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Pre Sowing Seed Treatments of Panchagavya, Magnetic, Electric and Temperature on Growth, Yield, Yield Attributing Traits and Seedling Characters of Tomato (*Solanum lycopersicon* L.) Variety-Arka Vikas

Venna Vijay Bhaskar Reddy*, Prashant Kumar Rai, E. Krishna Reddy,
Sura Venkata Nirmal Hruday and M. Raghavanjaneyulu

Department of Genetics and Plant Breeding, Naini Agricultural Institute, Sam Higginbottom
University of Agriculture Technology and Sciences, Prayagraj, UP-211007, India

*Corresponding author

ABSTRACT

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In the present investigation 13 priming treatments including control on tomato seed variety Arka Vikas (selection 22) were used to study under Post Graduate Laboratory and Field Experimentation center during Rabi, 2019-20. Post Graduate Laboratory and Field Experimentation center was laid out in Completely Randomized Design (CRD) and Randomized Block Design (RBD) with four and three replications respectively during Rabi 2019-20. Analysis for the data in laboratory and field experiment revealed significance mean sum of squares due to seed priming treatments for all the characters under study. Maximum germination %, Root length, Shoot length, shoot length, root length, Seedling length (cm) Seedling fresh weight (g), Seedling dry weight (g), Seedling vigor index-I, Seedling vigor index-II was recorded in T₅- Magnetic field (150mT) for 10Min. Minimum days to flower initiation and minimum days to maturity was recorded in T₅. Maximum plant height at 30 DAS (cm), 60 DAS (cm) and 90DAS (cm) and Number of primary branches per plant was recorded in T₅. Days to first fruit set was minimum in T₅. Maximum Number of fruits per plant, fruit weight (g) was recorded in T₅. Number of seeds per fruit was also maximum in T₅-Magnetic field. Seed yield is also high in T₅ of Magnetic field and followed by T₈. Electric field 150mA for 1 min followed by T₉ Panchagavya 3% foliar spray for 10 days after transplanting.

Introduction

Tomato is a rich source of vitamin A, C and minerals like Ca, P and Fe (Dhaliwal *et al.*, 2003). It also plays a pivotal role in improving nutrition resource's of poor population as

compared to meat, milk, fruits and other high priced fruit items Tomatoes are major contributors of antioxidants such as carotenoids (especially, lycopene and B-carotene), phenolics, ascorbic acid (vitamin C) and small amounts of vitamin E in daily diets

(Rai *et al.*, 2012). Tomato (*Solanum lycopersicon*) is the most important member of the family Solanaceae. It is native of south America having chromosome number $2n=24$. It is an herbaceous annual which sexually propagated by seed. Plants are dicot and grow as a series of branching stem, with terminal bud at the tip. Veins are typically covered with fine short hairs, most plants have compound leaves which are long, odd-pinnate, with 5 to 9 leaflets on petioles. Yellow coloured flowers appearing on the apical meristem have the anthers fused along edges, forming a column surrounding pistil is style. The tomato is classified as berry.

Tomato is commonly called a “poor man’s apple”. It has a good source of vitamin A and C (Buckseth, 2012). Among the main advantage of application on magnetic field on seeds this method has greater faculty of multiplication with a minimal risk to damage, when compare to manipulating tissue of leaves, roots or stems. One of the main reasons why the seeds treated with magnetic field has spread worldwide lies in positive impact that has on recovery of seed exhibiting a poor quality for certain vegetables species.

Materials and Methods

The field and lab experiments were conducted during Rabi season 2019-2020. Department of Genetics and plant breeding, Naini Agriculture Institute SHUATS, Prayagraj, (UP).

The statistical designs applied were carried out with Randomized Block Design (RBD) with 13 treatments and 3 replications and Complete Randomized Design (CRD) with 13 treatments and 4 replications. Seed material consists of Tomato variety Arka Vikas. The treatments were represented a To-control, T₁-magnetic field-100Mt for 1min T₂-magnetic field-100Mt for 5min T₃-magnetic field-100Mt for 10min T₄-magnetic field-150Mt for

1min T₅-magnetic field-150Mt for 10min T₆-electric field-100Ma for 1min T₇-Electric field-125Ma for 1min T₈-Electric field-150 Ma for 1min T₉-Panchagavya-3% foliar spray -10 DAT T₁₀-panchagavya-3%foliar spray-15DAT T₁₁-hot water treatment -15° C for 10min T₁₂-Hot water treatment-30^{0c} for 15 min.

