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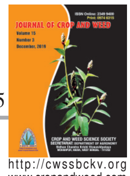

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Effect of seed priming with various micro-nutrients on seedling parameters of sponge gourd (*Luffa cylindrica*)

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ABSTRACT

The experiment was conducted in the Seed Testing Laboratory, Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology & Sciences, Naini, Prayagraj, Uttar Pradesh during 2020-2021 in Pusa Sneha variety of sponge gourd. Seeds of sponge gourd were primed with different nutrients for 12hours, after which they were dried to safe moisture content. In laboratory various germination methods i.e., between paper and sand method were adopted to study the effect of nutrient on seedling parameters i.e., germination percentage, root length, shoot length, seedling length, fresh weight of seedlings, dry weight of seedlings, vigour index I, vigour index II. The micro-nutrients used in the treatments of the sponge gourd seeds were T_1 – $ZnSO_4$ 0.1%, T_2 - $ZnSO_4$ 0.5%, T_3 – $ZnSO_4$ 1%, T_4 - $MnSO_4$ 0.1%, T_5 – $MnSO_4$ 0.5%, T_6 – $MnSO_4$ 1%, T_7 – $CuSO_4$ 0.1%, T_8 – $CuSO_4$ 0.5%, T_9- $CuSO_4$ 1%, T_{10}- $B_2(SO_4)_3$- 0.1%, T_{11}- $B_2(SO_4)_3$- 0.5%, T_{12}- $B_2(SO_4)_3$- 1% and untreated seeds kept as control were soaked in solution for 12 hrs. The highest seed germination per cent was recorded in $ZnSO_4$ 0.5%. $ZnSO_4$ 0.5% showed best result in all the quality parameters followed by $ZnSO_4$ 1%.

Keywords: Micro- nutrients, priming, $ZnSO_4$, $MnSO_4$, sponge gourd.

Plant growth as well as human health both require micro-nutrients. The most common means of micro-nutrient addition are soil and foliar sprays, however in under-developed countries, the difficulty and cost in getting fine micro-nutrient fertilizers are main challenges. Micro-nutrient seed-treatments, as priming of seeds and coating of seeds, are convenient and cost-effective options. Priming of seeds is a low-cost technique of ensuring uniform emergence and high seed vigour, resulting in improved establishment of crop and production. It is a low-cost simple procedure, in which seeds are partially wet to the stage that pre-germination metabolic activities begin without the actual germination of seeds, then re-dried to their original dry weight. Luffa sponge gourd (*Luffa cylindrica*) belongs to cucurbitaceae family with chromosome number 2n= 26. It is a tropical to-subtropical climate crop with annual climbing vine and have tendrils. Seeds are smooth, flat, white and sometimes black in colour (Okusanya,1978). This vegetable is abundant in almost all the states of India. Gilki and Turai are two of the most common names for sponge gourd. It thrives well in hot and humid environments. It is sensitive to frost and cold temperatures. It could be cultivated in various soils, however sandy loam soil is the best. When eaten, sponge gourd fruit is highly digestible and increases appetite.

Crop plants require seventeen key components for healthy growth and development. These minerals are referred to as macronutrients or micro-nutrients when they are required in relatively large levels. Micro-nutrients are just as vital as macronutrients for plant growth, even though they are required in lesser amounts. Suppression of growth or even complete inhibition may occured if soil is mineral deficient or is properly not balanced with other nutrients (Mengel *et al.,* 2001). In addition to serving as co-factors in enzyme system and participating in redox- reactions, micro-nutrients play a number of other important roles in plants. Most importantly, micro-nutrients are engaged in critical physiological activities like as respiration and photosynthesis (Marschner, 1995; Mengel *et al.,* 2001), and their deficiency can obstruct physiological processes, limiting yield gains.

In circumstances where micronutrient nutrition from the soil is insufficient, increasing plant micronutrient status would boost yield. Micronutrients can be used as foliar spray or incorporated as seed-treatments in agricultural plants. Although any of these approaches may provide the requisite amounts of micronutrients, foliar sprays have proven to be more effective in terms of yield enhancement and grain enrichment; nonetheless, their high cost has limited their adoption, particularly by resource-constrained farmers (Johnson *et al.,* 2005). Seeds can be treated with micro-nutrients by keeping them in a certain concentration of nutrient solution for a given amount of time (priming of seeds) or by coating of seeds with micronutrients. Seed-invigoration is new phrase that is practiced interchangeably for both seed-treatment approaches (Farooq *et al.,* 2009).

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Techniques for invigorating seeds, such as priming of seeds, have a significant impact on quality of seeds. Priming is a commercially viable way to amend germination of seeds and vitality. Priming of seeds is process of immersing seeds under controlled conditions in water to promote early germination, then dry the seeds back to their original moisture content (Pan and Basu, 1985). It is a type of resistance that is induced and that is critical mechanism in plants' tolerance to biotic stressors (Beckers and Conrath, 2007). Priming techniques also include accumulation of dormant signalling proteins or transcription factors, as well as the formation of epigenetic alterations that are controlled and developed quickly in response to stress, that results in more effective defence system (Bruce *et al.,* 2007). Keeping in view of the importance of seed treatments in sponge gourd, study was planned to determine the "Effect of seed priming with various micronutrients on seedling parameters of sponge gourd [*Luffa cylindrica*]" with the following objectives: 1) To decide a suitable treatment and chemical concentration on germination performance of sponge gourd seeds. 2) To edify effect of priming-treatments using micronutrients on germination performance and quality parameters of the seeds of sponge gourd.

