

Germination status of certified seed samples of paddy, ground nut and cotton collected from different seed testing laboratories of Tamil Nadu

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Abstract : A study was conducted to verify whether the validity period of nine months for the certified seed holds good for paddy, groundnut and cotton produced from various locations and stored under ambient conditions at Coimbatore. The validity period of certified seed samples of 29 paddy varieties (eight varieties each from Madurai and Dharmapuri STLs and 13 from Tirunelveli STL), five groundnut varieties (three varieties from Madurai and two from Dharmapuri STLs) and 11 cotton varieties / hybrids (eight varieties / hybrids from Madurai and three from Dharmapuri STLs) were assessed. The results clearly indicated that the validity period of nine months for the certified seeds of paddy and cotton is appropriate. However, the validity period of nine months may be reconsidered for groundnut, since in most of the varieties the germination fell below the minimum standard at 8th month itself. The results also indicated that good quality seed with high initial germination could retain desired levels of germination upto a validity period of nine months. Significant differences due to varieties as well as place of production were noticed for validity period in all the three crops tested. In cotton, irrespective of location of seed collection, the hybrids performed better than varieties.

Key words: Paddy, Groundnut, Cotton, Certified seeds, Validity period.

Introduction

India has achieved self-sufficiency in food production during the past decade and the country must now increase the same by atleast five million tones every year to sustain the self-sufficiency. On other hand, the cultivable land area is steadily decreasing and degrading day by day due to many factors. Therefore, increasing the productivity of food crops is the only possible way to sustain self-sufficiency in food grain production.

To achieve higher productivity, the most basic need is the good quality seeds of improved varieties and hybrids, without which the costlier inputs like fertilizer, pesticides, irrigation, etc. will not give due dividends. It has been estimated that 10-20 per cent yield increase can be obtained by the use of good quality seeds alone. However, the loss of seed quality in storage is a serious problem faced by the seed producers and farmers in the sub-tropical countries like India, where the seeds are to be stored at least for six

months from harvest to next sowing season, every year. Therefore, maintenance of seed vigour and viability during storage is a matter of prime concern in India.

The validity period of all crop seeds is fixed as nine months from the date of test for initial certification, which is further extendable upto six months provided the seeds conform to the minimum prescribed germination standards (Anon, 1999). According to Expert Group on Seeds (Anon, 1989), research on validation of crop seeds are essential, since the rate of deterioration of seed vigour and viability is not uniform in all the cultivated crop species. Therefore, uniform recommendation of nine months as validity period for all the crops needs further elucidation. Hence the present study was undertaken at Coimbatore during the year 2001-02 to determine the validity period of certified seed samples of paddy, groundnut and cotton produced from various location and stored under ambient conditions.

Table 1. Details on seed samples received from Seed Testing Laboratories

Crop	Madurai	Dharmapuri	Tirunelveli
Paddy	ADT 36, ADT 39, ADT 43 ASD 16, ASD 19, IR 20, CO 43, I.W. Ponni	ADT 36, ADT 39, ADT 42, ADT 43, ASD 19, ASD 20, IR 20, I.W. Ponni	ADT 36, ADT 39, ADT 42, ASD 16, IR 20, IR 36, IR 50 IR 64, CO 43, CO 47, MDU 5, TKM 9
Groundnut	TMV 3, VRI 2, CO 2	TMV 7, VRI 2	--
Cotton	Supria, NHH 44, Savitha, DCH 32, H10, LRA 516, LRA 5166, JKHY 1	Surabi, Supria, MCU 5	--

Table 2. Seed germination test conditions

S.No.	Crop	Substrata	Temperature (°C)	Final count (days)
1	Paddy	Between paper	20-30, 25	14
2	Groundnut	Sand	20-30, 25	10
3	Cotton	Sand	20-30, 25	12

