EFFECT OF HYDRO-PRIMING DURATION ON SEED QUALITY OF TWO OKRA LANDRACES (*Abelmoschus esculentus* L. Moench)

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ABSTRACT

A study was carried out to examine the effects of hydro priming duration on quality of seeds of two okra landraces ("Ikeregi and Bokungi) at the Federal University of Technology, Minna. Seeds of two landraces were subjected to four hydro priming durations in hours (6, 12,18, and 24 hours).The control did not receive any priming.Primed seeds of the two landraces were air dried in the laboratory at room temperature (27◦C), packaged in polythene envelopes and stored in a growth chamber at 30◦C and about 70% relative humidity to accelerate ageing for 18 weeks. Seed samples were drawn and tested for germination before storage at 2, 4, 6,8,10,12,14,16 and 18 weeks of storage. Prior to storage and up to 4 weeks after storage (WAS) germination was significantly promoted in seeds of the two landraces that received 12 hours priming than in all other priming durations and control. Seed viability declined from about 90 -75% as storage period increased beyond 4 WASin the primed seed lots irrespective of priming durations in both landraces. In contrast to observation in the primed seeds, germination of the unprimed seeds lots improved significantly over the primed seeds with storage time beyond 4 WAS. The superiority was maintained up to the end of storage. Generally, rapid germination was best with seeds primed for 12 hours and longevity was best maintained with unprimed seed lots in both landraces.

Keywords: Okra, Seed, Hydro,priming, landraces

INTRODUCTION

Okra is one of the world's important and major vegetable crops (Adebisi *et al.*, 2007). Okra is also seen as one of the most ,important fruit vegetable crops and also a source of energy for human consumption (NCR, 2006). It is mostly grown in the tropics. Okra is said to have originated in the Ethiopian highlands (Purse glove, 1984). Not only that the crop originated from Africa but also largely consume in the continent most especially in the sub-Sahara (Maity and Tripathy, 2009). The crop is among the most tolerant of heat, drought, poor soil with heavy clay and intermittent moisture (Adebisi *et al.*, 2007; Anon, 2007). Okra requires a moderate rainfall of 800-1000mm well distributed to produce it young edible fruits over a relatively long period (Babatunde *et al.*, 2007). Okra is sensitive to low temperature and develop poorly below 15°C (Marsh, 1992; Katung, 2007).

However, Okra seed production can be improved by hydro-priming. Seed priming i.e. controlled hydration of seeds by exposing them to low water potential and re-drying; to permit pre-germinative physio-biochemical change to occur but restrict germination is known technique for improved seed germination potential under normal as wes stressful environments (Khan *et al.*, 2017). Although, success of hydro priming, depends on priming duration which varies widely from crop to crop (Ghassemi-Golezani, et al., 2010; Khafagy, et al., 2014).

Studies have been conducted on Okra seed priming. For example Ogedegbe et al. (2013) focuses on different types of priming Okra seed. Shah, Ara and Shafi (2011) conducted Okra seed treatment using chemical priming. These studies do not focus on hydro-priming of Okra seeds. Although, few authors subject Okra seeds to hydro-priming. For example, Sharma *et al.* (2014) compared various Okra seeds using various priming methods including hydro-priming. Ali *et al.* (2016) use hydro-priming method on Okra seed but limited to growth parameter. In the same vein Rai and Basu (2014) subjected Okra seed to hydro-priming but restricted to seed treatment only. All these studies ignored hydro-priming duration on Okra seed quality. It is on this basis, this research examined the effect of hydro-priming at some duration on the germination and viability maintenance of two Okra seed landraces.

MATERIALS AND METHODS

This experiment was 2x5 factorial with 10 treatments. It consist of two landraces Ikeregi and Bokungihydro-primed for the period of 6, 12, 18 and 24 hours, the control received no priming. It was fitted into completely random design (CRD). There were four replicates for each of the treatments.