MATERIALS AND METHODS

Seeds were soaked in nutrient solution for 12 hours after that seeds were dried to their original moisture content. Seeds were then placed in germination paper and sand for 14 days. Germination papers was placed in germination chamber at 25 ^{o}C at an angle of 45°. Then, primed-seeds were brought back to the initial moisture-per cent under the shade to access quality parameters. Later seeds were placed in between paper-method for all observations.

Germination-per cent (ISTA, 2004), Shoot-length (cm), Root-length (cm), Fresh-weight (g), Seedling-length (cm), Dry-weight (g), vigour-index I and vigour-index II (AbdulBaki and Anderson, 1973) were noted. The experimental data were then subjected to statistical-analysis for the anova, range, mean, critical difference and coefficient of variation (Fisher, 1936).

RESULTS AND DISCUSSION

All the trestments showed effective results, there was significant difference between control (un-treated seed) and primed seeds in both paper and sand methods, as mentioned in Table 1. Seedling-characters were efficiently altered by $ZnSO_4$ 0.5 percent by both the paper and sand methods.

Between paper and sand methods, the Grand Mean (GM) was higher. The larger the extent of dispersion around mean, the higher the co-efficient of variance were observed. The more precise the estimation, smaller the co-efficient of variance was recorded. In general, a co-efficient of variance (CV) of less than ten was regarded good. From above conditions, it is clear that between paper method showed much better result than sand method.

Among all the treatments as T_0- Control, T_1- $ZnSO_4$ - 0.1%, T_2- $ZnSO_4$ - 0.5%,T_3- $ZnSO_4$ – 1%, T_4- $MnSO_4$ - 0.1%, T_5- $MnSO_4$-0.5%, T_6- $MnSO_4$ - 1%, T_7- $CuSO_4$ - 0.1%,T_8- $CuSO_4$ – 0.5%, T_9- $CuSO_4$ - 1%, T_{10}- B2(SO_4)3 – 0.1%, T_{11}- B2(SO_4)3 – 0.5%, T_{12}- B2(SO_4)3 – 1% , third treatment as T_2 – $ZnSO_4$- 0.5% was found suitable for seed quality parameters, by using two different germination methods as paper and sand method with soaking of seeds for 12 hrs.

The study showed that seed priming with micronutrients significantly affected seed germination per cent in lab conditions with 82% (BP) and 80 % (SM) treatment with $ZnSO_4$, while seed treatment with $MnSO_4$ was found at par with 79% (BP) and 76% (SM) where, as minimum was found in control.

However, Zn and $MnSO_4$ showed the best results among various treatments with paper and sand method. $ZnSO_4$ was at par with $MnSO_4$.

Table 1: ANOVA for vigour-characters in sponge gourd

MEAN SUM OF SQUARES				
Characters	**Paper method**		**Sand method**	
	Treatment (df=12)	Error (df=39)	Treatment (df=8)	Error (df=27)
Germination per cent	65.167*	1.590	67.917*	1.564
Root-length (cm)	2.569*	0.272	4.804*	0.290
Shoot-length (cm)	2.863*	0.343	4.736*	0.194
Seedling-length (cm)	9.818*	0.457	16.724*	0.309
Fresh-weight (g)	3.309*	0.554	1.692*	0.179
Dry-weight (g)	2.313*	0.072	0.575*	0.060
Seed Vigour index I	156765.435*	3492.111	200028.691*	2740.683
Seed Vigour index II	20449.660*	495.004	6328.096*	375.496

*Significant at 5% level of significance

Table 3.1: Analysis of variance for seedling traits of sponge gourd seeds for between paper method

Treatment	Germination %	Root length	Shoot length	Seedling length	Fresh weight	Dry weight	Vigour index I	Vigour index II
1	70.25	9.125	8.725	17.85	5.825	0.390	1,252	27.39
2	81.5	11.175	11.025	22.2	7.938	0.440	1,809	35.86
3	83.75	12	11.5	23.5	9.385	0.663	1,968	55.52
4	82.25	11.35	11.225	22.575	8.283	0.465	1,856	38.24
5	78.75	11.025	9.85	20.875	7.385	0.595	1,643	46.85
6	79.75	9.975	9.275	19.25	7.278	0.390	1,536	31.10
7	77.25	9.803	10.185	19.988	7.5	0.634	1,544	48.97
8	76.75	10.275	10.17	20.445	7.548	0.559	1,569	42.90
9	75.25	10.14	9.325	19.465	6.575	0.505	1,465	38
10	75	9.55	10.15	19.7	7.15	0.646	1,477	48.45
11	72.5	10.195	10.125	20.32	6.45	0.650	1,473	47.12
12	73.5	10.35	9.55	19.9	7.175	0.613	1,462	45.05
13	74.5	9.9	9.075	18.975	8.247	0.465	1,413	34.64
G. Mean	77	10.37	10.01	20.38	7.44	0.540	1574	41.54
C.D.	1.81	0.749	0.841	0.971	1.068	0.384	84.839	31.941
SE(m)	0.63	0.261	0.293	0.338	0.372	0.134	29.547	11.124
SE(d)	0.892	0.369	0.414	0.478	0.526	0.189	41.786	15.732
C.V.	1.637	5.028	5.849	3.317	10	7.252	3.752	7.767

