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Effect of organic substances and chemicals on seed germination and survivability of tamarind (*Tamarindus indica* L.) seedling in Durg District of Chhattisgarh

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Abstract
The present experiment entitled "Effect of organic substances and chemicals on seed germination and survivability of tamarind (*Tamarindus indica* l.) seedling in Durg district of Chhattisgarh" was conducted during the year 2024-25 at Department of Fruit Science, College of Horticulture and Research Station, Sankara, Patan, Durg (C.G.). A Completely Randomized Design was used for statistically analyzed of data, which consisted of 11 treatments and replicated thrice. The present research revealed that the earliest days taken to initiate seed germination (5.50 days), days taken to 50% germination (15.57 days), maximum germination percentage (98.02) and survival percentage of tamarind seedlings (97.25) was recorded under the T_7 (Soaking of seeds for 24 hours in GA_3@ 200 ppm) to be superior over other treatments. which was closely followed by GA_3 @ 400 ppm (Soaking of seeds for 24 hours in GA_3@ 200 ppm).

Keywords: Cow urine, cow dung slurry, tamarind, gibberellic acid, potassium nitrate, hydrochloric acid

Introduction

Tamarind (*Tamarindus indica* L.), commonly known as Imli or Indian Date, belongs to the Leguminaceae family. It is a diploid species with a chromosome number of 2n = 24 (Purseglove, 1987) [6]. Originally native to tropical regions of Africa, especially Sudan, it thrives well in both tropical and semi-arid regions of India (Tandon *et al*., 2021) [8]. Tamarind is recognized as a versatile tree with multiple uses. Tamarind trees are hardy and can withstand drought conditions. They hold significant value in social, urban, and agroforestry because of their diverse applications across industrial, pharmaceutical and commercial sectors. Nearly every part of the tamarind tree is utilized in various industries, including food, chemicals, pharmaceuticals and textiles, as well as for purposes like animal fodder, timber and fuel. Tamarind is a nutritious and versatile fruit, primarily made up of pulp and seeds. Its pulp is highly valued for use in preparing various foods and beverages, both at home and in industry. A key feature of tamarind fruit is its distinctive sweet and sour flavor, which comes from its high tartaric acid content (about 10%) and reducing sugars (30-40%). Whether ripe or dried, the fruit contains significant amounts of tartaric acid, reducing sugars, pectin, tannins, fiber, and cellulose (Ushanandini *et al*., 2006) [10]. Whole tamarind seeds contain protein, fats, sugars and carbohydrates. Both the pulp and seeds are rich sources of potassium, calcium and phosphorus, along with other minerals like sodium, zinc and iron. The tangy pulp is widely used in cooking for dishes such as curries, chutneys, sauces and soups. Tamarind fruits are particularly high in protein, B vitamins and tartaric acid. Tamarind is usually propagated from seeds, which are relatively large, measuring around 11-12.5 mm in diameter. The seeds are somewhat flat, glossy brown to blackish in color and encased in a hard, water-resistant seed coat. Tamarind seeds undergo epigeal germination but generally have a low germination rate, even under favorable conditions. Typically, seeds start germinating about 13 days after sowing, though the process may take up to a month to complete. This delay is often due to physical barriers like the hard, thick seed coat or issues related to storage and handling, leading to secondary dormancy.

Techniques such as acid or mechanical scarification and soaking seeds in hot water can help break seed dormancy and speed up germination (Vasantha *et al*., 2014) [11]. Plant growth regulators such as GA_3 and NAA support seed germination, seedling growth and survival. GA_3, in particular, helps weaken the seed coat, making it easier for the radicle to emerge during germination. In numerous fruit crops, pre-sowing treatments including bio-inoculants, KNO_3 and plant growth regulators are applied to enhance germination rates and seedling development. Biofertilizers, which contain beneficial microorganisms, play a role in converting unavailable nutrients into forms that plants can absorb through biological processes (Athani and Revanappa, 2009) [1]. Soaking tamarind seeds in GA_3 and NAA solutions for 12 hours leads to higher germination rates and increased shoot length. Additionally, treating seeds by soaking them in a 10% solution of cow urine or a mixture of 500 grams of cow dung in 10 liters of water for 24 hours significantly boosts germination, more than doubling the rate compared to untreated seeds (Tandon *et al*., 2021) [8].

