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Effect of seed treatment on seed quality of hybrid rice under storage

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Abstract: Seed storage studies were made with three rice hybrids at Department of Seed Technology Coimbatore. The results of Seed quality evaluations revealed that the storability of rice hybrid upheld the superiority of CORH-1 over TNRH-17 and TNRH-16. Among the treatments th halogen and halogen + fungicide treated seeds were better in maintaining seed quality unde ambient storage over control. *(Key words: Seed treatment, Period of storage, Hybrids).*

Inspite of developing number of rice hybrids in India, the success in hybrid rice technology could be visualized only if there is adequate quantity of quality seed production and supply to farmers. Seeds undergo considerable quantitative and qualitative changes (Christensen and Kaufmann, 1969) during storage which leads to loss of viability and vigour. The qualitative deterioration during storage is mainly attributed to periods of storage (Arulnandhy and Senanayake, 1988), seed treatment (Basu and Rudrapal, 1979) and genotypes (Sushilkumar and Singhal, 1991). The present study was taken since the precise information on the influence of seed treatment and genotype on seed quality under storage is very scanty.

Materials and Methods

Seeds of different rice hybrids *viz.* CORH-1, TNRH-16, TNRH-17 were cleaned, dried to 12 per cent moisture and treated with thiram @ 2g kg^{-1}, halogen (Calcium oxychloride + CaCO3 mixture at 1:1 ratio) @ 5 g Kg^{-1}, thiram + halogen (1:2 ratio) @ 3 g kg^{-1} and prosopis leaf extract @ 1% concentration and stored in cloth bag under ambient condition. Seed quality parameters *viz.* germination (%), dry matter production vigour, and dehydrogenase activity were evaluated trimonthly for nine months and subsequently accelerated ageing for five days.

Treatment	*Abbreviation*
Control	T1
Thiram	T2
Halogen	T3
Thiram + Halogen	T4
Prosopis leaf extract	T5

Period of storage	*Abbreviation*
Initial	P0
3rd month after storage	P1
6th month after storage	P2
9th month after storage	P3
Accelerated ageing (5 days)	P4

The germination test was conducted with 400 randomly counted seeds (4x100) from each treatment by using between paper towel medium (ISTA, 1993). The normal seedlings were counted on 14th day and expressed in percentage. The dry matter production was estimated with 10 seedlings randomly selected from each treatment and expressed in mg 10 $seedlings^{-1}$.

The vigour index of seedlings was computed using the following formula suggested by Abdul-Baki and Anderson (1973) and expressed in whole number.

(Vigour index = Germination x Dry matter production)

The dehydrogenase activity was estimated by adopting the method suggested by Kittock and Law (1968).

Results and Discussion

In the present study, irrespective of genotypes and seed treatments the mean germination percentage was reduced from 88 to 60 over a period of nine months of storage and accelerated ageing for five days (Table 1). Germination is the last measure of quality to decline as the seed deteriorates during storage. The reduction in germination percentage was minimum in fungicide, halogen and fungicide +halogen treated seeds than untreated seeds. Similar results of decline in synthetic activity were reported by Pal and Basu (1988), Ravichandran and Dharmalingam (1994) in rice.

The dry matter production decreased with increase in storage period irrespective of treatments and genotypes but the genotypic differences exist (Table 2). The dry matter content declined slowly in seeds treated with fungicide, halogen, fungicide + halogen while compared to untreated. The results are in conformity with the findings of Chandrasenan Nair (1996).

Similar trend was also observed in vigour index. The genotypes differed in the maintenance of vigour over the period of storage (Table 3). The reduction in weight of seedlings and vigour

Table 1. Effect of seed treatment on germination (%) of different rice hybrids under storage

Hybrids and treatments		Period of storage										Mean	
		P0		P1		P2		P3		P4			
CORH-1	T1	90	(71.65)	87	(69.92)	84	(66.46)	81	(64.16)	59	(50.18)	80	(63.46)
	T2	91	(72.56)	90	(71.65)	86	(68.07)	83	(65.73)	63	(52.53)	83	(65.73)
	T3	90	(71.65)	90	(71.65)	86	(68.07)	83	(65.73)	63	(52.53)	83	(65.73)
	T4	91	(72.56)	90	(71.65)	88	(69.71)	85	(67.31)	65	(53.72)	82	(64.89)
	T5	90	(71.65)	88	(69.78)	86	(68.07)	83	(65.73)	61	(51.53)	82	(64.89)
TNRH-17	T1	84	(66.46)	85	(67.31)	83	(65.73)	80	(63.46)	56	(48.44)	78	(62.02)
	T2	88	(69.79)	86	(68.07)	84	(66.46)	82	(64.89)	62	(51.49)	80	(63.46)
	T3	90	(71.65)	89	(70.93)	87	(68.92)	85	(67.31)	64	(53.13)	83	(65.73)
	T4	90	(71.65)	88	(69.79)	86	(68.07)	84	(66.46)	65	(53.72)	83	(65.73)
	T5	88	(69.79)	85	(67.31)	81	(64.16)	82	(64.89)	60	(50.76)	79	(62.72)
TNRH-16	T1	86	(68.07)	84	(66.46)	80	(63.46)	75	(60.00)	52	(46.14)	75	(60.00)
	T2	87	(68.99)	86	(68.07)	84	(66.46)	79	(62.72)	58	(49.60)	79	(62.72)
	T3	85	(67.31)	83	(65.73)	81	(64.16)	79	(62.72)	60	(50.76)	78	(62.02)
	T4	86	(68.07)	85	(67.31)	84	(66.46)	80	(63.46)	59	(50.18)	79	(62.72)
	T5	85	(67.25)	84	(66.46)	81	(64.16)	78	(62.02)	55	(47.76)	77	(60.60)
V (Mean)		83	(65.73)	81	(64.16)	77	(61.60)						
T (Mean)		78	(62.02)	81	(64.16)	82	(64.89)	82	(64.89)	79	(62.12)		
P (Mean)		88	(69.79)	87	(68.99)	84	(66.46)	81	(64.22)	60	(50.76)		

