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Research Article

Eco-friendly management of root wilt of chickpea and pigeon pea by using plant leaf extract

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Abstract

Antifungal activity of *Azardirachta indica* L., *Jatropha curcus* L., *Datura stramonium* L. and *Annona squamosa* L. were assessed against *Fusarium* wilt of chickpea and pigeon pea (*Fusarium oxysporum f. sp. ciceri* and *F. oxysporum f. sp. udum*) *Invitro.* Leaf extract of selected medicinal plant preparing various concentrations viz. 5, 10, 15 and 20 percent were tested against pathogenic fungi of selected pulses by food poisoning method. As concentration increases inhibitory activity also increases. Aqueous leaf extract of *J. curcus* shows maximum inhibitory effect on tested pathogens followed by *A. indica* and *A. squamosa*.

INTRODUCTION

Fusarium sp. is the most important and severe plant pathogenic fungi. It is infect any stage of growth and reduce total production of respective plant. After harvesting the plant it is survive on the plant trashes and soil. It infect also in post harvest stage.

Medicinal plants represent a rich source of antimicrobial agents (Mahesh and Satish, 2008). Many of the plant materials used in traditional medicine which are readily available in rural areas at relatively cheaper than modern medicine (Mann *et al.,* 2008). The use of biological compounds extracted from plants may be an alternative to conventionally used fungicides to control phytopathogenic fungi, due to their being bioactive chemicals such as flavonoids, phenols, tannins, alkaloids, quinones, saponins and sterols (Burt, 2004).

In recent year a number of plant extract their essential oils and their volatile components have been reported to have strong antifungal activity (Siripornvisal, 2009). According to (Thangavelu *et al.,* 2004), the mycelial growth of *Colletotrichum musae* was inhibited by the *Jatropha curcus* leaves extracts which are able to control the anthracnose disease in three banana varieties: 'Robusta', 'Rasthali' and 'Ney Poovan'. The use of medicinal plant materials for the inhibition of fungal diseases is an old practice in many countries and is still offers an enormous potential source of antifungal agent (Usharani and Chitra, 2014). Many phyto-chemical pesticides exhibiting broad spectrum of activity against pest and diseases have long been considered as attractive alternative to synthetic chemical pesticides as they are biodegradable, target specific and pose no or less hazard to the environment or to human health. (Walia *et al.,* 2014).

Plants have been a rich source of medicines because the produce a bioactive molecules, most of which probably evolved as chemical defenses against predation or infection (Anitha *et al.,* 2016). The testing of the efficacy of such potential plant based sources for antifungal activity could an important step towards the assessment of the degree of variability among the diverse natural flora (Manoorkar and Gachande, 2014).

MATERIALS AND METHODS:

Isolation of pathogenic fungi:

Infected plant of chickpea and pigeon pea were brought to laboratory and infected part cut with help of sterilized blade and washed with water then surface sterilization placed in 2 min in $HgCl_2$ and washed it 2-3 times with distilled water infected pieces was placed of PDA plate and incubate at room temperature. Each fungal colony separated at fifth day and making pure culture and observed under microscope, on the basis of their colony color, shape, size, conidia and mycelium and identified by using manual of The Illustration of Fungi (Mukadam D.S. *et al.*, 2006)

Collection of plant extracts:

Fresh healthy leaves of *D. stramonium* and *J. curcus* L. were collected from different location of Beed and Ahemdnagar district and washed with $HgCl_2$ for 2 min after that washed thoroughly 2-3 times with distilled water then leaves were grinded in mixture and obtained fine soft powder.

Preparation of plant extract:

Obtained powder of leaves is weighted and mixed with different level of concentration i.e. 5gm in 100ml, 10gm in 100ml, 15gm in 100 ml and autoclave it for 40 min at 120^0c.then extract was filtered through double layered muslin cloth and finally through Whatman filter paper no. 1 and filtrate was used for further investigation and stored in pre-sterilized flask.