Materials and Methods

The present experiment was conducted during the year 2024-25 at Department of Fruit Science, College of Horticulture and Research Station, Sankara, Patan, Durg (C.G.). The experiment was laid out in Completely Randomized Design with eleven treatments were *viz*. T_0-Control, (Soaking of seeds for 24 hours in Distilled water), (T_1) Soaking of seeds for 24 hours in Cow Urine@20%, (T_2) Soaking of seeds for 24 hours Cow Urine@30%, (T_3) Soaking of seeds for 24 hours in Cow dung slurry@20%, (T_4) Soaking of seeds for 24 hours in Cow dung slurry@30%, (T_5) Soaking of seeds for 30 minutes in KNO_3@1%, (T_6) Soaking of seeds for 30 minutes in KNO_3@2%, (T_7) Soaking of seeds for 24 hours in GA_3@200ppm, (T_8) Soaking of seeds for 24 hours in GA_3@400ppm, (T_9) Soaking of seeds for 30 minutes in HCl@0.5%, (T_{10}) Soaking of seeds for 24 hours in HCl@1%, which were replicated three times. Mature, healthy and disease-free ripen tamarind fruits were chosen and their seeds were carefully extracted. These seeds were then rinsed with tap water and left to dry in the shade for half an hour. From these, only healthy and well-formed seeds were selected. The required amount of 200 mg and 400 mg GA_3, 10 and 20 g of KNO_3 were weighed with the help of an electronic balance. After being weighed, GA_3 were placed into separate glass beakers using a gentle brush for dissolving the growth regulators, a few drops of 95% ethyl alcohol were added just to dissolve the growth regulators. Then 1000 ml of distilled water was added to create a solution of 200 and 400 ppm concentrations. In a glass beaker containing 10 and 20 g of KNO_3, 1000 ml of distilled water was added for making 1 and 2% concentration of solution. Hydrochloric acid 0.5 ml and 1 ml. was measured in a glass beaker and 100 ml of distilled water was added in each concentration to make the solution of 0.5%, 1% solution. Fresh cow urine 200 and 300 ml was measured in a glass beaker and 1000 ml of distilled water was added in each concentration to make the solution of 20 and 30 percent solution. Cow dung 200 and 300 gm were taken and 1000 ml distilled water was added in each concentration to make the solution of 20 and 30 percent solution of cow dung slurry. The extracted seeds were placed in a 1000 ml glass beaker for 24 hours of seed soaking. Each glass beaker was filled with a freshly made solution of GA_3, cow urine and cow dung slurry in desired concentrations according to the treatment separately. Seed were soaked in HCl and KNO_3 solution for 30 minutes. Treated tamarind seeds were sown after 24 hours in polythene bags containing Soil, Sand, FYM and cocopeat media (1:1:1:1) on 22th of January, 2025. One seed per poly bag was sown at a depth of 3-4 cm. After sowing of seed, light irrigation was given and polybags were arranged as per treatments. The observations recorded days taken to start germination, days taken to 50% germination, germination percentage and survival percentage of tamarind seedling.

Result and Discussion

Days taken to initiate seed germination

The present investigation found that the earliest germination (5.50 days) T_7 (soaking of seeds for 24 hours in GA_3 @200 ppm) the followed by (6.51 days) T_8 (soaking of seeds for 24 hours in GA3 @ 400 ppm). However, maximum days of 11.50 were taken to initiate germination under T_0 (control). The treatment with GA_3 200 ppm for 24 hours of soaking proved to be good treatment. Hence, due to involvement of GA_3 activation of cytological enzymes takes place which increases in cell wall plasticity and better absorption of water.

Similar findings were also reported by Parameshwari and Srimathi (2008) [4] in Tamarind, Patel *et al*., (2018) [2] in Tamarind, Vasantha *et al*., (2014) [11] in Tamarind and Tandon *et al*., (2019) [9] in Tamarind.

Days taken to 50% germination

The current study revealed that days taken to 50% germination of the seedlings was significantly impacted by the various organic substances and chemicals. The minimum days taken to 50% germination i.e. 15.57 days was observed in treatment T_7 (GA_3 @ 200 ppm for 24 hr) This was closely followed by (soaking of seeds for 24 hours in GA3 @ 400 ppm) T_8 (15.80 days). In contrast, the longest duration of 26.45 days was observed in the control treatment (T_0).

The positive effect of GA_3 on seed germination may be due to its role in increasing the activity of the enzyme alpha-amylase. This enzyme helps break down stored starch into simple sugars, releasing energy that is used to activate the embryo.

This findings are supported by Sharma (2016) [7] further reported that the tamarind seeds treated with GA_3 @ 200 ppm for 24 hours recorded the highest germination percentage (97.26%), while the lowest germination was recorded in control (80.33%). Similarly Lay *et al*. (2015) [5]. Tandon *et al*. (2019) [9] the minimum days taken to 50% germination (15.67) were recorded under GA_3 @ 300 ppm for 24hr in tamarind.

Germination percentage

The current study revealed that the highest germination percentage (98.02%) was observed in treatment, T_7 (were soaked for 24 hours in GA_3 at 200 ppm). This treatment was found to be significantly superior to all others. This was closely followed by (97.34%) treatment T_8 (soaking of seeds for 24 hours in GA_3 @ 400 ppm) while the minimum germination percentage (81.32%) was observed under T_0 (control).

The higher seed germination percentage in GA_3 was due to instigative action of GA_3 for germination of seeds. GA_3 induces the denovo synthesis of proteolytic enzymes like α-amylase and ribonuclease.

Similar work has been reported by Parameshwari and Srimathi (2008) [4], Sharma *et al*. (2016) [7] and Tandon *et al*. (2019) [9] in tamarind.

