I J PS INTERNATIONAL JOURNAL OF PLANT SCIENCES
Volume **8** | Issue 2 | July, 2013 | 414-418

RESEARCH ARTICLE

Studies on influence of chemopriming treatment on seed quality in okra (*Abelmoschus esculentus*)

■ BASAVARAJ S. LAKKUNDI AND A.S. CHANNAVEERSWAMI

SUMMARY

An investigation was carried out to study the influence of chemopriming treatment on seed quality in okra (*Abelmoschus esculentus*). in the Department of Seed Science and Technology, College of Agriculture, University of Agricultural Sciences, Dharwad following factorial CRD in four replications with the common control. These treatments were included in the study *i.e*. Factor-I: Inorganic salts (T) T_1 - KNO_3 1%, T_2 - NaCl 1%, T_3 - KH_2PO_4 1%, T_4 - $CaCl_2$ 1%, T_5 - KI 1% and factor-II: Drying (D) with drying (D1), without drying (D_2) with common control. Among the different inorganic salts used for priming in this study, T_5 recorded significantly highest germination (75.29%), root length (14.40cm), shoot length (18.85cm), seedling dry weight (27.31mg), seedling vigour index-I (2520), seedling vigour index-II (2063), field emergence (71.38%) and lowest electrical conductivity (0.665), among the drying treatments, significantly highest germination (80.38%), root length (14.61cm), shoot length (19.37cm), seedling dry weight (27.58mg), seedling vigour index-I (2732), seedling vigour index-II (2218), field emergence (76.87%) and lowest electrical conductivity (0.631) were recorded in D_1 and among interaction T_5D_1 recorded significantly highest germination (83.25%), root length (14.97cm), shoot length (20.39cm), seedling dry weight (28.14mg), seedling vigour index-I(2944), seedling vigour index-II (2343), field emergence (79.50%) and lowest electrical conductivity (0.609).

Key Words : Chemopriming, Seed quality, Okra

How to cite this article : Lakkundi, Basavaraj S. and Channaveerswami, A.S. (2013). Studies on influence of chemopriming treatment on seed quality in okra (*Abelmoschus esculentus*). *Internat. J. Plant Sci.*, **8** (2) : 414-418.

Article chronicle : Received : 16.05.2013; **Revised :** 04.06.2013; **Accepted :** 22.06.2013

Okra [*Abelmoschus esculentus* (L.) Moench] is one of the world's oldest cultivated crops believed to have originated from the Hindustani Centre, chiefly of India, Pakistan, Burma and Africa origin and it still remain the most important fruit vegetable grown in the tropical area. The special taste and nutritional value of this crop had attracted more attention in some tropical and subtropical areas of the world. It is a nutritious vegetable which plays an important role in meeting the demand for vegetables in our country where vegetables are scanty in the market. Seed is very important input on which the ultimate yield of the crop depends. Hence, there is need to give utmost attention to this non-monetar input for improvement of yield.

The improvement of vegetable industries in developed countries requires high quality seeds. However, mass production of the vegetables is limited due to poor seed quality which is mostly caused by seed development and maturation under unfavourable weather conditions. In biological system, ageing, senescence and deterioration leading to death are common phenomenon and seeds are no exception to this, the seed deterioration can be controlled by treating with certain seed invigoration chemical treatments. Various seed priming technologies have common objectives to improve seed performance under specific environmental conditions, such as low or high temperature, reduced water availability or salinity conditions. Practical applications of priming include increased germination rate, germination under a broader range of environments, increased the germination percentage, more uniform emergence with improved vigour ad growth of seedlings.

