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Physiological Components of Wheat as Influenced by Seed Treatments During Storage

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ABSTRACT

Seed of four wheat genotypes (Sonalika, Lok-1, Kalyan Sona and GW 496) treated with carbendazim, thiram, methyl parathion and castor oil alongwith a control were stored in polythene bags and evaluated for physical characters (seed index and seed density) and physiological characters (seed moisture and imbibitional rate). Seed moisture fluctuated and followed the pattern of fluctuations of atmospheric RH. A change in seed index followed the pattern of change in seed moisture. Imbibitional rate increased with decrease in seed moisture and seed index. Variety GW 496 recorded lower seed moisture and higher seed index throughout the storage while variety Lok-1 recorded higher inbibitional rate. Seed treatment with thiram was found beneficial as it recorded lower seed moisture and higher seed density as well as imbibitional rate throughout the storage.

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INTRODUCTION

A seed is most important input in modern agriculture. The crop yields basically depend on quality of seed. The safety of seed in storage is greatly dependent on the level of the moisture content which is closely related to the surrounding relative humidity (Singh, 1986). Cereal seeds loose their viability in a short period if they are stored under improper storage conditions. Under Indian conditions, ideal storage godowns are scarce. So emphasis on alternatives such as seed protectants and seed packaging devices become more suitable and economic substitutes. Seed treatment offers protection during storage, maintains the viability of seeds and in certain cases enhances it. However, information on changes in treated wheat seeds stored under ambient conditions is scarce. Hence, this experiment was conducted with different wheat varieties and seed treatments under ambient conditions of Sardar Krushinagar.

MATERIALS AND METHODS

Seeds of four wheat varieties viz., Sonalika, Lok-1, Kalyan Sona and GW 496 were cleaned with the help of seed blower and sun dried to adjust the moisture to 10 per cent. Five kg seed of each variety was treated with carbendazim (50%) and thiram (75% WDP) each @ 2 g/kg seed, methyl parathion (2% dust) and castor oil each @10 g/kg seed and a control (no seed treatment). Seeds were stored in polythene bags from May, 1992 in the

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boratory under ambient conditions of Sardar rushinagar in factorial CRD with four replications for a period of 12 months. Seeds were valuated for physical (index and density) and ysiological (moisture content and imbibitional te) components at monthly intervals. Seed oisture was determined by hot air oven ethod on wet weight basis. For seed index, 00 seeds were counted and weighed on ectrical balance. Seed density was measured water displacement method as below :

$$\text{eed density (g cm}^{-3}) = \frac{\text{Weight of seed (g)}}{\text{Volume of seed (cc)}}$$

For imbibitional rate, seeds (used for idex and density) were placed on three layered blotting paper kept in petri dish. The paper was fully moistened for continuous supply of moisture to seeds. These petri dishes were placed in incubator for 14 hours at 25 ± 1°C. Seeds were removed from the dishes, blotted and then weight and volume was recorded. The imbibitional rate was determined by the following formula (Singh, 1986).

$$\text{Imbibitional rate (cc g}^{-1}) = \frac{V_2 - V_1}{W_2 - W_1}$$

where, V_1 = initial volume of seeds
V_2 = volume of imbibed seeds
W_1 = initial weight of seeds
W_2 = weight of imbibed seeds

TABLE 1

Physico-physiological components as influenced by storage period, varieties and seed treatments.

Treatment	*Seed moisture (%)*	*Seed index (g)*	*Seed density (g cm^{-3})*	*Imbibitional rate (cc g^{-1})*
Storage Period (S) (in months)				
1	10.16	4.99	1.353	0.809
2	10.21	5.05	1.362	0.819
3	10.82	5.12	1.370	0.799
4	11.28	5.19	1.379	0.786
5	11.72	5.14	1.369	0.773
6	11.53	5.87	1.355	0.764
7	11.28	5.82	1.348	0.752
8	11.07	4.99	1.343	0.762
9	10.75	4.97	1.340	0.787
10	10.39	4.95	1.336	0.801
11	0.95	4.92	1.331	0.814
12	9.73	4.90	1.331	0.821
S. Em ±	0.009	0.009	0.004	0.001
C.D. (P=0.05)	0.026	0.026	0.010	0.004

1.	2.	3.	4.	5.
Varieties (V)				
Sonalika	10.80	5.07	1.262	0.803
Lok-1	10.78	5.12	1.190	0.808
Kalyan Sona	10.71	4.91	1.559	0.787
GW 496	10.67	5.00	1.396	0.765
S. Em. ±	0.008	0.007	0.004	0.001
C.D. (P=0.05)	0.023	0.019	0.012	0.002
Seed Treatments (T)				
Carbendazim	10.68	5.01	1.372	0.811
Thiram	10.64	5.01	1.372	0.817
Methyl Parathion	10.74	5.03	1.362	0.780
Castor oil	10.82	5.04	1.328	0.766
Control	10.82	5.04	1.319	0.780
S. Em. ±	0.018	0.017	0.004	0.001
C. D. (P=0.05)	0.051	NS	0.012	0.002
Interaction (V x T)				
S. Em. ±	0.019	—	0.005	0.002
C. D. (P=0.05)	0.052	NS	0.014	0.006