Table 3.2: Analysis of variance for seedling traits of sponge gourd seeds for sand method

Treatment	Germination (%)	Root length	Shoot length	Seedling length	Fresh weight	Dry weight	Vigour index I	Vigour index II
1	73	8.3	7.4	15.7	5.815	0.320	998	22.16
2	80.75	10.5	9.4	19.9	7.33	0.370	1,607	29.88
3	83	11.3	10.72	22.02	8.563	0.593	1,827	49.22
4	81.5	10.82	10.1	20.92	7.348	0.395	1,705	32.19
5	77.75	9.41	8.16	17.57	7.045	0.525	1,366	40.82
6	78.5	8.79	7.4	16.18	6.79	0.320	1,270	25.12
7	76	8.44	8.378	16.82	7.078	0.564	1,278	42.86
8	75.5	8.83	8.27	17.10	7.025	0.489	1,291	36.92
9	74.25	9.97	7.6	17.57	6.255	0.435	1,305	32.30
10	74.25	9.37	7.45	16.82	6.45	0.576	1,249	42.77
11	71.25	10.1	8.05	18.15	6.75	0.580	1,293	41.33
12	72.75	9.32	7.8	17.12	7.195	0.543	1,243	39.50
13	73.25	8.37	8.4	16.77	6.95	0.395	1,228	28.93
Total Mean	76	9.43	8.36	17.80	6.96	0.470	1359.01	35.69
C.D.	1.795	0.773	0.632	0.798	0.608	0.352	75.159	27.82
SE(m)	0.625	0.269	0.22	0.278	0.212	0.123	26.176	9.689
SE(d)	0.884	0.381	0.311	0.393	0.299	0.174	37.018	13.702
C.V.	1.646	5.708	5.263	3.121	6.078	7.742	3.852	8.01

An identical research was reported by Babaeva *et al.* (1999), who found that priming the *Echinacea purpurea* (L.) seed with 0.05 per cent of $ZnSO_4$ solution improved germination percent and the field emergence by 38% and 41%. Priming seeds with Zn considerably enhanced yield and associated parameters in *Phaseolus vulgaris* L. (Kaya *et al*., 2007). Priming seeds with Zn boosted germination and seedling development in drought-stressed barley (*Hordeum vulgare* L.) and increased water use efficiency by 44% (Ajouri *et al*., 2004).

CONCLUSION

In lab conditions, the non-identical priming treatments resulted in considerable improvements in germination and vigour in sponge gourd seeds. $ZnSO_4$ (0.5%) was shown to significantly boost germination and vigour in sponge gourd seeds in both traits when compared to the paper method and the sand approach. In comparison to the control, soaking sponge gourd seeds for 12 hours increased germinability and vigour. So, by inducing a range of biochemical, physiological, molecular, and sub-cellular changes in plants, seed-priming is a simple and effective method for improving stand establishment, economic yields, and tolerance to biotic and abiotic challenges in a variety of crops.

REFERENCES

Abdul Baki, A.A. and Anderson J. D. 2012. Vigor determination in soybean seed by multiple criteria 1. *Crop Sci.,* **13**(6): 630-633.

Ajouri, A., Asgedom, H. and Becker, M. 2004. Seed priming enhances germination and seedling growth of barley under conditions of P and Zn deficiency. *J. Pl. Nutri. Soil Sci.,* **167** (5):630-636.

Babaeva E.Y., Volobueva V.F., Yagodin B.A. and Klimakhin, G.I. 1999. Sowing quality and productivity of *Echinacea purpurea* in relation to soaking the seed in manganese and zinc solutions. *Izvestiya Timiryazevskoi Sel'skokhozyaistvennoi Akademii*. **4**, 73-80.

Farooq, M., Basra, S.M.A., Wahid, A., Khaliq, A. and Kobayashi, N. 2020. Rice seed invigoration. In: E. Lichtfouse (ed*.). Sust. Agric. Rev.,* 137-175*. Springer*, the Netherlands.

ISTA 2004. Rules amendments. Seed Science Technology, 29, supplement 2: 132.

Kaya, M., Atak, M., Khawar, K.M., Çiftçi, C.Y. and Özcan, S. 2007. Effect of pre-sowing seed treatment with zinc and foliar spray of humic acids on yield of common bean (*Phaseolus vulgaris* L.). *Int. J. Agric. Biol.,***7:**875-878.

Okusanya, O.T. 2008. The effects of light and temperature on germination and growth of *Luffa aegyptiaca*. *Physiology of Plants,* **44:**429-433.