

## Investigating the Effect of Aqueous Medicinal Leaf Extracts on Tomato Seed Quality

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The present study sought to highlight the potential use of plant derived products in the treatment and prevention of seed-borne diseases with the aim of reducing the yield loss one of the most important crops: Tomato. Medicinal plants are prominent and are cultivated worldwide and/or are used commercially. The present study evaluated and analysed the effect of plant extracts from two medicinal plants (*Ocimum basilicum* and *Artemisia absinthium*) on tomato seed quality. The study found that seed treatment with *Ocimum basilicum* showed greater root and shoot lengths than both the control and tomato seeds treated with *Artemisia Absinthium*. Also, *Ocimum basilicum* inhibited seed germination and vigour more than *Artemisia Absinthium*. The study concluded that seed treatment with medical plant extracts may enhance seed quality and vigour.

**Key words:** Germination, Seed Vigour, Medicinal Plants, *Artemisia absinthium*, *Ocimum basilicum*.

Medicinal plants are prominent and are cultivated worldwide and/or are used commercially. They are said to represent a vital health and economic component of biodiversity. The Arabian Peninsula is the birth place of herbal drugs according to (Al-Yahya, 1984) and the use of folk medicine has existed in the region since time immemorial. The Kingdom of Saudi Arabia has a wide range of flora that comprises a large number of medicinal herbs, shrubs and trees (Mossa, *et al.*, 1987). Saudi Arabia is estimated to have a great medicinal species diversity that is expected to be over 1200 (above 50%) out of its 2250 species.

Tomato (*Lycopersicon esculentum*) is an important vegetable crops cultivated all over the world. Tomato belongs to the family *Solanaceae*

and ranks second in importance among vegetables. Tomato is grown for its edible fruit, which can be consumed raw or cooked or in the form of processed products like juice, ketchup, sauce, pickle, pastes, puree and powder (Reddy, 2006). The plant is also a rich source of vitamins A and C. The genus *Lycopersicon* comprises 9 closely related species (Reddy, 2006). Due to the varied climatic tolerance of Tomato plants and to their high levels of nutrition and vitamins, it became a popular plant (Reddy, 2006). In tomatoes, losses due to poor fruit quality reduces the value of the crop in the fresh market.

Today, medicinal plant extracts have been accorded a lot of importance for crop protection against pest and disease due to their target specificity and safety. With the high rate of viral resistance to antivirals, there is a need to develop alternative antivirals that are effective, efficient and safe to use and that would protect crop and yield quality. Plant extracts and products have been observed to be effective against a large number of pathogens (Sheikh *et al.*, 2012). Similarly, viral pathogens and fungal, bacterial and viral pathogens have been

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mainly controlled through the use of plant seed oils (Jayashree *et al.*, 1999; Mandal and Singh, 2001; Kulkarni and Byadagi, 2004; Madhusudhan *et al.*, 2005). The current study seeks to evaluate the use of medicinal plant extracts (*Ocimum basilicum* and *Artemisia absinthium*) on tomato seed quality to identify potential enhancing properties.

## MATERIALS AND METHODS

### Preparation of Aqueous Plant Extracts

Aqueous extracts were obtained by grinding 100g fresh leaf of the plant species with 100 mL of phosphate buffer (0.01M, pH 7.2) (1:1 w/v) by using pestle and mortar. The extract was filtered through double-layered cheese cloth. The filtrate was sonicated and centrifuged at the rate of 10,000 rpm for 10 min.

### Seed Preparation and Treatment

Seeds of Tomato were obtained from local seed agencies in Hail, Saudi Arabia. 600 seeds were rinsed with tap water and divided as follows: 200 seeds as control; 200 seeds to be treated with *Ocimum basilicum* and 200 seeds to be treated with *Artemisia absinthium*. Hence, three experiments were carried out each containing 200 seeds. Liquid soap (pril or spuli) was then added drop wise to the seeds. After removing the soap with running tap water, the seeds were soaked in a diluted solution of sodium hypochlorite (1/4) containing 13% active chlorine. The seeds were treated with this solution 5 times (5 minutes for each batch) and then washed thoroughly using tap water. Each experiment of 200 seeds of tomato was placed in conical flasks containing the plant leaf extracts (10% w/v). The flasks were kept on a rotary shaker for 24 hours overnight. Treated seeds were rinsed several times

