

Original Research Article

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Influence of Pre-Sowing Treatments on Germination, Growth and Vigour of Mango (*Mangifera indica* cv. Seeripazham)

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ABSTRACT

Keywords

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An experiment was conducted in Annamalai Nagar, Tamil Nadu, India, to determine the effect of pre-sowing treatments on germination, growth and vigour of mango during 2017-2018. The various growth regulators viz., GA₃ (250 and 500 ppm), KNO₃ (0.5 and 1.0%), water soaking, control were treated before sowing the mango stones. Significantly higher values for all growth attribute parameters were recorded with the treatment (S₂T₃) i.e extracted kernel pre-treated with KNO₃ @ 0.5 percent found to be sound integrated practice, were it recorded maximum germination percentage (81.02%), number of leaves (12.92), vigour of seedling (1775.12) over all the other treatments. Whereas maximum seedling height (31.51 cm) intermodal length (9.80 cm) was recorded in extracted kernel pre-treated with GA₃ @ 500 ppm.

Introduction

Mango (*Mangifera indica*) was selected for the study as it is one of the most important fruits as the national fruit of India. India is the leading producer of mango in the world, while Tamil Nadu is the largest producer of mango with an annual production of 785.50 Metric tonnes from an area of 161.58 thousand ha, and productivity of 4.86 Metric tonnes per ha in the year of 2013-2014 (National Horticulture Board). Mango is predominantly grown as a cash crop nutritional value per

100g fruits is 250 KJ. Mango contains a variety of phyto chemicals (Ajila and Prasada, 2008).

In mango fruit pulp the vitamins “A and C” vitamin B₆ pyridoxine, folate, other “B” vitamins and essential nutrients such as potassium, copper, and amino acids are present. Mango peel and pulp contain other phyto nutrients, such as the pigment antioxidants – carotenoids and polyphenols and omega-3 and 6 poly unsaturated fatty acids (USDA, 2010).

India as witnessed an increase in the area under mango on account of demand for fresh fruits in the domestic as well as the international market.

However, the greatest bottleneck in the expansion of area under fruit crops is the non-availability of genuine and quality planting material in adequate quantity from reliable nurseries.

Health and good quality plant materials are the foundation for successful fruit industry in the country (Reddy and Shukla, 2007).

Synchronization and rapid seedling emergence are the commonly reported benefits of pre-sowing treatments on germination. In most of the fruit crops, rootstock influences the vigour, longevity, tree size, yield and quality (Mukherjee and Majumdar, 1963).

The rootstock is a very vital component of a grafted plant and once the trees are grafted on a certain rootstock and planted in the orchard it is not possible to change it without incurring losses.

To meet the ever rising market demand and to evolve a best technology for producing high quality mango planting material in a short period of time pre-sowing treatments are very important which will also regulate growth and vigour of the rootstock organized research work in these lines of mango is not available and hence. The pre present research work has been designed.

Materials and Methods

The experiment was carried out in the year of 2017-2018 at orchard of the Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalai Nagar in India. The experiment was laid out in Factorial Randomized Block Design with six treatments

by choosing two factors – seed material (whole nut and extracted kernel) and pre-sowing treatments (GA₃ @ 250 and 500 ppm), KNO₃ (0.5 and 1.0%) water soaking and control.

Treatment details

S₁T₁: Whole nut pre-treated with Gibberellic acid @ 250ppm for 12 hrs

S₁T₂: Whole nut pre-treated with Gibberellic acid @ 500ppm for 12 hrs

S₁T₃: Whole nut pre-treated with Potassium nitrate @ 0.5% for 12 hrs

S₁T₄: Whole nut pre-treated with Potassium nitrate @ 1.0% for 12 hrs

S₁T₅: Whole nut soaked in water for 12 hrs

S₁T₆: Control (Whole nut without any treatment)

S₂T₁: Extracted kernel pre-treated with Gibberellic acid @ 250ppm for 12 hrs

S₂T₂: Extracted kernel pre-treated with Gibberellic acid @ 500ppm for 12 hrs

S₂T₃: Extracted kernel pre-treated with Potassium nitrate @ 0.5% for 12 hrs

S₂T₄: Extracted kernel pre-treated with Potassium nitrate @ 1.0% for 12 hrs

S₂T₅: Extracted kernel soaked in water for 12 hrs

S₂T₆: Control (Extracted kernel without any treatment)

The soil media was prepared by using red soil, well rotten farmyard manure (FYM) and sand in the proportion of 1:1:1. Polythene bag with

a size of 7×9 inches and 300 gauge thickness were used for sowing of mango stones. Polythene bags were filled with 2/3rd of the potting mixture and mango stones are covered with 1/3rd of the potting mixture. The polythene bags were watered immediately after sowing and at regular intervals.

Observations were recorded on germination percentage, number of leaves, vigour of seedling, seedling height, intermodal length at 60 days after sowing. All the observations were recorded by selecting five plants randomly from each replication.