Both of the two landraces seeds samples from lots grown under good cultural practices were primed in distilled water for the period of 6, 12, 18 and 24 hours. Unprimed seeds served as the control after priming the seed were washed in running tap water and then, spread on the tray for drying at room temperature for seven days before packaging in the polythene envelopes for storage. After seven day the seeds moisture content level before storage was taken using the oven dry method (130°Cfor 60 minutes) and the percentage moisture content (on wet weight basis) were calculated as follows:

$$\frac{Weight\ of\ wet\ seed - weight\ of\ ovendry\ seeds}{Weight\ of\ wet\ seed} \times 100$$

The seeds of the two landraces and treatments were packed in polythene envelopes and stored at temperature 30°C for 18 weeks. Seed samples were drawn for germination test prior to storage and at two weeks interval after wards.

Germination test was carried out at the onset of storage at 0, 2, 4, 6, 8, 10, 12, 14, 16 and 18 weeks 50 seeds of four replicates were counted from each of the treatment combinations and placed on a layer of moist absorbent paper placed in plastic Petri dishes at 30°C. Germination count was taken every other day for a period of 28 days.

Completely random design was adopted for this study and all the data collected on germination were subjected to analysis of variance (ANOVA) using SAS package. Means were separated using the Duncan Multiple Range Test (DMRT) method. Data in percentages were transformed to arcsin before statistical analysis.

RESULTS

Effect of priming duration on two Okra landraces

Table 1 show the germination and longevity of seeds of the two okra landraces before and during storage as influenced by priming duration. Variety had significant effect on germination percentages at 0, 8, 12, 14, 16 and 18 Weeks after storage (WAS) with 'Ikeregi' germinating

significantly higher than 'Bokungi' at 0, 14, 16 and 18 weeks after storage. 'Bokungi' germinated significantly higher than 'Ikeregi' at 8 and 12 WAS. Right from the onset of storage the germination of primed seeds was greatly promoted in seeds primed for 12 hours with values ranging from about 89.25-91% between 0 and 4 WAS (Table 1). The improvement recorded was however short lived. For example, decrease in germination was recorded when the 12 hours primed seeds were stored beyond 4 weeks after storage which progressed to the end of storage. Seeds primed for 12 hours germinated significantly higher than those of 0, 6, 18 and 24 hours between 0 and 4 weeks after storage.

In contrast to the observation above, germination of unprimed seeds was characterized by initial poor germination values. Acceptable higher germination was obtained with increase in seed age. Maximum germination (83%) was obtained at 6 weeks after storage for the unprimed seed lots which was significantly higher than the values for all the primed seeds. This value was held constant up to 12 weeks after storage before a gradual decline set in. The superiority of the unprimed seeds over the primed lots as from 6 weeks after storage was maintained to the end of storage. Priming seeds beyond 12 hours (18 and 24 hours) resulted to significantly poorer germination and storability.

Table 1: Effect of hydro-priming duration on the germination and longevity of two Okra landraces

	Storage period									
	0	**2**	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**
P (hrs)										
0	42.25d	51.27c	51.00c	83.00a	82.25a	83.00a	82.75a	60.25	50.50a	46.50a
6	59.75b	62.25b	59.50b	64.75c	54.00c	38.50b	33.00b	21.25b	16.50b	10.25b
12	90.75a	91.00a	89.25a	75.00b	64.25b	41.75b	27.25c	13.25c	11.25c	6.50c
18	52.00c	45.00cd	42.50d	48.00d	38.00d	19.00c	10.00d	0.00d	0.00d	0.00d
24	42.25d	38.75d	36.50e	40.88e	25.25e	13.75c	0.00e	0.00d	0.00d	0.00d
S.E±	1.2	2.53	1.65	1.80	1.55	1.94	1.47	1.08	0.88	0.79
Landraces										
I	59.70a	57.30a	55.10a	61.50a	51.20b	37.70a	27.40b	20.20a	16.50a	13.70a
B	55.10b	58.00a	56.40a	63.15a	54.30a	40.70a	33.80a	17.70b	14.80b	11.60b
S.E±	0.77	1.60	1.04	1.14	0.39	1.23	0.93	0.63	0.53	0.50
Interaction										
PXL	*	NS	NS	*	*	*	*	*	*	NS

