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Seed Enhancement Technique to Alleviate the Effect of Salinity Stress in Okra (*Abelmoschus esculentus*)

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ABSTRACT: Study was conducted to evaluate the effect of seed enhancement technique on seed quality parameters under salt stress condition. Salt stress is the major abiotic stress which cause the reduction in the growth and yield of agriculture crops. Salt stress can be induced due to in appropriate use of fertilizers, low precipitation, lack of proper irrigation & drainage system and irrigating with salt water. In this laboratory experiment, factorial combination of 3 different salt stress conditions induced by using NaCl concentration (0, 100mM and 150 mM) viz S_0, S_1 and S_2.Okra seed var. *Arka Anamika* were primed with treatments consists of Panchagavya 3% (T_1) and 5%(T_2), Coconut water 8%(T_3) and 12%(T_4), Neem leaf extract 3% (T_5) and 5%(T_6), KNO_3 (3g/litre) (T_7), KCL (3g/litre) (T_8) for 8 hours, with one untreated dry seed serve as control(T_0) were laid out in CRD with 4 replications. Data collected on germination percentage, root length, shoot length, seedling length, fresh weight, dry weight, seed vigour I, seed vigour II and root-shoot ratio were evaluated. Results revealed that mean values of all characters varied significantly along the salinity gradient. The mean values of all the seed quality parameters are maximum in S_0(control) And were minimum in S_2(150mM NaCl)were clearly shows the impact of salt stress is the reason for the reduction. Seed primed with KNO_3 (3g/litre) performed superior in all seed quality parameters under salt stress conditions. So, KNO_3 (3g/litre) is the best seed enhancement technique for improving okra seed quality parameters under saline stress condition.

Keywords: Germination, okra, potassium priming, salt-stress, seed vigour, stress adaptability, seed enhancement, seed quality parameters.

INRODUCTION

Salinity stress or salt stress is the major abiotic stress in arid, semiarid and coastal regions. Salinization occurs mostly in irrigated lands due to lack of proper irrigation and drainage management, low precipitation, high evaporation and saline water irrigation (Munns and Tester, 2008). In worldwide about 34 million hectares of irrigated land are affected by salt. Thus, 50% of cultivable lands will be lost by the middle of the 21st century (Wang *et al*., 2003). Abiotic stress causes the delay or inhibit the Seed germination (Jamil *et al.*, 2005; Fazlali *et al*., 2013). In this respect, Jamil *et al.*, (2005), Patade *et al.*, (2011) and Rouhi *et al.*, (2011) stated that increase in the salt stress will eventually reduce the germination percentage and increase germination time.

Okra (*Abelmoschus esculentus* L.) is commonly known as Bhindi or lady's finger. It belongs to the family Malvaceae and is one of the most widely grown vegetables from tropical to subtropical and warmer parts of the temperate zone of the country. Its chromosome number is 2n = 130. It is an annual vegetable crop in tropical and subtropical parts of the world. It is one of the most important nutritious vegetable crops grown around the year in India. Okra is an important fruit vegetable of high commercial and food values. It is primarily valued for its tender, immature green pods in fresh form; however, its curry, soups, and edible young leaves are also popular. To a limited extent, it finds use in canned, dehydrated, or frozen forms for off-season consumption by the army at high altitudes and export (Sharma *et al.*, 2014). The major problem in okra cultivationis when okra seeds are sown in the early spring season, the seeds don't germinate properly as the temperature is below the optimum range of 25-35ºC also the hard seed coat of okra seeds restricts the imbibition of water and uniform growth and embryo development which reduces the uniform field stand and rapid germination. Young seedlings which germinated are extremely sensitive to salt stress, especially when they accumulates soluble salts from surface soils as a consequences of

evaporation and capillary rise of water (Mahmoudi *et al.,* 2012). Seed priming prevents seeds from entering stage of hydration (growth) by extending and holding seeds within activation phase when seeds are under dry stage (Heydecker and Coolbear, 1977). Seed priming is an efficient method for synchronization of germination and increasing seed vigor as well as allowing the growth of seedlings under stressful conditions (Bajehbaj, 2010). Seed priming increases the effect of salinity stress by promoting K^+ and Ca^{2+} accumulation on germination and seedling growth and decreases Na^+ and Cl^- accumulation in the seedlings (Afzal *et al.,* 2008). The main objective of priming treatments is to improve the seed germination and field emergence rate. Priming shows reduce in ion leakage through the membranes which could allows greater membrane integrity in the seed embryo (Mereddy *et al.,* 2000). There are a few priming methods are Hydropriming (seeds are soaked in water) osmopriming (seeds are soaked in osmatic solution)**,** halopriming (soaking of seeds in salt solution). Even though the mechanism behind the techniques of priming the seeds are still not fully understood, but certain physiological and beneficial changes had been observed that were associated with priming of seeds (Hu *et al.,* 2006).

