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Possibility of Seed Priming for good Germination of Cotton Seed under Salinity Stress

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Abstract
To check the effects of hydro-priming and priming with potassium nitrate on cotton seed germination and seedling emergence. Laboratory and green house experiment was set in University of agriculture Faisalabad, Pakistan. Different priming treatments used as hydro, $KN0_3$ and NaCl. Results showed that under salinity stress, hydro and potassium nitrate priming increased properties such as: germination of seed, emergence of seedling, radicle length, dry weight and plant leaf area. Priming with $KN0_3$ had the most positive effects on given traits under salinity stress.
Keywords: Priming. KN03, Cotton, salinity Stress

Introduction:
Seed is one of the most important inputs in cotton production. Pakistani soils becoming saline as the over us of tube well water and extensive farming system resulting low crop stand, high cotton seed requirement and low germination. Modern agriculture demands that each and every seed should readily germinate and produce a vigorous seedling. Uniformity of growth and synchrony in development are highly desirable characters for mechanized cultural operations. As such, only of high quality i.e., genetically pure and morphologically, pathologically and physiologically sound seed is capable of increasing the productivity, The Vigour of the seed could be activated through invigouration treatments. Seed invigouration implies to an improvement in seed performance by any postharvest treatment that focused on improvement in germiablity, storability and better field performance (Basu, 1990). One method of improving seed germination in the field has been through the use of pre-sowing treatments such as seed priming (Heydecker *et al.,* 1973). Hydro-priming is used to improve germinations, increase uniformity of germination and helps to enhance plant establishment. Seeds having priming treatment shows greater germination across a wider range of environmental conditions as temperature, than unprimed seed (Valdes and Bradford, 1987; Ellis and Butcher, 1988) and adverse field conditions such as salinity (Wiebe and Muhyaddin, 1987), under low water availability (Frett and Pill, 1989). Primed seeds shows greater vigor which leads to greater yield (Warren and Bennett, 1997). Hydro-primeng just increase the seed germination but not improve the dead seed (Cantliffe, 1989). The objective of this research is to test whether seed priming methods by using water treatments would affect seed germination and vigor of high performing varieties of cotton.

Material and method:
The experiment were laid out in completely randomized design (CRD) with an elite cotton varietie MNH-886 with five seed priming treatments in three replications at salinity of 4 and 8 ds m-1 . The seed priming treatment included Hydro-priming duration 12h, 20h, and 25 h, 20h priming with NaCl (2%) and KNO3 (5%) compare with the unsoaked seed (control). Approximately 30 seed for each treatment of each genotypes were placed on filter paper impregnated with water at room temperature (25 ºC). After soaking seeds were re-dried to original weight under shade for three days. 15 seeds from each of the treatments were sown in petri dish having 20 ml of designed saline solution. At the same time in greenhouse five pots of each treat is sown with three seed in each pot for 45 days and irrigated by 300 ml of sodium chloride solution every three days. A seed was considered as germinated when radicle had emerged more than 2 mm. Final germination percentage was calculated in petri dish radicle and plumule length were measured after 7 days, in green house plants heights, leaf area were measured and dry weights were determined after 45 days

Results:

Table 1: Effects of priming treatments on salinity conditions in laboratory experiment

Priming	Salinity (dsm-1)	FGP (%)	Plumule length (cm)	Radicle length (cm)	Seedling dry weight (g)
Control	4	46.66^{bic}	2.2^{bc}	3.4^{bdf}	0.19ad
Hydro (12 h)	4	66.66^{c}	4.6^{a}	4.6^{a}	0.21c
Hydro (20 h)	4	80^{d}	5.1^{d}	4.9^{a}	0.28b
Hydro (25 h)	4	64.44^{c}	4.8^{f}	4.6^{a}	0.22c
KNO3	4	91.11^{a}	5.3^{g}	5.1^{c}	0.27b
NaCl	4	28.88^{b}	2^{b}	3.2^{b}	0.11a
Control	8	20^{b}	1.9^{c}	2.3^{b}	0.13a
Hydro (12 h)	8	60^{c}	3.5^{f}	3.2^{b}	0.19d
Hydro (20 h)	8	70.77^{d}	3.3^{g}	4.2^{a}	0.22g
Hydro (25 h)	8	60^{c}	3.2^{f}	3.2^{d}	0.16a
KNO3	8	90^{a}	4.2^{f}	4.9^{a}	0.29b
NaCl	8	26.66^{i}	1.2^{bc}	2.1^{f}	0.09i

FGP, Final Germination Percentage, Similar letters at each column indicate the non-significant difference at 95 % confidence interval

Priming under salinity stress showed significant effects on different traits studied in laboratory and greenhouse. In laboratory experiment Plumule length (cm),Radicle length (cm) and seedling dry weight (g) was more in all seed priming treatment except that of NaCl as compared with control. KNO3 priming treatment shows maximum germination at both the level of salinity and difference among them is non-significant (Table 1). Plumule length is maximum in both the treatments hydro treatment (12 h) and KNO3 at Salinity level 4 dsm-1 but at Salinity level of 8 dsm-1 KNO3 is highest which is 4.2 cm. Radicle length don't shows significant difffernt among hydro treatments and KNO3 but at high salinity level performance of KNO3 treatment remains good (Table 1). Seedling dry weight was more in hydro priming of 20 h in both the salinity treatment. Kaya et al. (2006) reported the positive effect of KNO3 and hydro-priming Bocian and Holubowicz. (2008) found that priming with KNO3 enhanced seed germination of tomato.

