

Effect of *Zingiber officinale* and *Allium cepa* Aqueous Extract on the Germination and Seedling Growth of Tomato Seeds

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ABSTRACT

The present studies find out the potential use of plant derived products in the treatment of seed-borne diseases. Medicinal plants are prominent and are cultivated worldwide and are used commercially. The present study evaluated and analysed the effect of aqueous plant extracts from two medicinal plants (*Zingiber officinale* and *Allium cepa*) on tomato seed quality. The study found that seed treatment with *Zingiber officinale* showed greater seed germination than both the control and tomato seeds treated with *Allium cepa* extract. *Zingiber officinale* not only increases seed germination but also enhances vigour more than *Allium cepa* and control. The study concluded that seed treatment with medical plant extracts may enhance seed quality and vigour.

Key words: Germination, Seed Vigour, Medicinal Plants, *Zingiber officinale* and *Allium cepa*

INTRODUCTION

The use of plant extracts and phytochemicals, both well known for their antimicrobial properties, are of great significance to therapeutic treatments (Nagesh and Shanthamma, 2009). Extracts of some medicinal plants were used for the treatment of various diseases. However, this area is not much developed, as compared to modern system of treatments, mainly because of the lack of scientific documentation and knowledge in this field (Kalimuthu et al., 2010).

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.

Medicinal plant extracts and products have been observed and proved to be effective against a large number of pathogens (Sheikh et al., 2012).

Mainly the pharmacological activity of medicinal plants depends in its secondary

metabolites which are comparatively smaller molecules than primary molecules such as proteins, carbohydrates and lipids. These natural products provide sources to synthesize new structural types of antimicrobial and antifungal chemicals that are relatively safe to man than synthetic ones (Kalimuthu et al., 2010).

Tomato (*Lycopersicon esculentum* L.) belongs to family Solanaceae. It is considered to be as the most popular vegetable widely grown all over the world. It is popular because of its high nutritive value and miscellaneous uses. Tomato is one of the most important vegetable crops rich in vitamins and is therefore used in salads, cooked as a vegetable. It is a rich source of minerals, vitamins and organic acid, essential amino acids, dietary fibers, and Vitamin A and C, it also contains minerals like iron, phosphorus, and tomato also contains lycopene and Beta-carotene pigments. Being rich source of lycopene,

tomato is used in the treatment of cancer, especially the prostate cancer.

Seed germination is considered to be the most critical stage especially under stress conditions. During germination, biochemical changes take place, which provide the basic framework for subsequent growth and development (Hassan et al., 2012).

The current study seeks to evaluate the use of medicinal plant extracts (*Zingiber officinale* and *Allium cepa*) on tomato seed quality to identify potential enhancing properties.

MATERIALS AND METHODS

Preparation of Aqueous Plant Extracts

Samples of Zinger rhizome and *Allium* bulbs were collected from the local market. Samples were thoroughly washed with distilled water to remove all the dust and dirt particles and then were dried in drying oven. The extraction of samples was prepared by soaking of amount of the dry and powdered materials in distilled water (1:10 w/v) for 24 hours at room temperature. Extracts filtered by Whatman filter paper No.1 (Oudhia and Tripathy, 2001; Al-Zahrani and Al-Robai, 2007). Finally, extract kept under 4°C in the refrigerator. The distilled water alone was used as the control treatment.

Seed Preparation and Treatment

Seeds of Tomato were obtained from local market. 600 seeds were rinsed with tap water and divided as follows: 200 seeds as control; 200 seeds to be treated with *Zingiber officinale* and 200 seeds to be treated with *Allium cepa* extracts. Each experiment of 200 seeds of tomato was placed in conical flasks containing the plant extracts (10% w/v). Distilled water was used as control.

To evaluate the effect of *Zingiber officinale* aqueous rhizome extracts on seed quality, tomato seeds were rinsed with distilled water and treated with the aqueous rhizome extract of *Zingiber officinale* overnight. Also, to evaluate the effect of *Allium cepa* aqueous bulb extracts on seed

quality, tomato seeds were rinsed with distilled water and treated with the aqueous bulb extract of *Allium cepa* overnight.

Germination experiment

Ten seeds of the test plants were placed on filter paper inside a Petri-dish 9cm in diameter and 15-20 ml of the plant extract and distilled water for control treatment were constantly added. Petri plates were sterilized to avoid spoilage of seeds, and then filter paper was placed to provide support and hold moisture for the germination of seeds. The experiment was checked every 24 hours and the seed counted to germinated when the radical appearance. The experiment was conducted with four replicates. After 7 days, germination percent was calculated, filter paper was constantly moistened using the respective extracts.