The aim of the present study is to evaluate the effect of the seed enhancement on seed quality parameters under salinity stress in Okra var. *Arka Anamika* and to assess the best seed enhancement technique to alleviate the effect of salinity stress.

MATERIAL AND METHODS

Experiments were carried out at Department of Seed Science and Technology, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (Uttar Pradesh), 2019-2020. The study was conducted in order to evaluate the effect of priming on seed quality parameters of Okra under salt stress condition. A factorial experiment was conducted based on Completely Randomized Design with four replications. The Salt stress is induced by using NaCl at different concentration (0, 100 and 150 mM) viz S_0, S_1 and S_2.okra seed var. Arka Anamika were primed with treatments consists of Panchagavya 3% (T_1)and 5% (T_2), Coconut water 8% (T_3) and 12%(T_4), Neem leaf extract 3% (T_5) and 5%(T_6), KNO_3 (3g/litre) (T_7), KCL (3g/litre) (T_8) for 8 hours, with one untreated dry seed serve as control(T_0) were laid out in CRD with 4 replications and 100seeds per replication. To assess the seed quality parameters, seeds need to bring back to its original moisture content by remove them from the solutions and shade dried at room temperature. The between paper method of germination test were conducted in order to assess salt stress effect on seed germination. Germination paper was pre-soaked in three different concentrations of NaCl solution (S_0,S_1&S_2) used for conducting germination test. Seeds were germinated in a seed germinator maintained at 25 ± 2 °C temperature and 95 ± 3% RH. The seedlings were evaluated at the final count of okra seed i.e., 21 days, the normal seedlings were counted and expressed in percentage (ISTA, 2011). The root and shoot length were measured by randomly selecting the ten normal seedlings from each replication and the values were expressed in centimeter. These seedlings are placed in a paper cover and dried for 24 h in the shade and then kept in an oven maintained at 85±2 ºC for 24 h. The dried seedlings weight was measured and the mean values were expressed in mg/10 seedlings. Root-shoot ratio is calculated by the ratio between the root length of the seedlings and the shoot length of the seedlings. The formulae given by Abdul-Baki and Anderson (1973) used to calculate Vigour index. The data obtained from the experiments were subjected to an analysis of variance and treatment differences tested for significance (P= 0.05).

RESULTS AND DISCUSSION

The present study investigated the seed enhancement technique to alleviate the effect of salinity stress in okra. In general, increase in salt stress, reduce the germination percentage, root length, shoot length, seedling length, fresh weight, dry weight, seed vigour I, seed vigour II and root-shoot ratio. Seed-priming had a significant difference on germination percentage of okra seeds under salinity stress compared to control. Results revealed that mean values of all characters varied significantly along the salinity gradient. The mean values of all the parameters are maximum in S_0 (control) and were minimum in S_2 (150mM NaCl) (Table 1).

Table 1: Comparison between the overall mean of different seed quality parameters under different salinity levels.

Characters	Salinity level		
	S_0 (control)	S_1 (100mM NaCl)	S_2 (150mM NaCl)
Germination%	68.64	61.83	53.58
Shoot Length	20.21	17.03	12.43
Root Length	7.24	6.61	5.41
Seedling Length	27.45	23.64	17.84
Root-Shoot Ratio	0.36	0.392	0.442
Fresh Weight	5.65	4.77	3.49
Dry Weight	0.201	0.168	0.111
Seed Vigour Index I	1,904.94	1,480.38	970.49
Seed Vigour Index II	13.912	10.519	6.016

With increase in salt stress, the germination percentage of okra has significantly decreased which is similar to Ghoulam and Fares (2001) as he reported that salt stress at low level just delays the germination but higher salinity level not only reduce the germination percentage also inhibit the seedling emergence.

However, germination percentage of primed seeds have significantly increased when compared to (T_0) control (Table 2) were similar to Hopper *et al.*, (1979) and the highest germination percentage was registered with seeds primed with in all the three salinity stress levels. In saline condition, the significant increase in seed emergence and enhancement of seedling growth with increase in K^+ and Ca^{2+} concentration in different crop seed (Cramer *et al.*, 1990). The reason for improving the germination and growth of okra seed under salinity stress by KNO_3 $3gl^{-1}$(T_7) is may due to the ability of the potassium to maintain the ionic balance in cell and respiration and carbohydrate metabolism of seed by its effect on enzymes like pyruvate kinase (Aisha *et al.*, 2007; Nawaz, *et al.*, 2011).