MEMBERS OF THE RESEARCH FORUM

Author to be contacted :
BASAVARAJ S. LAKKUNDI, Department of Seed Science and Technology, College of Agriculture, University of Agricultural Sciences, DHARWAD (KARNATAKA) INDIA

Address of the Co-authors:
A.S. CHANNAVEERSWAMI, Department of Seed Science and Technology, College of Agriculture, University of Agricultural Sciences, DHARWAD (KARNATAKA) INDIA

Rapid germination and emergence is an important determinant of successful establishment (Heydecker, 1973 and Heydecker *et al.*, 1975). Harris *et al.* (1996) reported seed priming as one of the most important developments to help rapid and uniform germination and emergence of seeds and to increase seed tolerance to adverse environmental conditions. Seed priming has presented promising and even surprising results, for many crop seeds (Bradford, 1986). The few studies on okra are not overemphasized and are encouraging, but more information is required before, its use as a routine practice in seed technology (Knypl and Khan, 1981). According to, Khan (1992), osmotic conditioning in its modern sense, aims to reduce the time of seedling emergence, as well as synchronize and improve the germination percentage, by subjecting the seeds to a certain period of imbibition using osmotic solutions.

The seeds normally begin water uptake on contact with this solution and stop the process as soon as they become balanced with the water potential of the solution. Seed priming is basically a pre sowing seed treatment. The advantage of seed priming is reducing germination time and improving the emergence. But these may be characterized as germination promotive, dormancy breaking. However, the information on these aspects are scanty. Hence, the present investigation on the effect of seed priming on seed quality parameters and field emergence in okra seeds was studied.

MATERIAL AND METHODS

The laboratory studies were carried out in the Department of Seed Science and Technology, College of Agriculture, University of Agricultural Sciences, Dharwad following factorial CRD in four replications with the common control. These treatments were included in the study *i.e.* Factor-I: Inorganic salts (T) T_1 - KNO_3 1%, T_2 - NaCl 1%, T_3 - KH_2PO_4 1%, T_4 - $CaCl_2$ 1%, T_5 - KI 1% and factor-II: Drying (D) with drying (D_1), without drying (D_2).

RESULTS AND DISCUSSION

The experimental findings obtained from the present study have been discussed in following heads:

Germination (%) :

The original and arcsine transformed data on germination of okra seeds as influenced by inorganic salts used for priming in and drying over control are presented in Table 1. Chemicals used for priming exhibited significant differences on per cent germination. The inorganic salt (T_5) recorded significantly maximum germination (75.29%) which was superior over other inorganic salts used in the study and also over the control. This treatment was followed by T_1 (74.04%) and T_3 (73.59%) which were at par with each other. Significantly least germination was recorded in T_4 (72.17%) and T_2 (72.50%) which are at par with each other. Between the drying and non-drying methods, the drying treatment D_1 recorded significantly highest (80.38%) germination over D_2 and also significantly superior over control. Among the interaction treatment combinations T_5D_1 (83.25%) recorded significantly maximum germination which was superior over all other treatment combinations followed by T_1D_1 (81.33%) and T_3D_1 (80.50%) which were on par with each other.

The significantly least germination was recorded on treatment combination of T_4D_2 (66.17%) which was at par with T_2D_2 (66.33%) treatment combinations. In all the treatment combinations including without drying treatment were inferior compared to the treatments including drying treatment and also control.

Table 1: Influence of chemopriming on germination percentage and root length (cm) in okra

Treatments	Germination (%)			Root length (cm)		
	D_1	D_2	Mean	D_1	D_2	Mean
T_1 - KNO_3 1%	81.33 (64.37)	66.75 (54.76)	74.04 (59.57)	14.69	13.79	14.24
T_2 - NaCl 1%	78.67 (62.47)	66.33 (54.51)	72.50 (58.49)	14.46	13.71	14.09
T_3 - KH_2PO_4 1%	80.50 (63.77)	66.67 (54.72)	73.59 (59.24)	14.58	13.76	14.17
T_4 - $CaCl_2$ 1%	78.17 (62.12)	66.17 (54.41)	72.17 (58.27)	14.37	13.62	13.99
T_5 - KI 1%	83.25 (65.81)	67.33 (55.12)	75.29 (60.47)	14.97	13.82	14.40
Mean	80.38 (63.71)	66.79 (54.79)	73.51 (59.21)	14.61	13.74	14.17
Control		70.25 (57.08)			13.87	
For comparing means of	S.E.±		C.D. at 1%	S.E.±		C.D. at 1%
Inorganic salts (T)	0.19		0.73	0.02		0.09
Drying (D)	0.23		0.89	0.05		0.18
TxD	0.31		1.21	0.07		0.27
Treatment x Control	0.37		1.45	0.12		0.46

D_1 – Drying D_2 – Without drying

Root length (cm) :

The root length as influenced by priming with inorganic salts and drying treatments is presented in Table 1.

