Eco. Env. & Cons. 28 (May Suppl. Issue) : 2022; pp. (S115-S119)
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ISSN 0971–765X

DOI No.: http://doi.org/10.53550/EEC.2022.v28i03s.014

Pre-sowing Seed Treatments of Magnetic field, Electric field and Chemicals on Seedling Characters of Okra (*Abhelomoschus esculentus*) variety- Super green

Atluri Haripriya[1]*, Prashant Kumar Rai [1] and Prashant Ankur Jain[3]

[1,2] Department of Genetics and Plant Breeding,
[3]Department of Computational Biology and Bioinformatics,
Sam Higginbottom University of Agriculture Technology and Sciences, Naini Agriculture Institute, SHUATS, Prayagraj 211 007, U.P, India

(Received 28 August, 2021; Accepted 9 October, 2021)

ABSTRACT

The experiment was conducted in post graduate Seed Testing Laboratory Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P) during Rabi season 2020-2021, in order to standardize the suitable Pre-sowing seed treatment for Okra (VNR-Super Green). Different Pre-sowing seed treatments viz., T0-Control (Untreated), T_1- Magnetic Field @ 100mt -15 Minutes, T_2- Magnetic Field @200mt- 20 Minutes, T_3- Electric Field @250mA-10 minutes, T_4- Electricfield@300mA-15 minutes,T_5-Nacl@0.2% -12 hours, T_6 Nacl @0.3%-14hours, T_7- $Mgso_4$@0.3% for 4 hours, T_8- $Mgso_4$@0.4%-8 hours, T_9-zno @0.2%-6 hours, T_{10} Zno@0.4%-12 hours, T_{11}- Ascorbic acid@0.3%-6 hours, T_{12}-Ascorbic acid @0.3%-8 hours. It was found that all the Pre-sowing seed treatments recorded the significant difference with that of control. In lab condition highest germination percentage, shoot length, root length, seedling length, fresh weight, dry weight, seed vigour index-I, seed vigour index-II was found in T_3-Electric @250mA-10 minutes. Pre-sowing seed treatment with electric @ 250mA-10 minutes followed by T_{12}@0.3%-8 hours, Nacl@0.2%-12 hours significantly increased the germination percentage, shoot length, root length, seedling length, seed vigour index-I, seed vigour index-II of Okra seeds and found to be lowest in control seeds. Pre-sowing seed treatment leads to a physiological condition that allows the seed to germinate more effectively and no costly equipment and chemical requirements could be used. Hence it is a simple method for overcoming weak germination and seedling establishment and helps to preserve agriculture and economical, non-toxic, eco-friendly sources.

Key words : *Okra seeds, Electric field, Ascorbic acid, Nacl, Germination.*

Introduction

Okra (*Abelmoschus esculentus*) commonly known as lady's finger or bhendi. Okra is often cross-pollinated crop and having chromosome number 2n=130. Okra belongs to the family Malvaceae. It was originated in the tropical and subtropical areas of South Africa and Asia. It is a heat and drought tolerant crop. The crop is grown in both spring-summer (February-May) and rainy seasons in tropical

([1]Assistant Prof., [2]Assistant Prof., [3]Assistant Prof.)

and subtropical regions of the country. Okra occupies major position among fruit vegetables due to its high nutritive and medicinal values, growing in all seasons, wider adoptability, easy cultivation (Reddy *et al.,* 2013). In India, the second largest producer of Okra after china, it occupies an area of 4.98 lakh hectares with average production and productivity of 57.48 lakh tonnes and 11.75t/ha , respectively, and is 3.8% of total vegetable production (Vanitha *et al.,* 2013), Composition of Okra per 100 g edible pods is water 88.6 g, energy 36 Kcal, Protein 2.10 g, carbohydrates 8.20 g, fiber 1.70 g, fat 0.20g, Ca 84 mg, P 90 mg, Fe 1.20 mg, riboflavin 0.08 mg, thiamine 0.04 mg, niacin 0.60 mg, ascorbic acid 47mg (Gopalan *et al.,* 2007). Okra is an annual crop propagated from seed, grown for its green tender fruits, which are cooked and consumed as a vegetable purpose in a variety of ways (***chattopadhyay*** *et al.*, 2011). Seed is the important basic input in agriculture and quality seed is very important in crop establishment too Okra requires a long, warm and humid growing period. It can be successfully grown in hot humid areas. It is sensitive to frost and extremely low temperatures. For normal growth and development, a temperature between 24 and 28 °C is preferred. For seed germination optimum soil moisture pH range from 6 to 6.8 and temperature between 25 and 35 °C is needed with fastest germination observed at 35 °C. Beyond this range the germination will be delayed and weak seeds may not even germinate.