Similar trend was observed in shoot length, root length, seedling length, fresh weight, dry weight of okra seeds under salinity stress. Shoot length of primed seeds were greater than control and the maximum Shoot length was registered with seeds primed with KNO_3 $3gl^{-1}$(T_7) in all salinity level (Table 3).

Under saline condition plant growth and survival depends upon adaptation to high concentration of salts and a reduction in shoot length is expected (Wu *et al.*, 2015)**.** Root length of primed seeds were greater than control and the maximum root length was registered with seeds primed with KNO_3 $3gl^{-1}$(T_7) in all salinity level (Table 2).

Table 2: Overall treatment means for various seed quality parameter under salinity stress.

Treatment	Salinity	Germin-ation %	Shoot length	Root length	Seedling length	Root-Shoot ratio	Fresh weight	Dry weight	Seed Vigour index 1	Seed Vigour index 11
T_0	S_0	58.75	16.28	6.13	22.40	0.376	4.30	0.168	1316.00	9.871
	S_1	53.00	13.18	5.63	18.80	0.427	3.50	0.141	996.35	7.473
	S_2	45.25	08.95	4.58	13.53	0.511	2.38	0.093	612.05	4.209
T_1	S_0	68.25	22.25	7.10	29.35	0.319	5.75	0.198	2003.25	13.531
	S_1	61.25	17.83	6.50	24.33	0.365	5.00	0.167	1489.95	10.199
	S_2	53.50	13.03	5.30	18.33	0.407	3.70	0.111	980.45	5.872
T_2	S_0	76.00	23.15	8.08	31.23	0.349	5.78	0.223	2373.03	16.964
	S_1	66.75	19.13	7.15	26.28	0.374	5.00	0.182	1753.95	12.148
	S_2	57.75	14.15	5.85	20.00	0.414	3.80	0.12	1155.03	6.929
T_3	S_0	63.50	18.30	6.63	24.93	0.362	5.48	0.186	1582.70	11.810
	S_1	57.50	15.88	6.03	21.90	0.380	4.80	0.156	1259.23	8.985
	S_2	49.50	11.30	4.98	16.28	0.441	3.40	0.103	805.58	5.098
T_4	S_0	61.00	17.10	6.45	23.55	0.378	5.23	0.174	1436.63	10.613
	S_1	55.00	13.83	5.88	19.70	0.425	4.20	0.146	1083.58	8.043
	S_2	47.50	9.68	4.83	14.50	0.499	2.98	0.097	688.78	4.583
T_5	S_0	71.75	20.28	7.58	27.85	0.374	6.23	0.211	1998.48	15.138
	S_1	64.50	16.83	6.90	23.73	0.410	5.18	0.177	1530.43	11.400
	S_2	56.25	12.60	5.68	18.28	0.451	3.90	0.117	1028.38	6.566
T_6	S_0	65.50	19.25	6.90	26.15	0.359	5.08	0.192	1712.60	12.576
	S_1	58.75	15.78	6.30	22.08	0.400	4.13	0.161	1296.80	9.459
	S_2	51.00	11.35	5.18	16.53	0.456	3.00	0.106	842.58	5.418
T_7	S_0	79.25	24.05	8.48	32.53	0.353	6.63	0.236	2577.55	18.705
	S_1	71.25	20.93	7.78	28.70	0.372	5.58	0.198	2044.83	14.109
	S_2	62.25	15.90	6.30	22.20	0.422	4.20	0.131	1381.88	8.140
T_8	S_0	73.75	21.25	7.83	29.08	0.368	6.43	0.217	2144.25	16.003
	S_1	68.50	19.90	7.38	27.28	0.371	5.53	0.188	1868.35	12.859
	S_2	59.25	14.93	6.00	20.93	0.377	4.10	0.124	1239.70	7.330
SE(d)	(T)	58.75	0.147	0.059	0.138	0.006	0.044	0.001	12.426	0.091
	(S)	53	0.085	0.034	0.079	0.003	0.025	0.001	7.174	0.053
	(S)×(T)	45.25	0.254	0.103	0.238	0.01	0.076	0.002	21.523	0.158
SE(m)	(T)	0.262	0.104	0.042	0.097	0.004	0.031	0.001	8.787	0.064
	(S)	0.151	0.06	0.024	0.056	0.002	0.018	0.001	5.073	0.037
	(S)×(T)	0.453	0.18	0.073	0.169	0.007	0.054	0.002	15.219	0.111
CD@5%	(T)	0.737	0.292	0.118	0.274	0.012	0.087	0.002	24.77	0.181
	(S)	0.426	0.169	0.068	0.158	0.007	0.05	0.001	14.301	0.105
	(S)×(T)	1.277	0.506	0.205	0.475	0.021	0.151	0.004	42.904	0.314
F Test		S	s	S	S	S	S	S	S	S