The priming with inorganic salts exhibited significant differences on root length. Significantly maximum root length was recorded in T_5 (14.40 cm) which was superior over all other inorganic salts used for priming in this study and also over the control. This treatment was followed by T_1 (14.2cm) and T_3 (14.17 cm) which were at par with each other. Between the drying treatment D_1 recorded highest (14.61 cm) root length over D_2 (13.74 cm) and as well as over control (13.79 cm). Among the treatment combinations, the T_5D_1 (14.97 cm) treatment combinations recorded maximum root length which was superior over all other treatment combinations and also over the control. This treatment was followed by T_1D_1 (14.69 cm), T_2D_1 (14.46 cm) and T_3D_1 (14.58 cm) which were at par with each other. While, the significantly minimum root length was recorded in all the treatment combinations which include without drying treatment.

Shoot length (cm) :

The effect of priming with inorganic salts and drying treatments on shoot length, data which were significant are presented in Table 2. Significantly maximum shoot length was recorded in T_5 (18.85 cm) which was superior over all the inorganic salts used for priming in this study and also over the control.

Between the drying treatments, with drying (D_1) treatment recorded highest (19.37 cm) over without drying (D_2) (17.17 cm) and also over control (17.85 cm). Among the treatment combinations, the T_5D_1 (20.39 cm) treatment combinations recorded maximum shoot length over all other treatment

Table 2 : Influence of chemopriming on shoot length (cm) and seedling dry weight (mg) in okra

Treatments	Shoot length (cm)			Seedling dry weight (mg)		
	D_1	D_2	Mean	D_1	D_2	Mean
T_1 - KNO_3 1%	19.29	17.28	18.29	27.56	26.41	26.99
T_2 - NaCl 1%	18.98	17.08	18.03	27.39	26.33	26.86
T_3 - KH_2PO_4 1%	19.26	17.14	18.20	27.54	26.38	26.96
T_4 - $CaCl_2$ 1%	18.93	17.02	17.98	27.28	26.29	26.79
T_5 - KI 1%	20.39	17.31	18.85	28.14	26.48	27.31
Mean	19.37	17.17	18.27	27.58	26.38	26.98
Control		17.85			26.59	
For comparing means of	S.E.±	C.D. at 1%		S.E.±	C.D. at 1%	
Inorganic salts (T)	0.09	0.35		0.07	0.29	
Drying (D)	0.14	0.53		0.09	0.36	
T x D	0.17	0.66		0.13	0.52	
Treatment x Control	0.23	0.89		0.16	0.61	

D_1 – Drying D_2 – Without drying

Table 3 : Influence of chemopriming on seedling vigour index I and II in okra

Treatments	Seedling vigour index-I			Seedling vigour index-II		
	D_1	D_2	Mean	D_1	D_2	Mean
T_1 - KNO_3 1%	2764	2074	2419	2241	1763	2002
T_2 - NaCl 1%	2631	2042	2337	2155	1746	1951
T_3 - KH_2PO_4 1%	2724	2060	2392	2217	1759	1988
T_4 - $CaCl_2$ 1%	2597	2029	2313	2132	1740	1936
T_5 - KI 1%	2944	2096	2520	2343	1783	2063
Mean	2732	2060	2396	2218	1758	1988
Control		2228			1872	
For comparing means of	S.E.±	C.D. at 1%		S.E.±	C.D. at 1%	
Inorganic salts (T)	23	92		12	48	
Drying (D)	28	108		16	61	
T x D	39	153		24	93	
Treatment x Control	46	179				

D_1 – Drying D_2 – Without drying

combinations and also over the control. This treatment was followed by T_1D_1 (19.29 cm), T_2D_1 (18.98 cm), T_3D_1 (19.26 cm) and T_4D_1 (18.93 cm) which were at par with each other.

