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

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A B S T R A C T

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, 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 10 Min. 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 90 DAS (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.

Keys words
Electric, Magnetic, Tomato, Panchagavya, Hotwater

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 lycoperscion) 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 10minT12-Hot water treatment-300c 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, Amphimeter 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 field150mT 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                  | 74.9                   |
| 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   | 20.00 | 43.67                    | 149.33                  | 13.95                  | 100.45                 |
| T8         | 42.33                     | 48.67| 58.67                   | 29.83           | 54.83           | 74.83           | 16.67| 84   |                   |                          |                        |                        |                        |
| 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                  | 7.98                   | 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                  |
| Minimunum  | 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                   |

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