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Effect of seed treatment chemicals on seed quality and storabillty in rice (*Oryza sativa* L.) hybrid KRH-4

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Abstract
The experiment was conducted at Department of Seed Science and Technology G.K.V.K, U.A.S, Bengaluru to investigate the "Effect of seed treatment chemicals on seed quality and storabillty in rice (*Oryza sativa* L.) Hybrid KRH-4". Freshly harvested seeds were treated with the different seed treatment chemicals. The seeds were stored for twelve months under ambient condition and observation were recorded on seed quality parameters bimonthly up to ten months and their after observation were recorded monthly interval. Among different seed treatment chemicals, seeds treated with spinosad 45SC @ 2 ppm had better seed storability and seed quality parameters such as moisture content (10.18%), test weight (18.97 g), germination (80.08%), seedling vigour index-II (846), electrical conductivity of see leachates (3.79 dSm^{-1}), pH of seed lechates (7.33). alpha amylase activity (0.27 cm), total dehydrogenase activity (0.36 A_{480nm}),seed infection (15.37%), seed infestation (22.17%) and field emergence (76.29%). This study could be concluded, that the rice hybrid KRH-4 treated with Spinosad 45SC @ 2 ppm stored for longer period. However, untreated seeds recorded lower seed quality parameters.

Keywords: Seed treatment chemicals, seed quality, storabillty, rice, *Oryza sativa* L., hybrid KRH-4

Introduction
Rice (*Oryza sativa* L.) is one of the world's most favored staple food crops and more than 90 per cent of rice is produced and consumed in Asia. Rice occupies a pride place among food crops cultivated in world. Globally rice is cultivated in 160 million tones with an average productivity of 4.18 tonnes ha^{-1}. In India rice was cultivated in an area of 42 million hectares with production of 104.32 million tones with an average productivity of 2 tonnes ha^{-1}. In Karnataka rice is being grown over 2.72 million ha with production and productivity of 3.64 million tones and 2.51tonnes $ha^{-1,}$ respectively. In India the area under rice hybrid seed production is 2000 hectares with production of 3000tonnes with an average productivity of 1.5-2.5 tonnes ha^{-1} (Rice Knowledge Management Portal-2010, DRR).
The task of increasing rice supply to meet the anticipated demand will be difficult without further technological innovation to shift the yield ceilings and their large scale adoption. Hybrid technology in many crops has clearly shown that it can contribute significantly (20-30%) towards increased production, almost at the same level of input use except for the cost of seed. Even though per cent increase in yield of rice has shown an upward trend in the last few years it is still lower than many other countries.
The production and supply of quality seed is one of the important factors responsible for the increased productivity and production of any crop. The highest quality of the seed is attained under that complex of conditions evoking the most favourable interactions between genetic makeup of a seed and the environment under which it is produced, harvested, processed and stored.
Storage of seeds till the next sowing is an essential segment of the seed industry. It is essential to make available better quality seed for sowing. Seeds tend to deteriorate even under controlled conditions but at a very slower pace compared to ambient conditions.

Material and Methods
To study the effect of seed production locations on seed quality during storage
Freshly harvested rice hybrid KRH-4 F_1 seeds were collected from three different locations mainly from V.C. Farm, Mandya, Tumkur and Kollegala. Seeds were cleaned, graded, dried to safe level of moisture and used for the storage study. The initial moisture content of the seeds was in the range of 9 to 10 per cent.

Seed production locations
L_1: Mandya
L_2: Tumkur
L_3: Kollegala

The experiment was initiated on 14th May 2014 to 21st May 2015 with seven treatments by adopting factorial completely randomized design with three replications.

Table 1: Influence of locations, containers and seed treatments on germination (%) and seedling vigour index-II during storage in rice hybrid KRH-4

Treatments	Months of storage from May 2014 to May 2015											
	2	4	6	8	10	12	2	4	6	8	10	12
Germination (%)							Seedling vigour index-II					
c. Treatments												
T_1	94.44	92.78	87.17	82.64	82.06	80.08	1087	1054	993	922	904	847
T_2	92.78	92.28	85.72	80.86	81.19	78.66	1055	1031	964	892	882	822
T_3	92.14	91.94	84.92	78.56	78.40	76.47	1034	1010	940	857	841	790
T_4	92.25	91.92	85.25	79.69	80.08	77.49	1045	1024	954	876	866	808
T_5	92.56	91.58	85.03	79.56	79.84	77.49	1044	1016	949	872	862	805
T_6	92.39	91.97	85.25	79.11	79.04	77.21	1040	1017	950	863	851	799
T_7	91.25	90.75	83.42	76.94	76.89	75.16	1013	986	909	825	806	768
SEM±	0.38	0.24	0.37	0.44	0.47	0.40	9.31	9.23	9.1	7.48	7.57	8.11
CD (P=0.05)	1.06	0.68	1.04	1.21	1.32	1.11	25.96	25.75	25.5	20.87	21.12	22.63

T_1- Spinosad 45SC @ 2pp T_4- T_1+T_3 T_7-Control, T_2-Emamectin benzoate 5SG @ 2 ppm T_5- T_2+T_3, T_3- Thiram @ 3gm/kg T_6- Neem seed kernel extract @5%