RESULTS AND DISCUSSION

Seed moisture and seed index (Table 1) fluctuated and followed the pattern of fluctuations of atmospheric relative humidity. Highest seed moisture (11.72%) was observed when the seed was tested at the end of September (5 months). The seed stored under ambient conditions passed through high atmospheric relative humidity (RH) of whole monsoon and attained the equillibrium atmospheric moisture. Similarly, lowest seed moisture (9.73%) was observed after twelve months of storage (April) possibly due to low RH (Fig. 1). Similar trend with respect to seed moisture was reported in triticale and wheat by Agrawal (1978) and in sorghum by Singh (1986). Seed index was highest after six months of storage. The imbibitional rate was lowest (0.752 cc g^{-1}) after seven months of storage and increased with decrease in seed moisture and seed index during storage. It was highest after twelve months of storage. Seed density also increased with increase in seed moisture and

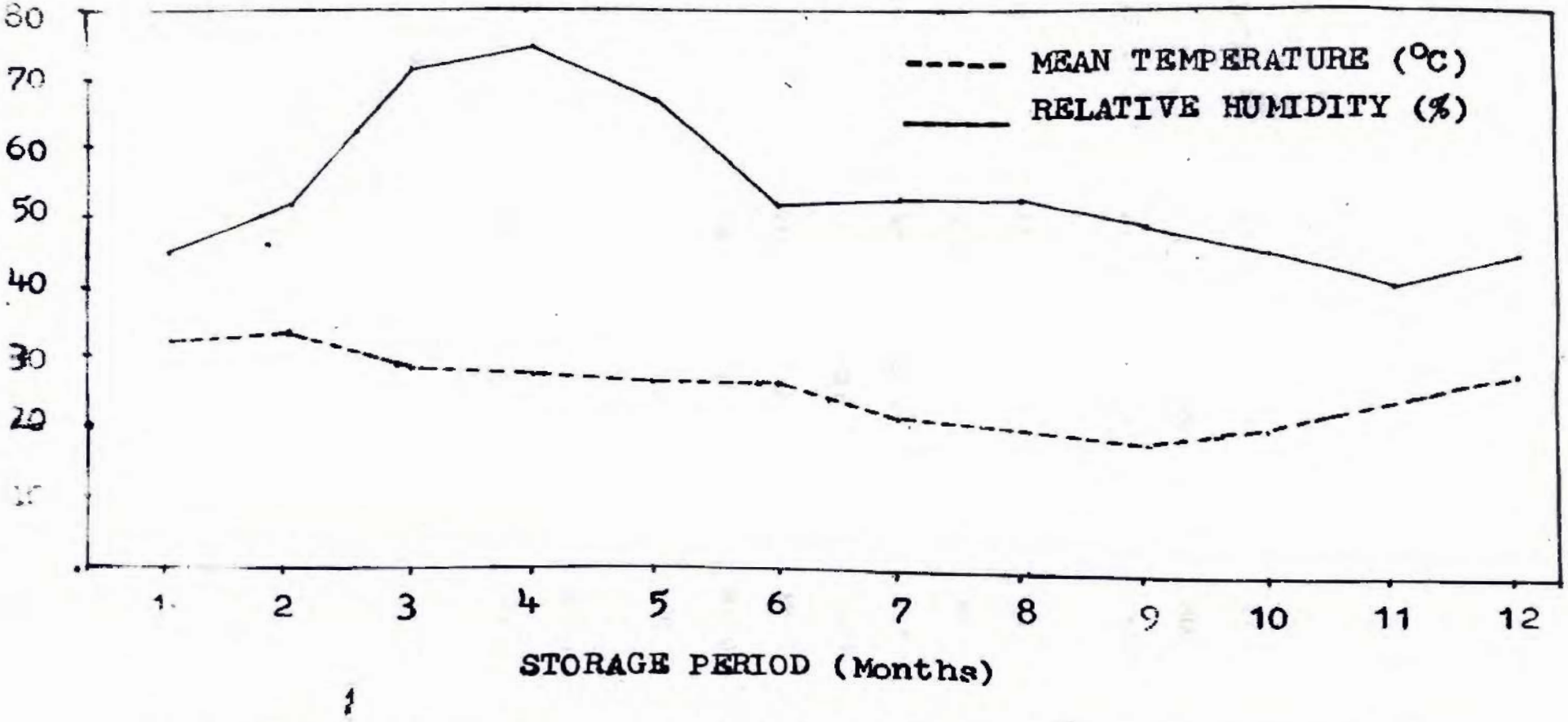


Fig. 1 : The mean monthly temperature and relative humidity recorded during May 1992 to April 1993.

seed index. It increased with storage upto four months and thenafter, decreased upon further storage. Similar results for sorghum have been reported by Singh (1986).

