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Impact of seed invigoration with panchagavya, Beejamrutha on seed quality parameters in ridge gourd (*Luffa acutangula*) under salinity conditions

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Abstract
The present study was carried out to assess the effect of organic seed treatments on seed quality parameters of Ridge gourd (*Luffa acutangula)* under increased salinity concentrations. The study was carried out in the seed testing laboratory of Department of Genetics and Plant Breeding, SHUATS, Prayagraj with the treatments as Panchagavya, Jeevamrutham, Beejamrutha, Coconut water and Aloevera extract of varying concentrations under salinity levels of 0 mM, 150mM and 250 mM NaCl. High salt conditions can inhibit seed germination and seedling growth in Ridge gourd. The results indicated that increased levels of salinity concentrations have negative impact on quality parameters of Ridge gourd. Soil salinity is the major abiotic factor that hinders the growth and establishment of the seedling. Priming enhances the quality parameters of the seedling up to certain salinity concentrations depending up on the type of primer and the dosage used for priming; beyond which it may be in efficient to show impact on the growth and development of seedling. Priming with coconut water and aloe vera extract were not found so effective in enhancing the seed quality parameters of Ridge gourd under the increased levels of salinity concentrations and its effect was recorded close to that of untreated control.

Keywords: Impact, invigoration, panchagavya, parameters, *Luffa acutangula*

Introduction
Ridge gourd belongs to genus Luffa of *Cucurbitaceae* and has a chromosome number of 2n = 26. Ridge gourd originated in India and it exhibits wide genetic variation for various morphological fruit characteristics. Green fruits are cooked as vegetable Ridge gourd (*Luffa acutangula* L.) popularly known as angled gourd, angled loofah, chinese okra, silky gourd and ribbed gourd. Fruit contains protein (0.5%), carbohydrate (3%), carotene (37 mg) and vitamin C (18 mg) per 100 g of edible portion (Thamburaj and Singh, 2013). Without good seed, the investment on fertilizer, water, pesticides and other inputs will not pay the desired dividends. allow the pre-germinative metabolism to proceed, later dried to the original moisture (McDonald, 2000) to fix all the metabolic changes Seed invigouration treatments are physiological treatments that imply an improvement in physiological status of seed, thereby achieved improved germinability, greater storability and better performance than the corresponding untreat seeds (Basu, 1979).

Fruits of Luffa are very nutritious and good source of vitamin A, calcium, phosphorus, ascorbic acid and iron. Identification of superior genotypes among the existing germplasm becomes imperative for promoting yield and yield related traits. Roots are yellowish-brown in colour, almost cylindrical in shape. They are rough because of the longitudinal wrinkles and also showed the presence of few adventitious roots.Stem is brownish-yellow in colour, 0.2-0.4 cm thick, 5 angled, glabrous, and consists of tendri ls(3-fid tendril). Petiole is brownish yellow coloured, 3-8 cm in length; somewhat twisted, wrinkled, orbicular, and angular lamina is pale or light- green in colour, crimpled and broad. Roots are yellowish-brown in colour, almost cylindrical in shape. Salinity in soil or water is one of the major abiotic stresses. It is most widespread in arid, semiarid and coastal regions.This is owing to inappropriate management of irrigation and drainage, low precipitation, high evaporation and irrigation with saline waters (Munns and Tester, 2008). High salinity levels take 1.5 million hectares of land out of production each year (Pitman and Läuchli, 2002; Munns and Tester, 2008). Thus, 50% of cultivable lands will be lost by the middle of the 21st century (Wang et al., 2003).

This layer is more saline than lower layers (Esechie, 1995). Thus, seeds show non-uniform germination and deficient seedling development. Jamil et al., (2005), Patade et al,. (2011), Rouhi et al., (2011) and Ansari et al., (2012) stated that increasing salt concentration decreases the germination percentage and increases germination time. Priming is a procedure that hydrates the seed in a specific environment, followed by drying the seed so that the germination processes begins, but radical emergence does not occur (Giri and Schillinger, 2003).