Bioassay of pathogenic fungi:

Bioassay was carried out in Czapek Dox broth medium. 10ml of leaf extract mixed with 10ml medium in 100ml sterilized conical flask and same quantity of water received for control. Seven days fresh culture inoculums disk of fungal pathogen transferred in flask containing medium with and without extract. The flask were incubated at room temperature for 10-12 days on incubation the mycelial biomass in each treatment was collected on pre-weighted filter paper and dry weight was determined after 24 hrs oven drying at 60^0 *c*. The dry weight of the mycelia was determined by subtracting the weight of the filter paper from the total weight of the filter paper with mycelia. Three replicates were maintained for each treatment. Percentage of inhibition was calculated by the formula, (Edington et al., 1971, Vincent, 1947)

$$\% \text{ of inhibition} = \frac{\text{wt. of mycelium in control} - \text{wt. of mycelium in treatment}}{\text{wt. of mycelium in control}} \text{ x100}$$

RESULT AND DISCUSSION:

Antifungal activity of four medicinal plant leaf extract tested exhibited different degrees of antifungal activity shown by *J. curcus* on *F. oxysporum f. sp. udum* (84.00) followed by *A. indica* (78.12) and in the case of *F. oxysporum f sp. ciceri* also *J. curcus* shown (77.77) followed by *A. squamosa* (77.22). The present study has shown that the extract of *J. curcus* and *A. indica* posses remarkable antifungal activity against many pathogenic fungi. Similar studies have been carried out by different researchers on antifungal activity of respective plant extract. The correlated study done by (Hussain *et al.,* 1992) reported the leaf extract of *D. stramonium* reduced the development of rust pustules on the leaves of wheat. (Mumtaz and Sumia 2017) Antifungal activity *Withania somnifera, Lantana camera, Aloe vera, Mentha arvensis, Tridax procumbens* and *Acacia nilotica* etc. were screened for their antifungal activity. Seed-borne fungi isolated from Sunflower *Helianthus annus* L. variety LSF-10 and LSF-9 are *Aspergillus niger, Aspergillus flavus, Fusarium moniliforme, Rhizoctonia bataticola, Curvularia lunata, Mucor* sp., *Cladosporium, Alternaria helianthi* and *Rhizopus nigricans.* (Jalander and Gachande, 2011) with plant leaf extract from *Tinospora cordifolia* against *Fusarium oxysporum* and *Alternaria solani*. (Jalander and Gachande, 2012) four sp. of *Datura stramonium, D. metal, D. ferox, D. innoxia* against *Fusarium oxysporum* (wilt of pigeon pea), *Alternaria solani* early blight of tomato.

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Table no. 1. Effect of aqueous plant leaf extract on pathogenic fungi of chickpea and pigeon pea.

Plant species	Pathogen	Mycelial wt. of pathogen (mg) and % of inhibition				
		Control	**5%**	**10%**	**15%**	**20%**
A. Indica L.	*F. oxysporum f. sp. ciceri*	54 (0.00)	32 (40.74)	28 (48.14)	23 (57.40)	17 (68.51)
	F. oxysporum f. sp. udum	64 (0.00)	29 (54.68)	23 (64.04)	18 (71.87)	14 (78.12)
J. curcus L.	*F. oxysporum f. sp. ciceri*	27 (0.00)	10 (62.96)	9 (66.66)	8 (70.37)	6 **(77.77)***
	F. oxysporum f. sp. udum	25 (0.00)	13 (48.00)	7 (72.00)	6 (76.00)	4 **(84.00)***
D. stramonium L.	*F. oxysporum f. sp. ciceri*	70 (0.00)	59 (15.71)	53 (24.28)	50 (28.57)	42 (40.00)
	F. oxysporum f. sp. udum	61 (0.00)	55 (9.83)	51 (16.39)	48 (21.31)	43 (29.50)
A. squamosa L.	*F. oxysporum f. sp. ciceri*	101 (00.00)	28 (72.27)	26 (74.25)	25 (75.24)	23 (77.22)
	F. oxysporum f. sp. udum	39 (00.00)	22 (43.58)	15 (61.53)	13 (66.66)	10 (74.35)

*****Maximum inhibition of pathogens.

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