during a period of 16 hours. Distilled water was used as control. Seeds were then planted on cotton wool. To evaluate the effect of *Ocimum basilicum* aqueous leaf extracts on seed quality, tomato seeds were rinsed with distilled water and treated with the aqueous leaf extract of *Ocimum basilicum* overnight and subsequently washed several times during a period of 16 hours. Also, to evaluate the effect of *Artemisia absinthium* aqueous leaf extracts on seed quality, tomato seeds were rinsed with distilled water and treated with the aqueous leaf extract of *Artemisia absinthium* overnight and subsequently washed several times during a period of 16 hours. Results were recorded for a period of 10 days (after 4 days, seed germination was calculated; following that germination, root length and shoot length were measured three times and two days apart). The seeds were subjected to the between paper (ISTA, 2003) germination test method. The formula used to calculate vigour index was:

$$VI = (MSL + MRL) \times \% \text{ of germination}$$

**MSL:** Mean Shoot Length

**MRL:** Mean Root Length

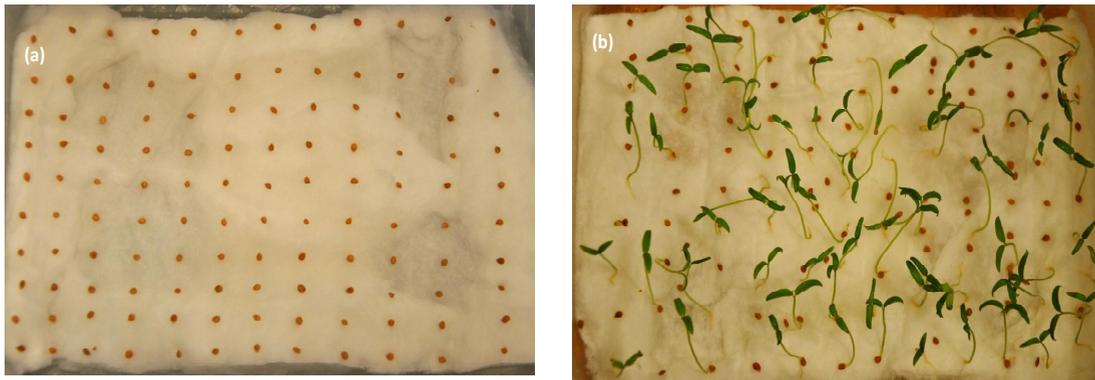
**VI:** Vigour Index (energy for germination)

## RESULTS

- 1 Effect of Aqueous Leaf Extracts on Tomato Seed Quality
- 2 Effect of Aqueous Leaf Extracts on Tomato Seed Quality Using *Ocimum basilicum* and *Artemisia Absinthium*
- 3 Representative Bar Chart of the Mean Shoot Lengths
- 4 Representative Bar Chart of the Mean Root Lengths

**Table 1.** The Vigour Index for Tomato Seeds Treated with Aqueous Leaf Extract Every value represents the mean of three experiments

Extract	Germination %	Mean Shoot length (MSL) in cm				Mean Root Length (MRL) in cm			Vigour Index (VI)		
		After 4 days	After 6 days	After 8 days	After 10 days	After 6 days	After 8 days	After 10 days	After 6 days	After 8 days	After 10 days
Control	66.67	4.2	5.5	6	5.2	7	7.7	626.7	833.4	913.4	
<i>Ocimum basilicum</i>	40.83	4.5	6	6.5	5	7.5	8	387.9	551.2	592.0	
<i>Artemisia Absinthium</i>	68.33	3.5	5	6	5.5	6.5	7.5	615.0	785.8	922.5	

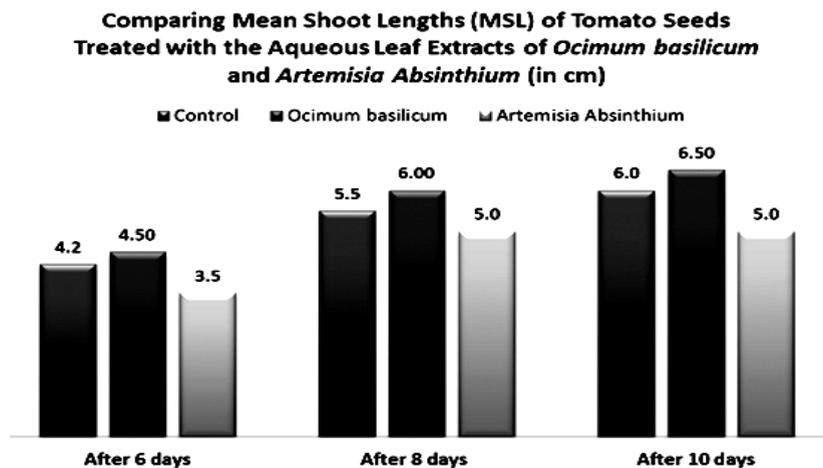


**Fig. 1.** (a) Control tomato seeds placed on cotton and rinsed with distilled water. (b) Control tomato seeds after 10 days

