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CAUSE OF PHYTOEXTRACTS ON DEVELOPMENT OF TOMATO FRUIT ROT AND EFFECT ON SPORE GERMINATION CAUSED BY *ALTERNARIA TOMATO* (COOKE) G. F. WEBER CAUSING FRUIT ROT OF TOMATO *(LYCOPERSICON ESCULENTUM* MILL.)

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ABSTRACT

Fruits and vegetables are important for human nutrition. They are also indispensible for the maintenance of human health and tomato (*Lycopersicon esculentum* Mill.) is one of them. A great damage is caused to tomato fruits in the field, during transit storage and thus marketed by fungal rots followed by the bacterial rots, which are responsible for decaying the tomato fruits. Here, leaf extracts of five plant species were tested against fruit rot of tomato caused by *Alternaria tomato*. In pre-treatment, after seven days of incubation, the lesion diameter was 24.27, 31.90, 34.03, 39.07 and 43.33 mm in leaf extracts of datura (*Datura stramonium*), neem (*Azadirachta indica*), garlic (*Allium sativum*), nilgiri (*Eucalyptus citridora*) and lantana (*Lantana camera*), while in case of post-treatment, all the phytoextracts significantly reduced the fruit rot of tomato over control. After seven days of incubation, the lesion diameter was 28.00, 36.00, 37.17, 45.07 and 46.93 mm in leaf extracts of datura (*Datura stramonium*), neem (*Azadirachta indica*), garlic (*Allium sativum*), nilgiri (*Eucalyptus citridora*) and lantana (*Lantana camera*) treatments respectively. For spore germination test, similar extracts of various plant species with suitable control were screened *in vitro* to know their inhibitory effect on the spore germination of *Alternaria tomato*. Here, all the phytoextracts efficiently reduced the spore germination over the control. The unsterilized leaf extract of datura (*Datura stramonium*) proved strongly inhibitory (10.90%) followed by neem leaf extract (*Azadirachta indica*) (19.23%), garlic (*Allium sativum*) (24.50%), nilgiri (*Eucalyptus citridora*) (29.12%) and lantana (*Lantana camera*) (44.54%) respectively.

Keywords: Phytoextract, Plant species, *Alternaria*, Inoculation and Incubation

INTRODUCTION

Fruits and vegetables are important for human nutrition. They are also indispensible for the maintenance of human health and tomato *(Lycopersicon esculentum* Mill.) is one of them. Tomato is a crop of immense value in olericulture. It is a solanaceous fruit vegetable believed to have its origin in Tropical America. Portuguese introduced it in India in the early 18th century. Tomato is a popular fruit vegetable available throughout the year in India.

Tomato is used as a fruit as well as vegetable in our diet and preferred by all people and consumed in different forms throughout the year. It can be consumed as a fresh ripe fruit and is one of the most popular salad vegetables. It is taken after cooking or raw or is made into soups, salad, pickles, ketchups, sauces and many other products. Hence, there is a great demand for tomato in the market as a fresh fruit. A great damage is caused to the tomato fruits in the field, during transit, storage and marketing by the fungal rots followed by the bacterial rots, which are responsible for decaying the tomato fruits. Annually 0.5 to 19.7 per cent damaged tomato fruits were found due to post-harvest fungal rots[1]. In field and marketing conditions, different tomato fruit rots have been reported due to *Rhizopus stolonifer, Alternaria solani, Penicillium notatum*. Tomato fruits are attacked by many fungi, but most important are *A. solani, Alternaria alternata, Alternaria*

tomato, Nicotianae spp., *Phytophthora* spp., *Fusarium roseum Fusarium solani, Penicillium italicum, Aspergillus niger, Fusarium chlamydosporium, Penicillium digitatum, R. stolonifer, Penicillium expansion and P. oxalicum.*

EXPERIMENTAL

Phytoextracts of datura *(D. stramonium),* neem (*A. indica),* nilgiri *(E. citriodora),* garlic (*A. sativum)* and lantana *(L. camara)* were tested. The fresh leaves were brought to laboratory and thoroughly washed with tap water and then with sterile distilled water and air dried. One hundred gram leaves were crushed in grinder mixer by adding 100 ml distilled water to obtain 1:1 extract. The phytoextracts, thus obtained were then, filtered through double layered sterile muslin cloth and the phytoextracts healed up to 40 °C. In case of pre-treatment, semi-ripe fruits were first dipped in the solution of the above different phytoextracts separately for five minutes, air dried and 12 hrs later, treated fruits were inoculated with. *A. tomato* by cork wounding method. In post- treatment, tomato fruits were inoculated by cork wounding method with *A. tomato* and 12 hrs later, the inoculated fruits were dipped into different phytoextracts separately for five minutes. The untreated inoculated fruits served as control. All these fruits were placed separately in sterilized, loosely tied polythene bags with a piece of sterilized wet absorbent cotton inside each bag and bagged fruits were kept at 28 ± 2 °C for seven days. Each treatment was replicated for three times and three fruits were kept in each replication. Observations on fruit rot development were recorded after three, five and seven days of incubation.