Seed priming is one of the useful physiological approaches that could adapt glycophyte species to saline conditions **(;** Ashraf and Foolad, 2005; Kazemi and Eskandari, 2012; Gholami et al., 2015) Various seed priming techniques have been developed including hydro, halo, osmo, thermo, solid matrix and biopriming (Ashraf and Foolad, 2005)

Materials and Methods

The study was carried out at seed testing laboratory of department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture Technology and Sciences (SHUATS), Naini Agriculture Institute (NAI), Prayagraj (U. P.). Current experiment conducted using Complete Randomized Design with four replication. The Ridge gourd cultivar were used for experiment with different organic seed treatments T0 to T8 using different salinity levels designated as S0, S1 and S2. Lab experiment data analysis were assessed by two-way ANOVA (salinity and treatments as factors) carried out according to procedure of Completely Randomized Design (Fisher, 1936) The study was conducted in order to evaluate the effect of priming on seed quality parameters of ridge gourd under salt stress condition. Treatments: T0- Control, T1-Panchagavya at 3% for 12 hrs, T2-Panchagavya at 5% for 12 hrs., T3- Panchagavya at 6% for 12 hrs. T4- Beejamrutha at 4% for 12 hrs.T5- Jeevamrutha at 20% for 12 hrs., T6- Jeevamrutha at 20% for 12 hrs., T7-Coconut water for 12 hrs., and T8-Aloevera gel for 12 hrs.; S0- 0mM NaCl, S1- 150mM NaCl and S2- 250 mM NaCl.

Methodology

Panchagavya, a fermented product is literally prepared from five products of a cow *viz*., milk, urine, dung, curd and ghee. These ingredients are placed in a pot and mixed twice daily to enhance the microbial activity; on the 15thday the enriched product panchagavya is formed. To prepare 3%, 5% & 6% solution; 30ml, 50 ml & 60mlof the fermented panchagavya was taken in beaker and then 1000ml distilled water was added with constant stirring to get mixed up properly.

Beejamrutha was prepared by taking 5 kg of local cow dung, it was bound to a tape and kept hanged in 20 litres of water for 12 hrs 50 g of slaked lime was dissolved in one litre of water after constant stirring. Earlier dissolved cow dung was squeezed in the lime water such that essential nutrients are maintained in the solution. A handful of soil was added and stirred properly to enhance microbial activity and finally 50 litres of cow urine was added with the constant stirring. To prepare 4% beejamrutha solution, 40 g of beejamrutha was taken in a beaker and was mixed with distilled water after constant stirring to get mixed up properly.

Jeevamrutha was prepared by taking 200 litres of water in a barrel, 10 kg local cow dung, 10 litres of aged cow urine, 2 kg jaggery, 2 kg pulse flour and hand full of soil were added. Periodical stirring for at-least 48 hours forms Jeevamruth solution. To prepare 20% beejamrutha solution, 200 g of jeevamrutha solution was taken in a beaker and was mixed with distilled water after constant stirring to get mixed up properly. 8.76g & 14.76g of NaCl was dissolved in 1000ml of water to constitute 150mM and 250mM NaCl salt solution respectively. After preparation of solution of panchagavya, beejamrutha, jeevamrtha. ridgess gourd seeds are soaked in required solution for 12 hours at 25° temperature untreated seeds are called as control. After 12 hour of soaking the solution drained out from the beaker and pre-soaked were air dried to original weight and then placed for germination in laboratory under controlled condition.

Result and Discussion

Germination (%): The treatments and salinity concentrations showed significant effect of seed priming on germination % of Ridge gourd seedlings. The maximum germination of 76.250% was exhibited by the treatment T_1- Panchagavya at 3% for 12 hrs and salinity stress level of S_0- 0mM NaCl recorded germination of 76.889% respectively. The minimum germination due to the effect of treatments of 68.5% was recorded with the untreated control (T_0) and salinity stress level S_2- 250mM NaCl recorded the lowest germination of 65.194% among the salinity stress levels induced. The maximum germination with the interaction of treatment and salinity (T x S) was recorded with T_1S_0- Panchagavya at 4% for 12 hrs at 0mM NaCl stress levels of 83% and minimum of the same was recorded with interaction T_0S_2- Control at 250 mMNaCl stress levels 62.750% of germination.

Root length: The treatments and salinity concentrations showed significant effect of seed priming on root length of Ridge gaurd seedlings. The maximum root length of 13.592cm was exhibited by the treatment T_1- Panchagavya at 3% for 12 hrs and salinity stress level of S_0- 0mM NaCl recorded root length of 12.739cm respectively. The minimum root length due to the effect of treatments of 9.383cm was recorded with the untreated control (T_0) and salinity stress level S_2- 250mM NaCl recorded the lowest root length of 10.644cm among the salinity stress levels induced. The maximum root length with the interaction of treatment and salinity (T x S) was recorded with T_1S_0- Panchagavya at 4% for 12 hrs at 0mM NaCl stress levels of 15.325cm and minimum of the same was recorded with interaction T_0S_2- Control at 250mM NaCl stress levels 8.8cm of root length.

