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RESEARCH ARTICLE

ANTIFUNGAL EFFECT OF SOME LATEX YIELDING PLANTS AGAINST *FUSARIUM OXYSPORUM* F. SP. *LYCOPERSICI*

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Abstract: The latex yielding plant shows inhibition on the growth of fungal pathogen.In the present investigation,In vitro antifungal efficacy of latex from selected latex yielding plants viz., *Calotopisprocera, Jatropa curcus, Argemonemaxicana, Opuntia dillenii, Ficus bengalensis* and *Ficus glomerata* against fungal pathogen *Fusarium oxysporum*.f.sp.*lycopersisci* is carried out here.The inhibition effects of the medicinal plants latex on test fungi (*Fusarium oxysporum*), *Jatropacurcus* latex showed maximum reduction in growth which is followed by *Ficus glomerata, Argemonemaxicana, Opuntia dillenii, Calotropis procera* and *Ficus bengalensis* respectively. The percent inhibition growth calculated here.

Keywords: Plant latex, Fungal pathogens, Growth inhibition, *Fusarium oxysporum*.f.sp. *lycopersici*

INTODUCTION

Tomato (*Solanum lycopersicum* L.) plant is an important member of Solanaceae (or Nightshade) family. It is a very common vegetable plant which spread from south America to Central America and also occurred all around the world. China is the major producer of tomato followed by India, USA, Turkey and Egypt. In India, the major tomato producing states are Andra Pradesh, Madhya Pradesh, Karnataka, Gujarat, Orisha, West Bengal, Maharastra, Chattishgarh, Bihar, Telangana, Uttar Pradesh, Haryana and Tamil Nadu. Tomato is the third most essential vegetable cultivated in India after potatoes and onions with a region of 780,000 hectares and productivity is approximately 25.04 Mt per hectare(Costa and Heuvelink,2018).Tomato is an important vegetable, commonly knowns 'Poor Men's Apple' because of their cheapest price and nutritional values. It contains of 93.4%-94.5% water, 0.85-4.6% sugar, 0.78%-0.88% protein. 0.2%-0.3% fat, minerals, mainly Potassium and is rich source of other nutrients such as Ascorbic acid(Vitamin C) and antioxidants compounds of carotenoids family like lycopene and ß-carotene (Rao and Agarwal 2000). This vegetable plant is very susceptible to many pathogens such Viruses, Bacteria, Fungus and Nematodes etc. Among the fungi, *Fusarium oxysporum* is one of the harmful fungal pathogen which causes vascular wilt in tomato plant and it is a soil borne pathogen affects crop yield, significantly decreasing the quantity and quality of crop (Wongpia and Lomathaisong, 2010). Jemenez-Fernandez *et al*. 2011 and also found that *Fusarium oxysporum* is soil borne in nature while according to Pandey *et al*., 2013, it is seed borne pathogen.

To prevent the disease in vegetable plants, many pesticides and fungicides are used which are hazardous to the environment and human health due to their non-biodegradable and potential effect upon non-targeted organisms, including humans particularly when used in excessive amount. To considered the above mention facts natural botanicals and latex are used in place of chemically synthesized pesticides and fungicides. The plant has latex and consisting of many bioactive molecules such as alkaloids, tannins, gums, resin and enzymes such as proteases, chitinases, lipases and glucosidases. It has been demonstrated these substances are source of natural fungicides (Barkai-Golan.2001) which is regarded as both safe and effective against various fungal pathogens. In the present investigation six latex yielding plants viz.,*Calotropis procera, Jatropacurcus, Argemonemaxicana, Opuntia dillenii, Ficus bengalensis* and *Ficus glomerata* were evaluated for their antifungal effect against *Fusariumoxysporum*. f.sp. *lycopersici*.

MATERIALS AND MATHODS

Plant Material and Latex collection: For the evaluation of antifungal effect of latex from the aerial parts of some selected plants against *Fusariumoxysporum*. f. sp. *Lycopersici* are used. The fresh latex of *Calotropis procera*, *Jatropacurcus*, *Opuntia* dillenii, *Argemone maxicana*,

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Ficusbengalensis and *Ficus glomerata* from the aerial parts of the plants via methanol and aqueous extraction method described by Aworh *et al*.(1994). The latex mixture was gently handled to maintain homogenecity during transport to the laboratory where it was stored at (4◦c) for futher use.

Test Pathogen: *Fusarium oxysporum* f. sp. *lycopersici*, wilt causal fungus used as test pathogen in the present investigation.