Materials and Methods

Certified seed samples of 29 paddy varieties (eight varieties each from Madurai and Dharmapuri STLs and 13 from Tirunelveli STL), five groundnut varieties (three varieties from Madurai and two from Dharmapuri STLs) and 11 cotton varieties / hybrids (eight varieties / hybrids from Madurai and three from Dharmapuri STLs) were collected (Table 1) and used for the study. The data on germination of seed samples (initial) were also received along with the date of test from the respective Seed Testing Laboratories. Seed Samples were stored in gada cloth bag and kept under ambient storage condition for 14 months. Samples were drawn at three months interval for groundnut and four months interval for paddy and cotton upto nine months and then monthly intervals upto 14 months and evaluated for their germination (ISTA, 1999) as detailed in Table 2. The data from various experiments were analysed by the F-test for significance following the methods described by Gomez and Gomez (1984).

Results and Discussion

Paddy

The results on germination test revealed that nearly 50 per cent of the varieties in each location i.e. 7 out of 8 in Madurai, 4 out of 8 in Dharmapuri and 5 out of 13 in Tirunelveli maintained minimum germination standard of 80 per cent upto the validity period of nine months (Table 3). A highly significant variation between varieties within each location was observed for the maintenance of minimum germination standard. This might be due to the genotypic influence on seed storability. The varietal differences in the seed viability period of paddy seeds during storage have been reported by Sharma *et al.* 1990. However, on an average, the overall mean of germination per cent of 29 varieties of all the three locations at validity period was 80 per cent. This result clearly indicated that the validity period of nine months for the certified seeds of paddy is appropriate.

Germination is the last measure of quality to decline as the seed deteriorates during storage.

Table 3. Germination status of certified seed samples of paddy collected from different STLs

Locations	Varieties (V)	Months after storage (P)								Mean		
		0	4	8	9	10	11	12	13		14	
Madurai	ASD 16	91 (72.54)	88 (69.73)	87 (68.87)	86 (68.03)	80 (63.44)	78 (62.67)	77 (62.03)	76 (61.34)	70 (56.79)	81 (64.15)	
	ASD 19	89 (70.63)	86 (68.02)	86 (68.03)	85 (67.22)	82 (64.89)	80 (63.43)	81 (64.16)	75 (60.00)	57 (49.03)	80 (63.44)	
	ADT36	87 (68.87)	87 (68.86)	88 (69.73)	86 (68.03)	75 (60.00)	71 (57.42)	72 (58.05)	73 (58.69)	56 (48.45)	77 (61.34)	
	IR 20	90 (71.56)	86 (68.03)	84 (66.42)	81 (64.16)	81 (64.16)	81 (67.22)	81 (64.15)	77 (61.34)	48 (43.86)	76 (60.67)	
	ADT39	89 (70.63)	89 (71.57)	89 (70.63)	85 (64.16)	81 (64.16)	80 (63.44)	79 (62.73)	77 (61.34)	60 (50.77)	82 (64.89)	
	LW.	85 (67.22)	82 (64.89)	78 (62.02)	78 (58.05)	72 (58.05)	71 (57.2)	70 (56.79)	66 (54.33)	63 (52.54)	74 (59.34)	
	Ponni	85 (67.22)	85 (67.21)	85 (67.21)	85 (66.42)	84 (66.42)	84 (66.42)	81 (64.44)	81 (64.15)	81 (64.16)	84 (66.42)	
	CO 43	85 (67.22)	85 (67.21)	85 (67.21)	85 (66.42)	84 (66.42)	84 (66.42)	81 (64.44)	81 (64.15)	81 (64.16)	84 (66.42)	
	Mean	88 (69.73)	87 (68.86)	85 (67.21)	83 (62.73)	79 (62.73)	78 (62.03)	78 (62.03)	76 (60.66)	61 (51.36)		
	CD (P=0.05)			V 2.2**			P 2.0**			VxP 6.2**		
	Dharmapuri	ADT36	90 (71.57)	85 (67.21)	82 (64.90)	80 (63.44)	75 (60.00)	72 (57.42)	71 (57.42)	70 (56.79)	71 (57.41)	77 (61.34)
		ADT42	93 (74.66)	91 (72.54)	88 (69.73)	87 (68.87)	85 (67.22)	78 (62.03)	78 (62.03)	72 (58.04)	26 (30.66)	77 (61.34)
		ADT43	88 (69.73)	81 (64.16)	81 (64.16)	80 (63.44)	76 (60.66)	78 (62.03)	78 (62.03)	78 (62.03)	77 (61.34)	79 (62.73)
		ASD19	91 (72.54)	85 (67.22)	79 (60.67)	79 (60.67)	78 (56.79)	77 (61.34)	77 (61.34)	74 (59.34)	71 (57.42)	77 (61.34)
ASD 20		91 (72.54)	88 (69.73)	86 (68.03)	78 (62.03)	66 (54.73)	66 (54.33)	66 (54.33)	64 (53.13)	62 (51.94)	74 (59.34)	
IR 20		91 (72.54)	80 (63.44)	73 (57.42)	71 (60.00)	70 (56.79)	70 (58.05)	70 (57.42)	70 (56.79)	69 (56.17)	74 (59.34)	
ADT39		95 (77.08)	82 (64.89)	82 (64.90)	81 (64.16)	77 (60.70)	76 (60.67)	76 (60.67)	76 (60.66)	70 (56.79)	79 (62.73)	
LW.		92 (72.57)	85 (67.21)	75 (60.01)	70 (56.79)	70 (56.79)	70 (56.79)	70 (56.79)	68 (55.55)	66 (54.33)	74 (59.34)	
Ponni		91 (72.54)	83 (65.65)	80 (63.44)	78 (62.03)	73 (58.70)	73 (58.70)	73 (58.70)	72 (58.05)	64 (53.13)		
Mean		91 (72.54)	83 (65.65)	80 (63.44)	78 (62.03)	73 (58.70)	73 (58.70)	73 (58.70)	72 (58.05)	64 (53.13)		
CD (P=0.05)				V 2.6**			P 2.5**			VxP 7.5**		