Pre-sowing treatments of their seeds for ensuring their earlier, successful germination, This will help people to minimize their production cost of seedlings on a broad scale. A considerable body of evidence suggests that Pre-sowing treatments strongly enhance the germination process (Hossain *et al.,* 2005). Seed priming enhances seed performance by rapid and uniform germination, normal and vigorous seedlings in different crops which have practical agronomic implications, notably under adverse germination conditions (Cantliffe, 2003). It permits seedling development in a wide range of agro-climatic conditions and decreases sensitivity to external factors (Ashraf and Foolad, 2005).

Materials and Methods

The present investigation was carried out at the laboratory of Seed Science and Technology in the department of Genetics and Plant Breeding, Prayagraj School of Agriculture, Sam Higginbottom University of Agriculture, Technology and Sciences (UP). Lab experiment was laid down using Completely Randomized Design in four replications. After cleaning and grading of Okra seeds variety VNR-Super Green were treated with different priming treatments with distilled water (T_0), Magnetic field@100mT-15minutes [T_1], Magnetic field@200mT-20 minutes [T_2], Electric field@250mA-10 minutes [T_3], Electric field @300mA-15 minutes [T_4], Nacl@0.2%-12hours [T_5], Nacl@0.3%-14hours [T_6], $Mgso_4$@0.3%-4hours [T_7], $Mgso_4$@0.4%-8hours [T_8], zno@0.2%-6hours[T_9], zno@0.4%-12hours[T10], Ascorbic acid@0.3%-6hours[T_{11}], Ascorbic acid@0.3%-8hours[T_{12}]. Germination percentage, shoot length, Root length, Seedling length, Fresh weight, Dry weight, seed vigour index-I, Seed vigour index-II was observed.

Results and Discussion

It is evident from the present investigation that different types of priming methods had positive effects on the seedling characters of Okra seeds. In general, most of the Pre-sowing Seed treatments were found effective in increasing the germination percentage at all stages significantly as compared to Control. The data performed in the (Table 1) shows the mean Performance of 13 treatments for 8 parameters of Okra crop.

Germination Percentage

In case of different Pre-sowing Seed treatments, germination percentage was found to significantly higher in Electric field @ 250 mA-10 minutes (90.5%), followed by Ascorbic acid @0.3% - 8hours (89%) and Magnetic field @100 mT-10 minutes (88.5%) when compared to control (distilled water) (72%). The data regarding the germination percentage found best in Electric field @250 mA-10 minutes among all the treatments. These similar results of germination percentage were observed by Podlenis, (2004); Lynikeine *et al.,* (2006); Gracia *et al.,* (2001) and De souza *et al* (2006).

Shoot length

In case of different Pre-sowing Seed treatments of seed length was to be highest in Electric field @ 250 mA- 10 minutes (11.56 cm), followed by Ascorbic acid @ 0.3% - 8 hours (11.46 cm) and Nacl @ 0.3% - 12 hours (10.65 cm) when compared with the Con-

trol (unprimed seeds) (7.37cm). When the data regarding the shoot length found best in Electric field @ 250mA-10 minutes among all the treatments. These similar results was observed by Rafique *et al.,* (2011); Aladjadjiyan (2002); Afzal (2009).

Root length

In case of different Pre-sowing seed treatments, Root length was found to be significantly higher in Electric field @ 250 mA -10 minutes (9.57cm), followed by Ascorbic acid @0.3% 8 hours (9.15 cm) and Nacl @0.3% (8.91) when compared to the unprimed seeds (6.42 cm). The data regarding the root length found to be best in Electric field@ 250 mA -10 minutes among all the treatments (9.57cm). The similar results was observed by Cantliffe (2003); Souza *et al.,* (2006).

Seedling length

In case of different Pre-sowing Seed treatments, Seedling length was found to be significantly higher in Electric field @ 250 mA-10 minutes (23.37cm), followed by Ascorbic acid @ 0.3% -8 hours (22.45 cm) and Magnetic field @100 m T - 15 minutes (21.55 cm), when compared to the Control (unprimed seeds) (15.16 cm). The data regarding to the seedling length found best in Electric field @ 250 mA-10 minutes (23.37 cm). Similar results were observed by Soltani *et al.,* (2006); Sivritepe *et al.,* (2003); Iqbal (2016).

Fresh weight

In case of different Pre-sowing Seed treatments, Fresh weight was found significantly higher in Electric field @250 m A-10 minutes (5.47g), followed by the Ascorbic acid @ 0.3% - 8hours (5.43 g) and Ascorbic acid @ 0.3% - 6 hours (5.35 g), when compared to the control (unprimed seeds) (4.27g). The data regarding to the fresh weight found best in Electric field @250 mA-10 minutes (5.47g). The similar results was observed by Kursinga Mamatha *et al.* (2019); Afzal (2006).

