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GERMINATION OF TOMATO (*LYCOPERSICON ESCULENTUM* CV. VAISHALI) SEEDS FOLLOWING DIFFERENT PRE-TREATMENTS

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Abstract
Experiments were conducted to study germination of tomato (Lycopersicon esculentum cv. Vaishali) seeds following different pre-treatments. Seeds were pre-treated with 3% HCL, 5% HCL, 3% H_2SO_4, 5% H_2SO_4, 100 ppm GA_3, 100ppm IAA, p-nitro phenol. In physical treatments Chilling treatment was given at -3°C for 4hrs and 3°C for three hrs.
Pre-treatment with 3% HCL, 5% HCL, 3% H_2SO_4, 100 ppm GA_3, p-nitro phenol Chilling treatment at -3°C for 4hrs has shown 100% germination in tomato seeds. while Pre-treatment with 100ppm IAA has no effect to enhance the germination of tomato seeds.
Key words- *Tomato, Seed germination, Pre-treatment.*

Introduction-

Tomato (*Lycopersicon esculentum* L.) is a plant belonging to the family Solanaceae. The fruits of the plant are used as a vegetable, it is a source of vitamin C, potassium, folate and vitamin K. It also contains an antioxidant lycopene which reduces risk of cancer and heart diseases.

In 2019-20 area under cultivation of tomato was 8.18 million hectares while production of tomato was 20.55 lakh metric tonnes.

Tomato plant is grown through the tomato seeds. Tomato seeds has very low rate of germination due to dormancy of the tomato seeds. Seed dormancy is the failure of an intact viable seed to complete germination under favorable conditions and is controlled by several environmental factors, such as light, temperature and the duration of seed storage (after ripening) (Finch-Savage et al., 2007; Penfield et al., 2005). Various studies have documented exogenous treatment of seeds to break seed dormancy.

In tomato dormancy of the seed is due to the presence of ferulic acid in the pulp of tomato.

Present investigations were carried out to break dormancy of the Tomato seeds in order to enhance percentage germination and to induce earlier germination in tomato seeds.

Materials And Methods-

The experiment was conducted at Department of Botany during September 2019. 20 seed were kept on moist filter papers to observe germination of the tomato seeds. Before keeping seeds for germination different Chemical and physical treatments were given to the tomato seeds. Chemical treatments include treatment with 3% HCL (T_1), 5% HCL (T_2), 3% H_2SO_4 (T_3) and 5% H_2SO_4 (T_4), 100ppm IAA (T_5) and 100ppm GA_3 (T_6), 0.1N p-Nitrophenol (T_7) while physical treatment given to the tomato seeds was chilling treatment (T_8 and T_9).

Seeds were kept in 3% HCL, 5%HCL, 3%H_2SO_4 and 5% H_2SO_4, 0.5N p-Nitrophenol for 5 minutes and washed thoroughly in water to remove traces of chemicals and kept in moist petri-plates for incubation. After soaking seeds in 100ppm IAA and 100ppm GA_3 for 30 min they were transferred to the moist petri-plates.

Chilling treatment was given at two different temperatures one at -3°C for 4 Hrs (T_8) and another 3°C for 4 Hrs (T_9). One set was kept for germination after soaking in plain water called Control (T_{10}). Observations were recorded in triplicate, mean value of percentage germination was calculated and tabulated in Table-1. IBM SPSS v. 24 used to perform one way ANOVA with Fishers LSD post hoc analysis at 0.05 level of significance to find the significantly different means. The means in the rows followed by a similar superscript are not significantly different means. The means with different superscripts indicate significantly different means. The means followed by ± is the standard error of the means. **Result And Discussion-**

All the treatments given to the Tomato seeds were significant except treatment of IAA to enhance the percentage germination of tomato seeds, Various treatments has also helped to reduce number of days required for the germination of tomato seeds. Maximum (100%) germination was recorded in the Tomato seeds due to T_1 (3% HCL), T_2 (5% HCL), T_3 (3% H_2SO_4), T_6 (100ppm GA_3), T_7 (P- Nitrophenol) and T_8 (Chilling @ -3°C). T_5 (5% H_2SO_4) has shown 97% germination of seeds while T_9 (Chilling @ 3°C) has shown 95% germination of the tomato seeds. It was more than the control which has shown 90% germination of the tomato seeds. T_5 (100ppm IAA) has shown no effect to enhance the germination percentage.

