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Short Communication

Influence of Seed Moisture Content and Seed Treatment Chemicals on Seed Quality during Storage of Hybrid Rice KRH-2

HV DIVYA*[1], R SIDDARAJU[2], S NARAYANA SWAMY[2], RAME GOWDA[1], GT THIRUMALARAJU[2] AND J SHANTALA[2]

[1]Department of Seed Science and Technology, CoA, [2]STR Centre, NSP
UAS, GKVK, Bangalore - 560065, Karnataka, India
*hvdivya28@gmail.com

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Rice is an important food crops grown across the world particularly in Asia and Africa. Globally rice is cultivated now on 154 million hectare with annual production of around 600 million tones and average productivity of 5.9 t/ha. In India during the period 2008-09, rice was cultivated in an area of 44.0 million hectare with production of 99.45 million tons [1]. Development of rice hybrids was initiated in India way back in 1970s, but with no success. Many rice hybrids were developed from public and private sector released rice hybrid KRH-2 is the most popular. As the seed ages, the membrane damage is more serious in hybrids [2]. The split glumes nature of hybrid rice seed has a deleterious effect on the quality of seed lots manifested by poor field emergence, seedling survival and serve as an easy avenue for the attack of pests and diseases [3]. The factors responsible for deterioration are many. Seed viability in storage is determined not only by the storage period, but also by seed moisture and chemical seed treatments. Keeping this in view, the present investigation was undertaken to study the influence of seed moisture content and seed treatment chemicals on seed quality during storage of hybrid rice KRH-2.

The experiment was conducted at Department of Seed Science and Technology, College of Agriculture, UAS, Bengaluru, Karnataka. Freshly harvested seeds of KRH-2 were collected during *kharif*, 2009 and the seeds were dried at two different moisture levels *viz*., 10 and 12 per cent seed moisture. These seeds were stored by treating with insecticide (Sevin @ 2g/kg of seed) and fungicides (Thiram @ 2g/kg of seed) and their combinations and stored for eight months under ambient condition. The seed samples drawn randomly at bimonthly intervals were evaluated for various seed quality attributes in order to determine the suitable seed moisture level and chemical seed treatments for better storage of hybrid rice. Seed moisture content was determined by using high constant temperature method as per ISTA [4]. About five grams of seed sample was taken at random from each treatment in two replications, ground and dried in oven at 130±1^0 C for two hours. The seed moisture content was determined by using the following formula and it was expressed on wet weight basis.

$$\text{Moisture content (\%)} = \frac{M_2 - M_3}{M_2 - M_1} \times 100$$

Where,

M_1 – Weight of the container without seed

M_2 – Weight of the container + seed before drying

M_3 – Weight of the container + seed after drying

Standard germination test was conducted between the paper (BP) in four replication of 100 seeds each following ISTA method at 25^{o}C (Anon., 1996). *viz*.; germination (%), vigour index-I (germination (%) x seedling length (cm)), [5], field emergence (%) was recorded by sowing of 100 seeds each in 4 replications.

The seed moisture content and seed treatment chemicals significantly influence on seed quality during the seed storage and the results are revealed herewith. Seeds moisture is an important factor influencing seed viability during storage. Seeds with 12 per cent moisture content recorded highest seed moisture (11.40%) compared to seeds stored with 10 per cent initial seed moisture (10.20%). This resulted in increase in insect damage (29.13%) at 12 per cent compared to 10 per cent moisture level (23.15%) (Table 1). Reduction in germination, vigour index based on mean seedling length (cm), field emergence (%) was recorded with increase in the seed moisture content. Whereas, the highest seed germination

Table 1. Seed moisture content (%), germination, vigour index, field emergence and insect damage (%) as influence by initial seed moisture and chemical seed treatments during storage

