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## Influence of mango rootstock by different soaking treatments on germination percentage and growth

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**Abstract**

A trial was conducted at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat during 2016-17. The results of experiment revealed that the stones soaked with *Vermiwash* 1 % showed the best results with respect to maximum germination percentage (71.33 %), maximum height of rootstock (22.26 cm), maximum diameter of rootstock (0.59 cm), maximum girth of rootstock (1.57 cm), maximum number of primary roots of rootstock (3.60) and maximum number of secondary roots of rootstock (29.73). *Vermiwash* 1 % was the best treatment for enhancing germination percentage and production of vigorous seedling.

**Keywords:** mango, soaking treatments, rootstock, *Vermiwash*.

**Introduction**

Mango (*Mangifera indica* L.), belongs to the family Anacardiaceae, is undoubtedly one of the preferable and most ancient fruit known to mankind, being successfully grown both in tropical as well as sub-tropical region of India. It has developed its own importance all over the World and its cultivation is nearly as old as Indian civilization. In the past two decades, India has witnessed an increase in the area under mango on account of demand for fresh fruits in the domestic as well as International market. In the past two decades, India has witnessed an increase in the area under mango on account of demand for fresh fruits in the domestic as well as International market. However, limited availability of genuine planting material is the most important bottleneck in the expansion of area under mango. As mango is a highly cross pollinated crop, there is an enormous variation in the seedlings raised even from the fruits of the same tree. When raised by seeds, mango plants are not true to type and lose many of their unique characteristics. Vegetative propagation thus became a necessity in mango to preserve and perpetuate the characteristics of each cultivar.

Most of the fruit crop seeds germinate poorly and unevenly and require more time for seedling emergence. The dormancy in seeds might be due to hard seed coat, impermeability to water and gases, physiological immaturity of embryo, deficiency of some endogenous growth promoters or excess of endogenous growth inhibitors. Different methods like water soaking, scarification and chemical treatments are used for breaking dormancy in such seeds to improve germination. Soaking of seeds in water promotes germination by softening the hard seed coat, activating the enzymes and diluting the effects of inhibitors. Duration of soaking varies from overnight to 3 or 4 days depending on the nature of seed coat while, scarification is the process of injuring the hard seed coat by any means to accelerate the water absorption and to improve the gaseous exchange for hastening the process of germination.

Rootstocks are always seedling origin irrespective of zygotic/ nucellar nature. In semi-arid regions the mango stones are available during the drier parts of the year (April- June) because of which the germination percentage and vigor is very low. Synchronization and rapid seed emergence are the benefits of bioformulations or organics on germination and seedling growth. The significant enhancement of germination was noticed in different pre-soaking treatments by Padma and Narayana Reddy (1998) [8] and Rao (2002) [10] in mango. Higher germination percentage of mango stones is the main criterion and strong base for successful grafts. The present investigation was conducted to study the germination and growth parameters by soaking treatments.

## Material and Methods

The present experiment was carried out during 2016-17 at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari under greenhouse conditions.

A completely randomized design was adopted with three replications. The experiment included twelve treatments viz., P<sub>1</sub>: *Neem seed* kernel extract (5%), P<sub>2</sub>: *Neem seed* kernel extract (10%), P<sub>3</sub>: Custard apple leaf extract (5%), P<sub>4</sub>: Custard apple leaf extract (10%), P<sub>5</sub>: Basil leaf extract (5%), P<sub>6</sub>: Basil leaf extract (10%), P<sub>7</sub>: Sucrose solution (1%), P<sub>8</sub>: Sucrose solution (2%), P<sub>9</sub>: *Vermiwash* (1%), P<sub>10</sub>: *Vermiwash* (2%), P<sub>11</sub>: Novel Liquid Organic Fertilizer (5%) and P<sub>12</sub>: Novel Liquid Organic Fertilizer (10%). The stones were soaked in these organics for 24 hr. Variety of Alphonso used for mango stones obtained from single lot in the experiment. Stones were washed thoroughly to remove extraneous material adhering to it. The stones were dipped in water and allowed to settle at the bottom of the container. Stones floating on the surface of water were discarded and those which settled at the bottom were used for experimentation.