In greenhouse effect of hydro priming is also significant with KNO3.. By increasing salinity stress, these trait increased at all priming treatments. Final emergence percentage (FEP) remains high in KNO3 with non-significant difference with 20 h hydro priming technique.similar result was found by Afkari (2010) that germination increase by priming with KNO3. Leaf area increase in KNO3 treatment but with the increase in salinity level hydro-priming shows superior effect. Yagmur (2008) found positive effect of osmotic priming in comparison with control on leaf area. Plant height (cm) and Plant dry weight (g) also showed positive effect on seed priming treatment as shown in table 2. KNO3 maximum value for both the characters with good very good

Table 2: Effects of priming treatments on cotton seed emergence and growth under salinity conditions in

Priming	Salinity	FEP (%)	LA (cm2)	Plant height (cm)	Plant dry weight (g)
Control	4	50ab	129cde	35^{abc}	5.5^{b}
Hydro (12 h)	4	80c	235a	48^{a}	7.7^{b}
Hydro (20 h)	4	90i	278a	49.5^{ab}	7.8^{ab}
Hydro (25 h)	4	81i	236b	42.7^{g}	7.3^{a}
KNO3	4	91i	289c	51.9^{b}	8.4^{f}
NaCl	4	49a	110c	30^{a}	5.3^{d}
Control	8	49a	110i	24^{c}	4.9^{c}
Hydro (12 h)	8	58d	180d	46.8^{d}	7.1^{a}
Hydro (20 h)	8	62g	189cd	38^{a}	6.1^{a}
Hydro (25 h)	8	51b	145e	46^{cd}	7.5^{a}
KNO3	8	79c	130i	50^{ac}	5.9^{d}
NaCl	8	34c	80g	31^{a}	4.1^{i}

FEP, final emergence percentage; LA, leaf area per plant. Similar letters at each column indicate the non-significant difference at 95 % confidence interval

results of hydro priming.

CONCLUSION

Priming for salinity stress with Water and KNO3 shows positive effect almost at all characters under both green house and laboratory conditions. Farmers may get benefited by seed priming before sowing under salt stress condation. Farmers even increase seed growth by using simple hydro priming treatment. Cakmak (2005) concluded that the improvement of K is of great importance and crucial for the survival of crop plants under environmental stress conditions, such as chilling, drought, salinity.

References;

Cakmak, I., 2005. The role of potassium in alleviating detrimental effects of abiotic stresses in plants. J. Plant Nutr. Soil Sci. 168: 521-530.

Yagmur, M. and D. Kaydan. 2008. Alleviation of osmotic stress of water and salt in germination and seedling growth of triticale with seed priming treatments. Afric. J. Biotech. 7(13): 2156-2162.

Kaya, M.D., G. Okcu, M. Atak, Y. Cikili and O. Kolsarici. 2006. Seed treatments to overcome salt and drought stress during germination in sunflower (Helianthus annus L.). Eur. J. Agron. 24: 291-295

Cantliffe, D.J. 1989. Stand establishment. Acta Horticulturae, v.247, p.175-179.

Warren, J. E. and M. A. Bennett. 1997. Seed hydration using the drum priming system. Hort. Sci. 32(7):1220-1221.

Frett, J.J. and W.G. Pill. 1989. Germination characteristics of osmotically primed and stored impatiens seeds. Scientia Hort. 40:171-179.

Wiebe, H. J. and T. Muhyaddin. 1987. Improvement of emergence by osmotic seed treatments in soils of high salinity. Acta Hort. 198:91-100.

Ellis, R.H. and P.D. Butcher. 1988. The effects of priming and 'natural' differencesin quality amongst onion seed lots on the response of the rate of germination to temperature and identification of the characteristics under genotypic control. J. of Experimental Bot. 39:935-950

Valdes, V. M. and K. J. Bradford. 1987. Effects of seed coating and osmotic priming on the germination of lettuce seeds. J. of American Society for Horti. Sci. 112:153-156

Heydecker, W., J. Higgins and R.L. Gulliver. 1973. Accelerated germination by osmotic seed treatment. Nature (London), 246: 42-44.

Basu, R.N., 1990, Seed invigouration for extended storability. Proceedings of the International conference on Seed Science and Technology, New Delhi.

Bocian, S. and R. Holubowicz, 2008. Effect of different ways of priming tomato (Lycopersicon esculentum MILL.) seeds on their quality. Pol. J. Natur. Sci. 23(4): 729-739.

Afkari, A., 2010. The effects of NaCl priming on salt tolerance in sunflower germination and seedling grown under salinity conditions. Afri. J. Biotech., 9(12): 1764-1770.