The formula used to calculate vigour index was:

$$\text{Emergence \%} = \frac{\text{Emerged Seeds}}{\text{Total seeds}} \times 100$$

Seedling vigor index (SVI) was calculated according to the following formula (Abdulkhali and Anderson, 1973):

$$\text{SVI} = \text{Germination/Emergence \%} \times \text{Radicule length (mm)}$$

RESULTS

In the present study, from [Table-1](#) we find out the use of aqueous medicinal plant extracts on tomato seed quality. Tomato seeds treated with the aqueous extract of *Zingiber officinale* rhizome and *Allium cepa* bulb had influenced the seed quality parameters. In tomato seeds treated with *Zingiber officinale*, the highest germination percentage was found to be as 52.5% ([Fig-1](#)) in comparison with 40% ([Fig-2](#)) when treated with *Allium cepa* extract. Least germination of tomato seeds was obtained in control treatment as 27.5% ([Fig-3](#)). Maximum mean seedling length was observed to be as 23.67mm in case of tomato seeds treated with *Zingiber officinale* extract and 20.40 mm seedling length was obtained for tomato seeds treated

with *Allium cepa* extract which was better than 14.50 mm seedling length measured in the control treatment.

The germination percentage and seedling vigour index were analysed and evaluated.

The Seedling Vigor Index (SVI) was highest recorded in case of *Z. officinale* extract treated seedlings as 1242.67. SVI as 816.00 was recorded to be in case of *Allium cepa* extract treatment when compared with the SVI as 398.75 of control seedlings.

Table1: The effect of medicinal plants aqueous extracts on seeds germination and plant emergence in tomato after 7 days (In Petri dish experiment)

| Treatments | Total Seeds | Germinated Seeds | % Germination | Seedling Length (Mm) | Seedling Vigor Index |
|----------------------------|-------------|------------------|---------------|----------------------|----------------------|
| <i>Zingiber officinale</i> | 10 | 5.25 ± 0.4 | 52.5% | 23.67 ± 0.2 | 1242.67 |
| <i>Allium cepa</i> | 10 | 4.00 ± 0.4 | 40.0% | 20.40 ± 0.6 | 816.00 |
| Control | 10 | 2.75 ± 0.4 | 27.5% | 14.50 ± 0.5 | 398.75 |

Results are the mean of four replicates ±S.E.M.



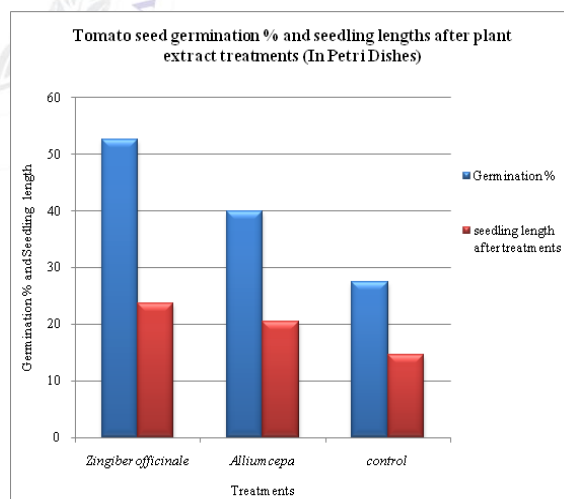
Fig-1: Tomato seedlings on 7 days. Treated with the aqueous rhizome extract of *Zingiber officinale*



Fig-2: Tomato seedlings on 7 days. Treated with the aqueous bulb extract of *Allium cepa*



Fig-3: Tomato seedlings after 7 days. Treated with only Distilled water as control treatment



Graph 1: Tomato seed Germination % and seedling lengths after plant extract treatments

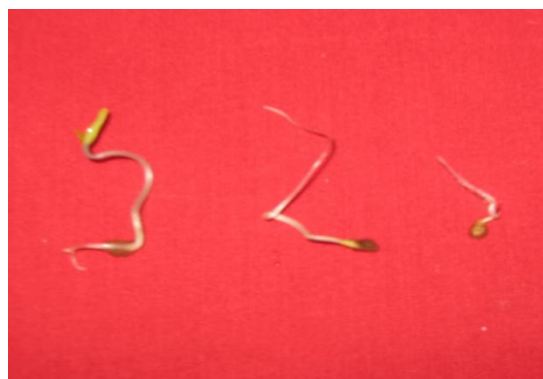


Fig-4: Comparison of seedling length at 7th day (*Zingiber officinale*, *Allium cepa* and control treatment seedling length respectively)

DISCUSSION

The results in this experiment indicate that the medicinal plants extract stimulated seed germination, seedling emergence. Treated seeds of tomato with medicinal plants extracts led to a pronounced increase in seed germination and seedling vigor. These results are in

agreement with those obtained by many authors (Culver et al., 2012; Norman et al., 2012; Ancuța et al., 2013).

Seedling vigor index (SVI) was also measured during the experiment and supported the view that extract treatment tend to increase the vigor index as well (Marraiki et al., 2013).

CONCLUSION

The study concluded that the enhancement in germination of seeds by extracts may improve the better emergence of seeds in fields.

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