The stones were sown in polythene bags after soaking as per the treatments. Germination percentage was computed using the formula:

$$\text{Germination \%} = \frac{\text{Number of stone germinated}}{\text{Number of stone sown}} \times 100$$

Regular plant protection measures were taken as and when required. Observations were recorded from five randomly selected and labeled rootstock in each treatment in a repetition. The data obtained from all plots per repetition under each treatment were averaged and reported. The data taken for all parameter was observed 30 days after sowing. The experimental data were subjected to the statistical analysis by using variance technique as described by Panse and Sukhatme (1967)<sup>[9]</sup>.

## Results and Discussion

The results obtained during study were described with the help of statistical analysis and discuss critically with relevant reference and literature.

### Germination percentage

The maximum germination percentage 71.33 % was recorded in *Vermiwash* 1 % (Table 1). It was at par with *Vermiwash* 2 % (70.25 %). The beneficial influence on germination of seeds may be due to increase of growth promoting substances in *Vermiwash*. It has to contain considerable amount of growth promoting substances and hence, might have brought this positive effect on the seed germination. The results are in

close agreement with Ashiya and Tank (2015)<sup>[1]</sup> in mango, Shakila and Rajeshwari (2008)<sup>[11]</sup> in okra and Swetha *et al.* (2015)<sup>[12]</sup> in capsicum.

### Height of rootstock

Height of rootstock 22.26 cm was observed in treatment *Vermiwash* 1 %. It was at par with *Vermiwash* 2 % (Table 1). This improvement in growth of plant might be due to enhancement in metabolic activities which leads to increase in various plant metabolites responsible for cell division and cell enlargement. These findings are agreement with Dawale *et al.* (2011)<sup>[3]</sup> in mango and Jagtap *et al.* (2013)<sup>[5]</sup> in fenugreek.

### Diameter and Girth of rootstock

The maximum diameter of rootstock observed in *Vermiwash* 1 % (0.59 cm). It was at par with *Vermiwash* 2 % (0.58 cm), Basil leaf extract 10 % (0.58 cm), Basil leaf extract 5 % (0.57 cm) and Sucrose solution 1 % (0.57 cm). *Vermiwash* 1 % found maximum girth of rootstock 1.57 cm. It was at par with *Vermiwash* 2 % (1.56 cm), Basil leaf extract 5 % (1.56 cm), Basil leaf extract 10 % (1.55 cm), Sucrose solution 1 % (1.54 cm), Sucrose solution 2 % (1.53 cm), Novel Liquid Organic Fertilizer 5 % (1.51cm) and Novel Liquid Organic Fertilizer 10 % (1.51cm) (Table 1). *Vermiwash* is a good source of minerals, Na, K, Ca, Mg, nitrogenous compounds and other micronutrients which might have contributed for vigorous growth of seedling. These findings are in agreement with those reported by Yoganand *et al.* (2004)<sup>[13]</sup> in bell pepper and Deshpande *et al.* (2008)<sup>[4]</sup> in chickpea. Who obtained increase in growth of seedlings by *Vermiwash*.

### Root parameters of rootstock

The maximum number of primary roots of rootstock (3.60) was recorded when mango stones were soaked in *Vermiwash* 1 %. It was at par with *Vermiwash* 2 % (3.47). The maximum number of secondary roots of rootstock (29.73) was recorded *Vermiwash* 1 % (Table 1). Number of primary and secondary roots were significantly influenced and found maximum in *Vermiwash* 1 % soaking treatment. The results were in conformity with Mankar *et al.* (1997)<sup>[7]</sup> in ber and Maiti *et al.* (2000)<sup>[6]</sup> in karonda.

Regarding root parameter, number of primary and secondary roots per seedlings was significantly influenced and found maximum in *Vermiwash* treated stones. The differential degree of stimulation of number of roots might be further related to different treatment degrees of production of gibberellins, auxins and vitamins by osmopriming. The increase in number of primary and secondary roots by different treatment was earlier reported by Chaudhari (2010)<sup>[2]</sup>; Ashiya and Tank (2015)<sup>[1]</sup> in mango.