	V	V	P	T	VP	PT	VT	VPT
SEd	0.64	0.82	0.852	NS	NS	NS	NS	NS
CD (P=0.05)	1.27	1.65	1.650	NS	NS	NS	NS	

Table 2. Effect of seed treatment on dry matter production (mg 10 seedlings^{-1}) of different rice hybrids under storage

Hybrids and treatments		Period of storage					Mean
		P0	P1	P2	P3	P4	
CORH-1	T1	150	147	140	138	130	140
	T2	150	148	143	140	136	133
	T3	152	150	148	147	145	148
	T4	152	150	146	144	140	146
	T5	150	148	142	136	133	142
TNRH-17	T1	145	141	138	130	127	136
	T2	146	143	140	136	134	140
	T3	147	146	143	140	140	142
	T4	147	145	142	140	137	132
	T5	145	143	140	137	130	139
TNRH-16	T1	140	137	132	128	125	132
	T2	141	140	139	133	132	137
	T3	142	141	140	139	138	140
	T4	142	141	140	138	135	139
	T5	130	140	138	132	129	136
V (Mean)		144	140	136			
T (Mean)		136	140	143	142	138	
P (Mean)		146	144	140	137	134	

	V	V	P	T	VP	PT	VT	VPT
SEd	0.71	0.92	0.92	NS	NS	NS	NS	NS
CD (P=0.05)	1.42	1.84	1.84	NS	NS	NS	NS	

Table 3. Effect of seed treatment on vigour index of different hybrids under storage

Hybrids and treatments		Period of storage					Mean
		P0	P1	P2	P3	P4	
CORH-1	T1	13500	12789	11760	11178	7670	11379
	T2	13650	13320	12290	11620	8568	11891
	T3	13680	13500	13172	12642	9425	12484
	T4	13832	13500	12848	12240	9100	12304
	T5	13500	13024	12213	11288	8113	11627
TNRH-17	T1	12180	11985	11454	10400	7112	10626
	T2	12848	12298	11760	11152	8308	11273
	T3	13230	12994	12441	11900	8960	11905
	T4	13230	12760	12212	11760	8905	11773
	T5	12760	12155	11340	11234	7800	11058
TNRH-16	T1	12040	11508	10560	9600	6500	10042
	T2	12267	12040	11676	10507	7656	10829
	T3	12070	11703	11340	10981	8280	10875
	T4	12212	11985	11760	11040	7965	10922
	T5	11900	11760	11178	10296	7095	10446
V (Mean)		11938	11327	10637			
T (Mean)		10682	11331	11755	11690	11044	
P (Mean)		12862	12488	11867	11189	8097	

	V	P	T	VP	PT	VT	VPT
SEd	106	137	137	NS	NS	NS	NS
CD (P=0.05)	212	274	274	NS	NS	NS	NS

index might be due to hydrolysis of reserve metabolites, activation of endogenous enzymes and breakdown of food reserves over the period of storage.

Dehydrogenase activity decreased with the advancement of storage period, irrespective of genotypes and treatments (Table 4). The decreasing trend was minimum in halogen treated seeds when compared to control. Similar results were reported by Balamurugan (1993). In aged seeds the loss of energy production during germination might be the reason for reduced dehydrogenase activity as reported by Adbul – Baki and Anderson (1973).

From the study it is evident that the rate of seed deterioration was minimum in seeds treated with halogen and also halogen + fungicide and genotypic variation might be due to genetic make-up of seeds.

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Table 4. Effect of seed treatment on dehydrogenase activity (O.D. value) of different rice hybrids under storage

Hybrids and treatments		Period of storage					Mean
		P0	P1	P2	P3	P4	
CORH-1	T1	0.150	0.136	0.128	0.126	0.112	0.130
	T2	0.150	0.142	0.136	0.134	0.120	0.136
	T3	0.150	0.147	0.145	0.140	0.130	0.142
	T4	0.150	0.145	0.140	0.137	0.125	0.139
	T5	0.150	0.140	0.133	0.130	0.115	0.134
TNRH-17	T1	0.144	0.127	0.120	0.120	0.106	0.123
	T2	0.145	0.136	0.130	0.126	0.115	0.130
	T3	0.145	0.142	0.138	0.134	0.120	0.136
	T4	0.144	0.140	0.134	0.130	0.117	0.133
	T5	0.144	0.131	0.126	0.122	0.110	0.127
TNRH-16	T1	0.140	0.125	0.120	0.116	0.103	0.121
	T2	0.140	0.134	0.128	0.124	0.110	0.127
	T3	0.140	0.140	0.135	0.135	0.118	0.133
	T4	0.140	0.137	0.132	0.127	0.115	0.130
	T5	0.140	0.130	0.125	0.120	0.107	0.124
V (Mean)		0.136	0.130	0.137			
T (Mean)		0.125	0.131	0.137	0.134	0.128	
P (Mean)		0.145	0.137	0.131	0.128	0.115	

	V	P	T	VP	PT	VT	VPT
SEd	0.0006	0.0008	0.0008	NS	0.00017	NS	NS
CD (P=0.05)	0.0012	0.0015	0.0015	NS	0.0026	NS	NS

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