Key: P= Priming duration (hour), L= Landraces, I= Ikeregi, B= Bokungi

Interaction between the priming duration and two Okra landraces

The interaction effect of priming ×landraces was significant at 0, 6, 8, 10, 12, 14 and 16 WAS (Table 2). Prior to storage, seed germination was greatly promoted by priming seeds of the two landraces as increase in germination were recorded with increase in priming duration. Maximum germination for the two landraces tested was obtained when seeds were primed for 12 hours. Germination of 93% was recorded for Ikeregi' which was significantly higher than 88.5% for 'Bokungi'. A sharp decline was recorded as priming duration increased beyond 12 hours. When seeds were stored for 6 WAS, unprimed seeds of the two landraces germinated significantly higher than all the primed seed lots tested. Although the germination values (81 and 85%) obtained from the unprimed seeds of 'Bokungi' and 'Ikeregi' respectively did not differ significantly from each other, 12 hours primed seeds of 'Bokungi' was statistically similar to the unprimed seed samples of the same landrace. At 8 WAS, unprimed seeds of the two landraces germinated significantly higher than all the primed seeds tested. Priming 'Bokungi' seeds for 6 hours influenced higher germination (60.8%) significantly over 'Ikeregi' (40.8%), such superiority was also recorded when seeds were primed for 24 hours. At 10 WAS, the superiority of unprimed seeds of the two landraces was still maintained. However, 'Bokungi' seeds primed for 6 and 12 hours germinated significantly better than their counterparts in 'Ikeregi. When seeds were stored for 12 weeks the germination of unprimed seed samples of the two landraces was still significantly higher than those obtained from primed seeds irrespective of duration of priming. All the primed seeds of 'Bokungi' germinated significantly higher than their counterparts in 'Ikeregi'. Although as from 14-16WAS, germination percentages of unprimed seeds of the two landraces decline with 'Ikeregi' having the highest value significantly. Their superiority over the primed seeds was still sustained. Seed storability was generally poor with priming, but germination was greatly promoted in the early few weeks of storage. On the other hand, germination was slow with unprimed seeds but the seeds stored relatively better.

Table 2: Interaction between priming duration and two Okra landraces

	Priming duration (hours)				
	0	6	12	18	24
			(0 Week)		
Ikeregi	45.50c	39.59c	93.00a	52.00d	48.50d
Bokungi	39.00f	60.00c	88.50b	52.00d	36.00f
S.E±	1.72				
			(6 Weeks)		
Ikeregi	50.00a	59.50d	74.50c	49.50e	39.00g
Bokungi	81.00ab	70.00c	75.50be	46.50ef	42.75f
S.E±	2.55				
			(8 Weeks)		
Ikeregi	84.50a	40.80c	62.50b	38.50c	22.50e
Bokungi	80.00	60.80b	60.00b	37.50c	28.00d
S.E±	2.19				
			(10 Weeks)		
Ikeregi	85.50a	31.50c	37.00c	20.00d	14.50d
Bokungi	80.50a	45.50b	46.50b	18.00de	13.00e
S.E±	2.75				
			(12 Weeks)		
Ikeregi	84.50a	28.00c	19.00d	5.50e	0.00f
Bokungi	81.00a	38.00b	35.50b	14.50d	0.00f
S.E±	2.07				
			(14 Weeks)		
Ikeregi	66.50a	22.50c	12.00d	0.00e	0.00e
Bokungi	54.00b	20.00c	14.50d	0.00e	0.00e
S.E±	1.53				
			(16 Weeks)		
Ikeregi	54.00a	17.00c	11.50d	0.00e	0.00e
Bokungi	47.00b	16.00c	11.00d	0.00e	0.00e
S.E±	1.18				