**Table 1:** Germination and growth of mango stones as influenced by various soaking treatments

Treatments	Germination percentage (%)	Height of rootstock (cm)	Diameter of rootstock (cm)	Girth of rootstock (cm)	No. of primary roots of rootstock	No. of secondary roots of rootstock
P <sub>1</sub> – <i>Neem seed</i> kernel extract (5%)	57.92	18.47	0.55	1.42	2.13	21.80
P <sub>2</sub> – <i>Neem seed</i> kernel extract (10%)	56.00	17.90	0.55	1.39	2.00	22.13
P <sub>3</sub> – Custard apple leaf extract (5%)	54.00	17.52	0.54	1.39	1.93	21.07
P <sub>4</sub> – Custard apple leaf extract (10%)	52.42	17.20	0.53	1.37	1.73	19.20
P <sub>5</sub> – Basil leaf extract (5%)	67.50	20.25	0.57	1.56	3.07	27.47
P <sub>6</sub> – Basil leaf extract (10%)	66.25	19.16	0.58	1.55	3.13	26.47
P <sub>7</sub> – Sucrose solution (1%)	64.75	19.37	0.57	1.54	2.80	25.93
P <sub>8</sub> – Sucrose solution (2%)	63.93	18.66	0.55	1.53	2.67	24.87
P <sub>9</sub> – <i>Vermiwash</i> (1%)	71.33	22.26	0.59	1.57	3.60	29.73
P <sub>10</sub> – <i>Vermiwash</i> (2%)	70.25	21.63	0.58	1.56	3.47	28.00
P <sub>11</sub> – Novel Liquid Organic Fertilizer (5%)	60.33	18.50	0.55	1.51	2.27	24.07

P <sub>12</sub> – Novel Liquid Organic Fertilizer (10%)	59.75	18.54	0.54	1.51	2.40	23.33
S. Em. ±	0.968	0.424	0.012	0.036	0.079	0.507
C. D. at 5%	2.755	1.206	0.034	0.102	0.226	1.442
CV%	2.70	3.84	3.68	4.16	5.29	3.58

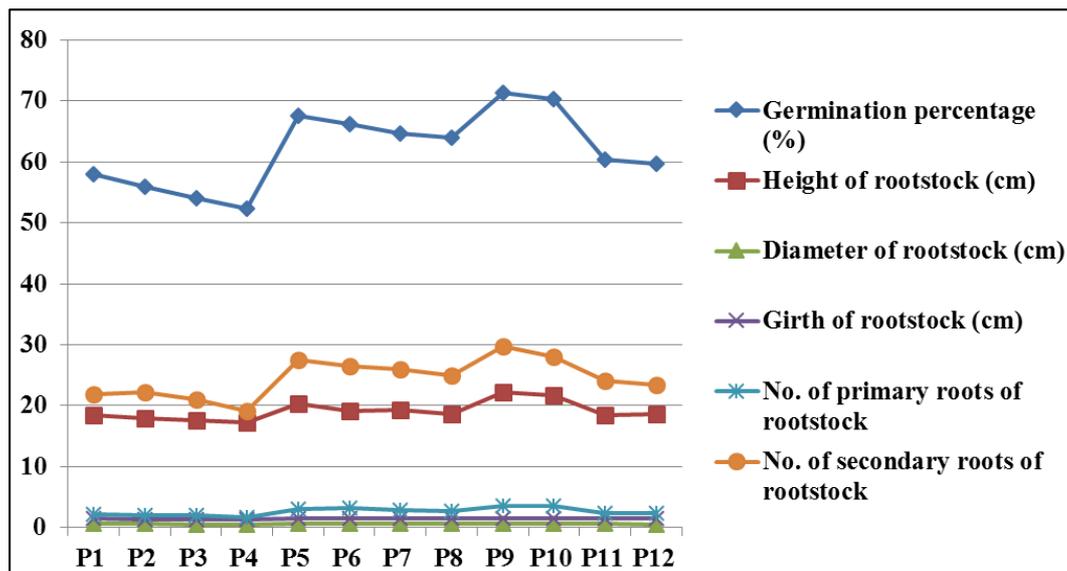


Fig 1: Germination and growth of mango stones as influenced by various soaking treatments

### Conclusion

Based on the above trial conducted in green house condition, it can be concluded that soaking mango stones in *Vermiwash* 1 % was the best treatment for enhancing germination percentage and production of vigorous seedling.

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