Treatment	Storage period (months)																			
	2						4					6					8			
	MC (%)	G (%)	VI	FE (%)	ID (%)	MC (%)	G (%)	VI	FE (%)	ID (%)	MC (%)	G (%)	VI	FE (%)	ID (%)	MC (%)	G (%)	VI	FE (%)	ID (%)
Seed moisture content (%)																				
M_1	9.77	92.19	2092	77.06	1.75	10.89	86.87	2661	71.23	7.52	10.81	80.1	2474	64.9	16.58	10.2	76.0	2287	61.75	23.15
M_2	11.02	91.94	2272	76.58	2.27	11.79	71.92	2512	69.33	8.19	11.6	76.2	2201	61.2	22.44	11.4	72.0	1987	55.94	29.13
SEm(±)	0.055	0.326	26.7	0.363	0.01	0.033	0.451	27.5	0.339	0.01	0.021	0.451	19.1	0.33	0.012	0.03	0.30	18.0	0.268	0.028
CD (p=0.05)	0.155	0.921	75.0	1.02	0.03	0.094	1.273	77.8	0.957	0.03	0.06	1.273	54.2	0.93	0.034	0.07	0.80	52.0	0.758	0.078
Seed treatment chemical																				
T_1	10.11	91.75	2106	76.58	1.63	11.57	82.58	2455	67.46	6.71	11.05	69.04	1861	48.8	29.63	10.8	63.88	1743	46.29	38.29
T_2	10.37	96.12	2265	80.63	0.13	11.36	96.71	2014	81.21	1.29	11.27	85.33	2791	77.2	7.71	10.78	91.88	2604	73.63	12.25
T_3	10.37	97.17	2492	82.08	0.25	11.08	96.75	3038	81.38	0.96	11.31	93.5	2993	80	4.08	11.1	95.54	2733	75.5	10.63
T_4	10.72	83.21	1865	68.0	2.01	11.36	64.42	1840	52.17	22.5	11.2	64.67	1706	46.5	36.63	10.56	61.25	1469	39.96	43.38
SEm(±)	0.047	1.302	37.0	0.514	0.004	0.064	1.8	38.9	0.479	0.011	0.048	0.637	27.13	0.47	0.017	0.03	1.557	26	0.38	0.039
CD (p=0.05)	0.133	0.461	106.88	1.451	0.012	0.181	0.637	110.1	1.354	0.031	0.135	1.8	76.65	1.32	0.048	0.085	0.551	74	1.072	0.11

MC: Seed moisture, G : Germination, VI : Vigour Index, FE : Field emergence, ID : Insect damage

Treatments:

M_1: 10% and M_2 :12% Seed moisture content

Seed storage containers:

C_1: Cloth bag, C_2: Polylined cloth bag, $C_{3:\ Super}$ bag, C_4: Tyvek bag

(76%), vigour index based on mean seedling length (2287) and field emergence (61.75%) were found in seeds with 10per cent moisture content compared to seeds with 12 per cent moisture content. This reduction in quality in terms of viability and vigour might be due to depletion of decline in synthesis activity of the embryo apart from death of the seeds due to insect damage [6]. Moreno *et al*. [7] obtained similar results in rice. They reported that germination capacity was negatively impacted as moisture content was increased in higher moisture levels shorten the time it took for the O_2 consumed and replaced with CO_2 during aerobic respiration. The respiration of seed samples during storage resulted in dry matter losses.

Among seed treatment chemicals, seeds treated with Thiram + Sevin @ 2 g/kg each recorded highest germination (96.54%) at the end of eighth months after storage compared to untreated control (61.25%). Similar results were obtained in other seed quality parameters *viz.,* highest vigour index based on seedling length (2733), field emergence (75.55%) (Table 1). Poonam Singh *et al.* [8] recorded similar results for all growth parameters in treated seeds, which were due to reduced level of insect and pathogen attack whereas, rice seeds treated with fungicide and insecticide gave higher germination and seedling vigour index over control [9]. This agrees with the findings of Sachan and Agarwal [10] in rice.

The major storage insects detected were rice moth (*Corcyra cephalonica*) and rice weevil (*Sitotroga cerealella)* during this study. The maximum incidence of rice moth was observed in hybrid rice compared to rice weevil during storage period. The lower incidences of insects were also observed in seeds treated with Thiram + Sevin @ 2 g/kg each (10.63 %) at the end of storage. This was due to the effectiveness of the seed dressing chemicals against storage insects [11] and also similar results were reported by Sharma *et al.* [9, 12-14] in rice. The study could be concluded that the Rice hybrid KRH-2 can be stored at 10 per cent seed moisture content and treated with Thiram + Sevin @ 2 g/kg each without affecting seed quality for more than eight months.

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