Shoot length: The treatments and salinity concentrations showed significant effect of seed priming on shoot length of Ridge gaurd seedlings. The maximum shoot length of 16.117cm was exhibited by the treatment T_1- Panchagavya at 3% for 12 hrs and salinity stress level of S_0- 0mM NaCl recorded shoot length of 14.661cm respectively. The minimum shoot length due to the effect of treatments of 11.617cm was recorded with the untreated control (T_0) and salinity stress level S_2- 250mM NaCl recorded the lowest shoot length of 13.019cm among the salinity stress levels induced. The maximum shoot length with the interaction of treatment and salinity (T x S) was recorded with T_1S_0- Panchagavya at 4% for 12 hrs at 0mM NaCl stress levels of 17.225cm and minimum of the same was recorded with interaction T_0S_2- Control at 250mM NaCl stress levels 10.95cm of shoot length.

Seedling length: The seedling length gradually decreased with the increase in salinity levels. The treatments and salinity

concentrations showed significant effect of seed priming on seedling length of Ridge gaurd seedlings. The maximum seedling length of 29.708cm was exhibited by the treatment T_1- Panchagavya at 3% for 12 hrs and salinity stress level of S_0- 0mM NaCl recorded seedling length of 27.4cm respectively. The minimum seedling length due to the effect of treatments of 20.917cm was recorded with the untreated control (T_0) and salinity stress level **S_2**- 250mM NaCl recorded the lowest seedling length of 23.664cm among the salinity stress levels induced. The maximum seedling length with the interaction of treatment and salinity (T x S) was recorded with T_1S_0- Panchagavya at 4% for 12 hrs at 0mM NaCl stress levels of 32.55cm and minimum of the same was recorded with interaction T_0S_2- Control at 250mM NaCl stress levels 19.75cm of seedling length.

Seedling fresh weight: The treatments and salinity concentrations showed significant effect of seed priming on seedling fresh weight of Ridge gourd seedlings. The maximum seedling fresh weight of 7.835 g was exhibited by the treatment T_1- Panchagavya at 3% for 12 hrs and salinity stress level of S_0- 0mM NaCl recorded. The minimum seedling fresh weight due to the effect of treatments of 4.970g was recorded with the untreated control (T_0) and salinity stress level S_2- 250mM NaCl recorded among the salinity stress levels induced. The maximum seedling fresh weight with the interaction of treatment and salinity (T x S) was recorded with T_1S_0- Panchagavya at 3% for 12 hrs at 0mM NaCl stress levels of 7.835 g and minimum of the same was recorded with interaction T_0S_2- Control at 250mM NaCl stress levels 4.970 g of seedling fresh weight.

Seedling dry weight: The treatments and salinity concentrations showed significant effect of seed priming on seedling dry weight of Ridge gourd seedlings. The maximum seedling dry weight of 0.798 g was exhibited by the treatment T_1- Panchagavya at 3% for 12 hrs and salinity stress level of S_0- 0mM NaCl recorded. The minimum seedling dry weight due to the effect of treatments of 0.570g was recorded with the untreated control (T_0) and salinity stress level **S_2**- 250mM NaCl recorded among the salinity stress levels induced. The maximum seedling dry weight with the interaction of treatment and salinity (T x S) was recorded with T_1S_0- Panchagavya at 3% for 12 hrs. at 0mM NaCl stress levels of 0.798 g and minimum of the same was recorded with interaction T_0S_2- Control at 250mM NaCl stress levels 0.570 g of seedling dry weight

Seed vigour Index I: The seedling Vigour index I gradually decreased with the increase in salinity levels. The treatments and salinity concentrations showed significant effect of seed priming on seedling Vigour index I of Ridge gourd seedlings. The maximum seedling Vigour index I of 2,701.50 exhibited by the treatment T_1- Panchagavya at 3% for 12 hrs and salinity stress level of S_0- 0mM NaCl recorded. The minimum seedling Vigour index I due to the effect of treatments of 1,239.95 was recorded with the untreated control (T_0) and salinity stress level **S_2**- 250mM NaCl recorded among the salinity stress levels induced. The maximum seedling Vigour index I with the interaction of treatment and salinity (T x S) was recorded with T_1S_0- Panchagavya at 3% for 12 hrs. at 0mM NaCl stress levels of 2,701.50 and minimum of the same was recorded with interaction T_0S_2- Control at 250mM NaCl stress levels1,239.95 of seedling Vigour index I.