Table 3. Contd..

Locations	Varieties (V)	Months after storage (P)									Mean
		0	4	8	9	10	11	12	13	14	
Tirunelveli	ASD 16	85 (67.22)	88 (69.73)	87 (68.87)	84 (66.42)	79 (52.72)	73 (58.70)	75 (60.00)	75 (60.00)	62 (51.94)	79 (62.73)
	ADT 36	82 (64.89)	80 (63.44)	75 (60.00)	73 (58.69)	69 (56.17)	73 (58.70)	71 (57.42)	70 (56.79)	72 (58.05)	73 (58.70)
	ADT42	90 (71.57)	85 (67.22)	76 (60.67)	76 (60.67)	66 (54.33)	64 (53.13)	60 (50.77)	61 (51.35)	30 (33.21)	66 (54.33)
	ADT43	88 (69.73)	88 (67.22)	83 (67.22)	85 (67.22)	69 (56.17)	69 (56.17)	67 (54.94)	66 (54.33)	26 (30.66)	71 (57.42)
	CO47	88 (69.73)	84 (66.42)	74 (59.34)	68 (55.55)	69 (56.17)	73 (58.70)	66 (54.33)	63 (52.54)	59 (50.18)	70 (56.79)
	MDU5	89 (69.73)	85 (67.22)	76 (60.67)	69 (56.17)	60 (50.77)	2 (51.94)	63 (52.54)	62 (51.94)	58 (49.60)	71 (57.42)
	TKM9	93 (74.66)	98 (81.87)	95 (77.08)	92 (73.57)	85 (67.22)	84 (66.42)	84 (51.94)	88 (69.73)	81 (64.16)	86 (68.03)
	IR20	88 (68.87)	83 (67.00)	78 (62.03)	76 (60.67)	66 (54.33)	66 (54.33)	61 (69.73)	61 (51.36)	60 (50.77)	69 (56.17)
	IR36	89 (69.73)	84 (66.42)	80 (63.44)	76 (60.67)	70 (56.79)	70 (56.29)	64 (51.36)	64 (53.13)	61 (51.36)	72 (58.05)
	IR50	89 (70.63)	84 (66.42)	80 (63.44)	80 (63.44)	78 (62.03)	72 (58.05)	69 (53.13)	67 (54.94)	64 (53.13)	75 (56.17)
	IR64	88 (69.73)	85 (67.22)	81 (64.16)	84 (66.42)	80 (63.44)	82 (64.89)	81 (54.94)	80 (63.43)	76 (60.67)	81 (60.00)
	ADT39	90 (71.57)	85 (67.22)	82 (64.89)	75 (60.00)	69 (56.17)	79 (62.73)	74 (63.44)	72 (58.05)	48 (43.86)	75 (64.16)
	CO43	87 (68.86)	80 (63.44)	77 (61.34)	72 (58.05)	67 (54.94)	65 (53.73)	64 (58.05)	60 (50.77)	50 (45.00)	69 (56.17)
	Mean	88 (69.73)	80 (63.44)	80 (63.44)	78 (62.03)	71 (57.42)	72 (58.05)	69 (55.55)	68 (55.05)	57 (49.03)	
	CD			V			P			VxP	
		(P=0.05)		1.88**			1.56**			5.63**	