Electric treatment

The treatment involves treating seeds with sodium chloride and electric conductivity meter of conducting AC current which includes battery eliminator of 2Amp, Amphi meter of (-ve) and (+ve) charges and rheostat of 1.8amp or 50 ohms current supplier. This involves treating seeds with electric conductivity for certain period of time and followed by air drying. The electric field effects on the transport and metabolism of ions and electrons.

Magnetic treatment

An electromagnetic field generator “Testron EM-20” with variable static magnetic field (SMF) strength (50 to 500 mT) with a gap of 5 cm between pole pieces was fabricated. A D.C. power supply (80V/10A) with continuously variable output current was used for the electromagnet.

A digital gauss meter model DGM-30 operating on the principle of Hall Effect monitored the field strength produced in the pole gap. The probe is made of Indium arsenide crystal and is encapsulated to a non-magnetic sheet of 5 mm x 4 mm x 1 mm and could measure 0-2 Tesla with full-scale range in increments of 5 MT.

By regulating the current in the coils, desired strength of SMF was monitored, which was measured by a Gauss meter. This involves treating seeds with magnetic field for certain period of time.

Panchagavya preparation

Fresh cow dung-5kg, Cow urine-3lit, Cow milk-2lit, Cow curd-2lit, Cow ghee -1/2kg, Jaggery-500gms/3lit of water, Coconut water-3lit, Banana-12, Grape juice -2lit. The contents were stirred by twice a day about 20min both in the morning and evening to facilitate aerobic microbial activity. After 15 days of incubation, preparation of Panchagavya solution made into different concentration for treating the seeds.

Results and Discussion

In different seed priming treatments T₅-Magnetic field 150mT for 10 minutes has performed the best results when compared to all the other priming treatments and the least results were showed by control. The T₅-Magnetic field-150mT for 10 minutes performed the best results in the field parameters *i.e.*, days to flower initiation (41.66) days to 50% flowering (47.67), Days to fruit set (56.667), plant height 30DAS (31.63 cm), plant height 60DAS (56.63 cm), plant height 90DAS (76.63 cm), number of branches per plant (18), days to maturity (72.67), number of fruits per plant (21), fruit weight (46.67g), number of seed per fruit (176.67), seed yield per plant (15.12g), seed yield per plot (113.4g) and the seed quality parameters *i.e.*, germination percentage (88.50), root length (5.90), shoot length (8.00), seedling length (13.9), seedling fresh weight (6.67), seedling dry weight (5.95), seedling vigour index (12031.5), seedling vigour index-II (840.7). and it was followed by T₈-electric field-150 mA @1 min the field parameters

i.e., days to flower initiation (42.33), days to 50% flowering (48.67), Days to fruit set (58.67), plant height 30DAS (29.83 cm), plant height 60DAS (54.83 cm), plant height 90DAS (74.83 cm), number of branches per plant (16.67), days to maturity (84), number of fruits per plant (20.00), fruit weight (43.67g), number of seed per fruit (149.33), seed yield per plant (13.95g), seed yield per plot (100.45g) and the seed quality parameters *i.e.*, germination percentage (82.50), root length (5.80), shoot length (7.85), seedling length (13.65), seedling fresh weight (6.42), seedling dry weight (2.92), seedling vigour index-I (11261.25), seedling vigour index-II (759.0).

It is concluded from the present investigation of seed treatments with different pre-sowing treatments, Magnetic treatment T₅- (150mT) @ (10Min) significantly increased the characters studied in laboratory as well as field experiment. In the different pre-sowing treatments magnetic treatment T₅- (150mT) @ (10Min) performed the best results in seedling characters like germination percentage (%), shoot length, root length, seedling length, fresh weight, dry weight, seedling vigour index I and II and growth and yield characters like days to flower initiation, days to 50% flowering, plant height, number of primary branches per plant, days to maturity, number of fruits per plant, fruit weight, seed yield and it was followed by T₈- electric field (150mA- 1min). Thus, application of magnetic field with (150 mT) @ (10Min) may be useful for improving growth, plant height and number of seed per fruit and fruit weight in case of tomato (Table 1 and 2).