This can be the result of physiological drought by the salt deposit in root cells, which could be the reason for the reduction of cell division and reduced root growth (Munns, 1993). Seedling length of okra seedling is the sum of shoot and root length, as maximum shoot length and root length are registered in seeds primed with KNO_3 $3gl^{-1}$(T_7) under all salinity level, seedling length also maximum registered with KNO_3 $3gl^{-1}$(T_7) primed seeds in all salinity levels (Table 2). Significant reduction of fresh weight and dry weight of okra

seedling were observed under salinity levels (Table 1). However, Fresh weight & Dry weight of primed seeds have significantly increased when compared to control (T_0) and the highest Fresh weight & Dry weight was registered with seeds primed with KNO_3 $3gl^{-1}$(T_7) in all the salinity levels (Table 1). Salinity stress reduced the Fresh weight and Dry weight of seedling. The contribution of phytohormones in the biosynthesis is decreased due to the reaction of salinity stress in seeds Cuartero *et al.,* (2006); Cicek and Cakirlar (2002) also reported that salinity reduced Fresh and Dry weight of maize seedling.

Table 3: Analysis of variance for different seedling growth parameters in okra under salinity stress.

Mean Sum of Square					
Sr.No.	**Character**	**Treatment (df=8)**	**Salinity (df=2)**	**Interaction (df=16)**	**Error (df=81)**
1.	Germination%	481.058*	2,046.29*	3.068*	0.821
2.	Shoot Length	76.95*	550.827*	1.182*	0.129
3.	Root Length	5.888*	31.169*	0.065*	0.021
4.	Seedling Length	123.616*	843.291*	1.549*	0.114
5.	Shoot-Root Ratio	0.301*	2.318*	0.03*	0.009
6.	Fresh Weight	5.442*	42.373*	0.043*	0.011
7.	Dry Weight	0.004*	0.074*	0.001*	0
8.	Vigour Index 1	1425506*	7880625.583*	38678.515*	926.456
9.	Vigour Index 2	57.208*	564.824*	3.002*	0.05

* Significant @5% Level of Significance.

The seed vigour I and seed vigour II of okra seedling observed in this is study is significantly decrease with increase in salinity stress. Since Seed vigour I and Seed vigour II is depend on the germination percentage, seedling length and dry weight of okra seedling as seed vigour I is the product of germination percentage and seedling length and seed vigour II is the product of Germination percentage and dry weight of okra seedling. Seed vigour I and seed vigour II of okra Seeds primed with KNO_3 $3gl^{-1}$(T_7) is found to be performed significantly better when compared to all other treatments and control under all salinity level. Decrease in the germination and seedling vigour due to NaCl salt stress observed in this study might be due to toxic effects of Na^+ and Cl^- ions as well as salt solution create an external osmotic potential in seed that inhibit water uptake reported by (Khajeh-Hosseini *et al.,* 2003). It is also evident that the salinity disrupted the cellular expansion and differentiation which cause modifications in metabolic activity (Scialabba and Melati 1990).

In case of Root-Shoot ratio, with increase in salt stress the root-shoot ratio of okra has increase significantly. The Root-shoot ratio of primed seeds also have significant difference among the treatment with maximum root-shoot ratio was registered in control (T_0) in salt stress levels but when we compare the Root-shoot ratio of treatments with the seedling length of the treatment it is clear that the maximum Root-shoot ratio of control is due to the lower shoot length (Table 2). When we consider the Root-shoot ratio, it is also important to analyse the shoot and root length of the seedling.

The higher Root-shoot ratio with low root and shoot length doesn't have any utility. Among the treatments with high shoot and root length, seed priming with KNO_3 $3gl^{-1}$(T_7) followed by seed priming with KCL$3gl^{-1}$(T_8) having optimum root-shoot ratio. In addition, salinity stress affects the absorption of mineral and balance of ions in plant. Hence mineral nutrient deficiency can attribute to reduction of shoot and root length. Activation of abiotic stress defence responses that are displayed by primed plants are faster and stronger (Conrath *et al.,* 2006).

