

Field performance of differentially aged seeds using seed and plant leaf extracts on seed yield and quality of paddy variety IR 20

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Abstract: Studies on the field performance of differentially aged seeds using seed and plant leaf extracts on seed yield and quality of paddy variety IR 20 revealed that the effect of accelerated ageing mimicked the natural ageing as was observed through reduction in germination, seedling length and drymatter production after hydration-dehydration either with water or using blackgram seed leachate (1:1) for 8 h and dried back to original moisture content. The effect of ageing could be alleviated through this treatment and this was reflected on enhancement of plant height, number of tillers/plant, days to 50% flowering, panicle length and other yield parameters.

Key words : *Paddy cv. IR 20, Aged seeds, Plant and leaf extracts, Alleviation, Treatments, Hydration - dehydration, Seed leachates.*

Introduction

The initial physiological potential of the seed may be attributed to its vigour and viability of seeds. The seeds of many crops deteriorate faster rate and loses the planting value the ageing of the seed is a serious problem associated with oxidation of lipids increase in fat acidity and membrane integrity leading to deterioration (Wilson and McDonald, 1986).

The percentage of germination is an excellent indicator of growth potential of surviving seeds irrespective of factors for loss of viability (Abdulla and Roberts, 1969) and accelerated ageing is an excellent predictor of seed storability (Egli *et al.* 1978). Hence the present study was initiated to evaluate the different preserving treatments with plant products and nutrients with a view to minimize the ageing decrease in stored rice seeds.

Materials and Methods

The seeds of paddy cv. IR 20 were given the following treatments.

- T₀ = Untreated seed/control (naturally aged)
- T₁ = Hydration-dehydration (1:1) soaking in water for 8 h and dried back to original moisture content.
- T₂ = Seeds soaked in the seed leachate of greengram for 8 h and dried back to original moisture content.

T₃ = Seeds soaked in the seed leachate of blackgram for 8 h and dried back to original moisture content.

T₄ = Seeds soaked in the aqueous solution of pungam (3%) for 8 h and dried back to original moisture content.

T₅ = Seeds soaked in the aqueous solution of Notchi (3%) for 8 h and dried back to original moisture content.

T₆ = Seeds soaked in the aqueous solution of Arappu (3%) for 8 h and dried back to original moisture content.

T₇ = Seeds soaked in the aqueous solution of vitamin-E (1%) (alpha-tocopherol) for 8 h and dried back to original moisture content.

The seeds were differentially aged at 40°C with 98% RH in the accelerated ageing chamber and evaluated for their seed quality parameters under laboratory conditions at AC & RI, Madurai and the same seeds were exposed to field conditions during *rabi* 1999. The observations on plant height, productive tillers/plant, days to 50% flowering, yield components like panicle length, weight of seeds per panicle, seed recovery percentage, thousand seed weight and seed yield were recorded as per technical programme and statistically analyzed by the method proposed by Gomez and Gomez, 1984.

Table 1. Effect of seed and plant leaf extracts on seed quality parameters after accelerated ageing in paddy cv. IR 20

Treatments	0 days			4 days			8 days			12 days			Mean		
	Ger%	Sd.I	dmp	Ger%	Sd.I	dmp	Ger%	Sd.I	dmp	Ger%	Sd.I	dmp	Ger%	Sd.I	dmp
T ₀	90 (71.62)	23.94	304	88 (58.70)	23.25	286	44 (41.36)	23.20	232	30 (33.42)	20.19	193	63 (51.28)	22.65	254
T ₁	92 (73.59)	27.10	332	90 (71.58)	25.60	305	73 (58.49)	24.40	240	57 (49.03)	22.03	210	78 (63.17)	24.78	278
T ₂	92 (73.59)	25.80	328	91 (72.89)	25.40	300	60 (44.55)	23.50	264	50 (45.19)	21.0	208	71 (56.38)	24.13	272
T ₃	90 (71.58)	27.80	334	80 (63.44)	26.20	313	73 (58.49)	25.70	279	53 (46.72)	23.9	215	77 (62.42)	25.7	282
T ₄	81 (63.92)	27.40	328	79 (63.44)	25.40	306	71 (57.42)	24.40	259	46 (43.86)	20.1	202	72 (64.24)	24.6	274
T ₅	91 (72.52)	26.60	208	80 (63.44)	26.50	289	77 (61.58)	24.10	252	48 (43.86)	20.6	189	74 (60.35)	24.4	262
T ₆	92 (73.59)	27.60	319	83 (65.91)	26.40	286	72 (58.06)	23.10	240	46 (42.90)	20.2	158	73 (60.12)	24.3	251
T ₇	87 (68.87)	25.50	302	64 (52.93)	26.20	279	41 (39.62)	22.40	212	32 (42.28)	19.8	179	56 (48.92)	23.02	245
Mean	90.50 (71.16)	26.46	319	82.00 (63.95)	24.40	296	64 (52.44)	23.83	247	45.3 (42.28)	20.9	20.90	-	-	-
Seedling length															
Germination			SEd	CD	Seedling length			SEd	CD	Drymatter production			SEd	CD	
Soaking			0.61	1.67**				0.48	0.16**				0.60	0.12**	
Ageing			0.55	1.09**				0.07	0.10**				0.50	0.11**	
Interaction			1.23	2.50**				0.16**	0.31**				0.12	0.25**	

Table 2. Effect of seed and plant leaf extracts on alleviation of seed ageing and its influence on growth characteristics of paddy var. IR 20