Table.1 Mean performance of seedling characters of tomato

Treatments	Germination%	Root length (cm)	Shoot length (cm)	Seedling length (cm)	Fresh weight (g)	Dry weight (g)	Vigour index-I	Vigour Index-II
T0	74.00	4.15	5.00	9.15	2.15	2.05	6771	481.0
T1	85.00	5.03	6.33	11.35	3.16	3.67	9647.5	569.5
T2	86.00	5.15	7.00	12.15	4.20	4.70	10449	602.5
T3	79.50	5.20	7.10	12.3	3.23	2.79	9778.5	628.0
T4	87.50	5.30	7.30	12.6	2.25	3.72	11025	630.0
T5	88.50	5.90	8.00	13.9	6.67	5.95	12031.5	840.7
T6	78.00	5.38	7.35	12.73	4.30	4.83	9929.4	647.4
T7	81.50	5.45	7.50	12.95	5.33	3.83	10554.2	676.4
T8	82.50	5.80	7.85	13.65	6.42	2.92	11261.2	759.0
T9	79.00	4.33	6.40	10.73	4.35	4.85	8476.7	671.5
T10	82.00	4.70	7.15	11.85	3.25	3.76	9717	623.2
T11	81.50	4.70	6.30	11.00	4.16	3.66	8965	537.9
T12	80.50	4.80	7.55	12.35	5.15	4.66	9941.75	531.3
Minimum	74.0	4.15	5.00	9.15	2.15	2.65	6771	481.0
Maximum	88.50	5.90	8.00	13.90	6.67	6.95	12301.5	840.7
GM	81.96	5.07	6.99	12.05	4.196	3.994	11964.1	687.9
S.EM+	1.83	0.292	0.329	0.442	0.094	0.047	94.675	1.479
CD	2.59	0.835	0.943	1.262	0.267	0.136	271.842	4.264
CV	5.26	11.52	9.43	7.33	14.65	12.35	16.01	10.30

Table.2 Mean performance of growth and yield attributing traits of Tomato

Treatments	Days to flower Initiation	DF50	Days to first fruit set	PH (cm) at 30 DAS	PH (cm) at 60 DAS	PH (cm) at 90 DAS	NBPP	DM	NFPP	Fruit weight (g)	No .of seeds per fruit	Seed yield per plant (g)	Seed yield per plot (g)
T0	45.67	52.00	62.00	23.63	48.63	68.63	11.33	94.67	16.00	35.33	136.67	6.55	39.96
T1	45.33	51.33	61.33	23.33	48.33	68.33	13.00	85.67	17.33	36.00	169.33	8.27	53.92
T2	44.67	49.33	59.33	24.17	49.17	69.17	14.33	81.67	17.67	36.33	153.33	9.39	67.6
T3	43.67	48.67	58.67	30.67	55.67	75.67	14.33	83.33	19.33	37.67	149.33	10.74	74.94
T4	43.00	49.00	59.00	31.20	56.20	76.20	15.33	87.67	19.67	44.33	136.67	11.49	77.19
T5	41.67	47.67	57.67	31.63	56.63	76.63	18.00	72.67	21.00	46.67	176.67	15.12	113.4
T6	43.67	49.00	59.00	27.67	52.67	72.67	14.67	96	19.67	38.07	160.67	9.07	58.05
T7	42.33	48.33	58.33	27.67	52.67	72.67	16.67	84.67	19.67	39.67	160.67	12.89	82.48
T8	42.33	48.67	58.67	29.83	54.83	74.83	16.67	84	20.00	43.67	149.33	13.95	100.45
T9	43.67	50.67	60.67	24.33	49.33	69.33	14.33	94.33	17.33	40.67	166.67	10.99	69.93
T10	43.00	50.33	60.33	29.00	54.00	74.00	12.33	86.67	16.33	36.67	163.33	9.63	61.23
T11	43.00	50.00	60.00	28.33	53.33	73.33	14.00	94.67	19.00	31.67	142.67	7.9	49.64
T12	43.00	50.33	60.33	29.00	54.00	74.00	13.33	86.33	17.67	35.67	152.00	8.61	53.57
Minimum	41.67	47.67	57.67	23.33	48.33	68.33	11.33	72.67	16.00	31.67	136.67.	6.55	39.96
Maximum	45.67	52.00	62.00	31.63	56.63	76.63	18.00	96.00	21.00	46.67	176.67	15.12	113.4
GM	43.46	49.64	59.64	27.73	52.73	72.73	14.49	87.1	18.51	38.65	156.72	10.35	69.41
S.Em	0.49	0.79	0.79	0.9	0.9	0.9	0.74	1.63	0.86	1.91	7.74	0.13	0.84
CD (5%)	1.43	2.31	2.31	2.63	2.63	2.63	2.16	4.76	2.51	5.57	22.59	0.38	2.54
CV	1.97	2.75	2.28	5.6	2.95	2.14	8.89	3.24	8.08	8.54	8.55	2.16	2.16