Isolation of test Pathogen, Fromsymptomatic Tomato Plants: Wiltdiseased tomato plant samples were collected and brought from farmer's fields to laboratory of Department of Botany, Meerut College, Meerut for experimental investigation. These diseased plant samples washed under running tap water to remove adhered soil particles; surface sterilized with 1% Sodium Hypochlorite solution for 1 to 2 minutes followed by rinsing twice with sterile distilled water then dried between sterile filter papers for 10 to 15 minutes. Infected and discoloured stem portions of diseased plant samples were cut into small pieces with sterilized knife and again washed with distilled water followed by disinfection for 2minutes with 2.5 percent Sodium Hypochlorite solution. To remove residues of Sodium Hypochlorite solution from diseased plant samples were again washed thrice with distilled water and then transfer aseptically under Laminar Air Flow system on to sterilized Petri plates containing PDA (Potato Dextrose Agar) medium. These Petri-plates were incubated at room temperature @ 27± 2°C for10days for development of typical mycelial growth of associated wilt causal fungal pathogen.

Identification of test Pathogen: Mycelial growth of isolated wilt pathogenic fungus i.e., *Fusarium* spp. was identified basedon the morphological and cultural characters described (Booth, 1971) and at species and formaspecial is as per fusarium Laboratory Manual (Nelson *et al*., 1983). The isolates were identified as *Fusarium oxysporum*f.sp. *lycopersici*, causal organism of fusarium wilt of tomato.

Fig.1 An Agricultural field with healthy tomato plants along with diseased plants.

Fig.2 A diseased tomato plant showing typical fusarium wilt symptoms

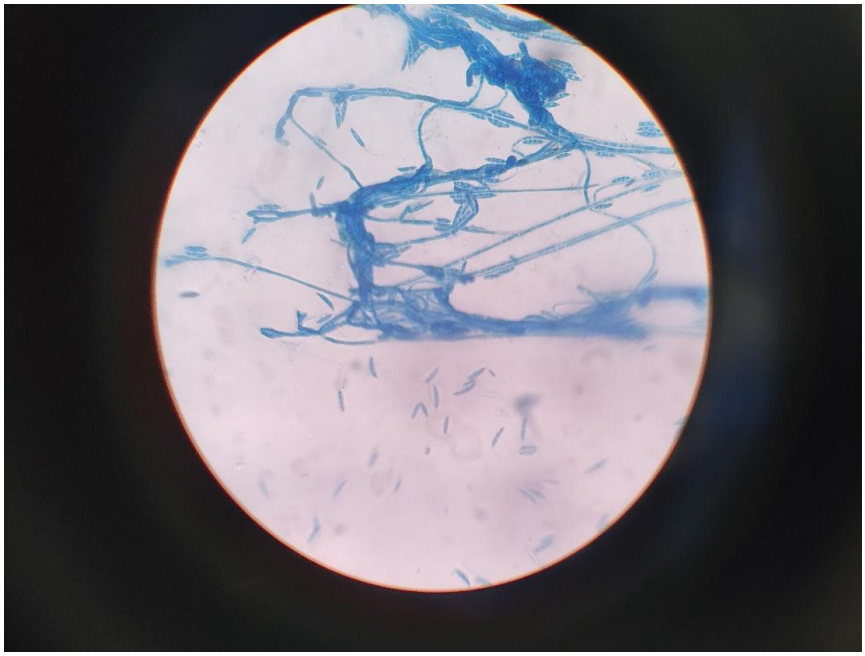

Fig.3 Identification of *Fusarium oxysporum*. f.sp. *lycopersici*

Preparation of plant latex extract: For preparation of extracts, plant parts were washed 2-3 times with running tap water, sterilized distilled water and finally surface sterilized with 90% alcohol. The fresh latex was centrifuged at 10000 rpm for 20 min. The precipitated material showing colloidal nature (like rubber aspect) was pooled apart and supernatant separated carefully. Finally, all the samples were centrifuged as described above and the clear supernatant were collected and the stock solutions (Juncker *et al*. 2009).

In vitro antifungal evaluation of plant latex extracts against test pathogen: Plant latex aqueous and alcoholic extracts of each prepared with distilled water and condensed to serve as stock extract was evaluated by food poison technique (Mishra and Tiwari, 1992) against test pathogen in four concretions. Petri plates containing Potato Dextrose Agar (PDA), supplemented with prepared different plant latex extracts at four concentrations with three replications were inoculated with 7 days old culture of test fungi (*Fusarium oxysporum*. f.sp. *lycopersici)* in 8 mm discs and kept upside down. These inoculated plates were incubated in BOD incubator at 25 ± 3°C for 7 days. Plates without plant latex extract serve as control. The percent growth inhibition was calculated by using the following formula (Vincent, 1947).

Percent inhibition of colony over control

$$= \frac{\text{growth in colony (mm) in control} - \text{growth of colony (mm) in treatment}}{\text{growth (mm) in control}} \times 100$$

RESULTS AND DISCUSSION

The results obtained from this In-vitro investigation are presented in Table1.The study had revealed that both the aqueous and alcoholic latex extracts from plant parts showed that antifungal effect against test pathogen.