Treatment	Plant height (cm)	Productive tillers (nos)	Days to 50% flowering	Panicle length (cm)
Control (Dry seed)	84.05	8.11	63.44	20.9
Hydration - dehydration	92.18	11.36	63.00	23.8
Greengram seed leachate	85.70	10.08	63.86	21.2
Blackgram seed leachate	91.90	11.08	62.47	24.2
Pungam 3% aqueous solution	86.57	9.36	64.30	23.3
Notchi 3% aqueous solution	88.02	9.99	65.72	20.7
Arappu 3% aqueous solution	91.55	9.55	66.33	21.4
Vitamin - E in 1% aqueous solution	88.43	9.11	67.14	21.8
Treatment	0.331	0.487**	0.601**	0.767**
Ageing	0.223	0.396**	0.425**	0.542**
Treatment x Ageing	0.661**	NS	NS	NS

Table 3. Effect of seed and plant leaf extracts on alleviation of seed ageing and its influence on yield and quality component characteristics of paddy var. IR 20

Treatment	Weight of seed per panicle (g)	Seed recovery (%)	Seed yield kg ha ⁻¹	1000 seed weight (g)
Control (Dry seed)	2.80	78.48	4010	17.74
Hydration - dehydration	2.86	81.76	4220	20.58
Greengram seed leachate	2.72	79.76	4061	18.88
Blackgram seed leachate	2.24	81.92	4103	20.53
Pungam 3% aqueous solution	2.82	76.25	3924	19.50
Notchi 3% aqueous solution	2.84	74.69	3930	20.36
Arappu 3% aqueous solution	2.83	75.25	4131	19.50
Vitamin - E in 1% aqueous solution	2.76	74.97	3909	20.12
Treatment	0.086	0.965	27.43	0.215
Ageing	0.70	0.681	19.40	0.152
Treatment x Ageing	0.172	NS	54.86**	0.429

Results and Discussion

The individual seed in a seed lot may undergo differential ageing depending upon the inherent vigour of the seed. Hence, creation of required favourable conditions to the maximum possible extent to protect the differentially aged seed is essential. The deterioration of biological material is an inevitable process, the prevention of which is not possible but can be slowed down.

Plant products, chemicals and nutrients can be used to correct and repair the damage

caused to seeds due to physiological ageing which could enhance emergence and establishment compared to aged and untreated seeds (Bas and Pal, 1979).

The results under laboratory conditions revealed that the seeds immediately after treatment through hydration-dehydration either alone or in combination with plant products did not have any effect on germination but differences could be clearly observed after ageing the seeds for 4,8 and 12 days. After ageing the seeds for 4,8 and 12 days the dry seeds recorded

38.44 and 30 per cent germination respectively. For the same seeds the values recorded for the hydration-dehydration alone were 29 and 27% higher after 8 and 12 days ageing followed by Arappu and Notchi aqueous solution which recorded 16 and 18% respectively higher than other treatments. The maximum seedling length (23.9 cm) and drymatter production (215 mg) was recorded by the seeds soaked in blackgram seed leachate followed by hydration-dehydration after 12 days of ageing (Table 1).

The observations recorded under field conditions revealed that the various invigoration treatments showed significant differences for growth characteristics like plant height, productive tillers/plant, days to 50% flowering, yield component like panicle length, weight of seeds/panicle (g), seed recovery percentage, seed yield and quality characters like 1000 seed weight (Table 2 and 3).

Among the non aged seeds the hydration-dehydration treatment recorded maximum productive tillers, weight of seed per panicle, germination percentage and drymatter accumulation of seedlings.

Among the aged seeds the treatment by soaking the seeds in blackgram seed leachate recorded advanced flowering followed by hydration-dehydration, registered maximum weight of filled seeds per panicle. The resultant plants after ageing registered 10.3, 10.5 and 19.0 per cent lesser yield over non aged respectively.

The rate of deterioration in viability and vigour and seeds may be attributed to its initial physiological potential of seed (Desai, 1976).

Among non aged seeds, soaking the seeds in blackgram seed leachate registered maximum seed yield of 4546 kgs followed by hydration-dehydration with water (4464 kgs). Irrespective of ageing, hydration-dehydration registered maximum 1000 seed weight of 20.84, 20.03 and 19.45 (g) after 4.8 and 12 days respectively.

It is evident that the aged seeds when soaked in leachate of blackgram followed by drying could perform better when assessed for viability parameters compared

to only soaking in water followed by drying. Effect of seed coat differentiation and leaching of free amino acids during soaking have been reported in blackgram (Konde *et al.* 1982). Similar beneficial effect have accrued in the present instance responsible for vigour and viability. Presence of amino acids like tryptophan, lysine, threonine and trypsin in the leachate of blackgram might be the possible reason for improvement of vigour and viability.

All the treatments recorded higher dry matter production over water. Dadarwal and Sen (1972) reported that the seed leachate of blackgram could enhance the rhizobial growth and stimulation of roots and gain support from the work of Chandra *et al.* (1973) and Jain and Rewari (1976).

The effect of accelerated ageing mimicked the natural ageing as was observed through reduction in germination, seedling length and drymatter accumulation under field conditions. The resultant plants from aged seeds recorded lower values for all the yield attributing parameters.

After hydration-dehydration either with water or using blackgram seed leachate the effect of ageing could be alleviated and this was reflected on enhancement of plant height, number of tillers/plant, days to 50% flowering, panicle length and other yield parameters.

Eight and twelve days ageing might be similar to 6 and 10 months or storage under ambient conditions as observed through progressive decrease in germination and other related parameters.

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