The decline in germination over periods of storage is due to depletion of food reserves, decline in synthetic activity as reported by Heydecker (1972) and Ravichandran and Dharmalingam (1994) in rice. The storability had shown significant differences due to varieties. Among the varieties, TKM 9 from Tirunelveli registered maximum germination both at the end of validity period as well as at 14th month of storage followed by CO 43 from Madurai. Whereas, the seeds of ASD 16 obtained from

Madurai recorded 70 per cent and MDU 5 from Tirunelveli registered 58 per cent. Irrespective of locations, out of 29 varieties tested, 16 varieties maintained minimum germination standard upto the end of validity period. The findings of the study clearly indicated that the validity period is also dependent on the genotypic variation.

The place of production also exerted significant influence on seed germination in paddy. The results of mean values of germination

in different varieties within each location indicated that four out of eight varieties in Madurai and two out of 13 varieties in Tirunelveli location had minimum germination standard of 80 per cent after a period of 12 months. Whereas, none of the varieties from Dharmapuri scored 80 per cent after 10 months of storage. This result indicated that the seed source had significant influence on seed germination in paddy.

Groundnut

Groundnut is a poor storer and the maintenance of seed viability in a specific environment upto the end of validity period is largely determined by its inheritance and pre-storage history, besides storage conditions. In the present study, the data on germination revealed that except VRI 2 of Madurai STL, all other varieties in both the STLs (Madurai and Dharmapuri) lost their minimum germination standard of 70 per cent at the end of validity period i.e. 9th month itself (Table 4). However, all other four varieties viz. TMV 7 and CO2

from Madurai and VRI 2 and TMV 7 from Dharmapuri maintained minimum germination standard upto eight months. The variation in the maintenance of germination of different varieties during the validity period might be due to the difference in initial germination. In the present investigation, the initial germination of VRI 2 from Madurai location was 87 per cent, while all other varieties registered about 75-81 per cent only. The results clearly indicated that good quality seed with high initial germination could retain desired levels of germination upto a period of nine months (recommended validity period). Therefore, it is concluded that the validity period of nine months for groundnut may be reconsidered as in most of the varieties i.e. four out of five varieties collected from both Madurai and Dharmapuri STLs, the germination fell below the minimum standard at 8th month itself.