Table 2: Influence of locations, containers and seed treatments on alpha amylase activity (cm) during storage in rice hybrid KRH-4

Treatments	Months of storage from May 2014 to May 2015											
	2	4	6	8	10	12	2	4	6	8	10	12
Total dehydrogenase activity (A_{480nm})							Field emergence (%)					
c. Treatments												
T_1	0.69	0.61	0.53	0.46	0.43	0.37	90.06	89.06	84.53	82.25	80.89	77.64
T_2	0.68	0.61	0.52	0.46	0.42	0.36	88.36	87.08	82.64	80.06	78.86	75.61
T_3	0.66	0.58	0.50	0.43	0.40	0.33	87.25	85.03	81.39	77.86	75.64	72.78
T_4	0.67	0.59	0.51	0.44	0.41	0.35	87.44	85.72	81.33	78.25	77.81	74.00
T_5	0.67	0.59	0.51	0.44	0.41	0.34	86.49	86.03	81.11	79.17	77.11	73.28
T_6	0.66	0.59	0.51	0.44	0.40	0.34	87.61	85.86	81.39	79.06	76.72	73.53
T_7	0.65	0.58	0.50	0.43	0.39	0.33	85.72	83.69	78.44	75.69	74.92	71.31
SEM±	0.00	0.00	0.00	0.00	0.00	0.00	1.03	0.53	0.74	0.85	0.88	0.58
CD (P=0.05)	0.01	0.01	0.00	0.01	0.01	0.01	2.88	1.49	2.06	2.38	2.46	1.61

T_1- Spinosad 45SC @ 2pp T_4- T_1+T_3 T_7-Control, T_2-Emamectin benzoate 5SG @ 2 ppmT_5- T_2+T_3, T_3- Thiram @ 3gm/kg T_6- Neem seed kernel extract @5%

Result and Discussion

Germination

Among seed treatments, the highest (94.44%) germination per cent was recorded in spinosad 45SC @ 2ppm compared to emamectin-benzoate 5SG @ 2ppm (92.78) at second month of storage and thereafter the germination slowly declined and reached 87.17 and 85.72 per cent germination at the end of six months of storage and 80.08 and 78.66 per cent germination at the end of twelve months of storage in spinosad 45SC and emamectin benzoate respectively. The similar results were obtained by Ghelani *et al*. (2009) [4] in pearl millet. This might be attributed to spinosad is highly active and kills insects through hyper excitation of the insect nervous system. This insecticide primarily targeting binding sites on nicotinic acetylcholine receptors (nAChRs) of the insect nervous system that are distinct from those at which other insecticides have their activity. (Qiao *et al.*, 2007) [5]. Spinosad so far has proved non cross-resistant to any other known insecticide (Sparks *et al*., 2001) thereby; it prevents the damage of seeds from insects in storage.

Seedling Vigour Index-II

Among seed treatments, the maximum SVI-II was recorded in spinosad 45SC @ 2ppm (1087) compared to emamectin-benzoate 5SG @ 2ppm (1055) in second months of storage and thereafter the SVI-II gradually declined and reached 993, 964 at the end of six months of storage and 847, 822 at the end of twelve months of storage in spinosad 45SC and emamectin benzoate, respectively. The similar results were obtained by Veda parimala and Uma Maheswari (2011) [6] in maize. This might be attributed increased germination and seedling length to increased seedling vigour index (Qiao *et al*., 2007) [5].

Total Dehydrogenase activity (A_{480nm})

Among seed treatments, the highest (0.69 $A_{480\ nm}$) total dehydrogenase activity was recorded in spinosad 45SC @ 2ppm compared to emamectin-benzoate 5SG @ 2ppm (0.68 $A_{480\ nm}$) in second month of storage and thereafter the total dehyrogenase activity gradually declined and reached 0.53, 0.52 $A_{480\ nm}$ and 0.36, 0.36 $A_{480\ nm}$ at the end of six and twelve months of storage period in spinosad 45SC and emamectin benzoate, respectively. This may be attributed to spinosad 45SC reduced the insect activity thereby increased cell membrane integrity and subsequent reduction of electrolytes leakage along the seed deterioration periods resulted in maintained of seed quality and vigour (Ellis., 1992) [3].

Field emergence (%)

Among seed treatments, the highest (90.06%) field emergence was recorded in spinosad 45SC @ 2ppm compared to emamectin-benzoate 5SG @ 2ppm (88.36%) in second month of storage and thereafter the field emergence slowly declined and reached 84.53, 82.64 per cent and 77.64, 75.61 per cent at the end of six and twelve months of storage period in spinosad 45SC and emamectin benzoate, respectively. These results were in accordance with Ghelani *et al*. (2009) [4] in pearl millet. This might be due to the effectiveness of spinosad 50SC has been reported in literature (Ghelani *et al*., 2009) [4]. Spinosad kills insects through hyper excitation of the insect nervous system (Anon., 1988) [1]. There by it enhances the storage capacity of seed vigour and its viability.

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