

Short Communication

Effect of Invigoration Treatment on Storability of Soybean Seeds

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Soybean occupies second place among the oilseed of India. The non-availability of quality seed is one major constraint which needs to be overcome quickly. Soybean seeds deteriorate rapidly under high temperature and high humidity conditions. The seed therefore needs special storage conditions to maintain their viability.

Mid storage hydration-dehydration (invigoration) treatment has helped to maintain vigour, viability and productivity of crop seeds [1, 2].

Hydration-dehydration treatment is ineffective in freshly harvested seeds of many crops including most of the leguminous crops [2, 3]. Soaking-drying treatment of soybean has adversely affected germinability and only moisture equilibration (seed takes up moisture in vapour form) followed by soaking-drying and moist sand conditioning-soaking-drying proved effective in medium vigour seeds [3, 4, 5]. In view of this an investigation was undertaken to study the effect of different mid-storage invigoration methods in extending the storability of soybean.

The freshly harvested seeds of two varieties of soybean i.e. MACS-13 and MACS-450 produced during *Kharif* 2000 were packed in gunny bag (GB) and polylined gunny bag of 400 gauge (PGB) and stored in godown having temperature 20-27°C and relative humidity 50-60 per cent at MPKV, Rahuri, Dist. Ahmednagar. At 90 days storage, half of the seeds of each variety from each container was invigorated by moisture equilibration-soaking-drying (ME-S-D) and moist sand conditioning - soaking-drying (MSC-S-D) methods as given below.

ME-S-D: Moisture equilibration with saturated atmosphere of 100 (± 2) per cent R.H. was maintained by using saturated solution of potassium sulphate in desiccators at 20°C [6]. After placing the seeds in moisture equilibration for 48 h. immediately the seeds were soaked in water for 2 h before drying back to original moisture content [7].

MSC-S-D: The seed was mixed with premoistened (10% M.C.-which was obtained by adding appropriate quantity of water) previously washed and dried fine grain sand and kept at room temperature for 24 h. Then the seeds were separated from sand and soaked in water for 2 h before drying back to original moisture content [7].

The per cent germination was tested in four replication of 100 seeds each from each treatment using between paper method at 20-30°C [8]. Normal seedlings were counted as germinated seeds. Ten normal seedlings from each replication were randomly selected and root-shoot length was measured. The moisture content of seeds was estimated with hot air oven method [8].

The per cent germination of soybean seed decreased with advancement of storage period (Table 1). The untreated seed recorded germination above the certification standard (70 %) upto 150 days in GB and in PGB storage it could be extended up to 210 days. The seeds invigorated by ME-S-D and MSC-S-D from both the containers recorded germination above the certification standards upto 210 days as compared to 150 days of untreated seeds stored in GB. This might be due to reduction

Table 1. Effect of container and invigoration treatment on germination percentage of soybean seed

Container	Treatment	Period storage (in days)									
		0	30	60	90	120	150	180	210	240	270
GB	Control	90.6 (72.3)	87.0 (68.9)	84.2 (66.7)	80.7 (64.0)	77.6 (61.8)	74.0 (59.4)	45.6 (42.5)	36.0 (36.8)	26.3 (30.8)	20.0 (26.1)
	ME-S-D	-	-	-	-	83.3 (65.9)	80.6 (63.7)	74.6 (59.8)	70.3 (57.0)	64.3 (53.3)	58.3 (49.8)
	MSC-S-D	-	-	-	-	85.0 (67.2)	82.6 (65.4)	77.0 (61.7)	72.6 (58.5)	66.5 (54.6)	60.0 (50.7)
PGB	Control	90.6 (72.3)	88.7 (70.5)	86.7 (68.7)	84.7 (67.0)	82.6 (65.4)	80.0 (63.5)	76.3 (60.9)	71.6 (57.8)	65.3 (53.9)	58.6 (50.0)
	ME-S-D	-	-	-	-	85.6 (67.8)	83.0 (65.7)	77.6 (61.8)	72.3 (58.3)	66.3 (54.5)	60.0 (50.8)
	MSC-S-D	-	-	-	-	87.3 (69.3)	85.3 (67.6)	80.0 (63.5)	74.6 (59.8)	68.3 (55.7)	62.0 (51.9)
CD (0.05)	Container	-	1.20	1.31	0.91	0.77	0.81	0.61	0.69	0.60	0.43
	Invigoration	-	-	-	-	0.95	0.99	0.75	0.84	0.73	0.53
	Interaction	-	-	-	-	N.S	N.S	1.06	1.19	1.03	0.74

(Figure in parenthesis indicate arc sine values)

of free radical, lipid peroxidation reactions [9, 10] and biochemical lesions [11] in stored seed by invigoration treatment.