For the spore germination test, spore suspension was prepared from seven days old culture of *A. tomato* grown on PDA medium in sterile distilled water. The suspension was examined under microscope in the low power magnification (100 X) and was adjusted to about 25 spores per microscopic field. Equal volume of spore suspension and phytoextract (1:1, 1:2 and 1:4) were mixed thoroughly in watch glasses. From, this, one drop of the suspension was placed on the slide and equal quantity of spore suspension and sterile distilled water served as control. All the slides were then placed in an inverted position in moist chambers. Spore germination was recorded under microscope in ten microscopic fields after 24, 36 and 48 hrs of incubation. Observations were tabulated and analyzed statistically. Percent spore germination was calculated by using following formula[2]-

Percent spore germination = [Germinated spores / Total number of spores] X 100

RESULTS AND DISCUSSION

Many phytoextracts are known to have inhibitory effect on the growth and sporulation of various fungi. This information is certainly useful in exploiting inhibitory principle for developing botanical fungicides for the plant disease management. In the present investigation, five unsterilized extracts of various plant species with suitable control were screened in *vitro* to know their inhibitory effect on the spore germination of *A. tomato.*

Pre-treatment effect of different Phytoextracts on development of Tomato fruit rots

Leaf extracts of five plant species were tested against fruit rot of tomato caused by *A. tomato.* To know the efficacy of leaf extract of these plant species, semi-ripe healthy tomato fruits of equal size were first treated with different phytoextracts and after 12 hrs of incubation, they were inoculated with *A. tomato*. All the phytoextracts significantly reduced the fruit rot development over control. Significantly less fruit rot development was observed in the treatments of datura leaf extract followed by neem and garlic leaf extracts after three, five and seven days of incubation. After seven days of incubation, the lesion diameter was 24.27, 31.90, 34.03, 39.07 and 43.33 mm, while diameter of sporulated area was 14.00, 15.78, 21.43, 32.54 and 33.53 mm in leaf extracts of datura, neem, garlic, nilgiri and lantana treatments, respectively. In untreated fruits (control), the lesion diameter

and diameter of sporulated area were 46.33 and 34.10 mm, respectively after seven days of incubation.

Post-treatment effects of different Phytoextracts on development of Tomato fruit rot

The phytoextracts tried as pre-treatment were also tested as post- treatment against fruit rot of tomato caused by *A. tomato.* The semi-ripe healthy tomato fruits of equal size were inoculated first with *A. tomato* and after 12 hrs of incubation; they were treated with the different phytoextracts.

All the phytoextracts significantly reduced the fruit rot of tomato over control. Un-sterilized leaf extract of datura was most effective followed by leaf extract of neem and garlic in controlling the fruit rot of tomato due to *A. tomato.* After seven days of incubation, the lesion diameter was 28.00, 36.00, 37.17, 45.07 and 46.93 mm, while diameter of sporulated area was 14.00, 18.90, 21.17, 28.03 and 35.10 mm in leaf extracts of datura, neem, garlic, nilgiri and lantana treatments, respectively. While, the lesion diameter and diameter of sporulated area were 48.46 and 36.10 mm, respectively in control after seven days, of incubation. Leaf extracts of neem and garlic at 1:1 concentration were equally effective in reducing fruit rot of tomato after seven days of incubation.

Patel (1991) tested phytoextracts of 19 species against *A. alternata* and reported that maximum inhibition by the turmeric rhizome (53.07 %) followed by datura leaf extract (52.24 %). Thakur *et al.* (1991) revealed that *D. metel* showed maximum antifungal activity of fungal growth of *M. roridum* and *A. alternata.*

Spore germination test

All the phytoextracts significantly reduced the spore germination over the control, while significantly less spore germination was observed in datura leaf extract at all the concentrations tested after 24, 36 and 48 hrs of incubation. After 48 hrs of incubation, 16.90, 15.23 and 21.29 per cent spore germination was obtained in the 1:1, 1:2 and 1:4 concentrations of datura leaf extract, respectively. Neem leaf extract was found next best in which spore germination was 19.23, 27.72 and 37.86 per cent in 1:1, 1:2 and 1:4 concentrations, respectively followed by garlic leaf extract which showed spore germination of 24.50, 38.53 and 43.26 per cent in 1:1, 1:2 and 1:4 concentrations, respectively. The spore germination was 29.12, 41.50 and 50.98 per cent in 1:1, 1:2 and 1:4 concentrations of nilgiri leaf extract, respectively. Unsterilized leaf extract of lantana was found least inhibitory. While, 66.73 per cent spore germination was observed in the control.

Similarly, Shekhawat and Prasad (1971) observed 100 and 64 per cent inhibition of spore germination of *A. tennis* over the control (22.6 %) from the five per cent (w/v) leaf extracts of *A. cepa* and *A. sativum,* respectively, probably due to presence of allicin in *A. sativum* and protocatochuic acid and catechol in *A. cepa.* Karade and Sawant (1999) tested extracts of 12 medicinal and wild plants against *A. alternata* and observed 10 spore germination in leaf extract of *A. sativum* and minimum spore germination was inhibited with the leaf extract of *L. camara.* Thus, the present investigations are in confirmation with the findings of above research workers.

CONCLUSION

In both pre and post treatment, datura extract was found most effective followed by leaf extracts of neem, garlic and nilgiri while, unsterilized leaf extract of lantana was found least inhibitory. Pre-treatment was found more effective than the post-treatment. While, in case of spore germination test, unsterilized leaf extract of datura proved strongly inhibitory (10.90 %) followed by neem leaf extract (19.23 %) at 1:1 concentration after 48 hrs of incubation.

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