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Evaluation of different organic and inorganic priming methods on seed quality parameters of Maize (*Zea mays* L.)

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Abstract
Maize (*Zea mays* L.) is an important crop in the world next to rice and wheat. Present experiment was conducted in 2021 at seed testing laboratory, Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj. Experiment was conducted to know the performance of different organic and inorganic treatments. To enhance germination, other quality parameters and nutrients availability during seedling development and to decrease the seed borne pathogens to produce quality seed in maize. The study was conducted by using comprised of various concentrations of distilled water, Ascorbic acid, Polyethylene glycol, salicylic acid, neem leaf extract, moringa leaf extract, beejamrutham, jeevamrutham and panchagavya. Seeds primed with above treatments for 12 hours. Seed priming in maize significantly enhanced the seed quality parameters compared to the untreated control. The treatment Ascorbic acid at 100 ppm for 12 hours performed well amongst the treatments and found to be promising.

Keywords: Ascorbic acid, leaf extract, maize, quality parameters, significant and treatments

Introduction
Maize (*Zea mays* L.) is an important crop in the world; it is widely used for feed and industrial raw material. Maize ranks the third in world production following wheat and rice for the area and production. Poor germination, insufficient partitioning of assimilates, lack of nutrients during seedling development and coupled with a number of seed mediated diseases were the reasons for availability of a quality seed in maize (J. Bhakth *et al.*, 2011) [1].

Seed priming is a controlled hydration technique that allows the pre-germination metabolism without actual germination, it is one of the most pragmatic and short-term approaches to combat the effects of drought and other environmental stresses on seedling emergence and stand establishment agents (Z. Hazzoumi *et al.*, 2014) [5]. So, the present study was carried to assess effect of priming with synthetics and botanicals on germination and seedling growth.

Plant growth regulators are extremely important agents and play an important role from germination up to senescence of the plant. Ascorbic acid as a seed primer improves abiotic stress tolerance in cereals (V. Ghodrat *et al.*, 2012) [4]. Salicylic acid is a signalling molecule, naturally occurs in plants and plays a major role in regulating plant growth and development. Polyethylene glycol (PEG) is one of the most prevalent treatment used as osmo-primer to enhance the seedling parameters. PEG 6000 is found to mimic drought stress and results in lowering of plants water potential due to osmotic stress (I. Muhammadh *et al.*, 2015) [6].

Organic seed priming *viz.*, *treatment* with Panchagavya, Beejamrutha, Jeevamrutha and botanicals provides resistant to high temperature and makes seed to withstand against seed borne pathogens. Bacterial isolates from panchagavya were capable of N_2-fixation, P solubilization and IAA, GA_3 production in addition to suppression of seed borne fungi *Sclerotium*. According to K.K. Bala Subramanyam *et al.*, (2019) [2] Beejamrutha is as an organic product, that possess several beneficial microorganisms mainly lactic acid bacteria, actinomycetes, photosynthetic bacteria, nitrogen fixers, yeast, phosphorus solubilizers and fungi.

Seed priming with Moringa leaf extract has been reported to effectively improve germination and seedling growth (C. Phiri *et al.*, 2010) [8]; due to the presence of zeatin that plays an important role in cell division, cell elongation, promotes the crop growth and helps to withstand adverse climatic conditions. Azardiractin is the main pesticidal component of the

neem; responsible for its extensive usage on plants because of its beneficial effects (M. Fathima *et al.*, 2014) [7].

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, Prayagraj. Laboratory experiment was carried out using Complete Randomized Design with four replication each carries 100-treated maize seeds were placed in between paper method. Lab experiment data analysis were assessed by ANOVA carried out according to procedure Completely Randomized Design (Fisher, 1936) [3].

Treatments: T_0- Control, T_1- Distilled water for 12 hrs., T_2- Ascorbiic acid at 100PPM for 12hrs., T_3-PEG at 100PPM for 12hrs., T_4-Salicylic acid at 50 PPM for 12 hrs., T_5- Neem leaf extract at 5% for 12hrs, T_6- Moringa leaf extract at 5% for 12hrs., T_7- Beejamrutha at 3% for 12hrs., T_8- Beejamrutha at 5% for 12hrs., T_9-Jeevamrutha at 3% for 12 hrs., T_{10}- Jeevamrutha at 5% for 12 hrs., T_{11}- Panchagavya at 3% for 12 hrs. and T_{12}- Panchagavya at 5% for 12 hrs.

