

# Effects of Different Applications on In-vitro Germination of Guava (*Psidium guajavas L.*) Seeds

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**Abstract:** This research has been conducted *in-vitro* conditions to determine the effect of different applications on germination of guava (*Psidium guajavas L.*) seeds. GA<sub>3</sub>, sulfuric acid, cold and hot water treatments were used on this study. After the treatments, seeds were germinated in the dark in MS basal medium supplemented with different hormones. At the end of the studies optimum germination treatments were determined.

**Keywords:** guava, seed, *in-vitro*, germination.

## Introduction

Guava (*Psidium guajavas L.*), the apple of tropics, is a low evergreen tree or shrub, with wide-spreading branches and squae, is a native of tropical America. Guava fruit contain Vitamin C, A, iron, calcium and phosphorus. Guavas are up to 5 times richer in Vitamin C than oranges, 10-30 times more than bananas, 10 times more than papaya (Jain et al, 2001; Khushk *et al*, 2009; Anonymous a, 2010). Guava is being importance of trade in most tropic countries and some subtropic countries such as Türkiye. It is commonly propagated by rooting of stem cuttings. Air layering, grafting and propagated by seed are also used for these species propagation (Anonymous, 2010).

There are several reports on seed germination and seed emergence revealed the beneficial effects of seed priming by several ways (heat, cold, soaking, temperatue, scarification, KNO<sub>3</sub>, GA<sub>3</sub> and NaCl salinity) (Ahmed et al. 2006; Tiryaki, 2006; Tzortzakis, 2009).

The objectives of the present study is to determine the effects of some pre-sowing treatments on seed germination of guava (*Psidium guajavas L.*).

## Material and Methods

The studies were carried out with seeds of guava (*Psidium guajavas L.*). For germination, different seed pre- treatments were tested *in vitro* conditions. Applications made below:

**Gibberellins treatment:** GA<sub>3</sub> was mixed with distilled water and made to different concentrations. The seeds were soaked in 250, 500, 750 and 1000 ppm GA<sub>3</sub> concentrations. These treatments were made in light and at room temperature for 24 h.

**Chemical stratification:** In the chemical stratification treatment, seeds were immersed in sulfuric acid (H<sub>2</sub>SO<sub>4</sub>) 1, 2 and 3 minutes. Thereafter, the seeds were rinsed several times in clean distilled water.

**Hot water treatment:** Seeds were treated in 60°C hot water bath and respectively 5, 10 and 15 minutes.

**Hot water treatment+cold storage (4°C+24 hours):** Guava seeds immersed in tap water in a jar and placed in refrigerator at +4°C for 24 hours.

**Cold treatment (4°C+24 hours):** Seed placed in jar and placed in refrigerator at +4°C for 24 hours.

**Soaking the seeds in tap water for 24 hours:** Guava seeds immersed in tap water for 24 hours.

### Germination

After each treatment the seeds were surface sterilized by soaking in 70 % alcohol for 30 seconds and 5 % sodium hypochlorite (NaOCl) solution for 20 minutes and subsequently rinsed thoroughly with sterilized water prior to applying any treatment. Thereafter, seeds were transferred to Murashige Skoog (1962) basal medium with darkness and temperatures of 24°C and relative humidity of 70 %. Germinated seeds were counted every 3 days.

Germination experiments were conducted using six replications of 30 seeds per treatment. Seeds were placed on Murashige Skoog basal medium. All dishes were sealed with a strip of parafilm to reduce water loss.

The number of germinated seeds was recorded for 15th, 21st, 27th, 31st and 33rd days. The GP and GR values were determined for each pre-treatment. The formula used in determining GR values is as follows (Pieper, 1952);

$$GR = \frac{(n_1 \times t_1) + (n_2 \times t_2) + (n_3 \times t_3) + \dots + (n_i \times t_i)}{T}$$

Where GP= Germination percentage (%), GR = Germination rate, *n* = number of days for each counting of germinated seeds, *t* = number of germinated seeds at each counting day, and *T* = total number of germinated seeds. The experiment lasted for about 50 days when it was observed that the seeds had stopped germinating.

## Results and Discussion

Data for all variables for all treatments are summarized in Table 1 and Table 2. Germination percentage ranges among treatments from 0 to 96.67. At the end of 33<sup>rd</sup> day, germination rate ranges from 20 to 96.67, also an 4.5-fold range (Table 1). The hot water treated for 15 minutes seeds have higher germination percentage than all other treated seeds. Germination percentage is significantly higher in hot water treated (different times) seeds than others.

Table 2 shows that the effects of different applications on the germination rate of guava seeds. Guava seeds were influenced by treatments. The highest germination rate was determined from hot water (exposed by 15 min) and cold water (exposed by 24 hours) treatments.

The germination responses to heat treatments (especially hot water) of guava seeds were higher than GA<sub>3</sub> and control treatments. Seed germination was not enhanced by gibberellin. Several studies (Cited in Tzortzakis, 2009) show that hot water, GA<sub>3</sub> and cold water treatments of seeds ensure higher germination percentage and rate than control treatment. Thus, it is concluded that hot water treatments may be recommended for obtaining higher germination rate of guava seeds.

Treatments	15 <sup>th</sup> day	21 <sup>st</sup> day	27 <sup>th</sup> day	33 <sup>rd</sup> day
1 (250 ppm GA <sub>3</sub> )	0	6.67	16.67	20
2 (500 ppm GA <sub>3</sub> )	0	10	10	13.33
3 (750 ppm GA <sub>3</sub> )	23.33	23.33	26.67	26.67
4 (1000 ppm GA <sub>3</sub> )	10	16.67	23.33	33.33

5 (Hot water+5 min)	0	26.67	50	56.67
6 (Hot water+10 min)	0	16.67	40	50.33
7 (Hot water+15 min)	56.67	73.33	83.33	96.67
8 (Cold water+24 hours)	13.33	23.33	50	70
9 (Cold+24 hours)	10	33.33	36.67	50.33
10 (Tap water+24 hours)	6.67	16.67	33.33	36.67
11 (Control)	10	30	60	76.67

**Table 1.** Effects of treatments on germination percentage (%)

Treatments	15 <sup>th</sup> day	21 <sup>st</sup> day	27 <sup>th</sup> day	33 <sup>rd</sup> day
1 (250 ppm GA <sub>3</sub> )	0,00	7,00	20,50	26,60
2 (500 ppm GA <sub>3</sub> )	0,00	15,75	15,75	24,00
3 (750 ppm GA <sub>3</sub> )	13,13	13,13	16,50	16,50
4 (1000 ppm GA <sub>3</sub> )	4,50	8,70	14,10	24,00
5 (Hot water+5 min)	0,00	9,88	21,00	24,88
6 (Hot water+10 min)	0,00	6,56	18,38	26,63
7 (Hot water+15 min)	8,79	12,41	15,21	19,76
8 (Cold water+24 hours)	2,86	5,86	16,14	25,57
9 (Cold+24 hours)	2,81	2,81	16,31	26,63
10 (Tap water+24 hours)	2,72	8,45	20,72	23,72
11 (Control)	1,96	7,44	21,52	24,39

**Table 2.** Effects of treatments on germination ratio

The present study suggest that hot water or secondly water treatments may improve guava seed germination rate and quality in *in vitro* conditions. They are economic and easily applicable by workers, compared to costly plant growth regulators and associated technicalities.

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