From the previous findings in Fenugreek by Soughir *et al.,* (2013) ; Sivritepe *et al*., (2003) working on melon and Bajehbaj, (2010) working on sunflower shows that decrease in K^+ and Ca^{2+} in the different part of the seedling due to NaCl salt stress causes increase in Na^+ ion concentration. So, the seed priming with KNO_3 $3gl^{-1}$(T_7) followed by seed priming with KCL$3gl^{-1}$(T_8) shows better performances in terms of salinity stress. Cakmak, (2005) also suggested that under environmental stress conditions the improvement of K-nutritional status crucial for the survival of crop plants.

CONCLUSION

Seed priming is a seed enhancement technique which is low cost, easy technique with minimal or no risk has improved seed quality parameters even under salinity stress. From this present investigation, any seed priming treatment have shown significantly better performance than control in all salinity stress levels. Among the seed priming treatment, seeds primed with KNO_3 $3gl^{-1}$(T_7) have shown superior performance followed by KCL$3gl^{-1}$(T_8) in all the seed quality parameters under all salinity stress level. Therefore, seed priming with KNO_3 $3gl^{-1}$(T_7) is the best seed enhancement technique to alleviate the effect of salinity stress in okra (*Abelmoschus esculentus*). These results are obtained in a controlled atmosphere of germination chamber, so it needs to get further investigated in field trails. If the results from the field trails will give clarity to the enhancement of seed under salinity stress. After that this method can be utilized for commercial cultivation by farmers.

Conflict of Interest. Nil.

REFFERENCE

Abdul-Baki, A. A., & Anderson, J. D. (1973). Vigor determination in soybean seed by multiple criteria. *Crop Science*, *13*: 630- 633.

Afzal, I., Rauf, S., Basra, S. M. A., & Murtaza, G. (2008). Halopriming improves vigor, metabolism of reserves and ionic contents in wheat seedlings under salt stress. *Plant Soil Environ.*, *54*(9): 382-388.

Aisha, A. H., Rizk, F. A., Shaheen A.M., & Abdel-Mouty, M. M. (2007). Onion plant growth, bulb yield and its physical and chemical properties as affected by organic and natural fertilization. *Res. J. Agric. Biol. Sci.*, *3*(5): 380-388.

Bajehbaj, A. A. (2010). The effects of NaCl priming on salt tolerance in cotton germination and seedling grown under salinity conditions. *African Journal of Biotechnology*, *9*: 1764-1770.

Cakmak, I. (2005). The Role of Potassium in Alleviating Detrimental Effects of Abiotic Stresses in Plants. *Journal of Plant Nutrition and Soil Science*, *168*: 521-530.

Cicek, N., & Cakirlar, H. (2002). The effect of salinity on some physiological parameters in two maize cultivars. *Bulgarian J. Plant Physiol.*, *28*: 66-74.

Conrath, U., Beckers, G. J. M., Flors, V., García-Agustín, P., Jakab, G., Mauch, F., Newman, M. A., Pieterse, C. M. J., Poinssot, B., Pozo, M. J., Pugin, A., Schaffrath, U., Ton, J., Wendehenne, D., Zimmerli, L.,& Mauch-Mani, B., (2006). Priming: getting ready for battle. *Mol. Plant-Microbe Interact*., *19*: 1062–1071.

Cramer G. R., Epstein, E., & Lauchli A. (1990). Effects of sodium, potassium and calcium on salt-stressed barley.*Physiol. Plant*., *80*: 83-88.

Cuartero, J., Bolarin M.C., Asins, M. J., & Moreno, V. (2006). Increasing salt tolerance in tomato. *J. Exp. Bot. 57*, 1045-1058.

Fazlali, R., Asli, D. E., & Moradi, P. (2013). The effect of seed priming by ascorbic acid on bioactive compounds of naked seed pumpkin (*Cucurbita pepo* var. *styriaca*) under salinity stress. *Int. J. Farm Allied Sci*., *2*(17): 587-590.

Ghoulam, C., & Fares, K. (2001). Effect of salinity on seed germination and early seedling growth of sugar beet (*Beta vulgaris* L.). *Seed Science and Technology*, *29*(2): 357-364.