The germination percentage was calculated using the formula at 60 days of sowing (Stephen, 2008).

$$\text{Germination percentage} = \frac{\text{Number of stones germinated}}{\text{Number of stones sown}} \times 100$$

The vigour of the seedling was calculated using the following formula at 60 days of sowing (Kumar *et al.*, 2007).

$$\text{Vigour of the seedling} = \text{Dry weight of the root stock} \times \text{germination percentage}$$

Results and Discussion

Statistically analyzed results are described and explained under the following subheads.

Germination characters

The data on germination percentage by pre-sowing treatments in mango cv. Seeripazham was presented in table 1. Extracted kernel pre treated with KNO₃ 0.5% found to be sound integrated practice, where it recorded maximum germination percentage (81.02%).

Lower concentrations of potassium nitrate had significantly influenced the germination percentage. The variation in germination in

pre-sowing osmoprimered stones might be due to stimulate effect of KNO₃ on the stones as well as enhanced enzymatic process and suppression inhibitors along with synthesis of RNA, which might have resulted in maximum germination percentage (Kumar *et al.*, 2007).

Extracted kernel recorded maximum germination percentage followed by whole nut. It might due to the removal of outer thin leathery seed coat probably increased the water absorption and might have lead to activate enzymes, hydrolysis of food material and resulted in maximum germination percentage.

The results are in conformity with the findings of Reddy and Khan (2001) in khirni, Rajamanickam *et al.*, (2002) in Amla and Shirol *et al.*, (2005) in khirni.

Vigour characters

Among the pre-sowing treatments studied KNO₃ 0.5% recorded maximum vigour of seedling (1775.12) followed by GA₃ and water soaking. All the osmoprimered treatments increased the seedling dry weight as compared to control.

Choudary and Chakrawar (1981) stated that the increase in number of leaves and root length had lead to overall assimilation and redistribution of photosynthates with in the plant and resulted in higher dry weight has the significant and there by increased the vigour of seedling similar results were reported Padma and Reddy and Khan (2001) in khirni, Raw *et al.*, (2002) in mango.

Growth characters

Extracted kernel pre-treated with GA₃ 500ppm recorded maximum seedling height and intermodal length. Rapid accumulation of food materials in this tissue results in obtaining maximum seedling height.

Table.1 Effect of pre-sowing treatments on germination, growth characters and vigour characters of mango

Treatment(T)	Germination %			Number of leaves			Seedling height			Intermodal length			Vigour of mango		
	Seed materials(S)			Seed materials(S)			Seed materials(S)			Seed materials(S)			Seed materials(S)		
	Whole nut	Extracted kernel	mean												
GA₃250PPM	57.21	65.61	61.4	9.07	9.89	9.48	23.05	26.69	24.87	8.54	10.43	9.48	789.9	990.98	887.9
GA₃500PPM	60.31	71.26	65.78	9.76	10.23	10.0	24.12	31.51	27.81	9.35	9.80	9.58	859.2	1135.15	997.20
KNO₃ 0.5%	65.59	81.02	73.31	10.53	12.92	11.72	22.94	25.08	24.01	8.59	9.47	9.03	1142.8	1775.12	1459.00
KNO₃ 1.0%	63.21	74.71	68.96	10.10	11.18	10.64	21.88	24.37	23.12	7.35	8.58	7.96	984.69	1356.38	1170.53
Water soaking	54.85	63.45	59.15	8.13	9.73	8.93	19.24	23.96	21.60	6.39	7.65	7.29	700.40	827.58	763.99
control	50.91	61.46	56.19	7.63	9.13	8.38	19.94	22.80	20.97	6.86	6.51	6.44	549.28	704.53	626.90
mean	58.68	69.58		9.20	10.51		21.73	25.73		7.85	8.74		836.9	1131.62	
	S	T	S×T												
SE m±	0.19	0.32	0.46	0.10	0.17	0.25	0.19	0.34	0.48	0.09	0.16	0.22	15.05	26.06	36.86
CD 5%	0.39	0.68	0.96	0.30	0.52	0.73	0.41	0.71	1.01	0.19	0.33	0.46	31.15	53.96	76.31
F-test	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

Higher concentrations of GA₃ had significantly influenced the seedling height with GA₃ might be attributed to the cell multiplication and cell elongation in the cambium tissue of the intermodal region. GA₃ all the concentrations used in the study, resulted in longer shoots with long and thin internodes. The results conformity with grape fruit seedlings elongation is a consequence of accelerated cell elongation rather than of cell multiplication. Rajamanickam *et al.*, (2004) in amla, Kumar *et al.*, (2007) in mango.

The increase in number of leaves might be due to the promotion of physiological processes and stimulatory action of KNO₃ to form new leaves at faster rate accelerated translocation of food material in the tissue which created an ideal condition for development of new leaf primordia. Similar results were reported by Bhambota and Kaul (1966) in citrus. These results are in conformity with the results reported by Padma and Reddy (1998) in mango.

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