Seed Research Vol. 34(1) 66-69, 2006

Seed Quality as Influenced by Accelerated and Natural Ageing in Bitter Gourd (*Momordica charantia* L.)

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ABSTRACT Fresh and one year old seeds of bitter gourd (*Momordica charantia* L.) were subjected to accelerated ageing treatment (98 ± 1% RH, 42 ± 1°C) for six days. The results showed that, one day of accelerated ageing recorded significantly higher germination (90.30%), vigour index (3029), field emergence (86.20%) and lower electrical conductivity (0.340 dSm^{-1}) compared to other ageing treatments irrespective of age of the seeds. Increase in germination value noticed in one day of accelerated aged seeds over no ageing might be due to the higher germination recorded by one day of accelerated ageing of fresh seeds as compared to one year old seeds. Three days of accelerated ageing recorded 87.20 per cent germination, which is comparable (87.00%) to 12 months of natural ageing.

Keywords: Bitter gourd, accelerated ageing, natural ageing, vigour, field emergence, seed storability.

The rate of seed deterioration greatly increase by exposing seeds under higher humidity (98±1%) and temperature (42±1°C) conditions. Information can be obtained on the probable longevity [1], storability [2] and vigour with the accelerated ageing test. The seeds of bitter gourd are known to loose viability and vigour slowly, than many kinds of seeds belonging to orthodax group [3]. Therefore, the present investigation was carried out to predict the storability of bitter gourd seeds by using accelerated ageing test.

MATERIALS AND METHODS

Seeds of bitter gourd (*Momordica charantia* L.) cv. Coimbatore Long (green) were produced under identical agronomic practices for seeds purpose in the rabi seasons of 2002-03 and 2003-04 at KRC College of Horticulture, Arabhavi, Karnataka State. The seeds produced during 2002-03 were packed in cloth bag and stored under ambient conditions for one year and used as one-year-old seeds for accelerated ageing test. Bimonthly observation were recorded on seed quality parameters. The fresh seeds produced during 2003-04 were immediately used for accelerated ageing test. Fresh seeds and one year old seeds were subjected to 98±1% relative humidity and 42±1°C temperature by keeping them in monolayer on a wire mesh for a period of six days. Accelerated aged samples were drawn at an interval of one day and those seeds were shade dried to initial moisture level and periodical observations on germination, electrical conductivity from seed leachate, vigour index and field emergence were observed. The germination results obtained after accelerated ageing were compared with that of germination percentage obtained under ambient storage conditions in cloth bag and utilized for predicting the storability of seed lots. Germination was tested by between the paper (BP) method [4]. The vigour index of seedling was calculated by adopting the methods [5] and expressed in whole number for each treatment by using the following formula: Vigour index = Germination (%) x Seedling length (cm). Five grams of seeds were surface sterilized with alcohol for half a minute and were

* Part of the Ph.D. Thesis submitted to the University of Agricultural Sciences, Dharwad.

Received March, 2005 Revised Nov., 2005 Accepted March, 2006

Table 1. Effect of accelerated ageing on germination, field emergence vigour index and electrical conductivity of seed leachate (dSm^{-1})

Days of accelerated ageing	Germination (%)			Field emergence (%)			Vigour Index			Electrical Conductivity (dSm^{-1})		
	A_1	A_2	Mean	A_1	A_2	Mean	A1	A2	Mean	A1	A2	Mean
D_0 — No ageing	80.00 (63.22)*	86.60 (68.38)	83.30 (65.80)	77.00	83.70	80.40	2468	2717	2593	0.450	0.355	0.402
D_1 — One day	96.20 (79.43)	84.30 (66.59)	90.30 (73.00)	92.00	80.30	86.20	3377	2681	3029	0.313	0.367	0.340
D_2 — Two days	90.70 (72.24)	81.70 (64.67)	86.20 (68.19)	86.00	76.00	81.00	2893	2394	2638	0.320	0.385	0.353
D_3 — Three days	87.20 (69.04)	78.00 (62.03)	82.60 (65.35)	76.70	71.30	74.00	2590	2114	2346	0.351	0.405	0.378
D_4 — Four days	80.00 (63.44)	73.20 (58.82)	76.60 (61.07)	70.30	64.00	67.20	2192	1808	1995	0.380	0.431	0.406
D_5 — Five days	74.25 (54.54)	65.00 (53.73)	69.62 (56.79)	60.30	52.70	56.50	1856	1385	1612	0.392	0.464	0.428
D_6 — Six days	70.12 (56.85)	58.50 (49.89)	64.31 (53.19)	53.40	41.40	47.40	1466	971	1206	0.403	0.483	0.443
Mean	82.64 (65.35)	75.33 (60.20)	78.99 (62.72)	73.70	67.10	70.40	2372	1979	2176	0.373	0.413	0.393
	S.Em±	C.D. at 5%		S.Em±	C.D. at 5%		S.Em±	C.D. at 5%		S.Em±	C.D. at 5%	
A	0.57	1.65		0.41	1.18		33	96		0.013	0.038	
D	1.12	3.23		0.77	2.22		62	179		0.018	0.052	
A x D	1.49	4.30		1.08	3.11		87	252		0.034	0.098	