Results and Discussions

The results from the table 1 indicates that treatment T_2 – Ascorbic acid at 100 PPM for 12 hrs. recorded maximum germination of 96% and untreated control recorded germination of 90% respectively.

Significantly, maximum seedling length of 40.89 cm with root and shoot lengths of 19.27 and 21.62cm respectively was found in treatment T_2 – Ascorbic acid at 100 PPM for 12 hrs.; T_1-Hydropriming for 12 hrs. recorded the lowest seedling length of 29.11 cm respectively.

6.42g of maximum fresh weight and 2.63g of dry wight was recorded in T_2 – Ascorbic acid at 100 ppm for 12 hrs respectively. Minimum fresh weight of 5.15g recorded in control and minimum dry weight of 1.56g found in hydropriming.

Maximum seedling vigour indices (i and ii) of 3925.23 and 252.71 were recorded in T_2 – Ascorbic acid at 100 ppm for 12 hrs. and lowest indices of 2626.91 and 144.62 were in control.

Based on results in table 1; it is evident that priming has enhanced the seed quality parameters compared to control. Hydro-priming and priming with bheejamrutha were found not so effective in enhancing seed quality since the recorded observations were so close to the control. Priming with botanicals and organics were also found effective in enhancing quality parameters as of the synthetics which we usually select as primers.

Table 1: Influence of seed priming on seed quality parameters of Maize (*Zea mays* L.)

S. No	Treatments	Germination (%)	Root length (cm)	Shoot length (cm)	Seedling length (cm)	Seedling fresh weight (g)	Seedling dry weight (g)	Seedling vigour index -i	Seedling vigour index -ii
01.	T0	90	13.85	15.335	29.185	5.150	1.608	2,626.92	144.62
02	T1	91.5	13.75	15.363	29.113	5.200	1.563	2,663.75	143.04
03.	T2	96	19.27	21.62	40.89	6.425	2.63	3,925.24	252.713
04.	T3	93.25	16.565	18.025	34.59	6.175	1.905	3,226.19	177.63
05.	T4	92.25	16.265	18.323	34.588	5.900	1.948	3,190.42	179.688
06.	T5	92.75	15.845	17.72	33.565	6.225	1.818	3,113.54	168.578
07	T6	92.75	15.8	18.228	34.028	6.100	1.88	3,155.96	174.45
08.	T7	92.25	16.393	18.653	35.045	6.150	2.125	3,233.05	196.028
09.	T8	94	18.643	20.775	39.418	6.400	2.473	3,705.14	232.48
10.	T9	92	15.033	17.488	32.52	6.125	1.925	2,992.07	177.063
11.	T10	91.5	14.995	17.455	32.45	6.200	2.068	2,968.50	189.175
12.	T11	91.5	14.693	16.915	31.608	6.175	1.943	2,892.10	177.76
13.	T_{12}	92.75	15.213	18.093	33.305	6.350	2.095	3,089.00	194.293
Grand Mean		92.5	15.87	17.99	33.86	6.04	1.99	3,137.07	185.19
F test		S	S	S	S	S	S	S	S
C.D. at 5%		2.150	0.442	0.615	0.790	0.329	0.241	105.920	23.421
SE (M)		0.749	0.154	0.214	0.275	0.115	0.084	36.889	8.157
SD (M)		1.059	0.218	0.303	0.389	0.162	0.119	52.169	11.536
C.V.		1.619	1.940	2.380	1.625	3.791	8.408	2.352	8.809

Conclusion

The overall performance of treatments based on the results obtained shows that treatment with T_2 – Ascorbic acid at 100 PPM for 12 hrs. found to be promising with maximum germination of 96.00%, 40.89 cm seedling length, dry weight of 2.63 g, 3925.23 seedling vigour index-i and 252.71 seedling vigour index-ii respectively and can be recommended for seed priming.

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