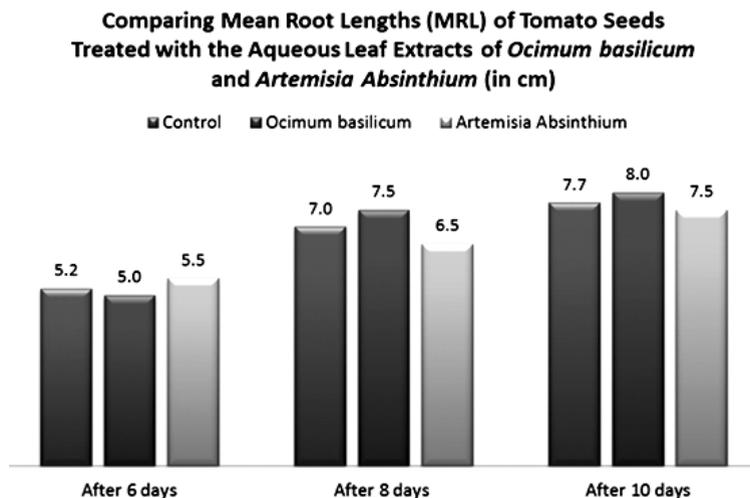


**Fig. 1(c).** Tomato seedlings after 10 days. Tomato seeds were placed on cotton and rinsed with distilled water and treated with the aqueous leaf extract of *Ocimum basilicum* overnight and subsequently washed several times during a period of 16 hours

**Fig. 1. (d)** Tomato seedlings after 10 days. Tomato seeds were placed on cotton and rinsed with distilled water and treated with the aqueous leaf extract of *Artemisia Absinthium* overnight and subsequently washed several times during a period of 16 hours



**Fig. 2.** Mean Shoot Lengths (MSL) of Tomato Seeds Treated with the Aqueous Leaf Extracts of *Ocimum basilicum* and *Artemisia Absinthium* showing *Ocimum basilicum* displaying maximum MSL



**Fig. 3.** Mean Root Lengths (MRL) of Tomato Seeds Treated with the Aqueous Leaf Extracts of *Ocimum basilicum* and *Artemisia Absinthium* showing *Ocimum basilicum* displaying maximum MRL

## DISCUSSION

In the present study, an attempt was made to investigate the use of aqueous medicinal plant extracts on tomato seed quality. Tomato seeds treated with the aqueous leaf extract of *Ocimum basilicum* and *Artemisia Absinthium* had influenced the seed quality parameters. In tomato seeds treated with *Ocimum basilicum*, the highest germination percentage was found to be (40%) in comparison with (67%) when treated with *Artemisia Absinthium*. Maximum mean shoot length observed in tomato seeds treated with *Ocimum basilicum* 6.5cm and the maximum mean shoot length for tomato seeds treated with *Artemisia Absinthium* was 6cm similar to that measured in the control.

The maximum root length observed in tomato seeds treated with *Ocimum basilicum* was 8cm whilst the maximum root length in tomato seeds treated with *Artemisia Absinthium* was 7.5cm compared to 7.7cm in the control. Tomato seeds treated with *Artemisia Absinthium* displayed reduced mean root lengths and shoot lengths when compared with both the control and tomato seeds treated with *Ocimum basilicum*. However, tomato seeds treated with *Ocimum basilicum* showed increased mean root lengths and shoot lengths when compared with both the control and tomato seeds treated with *Artemisia Absinthium* (Table 1).

The germination percentage and vigour

index were analysed and evaluated. Despite showing greater shoot and root lengths, seed treated with *Ocimum basilicum* had a lower germination percentage and vigour than those treated with *Artemisia Absinthium*. The differences could have been due to the phytotoxicity of the extract on seed quality. Thus it can be concluded that plants from the *Lamiaceae* family inhibit seed germination and vigour (compare figures 1(c) and 1(d)). In a study by (Deepthi, *et al.*, 2007), it was found that inhibition of germination and seed growth was also experienced when treating tomato seeds with *Leucas aspera* which is in the same family (*Lamiaceae*) as *Ocimum basilicum*. The study concludes that the use of certain medicinal plant extracts may enhance seed quality germination and vigour or may improve plant quality.

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