Similar results were reported by Kumar and Neelakandan (1992) while working with soyabean seeds emersed in GA_3 (50-100 mg/L) for six hrs. In papaya seeds treated with 200ppm GA_3 has shown maximum seed germination (Gangaram, 2020).

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Table- 1 - Effect of different pre-treatments on the germination of Tomato (*Lycopersicon esculentum* cv Vaishali) Seeds.

DAI	3 % HCL (T1)	5 % HCL (T2)	3 % H_2SO_4 (T3)	5 % H_2SO_4 (T4)	GA_3 (T5)	IAA (T6)	p-Nitrophenol (T7)	-3°C (T8)	3°C (T9)	Control (T10)
1	0 ± 0.0	0 ± 0.0	0 ± 0.0	0 ± 0.0	0 ± 0.0	0 ± 0.0	0 ± 0.0	0 ± 0.0	0 ± 0.0	0 ± 0.0
2	0 ± 0.0	3.3^{a} 0 ± 1.7	6.7^{b} ± 1.7	3.3^{a} ± 1.7	5.0^{b} ± 0.0	0 ± 0.0	0 ± 0.0	0 ± 0.0	0 ± 0.0	0 ± 0.0
3	13.3^{a} ± 1.7	76.7^{c} ± 1.7	36.7^{b} ± 1.7	31.7^{d} ± 1.7	33.3^{bd} ± 1.7	0 ± 0.0	8.3^{e} ± 1.7	25.0^{f} ± 2.9	13.3^{a} ± 1.7	0 ± 0.0
4	53.3^{b} ± 3.3	96.7^{c} ± 1.7	56.7^{b} ± 1.7	98.3^{c} ± 1.7	81.7^{d} ± 1.7	6.7^{a} ± 1.7	30.0^{e} ± 2.9	38.3^{f} ± 1.7	33.3^{ef} ± 1.7	8.3^{a} ± 1.7
5	96.7^{b} ± 1.7	100.0^{b} ± 0.0	81.7^{c} ± 1.7	98.3^{b} ± 1.7	96.7^{b} ± 1.7	30.0^{a} ± 2.9	55.0^{d} ± 0.0	65.0^{e} ± 2.9	70.0^{e} ± 2.9	30.0^{a} ± 2.9
6	100.0^{b} ± 0.0	100.0^{b} ± 0.0	96.7^{b} ± 1.7	98.3^{b} ± 1.7	100.0^{b} ± 0.0	38.3^{a} ± 1.7	85.0^{c} ± 0.0	90.0^{d} ± 2.9	91.7^{d} ± 1.7	38.3^{a} ± 1.7
7	100.0^{b} ± 0.0	100.0^{b} ± 0.0	100.0^{b} ± 0.0	98.3^{b} ± 1.7	100.0^{b} ± 0.0	38.3^{a} ± 1.7	100.0^{b} ± 0.0	91.7^{c} ± 1.7	95.0^{d} ± 0.0	40.0^{a} ± 0.0
8	100.0^{b} ± 0.0	100.0^{b} ± 0.0	100.0^{b} ± 0.0	98.3^{b} ± 1.7	100.0^{b} ± 0.0	51.7^{a} ± 1.7	100.0^{b} ± 0.0	93.3^{c} ± 1.7	95.0^{c} ± 0.0	50.0^{a} ± 0.0
9	100.0^{b} ± 0.0	100.0^{b} ± 0.0	100.0^{b} ± 0.0	98.3^{b} ± 1.7	100.0^{b} ± 0.0	61.7^{c} ± 1.7	100.0^{b} ± 0.0	100.0^{b} ± 0.0	95.0^{d} ± 0.0	58.3^{a} ± 1.7

***DAI – Days After Incubation**

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