The decline in germinability with increase in the storage period could be due to the phenomenon of ageing associated with irreversible

Table 4. Germination status of certified seed samples of groundnut collected from different STLs

Location/ Varieties	Parameters (V)	Months after storage (P)									Mean		
		0	4	8	9	10	11	12	13	14			
Madurai	VRI2	87 (68.87)	85 (67.22)	83 (65.65)	83 (65.65)	80 (63.44)	75 (60.00)	70 (56.79)	48 (43.86)	40 (39.23)	38 (38.06)	36 (36.87)	65.9 (55.20)
	TMV7	80 (63.44)	78 (62.03)	75 (60.00)	70 (56.79)	75 (60.00)	68 (55.55)	61 (51.36)	40 (39.23)	42 (40.40)	30 (33.21)	32 (34.45)	59.40 (49.00)
	CO2	81 (64.16)	76 (60.67)	75 (60.00)	73 (58.70)	72 (58.05)	64 (53.13)	52 (46.15)	46 (42.71)	38 (38.06)	34 (35.67)	32 (34.45)	58.3 (48.10)
	Mean	82.5 (65.65)	79.5 (63.44)	77.6 (62.03)	76.1 (60.67)	75.6 (60.67)	69.0 (56.17)	61.0 (51.36)	44.6 (42.13)	40 (39.23)	34.0 (35.67)	33.3 (35.06)	
	CD (t=0.05)		V 26**			P 49**			VP NS				
Dharma-puri	TMV7	80 (63.44)	78 (62.03)	78 (62.03)	74 (59.34)	72 (58.05)	68 (55.55)	60 (50.77)	54 (47.29)	46 (42.71)	46 (42.71)	48 (43.86)	63.8 (53.00)
	VRI 2	75.0 (60.00)	74.0 (59.34)	74 (59.34)	73 (58.70)	71 (57.42)	62 (51.94)	49 (44.43)	48 (43.86)	42 (40.40)	46 (42.71)	44 (41.56)	59.7 (50.34)
	Mean	77.5 (62.03)	76.0 (60.67)	75.8 (60.67)	73.0 (58.70)	71.0 (57.42)	65.0 (53.73)	54.0 (47.30)	51.0 (45.57)	44.0 (41.56)	46.0 (42.71)	46.0 (42.71)	
	CD (t=0.05)		V 27**			P 64**			VP NS				

Table 5. Germination status of certified seed samples of cotton collected from different STLs.