Seed vigour Index II: The treatments and salinity concentrations showed significant effect of seed priming on seedling Vigour index II of Ridge gourd seedlings. The maximum seedling Vigour index II of 66.220exhibited by the treatment T_1- Panchagavya at 3% for 12 hrs and salinity stress level of S_0- 0mM NaCl recorded. The minimum seedling Vigour index II due to the effect of treatments of 35.790 recorded with the untreated control (T_0) and salinity stress level S_2- 250mM NaCl recorded among the salinity stress levels induced. The maximum seedling Vigour index II with the interaction of treatment and salinity (T x S) was recorded with T_1S_0- Panchagavya at 3% for 12 hrs. at 0mM NaCl stress levels of 66.220and minimum of the same was recorded with interaction T_0S_2- Control at 250mM NaCl stress levels135.790of seedling Vigour index II.

Table 1: Show the germination percentage

	Germination percentage			**Root length**			**Shoot length**			**Seedling**		
	S0	S1	S2	S0	S1	S2	S0	S1	S2	S0	S1	S2
T0	73.500	69.250	62.750	9.625	9.725	8.800	12.000	11.900	10.950	21.625	21.375	19.750
T1	83.000	74. 750	69.500	15.325	13.275	12.175	17.225	16.175	14.950	32.550	29.450	27.125
T3	81.250	74.000	67.500	14.925	12.825	11.975	16.825	15.925	14.800	31.750	28.750	26.775
T4	76.750	71.500	64.250	14.275	12.325	11.750	16.750	15.250	14.575	31.025	27.575	26.325
T5	74.500	72.000	64.000	13.150	11.775	11.150	15.425	14.400	13.950	28.575	26.175	25.100
T6	74.000	71.000	63.750	12.775	11.175	10.800	14.425	13.475	13.200	27.200	24.650	24.000
T7	77.500	71.750	64.750	12.000	11.050	10.225	13.675	13.250	12.350	25.675	24.300	22.575
T8	75.000	71.250	65.500	11.625	10.150	9.750	13.200	12.825	11.425	24.825	22.975	21.175
T9	76.500	70.750	64.750	10.950	9.925	9.175	12.425	12.325	10.975	23.375	22.250	20.150
GM	76.889	71.806	65.194	12.739	11.358	10.644	14.661	13.947	13.019	27.400	25.278	23.664
S.Em(T)	0.436			0.244			0.645			0.936		
S.Em(S)	0.252			0.141			0.372			0.541		
S.Em (TXS)	0.756			0.43			1.117			1.622		
F-Test	S			S			S			S		
C.D(T)	1.230			0.688			0.229			0.332		
C.D(S)	0.710			0.397			0.132			0.192		

Table 2: Show the Seedling fresh and dry weight

	Seedling fresh weight			Seedling dry weight			Vigour index -I			Vigour index –II		
	S0	S1	S2	S0	S1	S2	S0	S1	S2	S0	S1	S2
T0	6.270	5.540	4.970	0.643	0.603	0.570	1,589.08	1,479.60	1,239.95	47.255	41.723	35.790
T1	7.835	7.088	6.873	0.798	0.775	0.730	2,701.50	2,178.80	1,885.30	66.220	57.360	50.733
T2	7.713	6.898	6.750	0.765	0.763	0.693	2,580.00	2,148.95	1,806.80	62.168	57.000	46.780
T3	6.958	6.820	6.598	0.735	0.715	0.613	2,380.83	1,971.28	1,692.18	56.418	51.115	39.343
T4	7.648	7.048	6.120	0.755	0.743	0.625	1,786.45	1,574.05	1,303.65	56.243	53.458	40.003
T5	7.548	6.873	6.408	0.758	0.750	0.638	2,012.33	1,750.38	1,530.23	56.045	53.245	40.655
T6	6.953	6.920	6.020	0.753	0.715	0.618	1,989.15	1,743.73	1,463.10	58.325	51.298	39.958
T7	6.840	6.808	6.015	0.740	0.693	0.633	2,128.28	1,884.55	1,606.28	55.495	49.343	41.420
T8	6.913	6.438	5.725	0.733	0.685	0.615	1,861.30	1,636.60	1,385.80	56.050	48.460	39.838
GM	7.186	6.714	6.164	0.742	0.716	0.637	2,114.32	1,818.66	1,545.92	57.135	51.444	41.613
S.Em(T)	0.590			0.006			0.006			0.590		
S.Em(S)	0.340			0.004			0.004			0.340		
S.Em (TXS)	1.021			0.011			0.011			1.021		
F-Test	S			S			S			S		
C.D(T)	1.662			0.018			0.018			1.662		
C.D(S)	0.960			0.010			0.010			0.960		
C.D (TXS)	2.879			0.031			0.031			2.879		

Future Scope: The further investigation needs to conduct for the field trail in the research farm or pot culture in the green house using salt affected soils in the different region of the country as the ridge gourd variety used in this study which is widely recommended in the Uttar Pradesh state of the India.

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