EFFECT OF SOME PLANT EXTRACT AGAINST SEED BORNE INFECTION OF *COLLECTOTRICHUM DESTRUCTIVUM* ON *VIGNA UNIGUCULATA* L.

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ABSTRACT

The cowpea, *Vigna unguiculata* L. Walp is an ancient food crop, suffering from many fungal diseases. *Collectotrichum destructivum* is a harmful seed borne pathogen causing disease to the cowpea plant. Control of seed borne infection would be a possible means of reducing losses due to this disease, attempts were made, fungal species isolated from cowpea seeds were used as inocula. The effects of leaf extracts of *Argemone mexicana* L., *Semecarpus anacardium* L., *Cassia fistul*a L., *Tephrosia purpurea* (L.) Pers*.,* were evaluated for the control of *Collectotrichum destructivum* on seeds of cowpea. The seeds were soaked in sterile distilled water extract (10, 20 and 30%, w/v) of the leaves for 5, 10 and 15 h. All these plant extracts had significant inhibitory growth effect on the fungal pathogen. *Argemone mexicana* extract was more effective followed by *Semecarpus anacardium, Cassia fistul*a and *Tephrosia purpurea* plant extracts and compared favorably with benomyl in the control of the pathogen.

Key words: *Collectotrichum destructivum*, Benomyl, *Vigna uniguculata*.

INTRODUCTION

Cowpea is one of the most ancient human food sources and has probably been used as a crop plant since Neolithic times (Summerfield *et al*., 1974). It is mainly consumed as a favorite foodstuff in the form of dried seeds, either as flour or split (Johnson and Raymond, 1964; van Wyk and Gericke, 2000). They are a good source of carbohydrates, vitamins, and protein, providing more than half of plant protein in human diets in some areas of the semiarid tropics (Singh *et al.,* 1997; Tuan and Phillips, 1992). The fungus *Collectotrichum destructivum* attacks all parts of the plant: seedlings, hypocotyl, stems, penduncles, flowers, leaves and pods (Allen *et al*., 1998). Yield loss of up to 75% due to disease in cowpea has been reported (Emechebe, 1981). *Colletotrichum* itself was introduced by Corda (1831), It encompasses species with endophytic, epiphytic, saprobic and phytopathogenic lifestyles (Kumar and Hyde, 2004; Photita *et al*., 2001a,b, 2003, 2004; Liu *et al*., 2007; Prihastuti *et al*., 2009). The genus has worldwide importance, causing diseases on a wide range of economic crops and ornamental plants (Sutton, 1992; Than *et al*., 2008a-c; Hyde *et al*., 2009). The fungus is seed borne, seed transmitted and causes reduced seed germination (Emechebe, 1981). The control of disease in cowpea has been sought through chemical means and the use of host plant resistance (Oladiran and Oso, 1983; Alabi *et al.,* 1986; Alabi and Emechebe, 1990). However, the average Indian farmer cannot afford the increasing cost of synthetic chemicals. Furthermore, the use of fungicides has of late resulted in the build up of toxic chemicals potentially hazardous to man and environment and also in the build up of resistance by pathogens (Sinclair, 1971; Adesiyan, 1983).

Therefore, the development of biopesticides has been focused as a viable pest control strategy in recent years. One source of potential new pesticides is natural products produced by plants. Plant extracts and essential oils show antifungal activity against a wide range of fungi (Grane & Ahmad, 1988; Wilson *et al*., 1997; Abd-Alla *et al.,* 2001). Recently Alkhail (2005) showed that aqueous extracts of plants viz., *Allium sativum, Cymbopogon proxims, Carum carvi, Azadirachta indica* and *Eugenia caryophyllus* had strong antifungal activity against fungi viz., *Fusarium oxysporum, Botrytis cinerea* and *Rhizoctonia solani.* In the present study the antifungal activity of aqueous leaf extracts of four plants against *Collectotrichum destructivum* was investigated.

MATERIALS AND METHODS

Fresh leaves of *Argemone mexicana*, *Semecarpus anacardium*, *Cassia fistul*a, *Tephrosia purpurea* were collected and washed with distilled water. The solutions were allowed to stand overnight and were strained through a clean muslin cloth. These were centrifuged at 1200 rpm for 20 min. Three concentrations were prepared by extracting 10, 20 and 30 g of plant extracts in 100 ml of sterile distilled water. The seeds, with high infection by *C. destructivum* as determined by the blotter method, were treated with each of the extracts treatment involving soaking the seeds in each of the concentration for 5, 10 and 15 h. Treated seeds were dried on blotter sheets for 8-10 h and subjected to blotter test. Seeds were also soaked in 3.0% benomyl for 30 min and untreated seeds served as control. For each treatment, four replicates of 25 seeds each were considered making a total of 100 seeds for each treatment. Observation for the incidence of *C. destructivum* was made under microscope. Cultures and slides were compared with standards. The data on average incidence of *C. destructivum* were subjected to ANOVA and means were separated using the Duncan's Multiple Range Test (DMRT).