Heydecker, W., & Coolbear, T. (1977). Seed treatments for improved performance survey and attempted prognosis. *Seed Sci. Technol.*, *5*: 353-425.

Hopper, N. W., Overholt, J. R., & Martin, J. R. (1979). Effect of cultivar, temperature and seed size on the germination and emergence of soy beans (*Glycine max* (L.) Merr.). *Ann. Bot.*, *44*: 301-308.

Hu, J., Xie, X. J., Wang, Z. F., & Song, W. J. (2006). Sand priming improves alfalfa germination under high salt concentration stress. *Seed Sci. Technol.*, *34*: 199–204.

ISTA [International Seed Testing Association] (2011). "International rules for seed testing", Seed Sci. Techn., 21(Suppl.), Pp. 1–288.

Jamil, M., Lee, C. C, Rehman, S. U., Lee, D. B., Ashraf, M., Rha, & E.S. (2005). Salinity (NaCl) tolerance of Brassica species at germination and early seedling growth. *Electron. J. Environ Agric Food Chem.*, *4*: 970-976.

Khajeh-Hosseini, M., Powell, A. A and Bingham, I. J. (2003). The interaction between salinity stress and seed vigour during germination of soybean seeds. *Seed Sci. & Techol.*, *31*: 715- 725.

Mahmoudi, H., Massoud, R. B., Baatour, O., Tarchoune, I., Salah, I. B., Nasri, N., Abidi, W., Kaddour, R., Hannoufa, A., Lachaal, M., & Ouerghi, Z. (2012). Influence of different seed priming methods for improving salt stress tolerance in malvaceae crops. *Journal of Plant Nutrition*, *35*: 1910-1922.

Mereddy, R., Wu, L., Hallgren, S. W., Wu, Y., & Conway, K. E. (2000). Solid matrix priming improves seedling Vigor of okra seeds. *Proceedings of the Oklahoma Academy of Science*, *80*: 33-37.

Munns, R., & Tester, M. (2008). Mechanisms of salinity tolerance. *Annu. Rev. Plant Biol.*, *59*: 651-681.

Munns, R. (1993). Physiological processes limiting plant growth in saline soil: Some dogmas and hypotheses. *Plant Cell Environ*, *16*: 1-24.

Nawaz, A., Muhammad, A., Muhammad, & A. P., Afzal, I., (2011). Effect of halopriming on germination and seedling Vigor of tomato. *Afr. J. Agric. Res. 6*: 3551–3559.

Patade, V. Y., Maya, K., & Zakwan, A. (2011). Seed priming mediated germination improvement and tolerance to subsequent exposure to cold and salt stress in capsicum. *Res J. Seed Sci., 4*: 125-36.

Pitman, M.G. and Lauchli, A. (2002). Global Impact of Salinity and Agricultural Ecosystems. Kluwer, Dordrecht, 3-20.

Rouhi H. R., Abbasi Surki, A., Sharif-Zadeh, F., Tavakkol, Afshari, R., Aboutalebian, M. A., & Ahmadvand, G. (2011). Study of different priming treatments on germination traits of soybean seed lots. *Not Sci Biol.*, *3*(1): 101-108.

Scialabba, A., & Melati, M. R. (1990). The effect of NaCl on growth and xylem differentiation of radish seedlings. *Bot. Gaz.*, *151*: 516-521.

Sharma, A. D., Rathore, S. V. S., Srinivasan, K., & Tyagi, R. K. (2014). Comparison of various seed priming methods for seed germination, seedling Vigor, and fruit yield in okra (*Abelmoschus esculentus* L. Moench) *Scientia Horticulturae*, *165*: 75–81.

Sivritepe, N., Sivritepe, H. O., & Eris, A. (2003). The effects of NaCl priming on salt tolerance in melon seedlings grown under saline conditions. *Scientia Horticulturae*, *97*, 229-237.

Soughir, M., Elouaer, M. A., & Hannachi, C. (2013). The effect of NaCl priming on emergence, growth and yield of fenugreek under saline conditions. *Cercetari agronomice in Moldova*, *46*(2), 73-83.

Wang, W., Vinocur, B., & Altman, A. (2003). Plant responses to drought, salinity and extreme temperatures: toward genetic engineering for stress tolerance. *Planta*, *218*: 1-14.

Wu, G. Q., Jiao, Q., & Shui, Q. Z. (2015). Effect of salinity on seed germination, seedling growth, and inorganic and organic solutes accumulation in sunflower (*Helianthus annuus* L.). *Plant, Soil and Environment*, *61*: 220-226.

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