The treatments those include with drying factor were superior over all the treatment combinations including the treatment without drying.

Seedling dry weight (mg) :

The data which showed significant differences on seedling dry weight due to priming with inorganic salts and drying treatments are presented in Table 2.

Significantly more seedling dry weight (27.31 mg) was recorded in priming with T_5 inorganic salt which was superior over all other inorganic salts used in the study. This treatment was followed by T_1 (26.99 mg), T_2 (26.86 mg), T_3 (26.96 mg) and T_4 (26.79 mg) which were at par with each other.

Between the drying treatments, D_1 recorded maximum (27.58 mg) seedling dry weight over D_2 (26.38 mg) and also over control. Among the treatment combinations, T_5D_1 (28.14 mg) recorded significantly maximum seedling dry weight over all other treatment combinations including control. While, the lowest was recorded in T_4D_2 (26.29 mg).

Seedling vigour index -I :

The seed quality assessed through seedling vigour index exhibited significant differences due to priming with inorganic salts and also drying treatments are presented in Table 3.

Significantly highest seedling vigour was recorded in T_5 (2520) which was superior over all other inorganic salts used for priming in the study. This treatment was followed by T_1 (24.19 mg), T_2 (23.37 mg) and T_3 (23.92 mg) which were at par with each other. Significantly lowest seedling vigour index was recorded in T_4 (2313). Between the drying treatments, significantly maximum (2732) seedling vigour index was recorded in D_1 over D_2 and also over control.

Among the treatment combinations T_5D_1 (2944) recorded highest seedling vigour index over all other treatment combinations and also over control. This treatment combination was followed by T_1D_1 (2764, T_2D_1 (2631) and T_3D_1 (2724) which were at par with each other. The treatments those include without drying treatments were inferior over to all other treatment combinations and also over control.

Seedling vigour index -II :

The computed values on seedling vigour index II due to priming with inorganic salts and also drying treatments are presented in Table 3.

Priming with inorganic salts and drying treatments recorded significant differences on seedling vigour index II. The T_5D_1 (2343) recorded highest seedling vigour index among all other treatment combinations. While, the lowest seedling vigour index was recorded in T_4D_2 (1740) which was at par with all the treatment combinations those include without drying factor.

Electrical conductivity (dSm^{-1}) :

The values on seed leachate as influenced by priming with inorganic salts and drying treatments are presented in Table 4.

The priming with inorganic salts T_5 (0.665 dSm^{-1}) registered significantly lowest seed leachate values among

Table 4 : Influence of chemopriming on electrical conductivity (dSm^{-1}) and field emergence (%) in okra

Treatments	Electrical conductivity (dSm^{-1})			Field emergence (%)		
	D_1	D_2	Mean	D_1	D_2	Mean
T_1 - KNO_3 1%	0.631	0.732	0.683	77.75 (61.83)	62.50 (52.22)	70.13 (57.02)
T_2 - NaCl 1%	0.662	0.748	0.705	75.17 (60.09)	61.75 (51.77)	68.46 (55.93)
T_3 - KH_2PO_4 1%	0.659	0.728	0.694	77.25 (61.49)	62.33 (52.12)	69.79 (56.80)
T_4 - $CaCl_2$ 1%	0.640	0.735	0.687	74.67 (59.76)	61.33 (51.77)	68.21 (55.77)
T_5 - KI 1%	0.609	0.721	0.665	79.50 (63.05)	63.25 (52.66)	71.38 (57.86)
Mean	0.631	0.733	0.683	76.87 (61.24)	62.32 (52.11)	69.59 (56.68)
Control		0.695			67.88 (55.45)	
For comparing means of	S.E.±	C.D. at 1%		S.E.±	C.D. at 1%	
Inorganic salts (T)	0.002	0.009		0.17	0.67	
Drying (D)	0.004	0.015		0.25	0.96	
T x D	0.005	0.019		0.29	1.13	
Treatment x Control	0.007	0.029		0.36	1.41	

