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Seed Quality as Influenced by Harvesting Stages and Drying Methods in Okra (*Abelmoschus esculentus* (L) Moench)

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ABSTRACT An attempt was made to know the optimum stage of harvest and suitable method of drying for seed production in okra. The tagged fruits were harvested at 15, 25, 30, 40 and 45 days after anthesis. Among the harvested fruits 50 per cent were used for immediate seed extraction and drying (D_1). The remaining 50 per cent fruits were shade dried for 6 days and seeds extracted manually (D_2). The optimum stage was found to be 40 days after anthesis coupled with shade drying of fruit resulted in higher test weight, germination, root length, shoot length, seedling dry weight, vigour index and reduced electrical conductivity.

Keywords: Harvesting stages, drying and seed germination.

Okra is an annual vegetable grown for tender fruits, which can be dehydrated and marketed for vegetable purpose. The stage of fruit harvest have greater influence on seed quality. As maturity advances initial green color changed to brown, fruits become hard, fibrous, rind dries and split at top and seeds become greyish-black in color. Thus there is a need to optimize the stage of harvest and determine physiological maturity stage for getting higher seed yield with better quality [1]. Further the fruits harvested at physiological maturity contains very high moisture which is likely to spoil the seed quality. Thus, there is need to reduce the moisture content of seed by adopting proper drying method. Hence, keeping all these points in view the present investigation was planned on influence of stage of harvest and drying methods on seed quality in okra.

MATERIALS AND METHODS

Field trial was conducted during *Kharif* and *Rabi* season during 1998 at Agricultural Research Station, Bagalkot under protective irrigation. On the day of anthesis about 600-700 flowers were tagged. The tagged fruits were harvested at 15,25,30,40 and 45 days after anthesis (DAA). Among the harvested fruits 50 per cent were used for immediate seed extraction and drying (D_1). The remaining 50 per cent fruits were shade dried for 6 days and seeds were extracted manually (D_2). The collected seeds were subjected to laboratory test. The observations on test weight, seed diameter, germination, root length, shoot length, seedling dry weight and EC of seed leachate were recorded. Vigour index was worked out as per procedure prescribed by Abdul Baki and Anderson [2]. In each treatment combination seeds were subjected to accelerated ageing test [3]. The data recorded on various characters were analysed by adopting randomised block design with factorial concept and three replication.

RESULTS AND DISCUSSION

The seed quality characters differed significantly due to stages of harvesting in both the seasons (Table 1&2). During *Kharif* maximum seed weight (6.51 g) and seed diameter (5.93 mm) was attained at (40 DAA) subsequently slight decline was noticed at 45 DAA. Similar trend was observed in *Rabi* season. The results are in conformity with the findings of Velumani and Ramsamy [4] in okra. The initial germination of 18 per cent was observed at 25 DAA and it progressively increased up to 89.2 per cent at 45 DAA. However, the minimum germination standard for okra seed was attained at 40 DAA

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Table 1. Seed quality parameters as influenced by harvesting stages and drying methods in okra

Treatment	Test Weight (g)		Seed diameter (mm)		Seed germination (%)		Root length (cm)		Shoot length (cm)	
	Kharif	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*
Drying Methods										
D_1	4.86	4.79	4.40	4.30	45.3 (32.9)	43.6 (32.1)	3.37	3.27	11.73	11.28
D_2	5.55	5.49	4.74	4.44	73.3 (50.2)	71.3 (48.9)	5.94	5.88	17.24	16.69
CD at 5%	0.20	0.12	0.12	NS	1.55	1.66	0.16	0.13	0.44	0.52
Harvesting stages										
H_1 (15 DAA)	3.03	3.03	2.89	2.54	-	-	-	-	-	-
H_2 (25 DAA)	4.57	4.49	3.79	3.53	18.0 (18.4)	16.6 (17.6)	2.77	2.70	8.01	7.71
H_3 (30 DAA)	4.69	4.67	4.09	4.47	43.8 (40.7)	42.3 (39.8)	4.81	4.83	16.42	15.91
H_4 (35 DAA)	5.84	5.79	4.79	4.62	60.3 (51.3)	57.2 (49.5)	6.36	6.22	19.96	19.37
H_5 (40 DAA)	6.51	6.45	5.93	5.55	85.3 (67.9)	82.8 (66.2)	6.88	6.83	21.87	20.83
H_6 (45 DAA)	6.48	6.44	5.93	5.54	89.2 (70.8)	88.5 (70.3)	7.11	6.86	20.63	20.09
CD at 5%	0.35	0.21	0.21	0.80	2.69	2.87	0.28	0.22	0.76	0.90
Interaction	0.50	0.30	NS	NS	3.79	4.06	0.40	0.32	1.08	1.27