Table 1. Antifungal effect of some plant latex extracts against wilt causing fungi of tomato plant

Plant sps. (name)	Family	Used Conc. (%)	Radial growth of Fungi	Percent inhibition
Calotropis procera	Asclepediaceae	25%	42	53.33%
		50%	30	66.66%
		75%	28	68.88%
		100%	24	73.33%
Jatropacurcus	Euphorbiaceae	25%	08	91.11%
		50%	06	93.33%
		75%	04	95.55%

		100%	00	100.00%
Opuntia dillenii	Cactaceae	25%	40	55.55%
		50%	34	62.22%
		75%	28	68.88%
		100%	24	74.33%
Argemone maxicana	Papaveraceae	25%	48	46.66%
		50%	38	57.77%
		75%	29	67.77%
		100%	22	75.55%
Ficus bengalensis	Moraceae	25%	44	51.11%
		50%	38	57.77%
		75%	34	65.22%
		100%	28	68.88%
Ficus glomerata	Moraceae	25%	29	67.77%
		50%	24	73.33%
		75%	20	77.77%
		100%	18	80.00%

Fig 4. Fungal growth inhibition by using plant latex of *Calotropis procera*

Fig 5. Fungal growth inhibition by using plant latex of *Jatropacurcus*

Fig 6. Fungal growth inhibition by using plant latex of*Opuntia dillenii*

Fig 7. Fungal growth inhibition by using plant latex of*Argemone maxicana*

Fig 8. Fungal growth inhibition by using plant latex of*Ficus bengalensis*

Fig 9. Fungal growth inhibition by using plant latex of *Ficus glomerata*

The inhibition effects of the medicinal plant latex on test fungi, *Jatropacurcus*latex showed maximum (100%) reduction (or inhibition of radial growth of*Fusariumoxysporum* .f. sp. *lycopersici*) which is followed by *Ficus glomerata* (80%),*Argemone maxicana* (75.55%), *Opuntiadillenii* (74.33%), *Calotropis procera* (73.33%) and *Ficus bengalensis* (68.88%) respectively.

DISCUSSION

The similar observations on different plant pathogens were done by many researchers time to time. The best antifungal activity was recorded in ethanol extract of *Calotopis procera* latex against *Candida albicans* (Kareem *et al.* 2008). Leaf extracts, chopped leaves and latex of *Calotropis procera* have great promise as a nematicide in-vitro and in-vivo (Khirstova and Tissot,1995).The antifungal potency of *Calotropis gigentia* latex extract on the *Candida albicans* showed a larger diameter clearance than that of other fungal pathogens (Ven Katesan and Subramanian, 2010).

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REFERENCES

Agrios (2005). Plant Pathology 5th Edition.Elsevier Academic Press. Page No 539-540.

Google Scholar

Aworh, O.C., Kasche, V. and Apama, O.O. (1994). Purification and properties of Sodom Apple latex properties. *Food Chem.*, **50**: 359-362.

Google Scholar

Barkai-Golan, R. (2001). Postharvest Disease of Fruits and Vegetables. Development and Control. Elsevier, Amesterdam, The Netherlands,418pp.

Google Scholar

Booth (1971). The Genus Fusarium. Commonwealth Mycological Institute.CAB International Kew, Surrey. England.

Google Scholar

Costa, J.M. and Heuvelink, E. (2018). The Global Tomato Industry. In E. Heuvelink (Ed.),Tomatoes (2nd edition.pp.1-26).(Crop production science in horticulture series;Vol.**27**).

Google Scholar

Kareem, S.O., Akpan, I. and Ojo, O.P. (2008). Antimicrobial activities of *Calotropis procera* on Selected Pathogenic Microoraganisms. *African Journal of Biomedical Research*,**11**:105-110.

Google Scholar

Khirstova, P. and Tissot, M. Soda (1995). Anthraquinone Pulping of *Hibiscus sabdriffa* (Karkadeh) and *Calotropis procera* from Sudan. *Bioresource Technology*, **53**:672-677.

Google Scholar

Mishra, M. and Tiwari, S.N. (1992). Toxicity of *Polyalthia longifolia* against fungal pathogens of rice. *Indian Phytopathol*., **45**,59-61.

Google Scholar

Nelson, P.E., Toussoun, T.A and Marasas, W.F.O. (1983). *Fusarium species*: An Illustrated Manual for Identification. University Park, Pennsylvania State University Press.

Google Scholar

Nirmaladevi, D. and Srinivas, C. (2012). Cultural Morphological and Pathogenicity variation in *Fusarium oxysporum*.f.sp.*lycopersici* causing wilt of tomato, Batman University. *Journal of Life Sciences*, **2**(1):1-16.

Google Scholar

Venkatesan, S. and Subramanian, S.P. (2010). Evaluation of antifungal activity of *Calotropis gigentia* latex extract, An invitro Study. *International Journal of Pharmaceutical Sciences and Research*, **1**(9):88-96.

Google Scholar

Vincent, J.M. (1947). Distortion of fungal hypha in the presence of certain inhibitors.*Nature*,**150**: 850.

Google Scholar