D_1 – Drying D_2 – Without drying

all the inorganic salts used for priming in the study and as well as over control. However, highest seed leachate values were recorded in T_2 (0.705 dSm^{-1}). Between the drying treatments, with drying treatment (D_1) recorded significantly minimum (0.631 dSm^{-1}) seed leachate values while, the maximum (0.735 dSm^{-1}) was with without drying treatment (D_2).

The treatment combination of T_5 recorded lowest (0.609 dSm^{-1}) seed leachate value which was superior over all other treatment combinations and also over control. While, the maximum (0.748 dSm^{-1}) seed leachate value was recorded in T_2D_2 which was at par with T_1D_2 (0.732 dSm^{-1}) and T_4D_2 (0.735 dSm^{-1}).

Field emergence (%) :

The field emergence was significant due to priming with inorganic salts and drying treatments are presented in Table 4.

Significant differences were observed due to effect of priming with inorganic salts and drying treatments. The highest field emergence was recorded in T_5 (71.38%) inorganic salts which was superior over all other inorganic salts used for priming in the study. This treatment was followed by T_1 (7013%) and T_3 (69.79%) which were at par with each other. The drying treatment D_1 recorded significantly maximum (76.87%) field emergence over D_2 and also control.

The interaction effect of T_5D_1 was superior (79.50%) over all other treatment combinations and lowest was observed in T_4D_2 (61.33%) which was on par with T_2D_2 (61.75%) treatment combinations.

Iodine is one of the halogens that stabilizers the lip-protein membranes of cell by the saturation of unsaturated fatty acids that render the cell less susceptible to lipid peroxidation and free radical reactions which are major cause for the deterioration of seeds. In the present study, KI recorded higher per cent germination than control due to the prevention of lipid peroxidation by stabilization of double bonds by iodine molecules. On contrary, the deleterious effect of chemicals on germination were noticed, those caused injury to the seeds. These results are in close conformity with the findings of Natarajan (2005) in marigold and Afzal *et al*. (2009) in china aster.

REFERENCES

Afzal, I., Ashraf, S., Qasim, M., Basra, S.M.A. and Shahid, M. (2009). Does halopriming improve germination and seedling vigour in marigold (*Tagetes* spp.). *Seed Sci. & Technol.*, **37**: 436-445.

Bradford, K.J. (1986). Manipulation of seeds water relations via osmotic priming to improve germination under stress conditions. *Hort Sci*., **59**(2): 672-676.

Harris, D. (1996). Effects of manure, genotype, seed priming, depth and date of sowing on the emergence and early growth of *Sorghum bicolor* (L.) Moench in semi-arid Botswana. *Soil & Tillage Res.*, **40**:73–88.

Heydecker, W. (1973). Panel discussion-presowing treatments. (ln): *Seed ecology*, pp. 521- 531. W. Heydecker (Ed). Butterworts, LONDON, UNITED KINGDOM.

Heydecker, W., Higgins, J. Turner, Y.J. (1975). Invigoration of seeds? *Seed Sci. & Technol*., **3**(3/4): 881-888.

Khan, A.A. (1992). Preplant physiological conditioning. *Hort. Rev*., **13**: 131–181.

Knypl, J.S. and Khan, A.A. (1981). Osmoconditioning of soybean seeds to improve performance at suboptimal temperatures. *Agron J., Madison*, **73**:112-116.

Natarajan, K. (2005). Research focus on nursery, production, processing and storage in petunia cv. Mix. M.Sc. (Ag.) Thesis, Tamil Nadu Agricultural University, Coimbatore, T.N. (INDIA).