References

- AnanthaVashisth, Ravender Singh and D.K. Joshi. (2013) Effect of magnetic field on germination and seedling attributes in tomato (*Solanum lycopersicum*). *Journal of Agricultural Physics*, ISSN 0973-032X Vol. 13(2): 182-185.
- Buckseth, T., Sharma, M.K. and Thakur, K.S. (2012). Genetic diversity and path analysis in tomato (*Solanum lycopersicum* L.). *Vegetable Science* 39 (2): 221-223.
- Cakmak, T., Dumlupinar, R. and Erdal, S. (2010). Acceleration of germination and early growth of wheat and bean seedlings grown under various magnetic field and osmotic conditions. *Bioelectromagnetics*. 31: 120-129.
- Dhaliwal, M.S., S. Singh and Cheema, D.S. 2003. *Line –Tester analysis for yield and processing attributes in Tomato*. *J. Res.*, 40(1): 49-53.
- Girish, Yadav S.K, Lal S.K, Jain S.K., (2011) Static magnetic field treatment enhances seed performance in cotton (*Gossypium hirsutum* L.). *Seed Res.*, 39 (2): 272-281.
- Hozayn M, Animal A.A EL-Mahdy and Abdel-Rahman H.M.H (2015) Effect of magnetic field on germination, seedling growth and cytogenetic of onion (*Allium cepa* L.) *African Journal of African Research*. 10 (8): 849-857.
- Kumar, R.S. Ganesh, P., Tharmaraj, K., and Saranraj, P. 2011. Growth and development of black gram (*Vigna mungo*) under foliar application of

- panchagavya as organic source of nutrient. *Current Botany*, 2 (3): 09-11. *sciences*, 22 (1): 231-232.
- Majid, A.S., Latifeh, P. and Nafiseh, A. 2013 Magnetic field effects on seed germination and activities of some enzymes in cumin. *Life Sci. J.*, 10(1): 323- 328.
- Mamatha, PK Rai and Saritha Khandka (2019) Comparative Study of Magnetic, Electric and Botanical Seed treatment on Seedling Characters of Desi and Kabuli Chickpea (*Cicer arietinum* L.) seeds. *Int.J.Curr.Microbiol.App.Sci.* Vol. 8 (8): 998-1003
- Nilimesh Mridha, and Shanti Nagarajan (2014). Effect of Pre-Sowing Static Magnetic Seed Treatment on Germination and Root Characters in Chickpea (*Cicer arietinum* L.). *Journal of Agricultural Physics* ISSN 0973-032X Vol. 14, No. 1, pp. 22-29.
- Rai, G.K, R. Kumar, A.K. Singh, P. K. Rai, M. Rai, A.K. Chaturvedi and Rai, A.B. 2012. Changes in antioxidant and phytochemical properties of tomato (*Lycopersicon esculentum* mill) under ambient condition. *Pak. J. Bot.*, 44(2): 667-670.
- Srikanth, Prasant Kumar Rai, Saritha Khandka and G.B.N. Jyothi (2018) Influence of Magnetic and Electric field on germination attributes of Chilli (*Capsicum annum* L.) *Seeds Int. J. Pure App. Biosci.* 6 (3): 496-501.
- Suchitra R, S. Pooonguzhali, B. Saranya, Suguna and K. Jothibas (2017) Effects of panchagavya on growth and yield of *Abelmoschus esculentus* ArkaAnamika *Int.J.Curr.Microbiol. App.Sci.*, 6(9): 3090-3097

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