The moisture content of the seed increased with programme of storage however, the increase was lower in 400 gauge PGB as compared to GB (Table 2). Treated seeds maintained low moisture content as compared to untreated seeds stored in GB. The seeds invigorated by MSC-S-D recorded higher moisture content as compared to seeds invigorated by ME-S-D.

The root-shoot length of seedlings of soybean seed decreased with advancement of storage (Table 3). The root-shoot length of seedlings of seeds stored in PGB was significantly higher as compared to GB which could be attributed to the slow deterioration of soybean seeds stored in PGB. The invigorated seeds recorded higher root-shoot length than untreated seeds stored in GB.

MSC-S-D method of treatment was more effective to control the deteriorative senescence of aged seeds as compared to ME-S-D method. This could be ascribed to the fact that more hydration could be obtained, after 2 hours of soaking in water by MSC-S-D method as compared to ME-S-D method. Villers and Edgcumbe [5] stated that in Low-medium vigour seeds, a higher moisture level would be necessary for the extensive corrections of biochemical lesions.

Moist-sand conditioning - soaking - drying (MSC-S-D) method of invigoration would be easy for treating large amount of seed at farmers level as compared to moisture equilibration - soaking - drying (ME-S-D). Thus it can be stated that, the storability of soybean seed can be extended up to 210 days with mid-storage invigoration treatment (MSC-S-D) to the seeds stored in gunny bags or storing the seed in polylined gunny bags (400 gauge) with lower moisture content at the beginning of storage.

Table 2. Effect of container and invigoration treatment on moisture content percentage of soybean seed

Container	Treatment	Period storage (in days)									
		0	30	60	90	120	150	180	210	240	270
GB	Control	7.1	7.5	7.8	8.2	8.5	8.8	9.2	9.4	9.5	9.5
	ME-S-D	-	-	-	-	8.3	8.5	8.7	8.9	9.0	9.0
	MSC-S-D	-	-	-	-	8.4	8.5	8.8	8.9	9.1	9.2
PGB	Control	7.1	7.1	7.2	7.3	7.3	7.4	7.5	7.6	7.6	7.7
	ME-S-D	-	-	-	-	7.7	7.9	8.2	8.4	8.5	8.6
	MSC-S-D	-	-	-	-	7.7	8.0	8.3	8.4	8.6	8.7
CD (0.05)	Container	-	1.20	1.10	0.10	0.07	0.07	0.07	0.07	0.09	0.06
	Invigoration	-	-	-	-	0.08	0.08	0.09	0.09	0.11	0.08
	Interaction	-	-	-	-	0.11	0.12	0.13	0.12	0.15	0.11

Table 3. Effect of container and invigoration treatment on root-shoot length (cm) of soybean seed

Container	Treatment	Period storage (in days)									
		0	30	60	90	120	150	180	210	240	270
GB	Control	28.5	27.7	26.7	25.5	24.4	23.1	20.8	17.8	16.3	15.3
	ME-S-D	-	-	-	-	25.7	24.2	22.6	21.6	20.6	19.8
	MSC-S-D	-	-	-	-	25.9	24.5	23.1	22.2	21.3	20.5
PGB	Control	28.5	28.0	27.2	26.4	25.6	24.7	23.2	22.0	21.0	20.2
	ME-S-D	-	-	-	-	26.6	25.2	23.6	22.6	21.7	21.0
	MSC-S-D	-	-	-	-	26.8	25.5	24.2	23.3	22.5	22.0
CD (0.05)	Container	-	0.20	0.26	0.22	0.17	0.18	0.16	0.15	0.14	0.15
	Invigoration	-	-	-	-	0.21	0.22	0.20	0.18	0.17	0.19
	Interaction	-	-	-	-	N.S	0.30	0.28	0.26	0.24	0.27

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