Significant differences in seed moisture, index, density and imbibitional rate due to varieties indicated genotypic variation for these characters. Varieties Sonalika and GW 496 recorded the highest (100.80%) and lowest (10.67%) seed moisture, respectively. But, the magnitude of difference was very small (0.13%). The genotypic difference in moisture content in the present study may be attributed to the inherent variation in the chemical composition of seeds from different varieties. Present findings supports the findings of Aswathaiah and Murthy (1986) and Parkhe *et al.* (1987). Maximum seed density (1.559 g cm^{-3}) and imbibitional rate (0.808 cc g^{-1}) were recorded in varieties Kalyan Sona and Lok-1, respectively. Genotypic variation for these characters have also been reported by Singh (1986).

TABLE 2

Interaction effect of varieties x seed treatments on seed moisture, seed density and imbibitional rate during storage.

Varieties	*Seed Treatment*				
	T_1	T_2	T_3	T_4	T_5
Seed Moisture (%)					
V_1	10.71	10.66	10.81	10.92	10.93
V_2	10.70	10.65	10.77	10.89	10.88
V_3	10.67	10.65	10.71	10.75	10.75
V_4	10.64	10.62	10.67	10.72	10.72
C. D. (P=0.05) : 0.052					
Seed Density					
V_1	1.281	1.287	1.267	1.243	1.232
V_2	1.206	1.207	1.197	1.174	1.165
V_3	1.585	1.589	1.574	1.524	1.519
V_4	1.416	1.421	1.407	1.373	1.362
C. D. (P=0.05) : 0.014					
Imbibitional Rate RATE					
V_1	0.825	0.827	0.793	0.780	0.792
V_2	0.830	0.849	0.790	0.779	0.789
V_3	0.810	0.812	0.772	0.765	0.774
V_4	0.780	0.778	0.764	0.738	0.763
C. D. (P=0.05) : 0.006					

Seed moisture, density and imbibitional rate were influenced significantly by seed treatments. Thiram treated seeds recorded the lowest (10.64%) seed moisture whereas, the highest (10.82%) was recorded in untreated as well as castor oil treated seeds. The beneficial effect of thiram in maintaining lower seed moisture may be attributed to the seperation of seeds from the atmospheric condition by forming relatively impermeable barrier by this fungicide (Vyas and Nene, 1975). Similarly, higher seed density 91.372 g cm^{-3}) and imbibitional rate (0.817 cc g^{-1}) were recorded by thiram treated seeds. Beneficial effect of thiram have been reported by Dakshinamoorthy and Sivaprakasam (1988).

The interaction (Table 2) revealed that variety x seed treatment interaction was significant for seed moisture, density and imbibitional rate. Irrespective of varieties, seed treatment with thiram proved its superiority by recording lower seed moisture and higher inbibitional rate throughout the storage, but was at par with carbendazim treatment. Variety GW 496 recorded the lowest seed moisture, but it was at par with Kalyan Sona. Variety Lok-1 recorded highest imbibitional rate, but was at par with Sonalika variety. Singificantly lower (10.62%) seed moisture was recorded by GW 496 when treated with thiram. This combination was at par with that recorded by the seeds of all the varieties treated with thiram indicating superiority of thiram in maintaining lower seed moisture. Irrespective of treatments, variety Kalyan Sona recorded significantly higher seed density. Whereas, thiram recorded higher density which was at par with carbendazim treatment. The seeds of Kalyan Sona variety treated with thiram treatment recorded significantly higher (1.589 g cm^{-3}) seed density but it was at par with that recorded by the seeds of same variety treated with carbendazim. In the case of imbibitional rate, the seeds of Lok-1 variety treated with thiram recorded significantly higher (0.849 cc g^{-1}) value.

REFERENCES

Agrawal, P. K. (1978). Changes in germination, moisture and carbohydrate of hexaploid triticale and wheat seed stored under ambient conditions. *Seed Sci. & Technol.* **6** : 711-716.

Aswathaiah, B. & S. Murthy (1986). Study on sorghum (*Sorghum bicolor* (L.) Moench) seed quality in storage. *Seeds & Farms* **5** : 9-14.

Dakshinamoorthy, T. & K. Sivaprakasam (1988). Effect of seed treatment with fungicides and insecticides on the viability of pearl millet seeds during storage. *Madras Agrci. J.*, **75** (9 & 100) : 339-343.

Parkhe, B. D., A. R. Singh., S. B. Choulwar & S. T. Borikar (1987). Quality of seed as influenced by genotypes and development stages in sorghum. *Seed Res.* **15** (2) : 122-127.

Singh, A. R. (1986). Physico-physiological components of sorghum as influenced by seed size during storage. *J. Maharashtra Agric. Univ.* **11** (2) : 153-156.

Vyas, S. C. & Y. L. Nene of (1975). Influence of moisture on the persistance of thiram on sorghum during storage. *JNKVV Res. J.*, **9** (1 & 2) : 50-51.