moisture might be attributed to the separation of seeds from the atmospheric relative humidity by forming relatively impermeable barrier by this fungicide (Vyas and Nene, 1975). The same treatment recorded significantly higher vigour (2233), germination (93.88%) and germination rate (13.97). Beneficial effect of thiram in maintaining seed viability have been reported by Singh *et al.* (1982) and Dakshinamoorthy and Sivaprakasam (1988).

TABLE 2

Interaction effect of varieties and seed treatments on seed moisture (%), per cent germination, germination rate and vigour index during storage.

Varieties	*Seed treatments*				
	Carbendazim	*Thiram*	*Methyl Parathion*	*Castor Oil*	*Control*
Seed Moisture (%)					
Sonalika	10.71	10.66	10.81	10.92	10.93
Lok-1	10.70	10.65	10.77	10.89	10.88
Kalyan Sona	10.67	10.65	10.71	10.75	10.75
GW 496	10.64	10.62	10.67	10.72	10.72
C. D. (p=0.05)	0.052				
Germination (%)					
Sonalika	73.72 (92.00)	75.29 (93.00)	73.25 (91.00)	68.06 (86.00)	73.45 (91.00)
Lok-1	74.19 (92.00)	75.70 (93.00)	72.82 (91.00)	71.10 (89.00)	73.12 (91.00)
Kalyan Sona	75.31 (93.00)	76.87 (94.00)	74.46 (92.00)	72.46 (91.00)	74.29 (92.00)
GW 496	76.32 (94.00)	78.93 (96.00)	75.43 (93.00)	73.75 (92.00)	75.17 (93.00)
C. D. (p=0.05)	0.64				
Germination rate					
Sonalika	13.38	13.48	12.85	12.13	12.81
Lok-1	13.55	13.67	13.12	12.52	13.04
Kalyan Sona	13.83	13.93	13.55	12.84	13.45
GW 496	14.18	14.81	13.76	13.20	13.63
C. D. (P=0.05)	0.19				

1.	*2.*	*3.*	*4.*	*5.*	*6.*
Vigour index					
Sonalika	2118	2155	2035	1856	2035
Lok-1	2054	2119	1946	1846	1947
Kalyan Sona	2032	2093	1928	1627	1919
GW 496	2470	2563	2033	1917	2026
C. D. (p=0.05)	24.73				

Note : Figures in the parentheses are untransformed means.

TABLE 3

Monthly temperature, humidity and rainfall during May, 1992 to April, 1993.

Months	*Max. Temp. (C)*	*Min. Temp. (C)*	*Relative Humidity (%)*	*Rainfall (mm)*
May	40.4	24.7	45.0	0.0
June	40.5	27.3	52.0	8.0
July	34.2	24.9	71.5	582.9
August	32.0	24.9	74.5	233.3
September	32.5	22.1	67.5	687.0
October	34.6	20.0	52.5	1.0
November	31.2	13.5	53.5	8.0
December	29.6	11.4	53.2	0.0
January	27.2	10.5	50.0	0.0
February	31.3	10.9	46.0	11.0
March	32.9	15.3	41.5	0.0
April	37.9	20.1	41.8	0.0

The interaction effect (Table 2) revealed that V x T interaction was significant for all the characters studied. Seeds of variety GW 496 treated with thiram recorded significantly lower seed moisture (10.62%). But was at par with that recorded by the seeds of all the varieties treated with thiram. In case of germination per cent and rate as well as vigour, GW 496 treated with thiram recorded significantly higher values as compared to other combinations indicating superiority of thiram in maintaining seed viability.

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