D1 - Drying of seeds after extraction; D2 - Drying of fruits and extraction of seeds; Figures in parenthesis indicate means of angular transformed values.

Table 2. Seed quality parameters as influenced by harvesting stages and drying methods in Okra

Treatment	One seedling dry weight (mg)		Seedling vigour index		EC dsm^{-1}		Germination of AA Seeds (%)	
	Kharif	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*
Drying Methods								
D_1	31.1	30.7	905	828	1.01	0.91	30.6 (27.6)	28.7 (26.4)
D_2	43	42	1736	1674	0.88	0.78	53.4 (44.7)	46.7 (41.4)
CD at 5%	1.61	2.0	80.87	73.55	0.02	0.03	1.82	1.78
Harvesting stages								
H_1 (15 DAA)	-	-	-	-	1.16	0.94	-	-
H_2 (25 DAA)	18.6	17.5	385	347	1.11	0.96	13.2 (15.4)	6.8 (10.8)
H_3(30 DAA)	39.3	40.6	1014	963	1.02	0.92	34.3 (33.3)	32.7 (32.1)
H_4 (35 DAA)	46.5	45	1578	1543	0.89	0.83	52.4 (46.4)	41.9 (45.2)
H_5 (40 DAA)	57.4	55.2	2477	2318	0.79	0.77	73.4 (59.1)	70.2 (57.2)
H_6(45 DAA)	60.4	59.7	2468	2335	0.73	0.64	79.9 (62.18)	77.2 (61.5)
CD at 5%	2.79	3.46	140	127.4	0.03	0.67	3.17	3.09
Interaction	3.94	4.89	198.1	180.2	0.05	NS	4.48	4.38

D1 - Drying of seeds after extraction; D2 - Drying of fruits and extraction of seeds; Figures in parenthesis indicate means of angular transformed values.

(85.3%) in *kharif* season. Whereas seeds obtained at 15 DAA failed to germinate. The progress in germination up to 40 DAA was attributed to the complete development of seeds which was evidenced by the higher seed diameter and 100 seed weight. Further, it is also evidenced by higher germination recorded after accelerated ageing of seeds. The trend was similar in *Rabi* also [7]. During *Kharif* the seedling vigour index was highest at 40 DAA. The seedling vigour index also increased from

385 to 2477 at 25 and 40 DAA respectively. The increased seedling vigour index may be attributed to higher values recorded with respect to root length, shoot length and decreased electrical conductivity (Table 2). These results are in agreement with the findings of Bhat [5], Demir [6] and Devadas *et al.* [1] in okra.

The drying methods significantly influenced the seed quality parameters (Table 1). 73.3% germination was observed in D_2 method of drying as compared to 45.3% D_1 in *Kharif* season. The higher germination with D_2 was due to slow drying of seeds as compared to D_1 method of drying. The slow drying improves germination [6], test weight and seed diameter, and reduces electrical conductivity of seed leachate. Similarly, Nepane *et al* [7] observed better germination in sweet pepper with shade drying. The superiority of seedling vigour index in D_2 (1736) was due to increased root length (5.94 cm), shoot length (1724 cm) and seedling dry weight (43.0 mg). These results are in conformity with findings of Singh *et al.* [8] in tomato and Demir [6] in okra.

The interaction effects due to stages of harvest and drying methods were significant during both the seasons for test weight, seed germination, root length, shoot length, seedling dry weight, reduced electrical conductivity and vigour index. The present investigation revealed that harvesting of fruits at 40 days after anthesis coupled with shade drying is superior for getting higher seed yield with better quality.

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