Survival percentage

The data presented in the table clearly demonstrate that various seed priming treatments had a significant effect on the survival percentage of tamarind seedlings. recorded the highest survival percentage (97.25%), the treatment (T_7) (soaking of seeds for 24 hours in GA_3@ 200 ppm) which was significantly superior to all other treatments. This was followed by (96.33%) treatment (T_8) (soaking of seeds for 24 hours in GA_3@ 400 ppm), On the contrary, the lowest survival percentage (80.23%) was observed in the control (T_0) indicating the effectiveness of growth regulators and chemical priming in improving seedling establishment. These treatments might have enhanced physiological and biochemical processes during germination, leading to vigorous seedling growth and higher survival.

The present result is supported by the findings of Tandon *et al*. (2019) [9] Patel *et al*. (2018) [2] in tamarind, Palepad *et al*. (2017) [3], they found that the custard apple Vasantha *et al*. (2014) [11] in tamarind.

Table 1: Effect of organic substances and chemicals germination parameters of tamarind seedling

Notations	Treatment details	Days taken to initiate seed germination (DAS)	Days taken to 50% germination (DAS)	Germination percentage (%)
T_0	Control	11.50	26.45	81.32
T_1	Cow urine @20%	8.62	18.27	89.86
T_2	Cow urine @ 30%	8.49	17.68	91.22
T_3	Cow dung slurry @20%	10.50	24.55	84.57
T_4	Cow dung slurry @ 30%	9.55	24.04	85.72
T_5	KNO_3 @1%	7.47	16.58	94.35
T_6	KNO_3 @2%	7.32	16.21	95.61
T_7	GA_3 @200 ppm	5.50	15.57	98.02
T_8	GA_3 @400 ppm	6.51	15.80	97.34
T_9	HCl @0.5%	9.32	22.89	86.53
T_{10}	HCl @1%	9.25	19.28	88.63
	SEm±	0.22	0.58	0.55
	CD at 5%	0.67	1.71	1.62

Table 2: Effect of organic substances and chemicals survival percentage of tamarind seedling

Notations	Treatment details	Survival percentage of seedling (%)
T_0	Control	80.23
T_1	Cow urine @20%	89.67
T_2	Cow urine @ 30%	92.13
T_3	Cow dung slurry @20%	82.51
T_4	Cow dung slurry @ 30%	85.17
T_5	KNO_3 @1%	93.13
T_6	KNO_3 @2%	94.69
T_7	GA_3 @200 ppm	97.25
T_8	GA_3 @400 ppm	96.33
T_9	HCl @0.5%	85.67
T_{10}	HCl @1%	87.13
	SEm±	0.56
	CD at 5%	1.63

References

1. Athani SI, Revanappa DPR. Influence of organic fertilizer doses and vermicompost on growth and yield of banana. Karnataka J Agric Sci. 2009;22(1):147-150.
2. Patel M, Tank RV, Bhanderi DR, Patil HM, Patel VPV, Desai MD. Response of soaking time and chemicals on germination and growth of tamarind (*Tamarindus indica* L.); 2018.
3. Palepad KB, Bharad SG, Bansole GS. Effect of seed treatments on germination, seedling vigour and growth rate of custard apple (*Annona squamosa*). J Pharmacogn Phytochem. 2017;6(6):20-23.
4. Parameswari K, Srimati P. Influence of growth regulators on elite seedling production in tamarind (*Tamarindus indica* L.). Legume Res. 2008;31(4):300-302.
5. Padma Lay, Basvaraju GV, Sarika G, Amrutha N. Effect of seed treatments to enhance seed quality of papaya (*Carica papaya* L.) cv. Surya. Greener J Biomed Health Sci. 2015;2(3):221-225.
6. Purseglove JW. Tropical crops. Dicotyledons. London: Longman Science and Technology; c1987, p. 204-206.
7. Sharma DK. Effect of growth regulators, biofertilizers and scarification on germination and seedling growth of tamarind. Adv Life Sci. 2016;5(7):2818-2823.
8. Tandon K, Gurjar PKS, Gurjar P, Lekhi R. Effect of organic substances and plant growth regulators on growth of tamarind (*Tamarindus indica* L.) seedlings. Int J Chem Stud. 2021;9:1700-1705.
9. Tandon K, Gurjar PKS, Lekhi R, Soni D. Effect of organic substances and plant growth regulators on seed germination and survival of tamarind (*Tamarindus indica* L.) seedlings. Int J Curr Microbiol Appl Sci. 2019;8(2):2270-2274.
10. Ushanandini S, Nagraju S, Kumar KH. The antisnake venom properties of Tamarindus indica L. seed extract. Phytother Res. 2006;20(10):851-858.
11. Vasantha PT, Vijendrakumar RC, Guruprasad TR, Mahadevmma M, Santosh KV. Studies on effect of growth regulators and biofertilizers on seed germination and seedling growth of tamarind (*Tamarindus indica* L.). Plant Arch. 2014;14(1):155-160.