DISCUSSIONS

Results of this study revealed that rapid and high germination percentages were recorded at the beginning and up to four weeks of storage by primed seeds of the two landraces. This suggests that the resistance to germination that is usually associated with okra seeds due to hard seed coat must have been removed. During priming some preliminary metabolic processes in the seeds occur before actual germination (Bradford, 1990; Yari *et al.*, 2010). This processes triggers the synthesis or activation of some enzymes that catalyze the mobilization of storage reserves in seed, while the endosperm is weakened by hydrolase to facilitate rapid germination in primed seeds.(Varier *et al.*, 2010). During priming, seeds are particularly hydrated so that pre-germinative metabolic activities proceed (Mc Donald, 2000). Priming increase RNA and protein synthesis (Fu et al., 1998), faster embryo growth and subsequent germination and seedling establishment (Dahal *et al.*, 1990).

The short lived germinability of seeds of the primed lots (from 0-4WAS) may be linked to damage done to the seed coat during soaking. Pigment of the seed coat of okra is known to proffer some protection against pest and diseases which may reduce the quality of seeds when altered. Priming is evident by leaching of the seed coat, weakening the seeds coat and the water turns brown after the process (Chiu *et al.*, 2002). The seeds may have been infected during this process thereby promoting only rapid germination but reducing their chances for storability. This speculation agrees with the report of several authors. Argerrich *et al.*, (2009) observed that primed seeds of tomato exhibited delayed germination and a lower mean germination when stored at 30°C for 6 months as compared with unprimed control. In lettuce, any priming protocol that improved seed germination rate decreased longevity faster than the nonprimed control seed under controlled storage condition.

The initial low germination recorded in the nonprimed seed lots which improved with storage time in this study is a known natural phenomenon in most seeds. Fresh seeds of most vegetables are known to posses some levels of dormancy which is characterized with low germination capacity (Khan, 2003). This assertion confirms the earlier report of Lee *et al.* (2002) who reported that some period of seed storage is known to break dormancy in some crop species. Gabriela *et al.*, (2004) also recorded significant improvement in germination of some dormant orthodox seeds during storage. Results of the study conducted by Oladiran and Haruna (2002) on germination behavior of pepper seeds revealed that germination percentages were low but that general increases were recorded with time in storage before decline set in. Similar result was recently reported in okra by Ibrahim *et al.*, (2011)

A major cause of poor germination and vigour has been identified as seed ageing (Mathews, 1980). As seeds age they undergo changes which lower their potential vigour and performance capability (Oladiran and Mumford, 1990). The performance capabilities of many seeds deteriorate during prolonged storage (Robert, 1989). These views explains the reasons why germination was found to decline after maximum attainable by seeds generally irrespective of treatment in this study. The works of Mwai *et al.* (2005) and Aghabarati and Maralian (2011) show that as seed ageing increases, seed deterioration progresses and performances is increasingly compromised, evidence by reduced germination and vigour in crop species The works of Ayyappan *et al.* (2006) and Aghabarati and Maralian (2011) show a reduction in the total contents of storage components such as proteins and carbohydrates in aged seeds of carrot. Increase in total oil was detected due to accelerated ageing in seeds of watermelon (Laila et al.,

2010). A similar result was obtained in cucumber (Rina and Wahida, 2008). Laila *et al.* (2010) postulated that during ageing, unsaturated fatty acid component of liquid membranes that is phospholipids are converted into free radicals and cytotoxicaldehydes by the reaction with atmospheric oxygen and lipoxygenase activity. The resulting chemical changes bring about alteration in the permeability properties of bio-membranes making them leaky. This would explain accelerated loss of viability in the presence of increased partial pressure of oxygen during storage.

In conclusion, hydro seed priming greatly promoted rapid germination before storage and up to 4 weeks after storage only. Therefore, may not be effective for the maintenance of Okra seed viability during storage. Furthermore, although unprimed seeds germinated slowly, significant increases were recorded with storage time. The superiority of unprimed seeds was maintained up to the end of storage as from 4 weeks after storage. Priming of Okra seeds with water enhances rapid seed germination. Longevity was not maintained. Unprimedseeds sustain viability in storage.

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