Dry weight

Dry weight recorded high in case of primed seeds compared to unprimed seeds in this experiment. Among all different Pre-sowing seed treatments, Electric field@250mA-10minutes (0.832g) and control found to be lowest (0.122g) among all treatments. The similar results was observed by Waleed *et al.,* (2013); Ameer (2010); Iqbal (2011).

Table 1. Mean Performance of seedling characters of Okra

Treatment		Germination (%)	Shoot length (cm)	Root length (cm)	Seedling length (cm)	Fresh weight (g)	Dry weight (g)	Vigour index- I	Vigour index- II
1.	T	72	7.37	6.42	15.16	4.27	0.122	1097.13	8.69
2.	T	88.5	10.63	7.64	21.55	5.10	0.142	1912.38	12.61
3.	T	83.5	8.68	7.12	18.67	4.88	0.135	1563.02	11.27
4.	T	90.5	11.56	9.57	23.37	5.47	0.832	2114.44	75.44
5.	T	85.5	10.59	7.91	21.04	4.83	0.142	1793.42	12.39
6.	T	88.5	10.65	8.91	21.21	4.59	0.162	1878.56	14.4
7.	T	76.5	10.33	7.40	20.07	4.52	0.162	1533.01	12.7
8	T	83	9.44	7.74	19.15	4.69	0.232	15841.2	19.06
9.	T	84	9.33	8.77	19.10	4.67	0.29	1604.66	24.34
10	T	87	9.45	7.67	18.95	5.09	0.3025	1647.25	26.31
11	T	87.5	9.47	7.18	17.51	4.62	0.285	1533.83	24.485
12	T	86	9.08	7.51	17.54	5.35	0.272	1508.33	23.53
13	T_{12}	89	11.46	9.15	22.45	5.43	0.375	1992.16	33.37
Grand mean		84.73	11.75	7.92	19.67	4.93	0.28	1674.03	22.97
SE(m)		2.988	0.606	0.611	0.8459	0.2827	0.039	088.53	4.68
CV		7.05	10.321	15.43	8.597	11.45	28.316	7.0534	40.755
C.D at (5%)		8.547	1.734	1.749	2.419	0.808	0.1136	253.27	13.38

Legends: T_0 - Control, T_2 - Magnetic field @ 100mT -15 minutes, T_1- Magnetic field @ 200mT - 20 minutes, T_3- Electric field @ 250mA - 10 minutes, T_4- Electric field @ 300mA - 15 minutes, T_5- Nacl @ 2% - 12hours, T_6- Nacl @ 3% - 14 hours, T7- $Mgso_4$ @ 3% - 4hours, T_8- $Mgso_4$ @ 4% - 8 hours, T_9- zno @ 2% - 6 hours, T_{10} -zno @ 4% -12 hours, T_{11}- Ascorbic acid @ 3% - 6 hours, T_{12}- Ascorbic acid @ 3% - 8 hours.

Seed vigour index-I

Seed vigour index-I recorded high in case of primed seeds compared to the unprimed seeds in this experiment. Among all different Pre-sowing seed treatments, Electric field @250 mA-10minutes recored highest seed vigour index-I (2114.44), followed by Ascorbic acid @ 0.3%-8 hours (1992.16) and Magnetic field @100 mT-15minutes (1912.38). Seed vigour index-I found best in Electric field @250 mA-10 minutes (2114.44) compared to the control. The similar results was observed by Amjad *et al.*, (2015); Kordas (2002)

Seed vigour index-II

In case of different Pre-sowing Seed treatment, Seed vigour index-II was found significantly higher in Electric field @250 mA-10 minutes (75.44), followed by Ascorbic acid @0.3%-8 hours (33.375) and zno @0.2% -6 hours (26.31). The data regarding the seed vigour index-II found best in Electric field @250 mA-10 minutes among all the treatments. This similar results was observed by Khan *et al.,* (2009); Iqbal (2016); Priscy *et al.,* (2019); Yashwant Krishna (2017).

Conclusion

The overall performance of Pre-sowing seed treatments under study judged on the basis of positive results obtaining indicate that, Electric field @ 250 mA-10 minutes had shown supervisor performance with respect seedling characters under agro-climatic conditions of prayagraj region, found to be vigorous among the 13 Pre-sowing seed treatments with high seed vigour indices. Similarly the Ascorbic acid @0.3%-8 hours performance of at par. Hence Electric field and Ascorbic acid are the suitable Pre-sowing seed treatments for Okra in prayagraj region.

Further Research

The further investigation needs to conduct for the confirmation of the promising Pre-sowing seed treatments for prayagraj. The treatments Electric field @250 mA-10 minutes where found most promising for commercial cultivation in prayagraj agro-climatic conditions.

Acknowledgement

I express gratitude to my Advisor Dr. Prashant Kumar Rai and all faculty members of Department of Genetics and Plant Breeding for constant support and guidance to carry out the whole experimental research study.

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