Locations	Varieties hybrids (V)	Months after storage (P)									Mean
		0	4	8	9	10	11	12	13	14	
Madurai	Supria	81 (64.16)	75 (60.00)	75 (60.00)	72 (58.05)	68 (55.55)	66 (54.33)	63 (52.54)	63 (52.54)	64 (53.13)	69.7 (50.89)
	Savitha	81 (64.16)	75 (60.00)	67 (54.94)	69 (56.17)	65 (53.73)	63 (52.54)	63 (52.54)	63 (52.54)	62 (51.94)	67.6 (58.20)
	LRK516	78 (62.03)	73 (58.70)	68 (55.55)	69 (56.17)	67 (54.94)	65 (53.73)	65 (53.73)	65 (53.73)	60 (50.77)	67.8 (58.46)
	LRA5166	79 (62.73)	74 (59.34)	79 (62.72)	81 (64.16)	72 (58.05)	70 (56.79)	65 (53.73)	64 (53.13)	60 (50.77)	71.6 (57.89)
	NHH44	81 (64.16)	81 (64.16)	80 (63.44)	79 (62.73)	75 (60.00)	72 (58.05)	70 (56.79)	69 (56.17)	65 (53.73)	74.7 (55.20)
	DCH32	88 (69.73)	71 (57.42)	82 (63.44)	71 (62.73)	70 (60.00)	68 (58.05)	65 (56.79)	62 (56.17)	58 (53.73)	70.6 (62.55)
	H10	84 (66.42)	78 (57.42)	78 (58.05)	75 (57.42)	74 (56.79)	72 (55.05)	65 (53.73)	60 (51.94)	56 (49.60)	71.3 (57.68)
	JKHY1	89 (70.63)	90 (62.02)	79 (62.03)	75 (60.00)	75 (59.34)	72 (55.05)	68 (53.73)	62 (50.77)	58 (48.45)	74.2 (54.70)
	Mean	82.6 (65.65)	77.1 (71.57)	76.0 (62.73)	71.2 (60.00)	70.7 (60.00)	68.5 (58.05)	65.5 (55.55)	64.3 (51.95)	60.3 (49.60)	
	CD (P=0.05)		V 2.92**		P 3.09**		VxP 8.76**				
Dharma- puri	MCU5	89 (70.63)	76 (61.41)	76 (60.20)	76 (57.55)	75 (55.86)	75 (56.42)	73 (54.88)	72 (53.37)	70 (51.00)	74.1 (59.44)
	Surabi	80 (63.44)	77 (60.67)	75 (60.67)	70 (60.67)	69 (60.00)	69 (60.00)	69 (58.05)	68 (58.70)	68 (56.79)	70.6 (61.70)
	Supria	76 (60.67)	76 (61.34)	69 (60.00)	68 (60.00)	68 (56.17)	67 (56.17)	67 (56.17)	67 (55.55)	62 (55.55)	68.0 (53.73)
	Mean	81.5 (62.67)	76.3 (60.67)	73.3 (56.17)	71.3 (56.17)	70.7 (55.55)	70.3 (54.94)	69.7 (54.94)	69.0 (54.95)	66.7 (51.95)	
	CD		V 3.25**		P 5.64**		VxP 9.77**				

physical, physiological and biochemical changes occurring in the seed. In this study also significant reduction in germination was observed in all the varieties both at validity period as well as at the end of 14 months. However, the rate of reduction varied due to varieties and place of seed collection. Among the varieties, VRI 2 from Madurai and TMV 7 from Dharmapuri maintained higher germination at all the stages of evaluation compared to other varieties. Similar varietal difference in viability and vigour status

during storage of seeds has been reported by Narayanaswamy *et al.* 1994 in groundnut.

Agroecological conditions largely comprising of edaphic and environmental factors can have more than one effect on the performance of the seed (Heydecker, 1972). Similar effect was also observed in the present study. Irrespective of varieties, the seeds obtained from Madurai STL registered comparatively higher germination than Dharmapuri STL. The locality and growing conditions and tillage practices had significant

influence on the seed quality. The variations in germination could be due to weather conditions that prevailed during crop growth and seed development in different locations.

Cotton

The results of seed germination revealed that all varieties / hybrids significantly maintained their minimum germination standard at the end of validity period of nine months (Table 5). In addition, except Savitha and Supriya, all other varieties / hybrids maintained minimum germination standard upto 12 months of storage. Further, NHH 44 from Madurai and MCU 5 and Surabi from Dharmapuri STL maintained minimum germination standard upto 14 months of storage. The results of present investigation clearly indicated that under ambient storage condition, the validity period of nine months for the certified seed of cotton is appropriate. The results are in confirmation with the earlier findings of Rao *et al.* (1973). They concluded that the initial seed germination to pass truthful labelling and certification standard was maintained upto 17 - 20 months depending upon the varieties and initial germination per cent in cotton.

In this study a wide variation in viability was observed among the varieties / hybrids, which ranged from 9-14 months depending upon the varieties / hybrids. The varietal differences in loss of germination during seed storage was reported by many workers (Rajendra-Prasad, 1983; Selvaraj, 1983). In the present investigation, varieties / hybrids collected from Dharmapuri STL maintained higher germination at the end of validity period as well as end of storage compared to those from Madurai. It is observed that place of production also plays a significant role in deciding the validity period of seed. Similar observations on the role of place of seed production / location on the germination of cotton seeds were reported by Kadirvelu (1994).

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