A_1 – Fresh seed; A_2 – One year old seed

* Figures in the parenthesis indicate angular transformed values

thoroughly washed in distilled water for five times. Then the seeds were soaked in 25ml distilled water and kept at 25±1°C for 24 hours in incubator. The leachates were decanted to the measuring cylinder and the volume was made up to 25ml by adding distilled water. Then the electrical conductivity of seed leachate was measured with electrical conductivity bridge and expressed in dSm^{-1}. One hundred seeds in four replications were taken randomly sown in the specially prepared seedbeds for the purpose. On 21st day the field emergence was recorded and expressed in percentage.

RESULTS AND DISCUSSION

Age of the seed lots showed significant influence on seed quality parameters. Fresh seeds recorded maximum germination percentage (82.64), field emergence (73.70%), vigour index (2372) and the lowest electrical conductivity of seed leachate (0.373 dSm^{-1}) compared to one-year-old seeds (Table 1). Poor seed quality of one-year-old seed is due to faster deterioration of seeds resulting into excessive leaching of soluble sugars and free amino acids. Similarly, faster reduction in germination and other quality parameters was reported in old seeds of barely as compared to new seeds during accelerated ageing test [6]. Similar results were observed earlier in okra [7] and in *Cucurbita pepo* [8].

Accelerated ageing period had significant effect on seed quality parameters (Table 1). The highest per cent germination (90.30), field emergence (86.20%) and vigour index (3029) were recorded in one day of accelerated ageing treatment compared to other treatments. The higher seed quality recorded in one day accelerated ageing of seeds might be due to breakage of dormancy in fresh seeds on exposure to high temperature and relative humidity. There was a linear decrease of seed quality parameters with an advancement of accelerated ageing period starting from second day of accelerated ageing. The linear decrease in seed quality parametes could be attributed to reduced seed vigour. Since seeds were exposed to highly adverse conditions of temperature and relative humidity, it might have led to various biochemical changes in sub celluler system and membrance degradation, which in-turn affected the vigour of seed. Similar results were obtained in bitter gourd [3], in field bean [9] and in onion and water melon [10].

Accelerated ageing treatment showed significant influence on electrical conductivity from seed leachate (Table 1). Electrical conductivity of seed leachate increased (0.340 to 0.443 dSm^{-1}) with an increase in accelerated ageing period starting from second day of ageing. Seed leachates in control (no ageing) had 0.402 dSm^{-1} electrical conductivity. The electrical conductivity value increased as the ageing period increased. This might be due to loss in membrane integrity during ageing process leading to loss of electrolytes into the imbibing medium. Significantly negative correlation had been registered between viability and vigour with electrical conductivity values [2]. The similar results were reported in bitter gourd [3] and in field bean [9].

Interaction effects due to age of seed lot and ageing period on seed quality

The interaction effect due to age of seed lot and ageing period showed significant effect on seed quality parameters. Fresh seeds (A_1) exposed to one day of accelerated ageing recorded significantly maximum germination (96.20), field emergence (92.00%), vigour index (3377) and the minimum electrical conductivity from seed leachates (0.313 dSm^{-1}) compared to all other treatment combinations. The poor seed germination (58.50%), field emergence (41.40%), vigour index (971) and the higher electrical conductivity from seed leachate (0.483 dSm^{-1}) were observed in one-year-old seeds exposed to accelerated ageing conditions for six days. Similar results were observed in okra [2] and in *Cucurbita pepo* [3].

Prediction of storability of seeds

Three days of accelerated ageing recorded 87.20 per cent germination and similar germination (87.00%) was recorded with 12 months of natural ageing period. The three days-old-aged seed predict the storability for 12 months naturally aged seeds. Hence, three days of accelerated ageing is equal to 12 months of natural ageing (Table 2). Similar results were obtained in chilli [11].

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Table 2. Germination (%) as influenced by accelerated ageing and natural ageing in bitter gourd

Accelerated aged seeds		Naturally aged seeds	
Ageing (days)	Germination (%)	Storage period (months)	Germination (%)
0	80.00 (63.44)*	0	81.20 (64.30)
1	96.20 (78.76)	2	94.33 (76.19)
2	90.70 (72.24)	4	93.30 (75.00)
3	87.20 (69.04)	6	90.00 (71.56)
4	80.00 (63.44)	8	89.80 (71.37)
5	74.24 (59.46)	10	89.00 (70.63)
6	70.12 (56.85)	12	87.00 (68.87)

* Figures in the parenthesis indicate angular transformed values

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