RESULTS AND DISCUSSION

Effect of aqueous leaf extract of four plants viz. *Argemone mexicana*, *Semecarpus anacardium*, *Cassia fistul*a, *Tephrosia purpurea* was evaluated against seed borne infection of *Collectotrichum destructivum* on *Vigna uniguculata* L. The three concentrations 10, 20 and 30 of the plant extracts at different time of exposure (soaking hours) reduced the incidence of *C. destructivum*. Complete control was obtained with *Argemone mexicana* using 30% extracts at 10 and 15h soaking period. There were significant differences in the incidence of *C. destructivum* on seed treated with the different concentrations of the extracts of *S. anacardium* and at different time of exposure, soaking periods. The incidence of the pathogen was reduced significantly to 22.0% on cowpea seeds treated with 10% extracts for 15 h. Complete control was achieved by treating cowpea seeds with 20 and 30% extract soaked for 10 and 15 h, respectively (Table 1). Leaf extracts of *A. mexicana* considerably reduced the fungal incidence to 7.2 and 2.2% in 20% extract after soaking for 10 and 15 h, respectively. The crude extracts from *Cassia fistul*a and *Tephrosia purpurea* did not completely reduce the incidence of the fungus in all concentrations. However at 30% concentrations, a considerable and significant reduction in the incidence of the pathogen was obtained as 2.0 and 1.0 of *C. fistul*a and 3.0 and 1.5 of *T. purpurea*. A comparison between the effect of all the plant extracts at 20% concentration (soaking period of 15 h) and benomyl (a standard fungicide), indicated that the extracts from *A. mexicana* and *S. anacardium* were superior to the fungicide in achieving disease control in that they completely inhibited the growth of the fungus than the fungicide at 2% concentration and 5, 10 and 15 Min soaking. Most botanical pesticides are known to be general bio-cides or bio-irritants (White, 2004). An *in vitro* study showed that an aqueous extracts from leaves showed anticancer activity, (Kiranmayi Gali *et al*., 2011) and antibacterial activity (Kempraj and Bhatt, 2010). Mohanta *et al.* (2007) prepared the aqueous and organic solvent extracts of the plant *S. anacardium* and screened for antimicrobial (disc diffusion method) and phytochemical properties. The petroleum ether (PEE) and aqueous extract fractions (AQE) showed inhibitory activity against *Staphylococcus aureus* (Mona Semalty *et al.,* 2010). *C. fistula* leaves contents about 72 and 15 % of the anthraquinone glycosides which was 0.62 – 2.01 % ww (Council of Europe, 2000), plant extract contents the laxative potency. All the *Cassia fistula* extracts were screened for their antibacterial and antifungal activities against the *Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus, Streptococcus pyogenes* and the fungi *Candida albicans, Aspergillus niger*, and *Aspergillus clavatus (Bhalodia and Shukla, 2012).* In this study, the plant extracts exhibited anti-fungal activity which varies with varied degrees of concentration and time of exposure to the seeds. Aqueous extracts from leaves of *A. Mexicana, S. anacardium* and *Cassia fistula* proved to be more effective in this study against *C. destructivum*. No work has been reported on the fungitoxicity of this plant extract of *T. purpurea* on fungus hepatoprotective activity used for human health.

Table 1: Effect of different plant extracts on seed-borne *C. destructivum*

Concentration (%)	Exposure time (h)	Pathogen incidence				
		Benomyl 2%	*Argemone mexicana*	*Semecarpus anacardium*	*Cassia fistul*a	*Tephrosia purpurea*
Control		70.2	70.2	70.2	70.2	70.2
10	5	39.2	30.4	31.4	40.1	41.2
	10	38.1	27.2	26.2	38.1	39.6
	15	35.4	22.2	22.0	37.2	37.2
20	5	17.2	15.4	16.4	19.1	20.2
	10	12.2	7.2	8.5	12.2	12.8
	15	8.2	2.8	4.6	8.4	8.8
30	5	2.5	0.5	2.0	3.8	4.8
	10	1.0	0.0	0.0	2.0	3.0
	15	0.0	0.0	0.0	1.0	1.5

Values are percentage incidence of *C. destructivum* subjected to square root transformation, and values in the same column followed by the same letters are not significantly different (p _ 0.05 LSD).

ACCKNOWLEDGEMENT

Authors are thanks to the Principal, J. E. S. College, Jalna for providing necessary facilities and grateful to UGC for financial assistance.

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