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Effect of some plant part extracts in management of seed borne pathogens

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Abstract

Plant disease causing pathogens are mostly seed borne and seed transmitted. Seed borne pathogens cause diseases of seed, seedling, and adult plants at various growth stages. Seeds are treated by various means to get rid of such pathogens, physical, chemical, and biological methods are available for treatment. Biological method need preference since plant metabolites and plant based pesticides appear to be one of the better alternatives as they are known to have minimal environmental impact and danger to consumers in contrast to synthetic pesticides. Exploitation of plant metabolites in crop protection and prevention of biodeterioration caused by fungi appear to be promising. In view of these the present investigation has to be undertaken to screen some plant extracts against seed borne pathogenic fungi .The purpose of investigation is to search for alternative approach to prevent bio deterioration of seeds in an ecofriendly way.

INTRODUCTION

The most vital input in crop production programme is seed, it should be of high quality and pathogen free. Pathogen free sound seeds are preferred for sowing to have desired germination, emergence, health seedlings and plant population[1-4] Fungi form the largest group among such microorganisms causing seed damage ,seed rot diseases at later stages of crop growth till maturity Seed borne fungi may be present in form of hyphae, conidia, oospores, chlamydospores, sclerotia, microspores, hyalospores and phaeospores.[5,6] Seeds provide natural substrate for the growth of associated fungi, they get associated with seed externally on the seed surface, seed coat and internally with the endosperm, cotyledons, plumule ,radical, embryo. Some are on the seed surface as contaminant this influences the seed to plant transmission of the pathogen. .[7-10] Seed borne pathogens result in heavy losses in crop yield and seed quality. Management of seed borne pathogens is the need of hour. Biological control of plant pathogens is preferred over the hazardous chemical based products. Botanicals like leaf, root, stem, rhizomes, bulbs and other plant parts are used as extracts to control seed borne pathogens by seed treatment[11,12] There is an urgent need to find out effective, alternative methods of diseases control, which are less harmful to human beings and environment[13.14] In view of these the present investigation was undertaken to screen some plant part extracts against seed borne pathogenic fungi and the data has been presented in this paper[15,16,17]

MATERIALS AND METHODS

Collection of plants

The plants used in the present studies were collected from different regions of Marathwada particularly Nanded. After pressing and drying herbarium sheets of these plants, their identification was confirmed through consultation with Department of Botany, Yeshwant Mahavidyalaya, Nanded using the "Flora of Marathwada"[18]. The leaves of *Cymbopogon citratus* (Poaceae), rhizomes of *Curcuma amada* (Zingeberaceae), and roots of *Asparagus racemosus* (Liliaceae) were collected separately, surface sterilized with 0.1 % $HgCl_2$ and washed two to three times with sterile distilled water. Plant parts like leaves, rhizomes, tubers, and roots, were separated and dried in a oven at 50-60 °C for 48 hours. Fine powders of these plant parts were prepared and preserved separately in polythene bags at room temperature (28 ± 2°C) for 48 hours.

Isolation of Phytopathogenic fungi

The test fungus namely *Alternaria solani,* was isolated from diseased leaves of tomato and *Fusarium moniliforme* was isolated from Maize seeds. For this the affected parts of the host were brought to the laboratory in polythene bags. They were cut into small pieces; surface sterilized with 0.1 per cent $HgC1_2$ solution and passed through three changes of sterile distilled water. The affected bits were placed aseptically on Glucose Nutrient Agar (GNA) plates. The fungal growth from the affected bits was picked up and transferred on GNA slalnt. The fungus identification was confirmed using manual of fungi [4] maintained on GNA slants for further investigation.

Fusarium moniliforme (Sheldon, 1904), Deuteromycetes, Form Family-Tuberculariaceae:

The fungus is pathogenic to plants especially in agricultural settings. The fungus causes serious diseases such as damping off of seedlings, root rot, wilting of several plants and rots of fruits and vegetables.

Alternaria solani (L.R Jones and Grout, 1896), Deuteromycetes, Form Family- Dematiaceae:

Alternaria solani causes diseases of several crop plants of family solanaceae. The early symptoms are in the form of small spots on the leaves which later on enlarge to form concentric rings. The fungus also infects fruits and tubers in severe condition.

Preparation of plant extracts

Hot water, Cold water, Alcoholic (ethanolic) and Ethyl acetate extracts of these plant parts were prepared. Hot water extract was prepared by heating extract in a container at 80 °C temperature for 20 minutes. 5 ml of alcohlic (ethanolic) and ethyl acetate extracts were evaporated on water bath and sterile distilled water was added to make up the volume of 5 ml. These extracts were used for further experiments.

Plant Extracts

2.5 g / 5 g / 7.5 g / 10 g powder each of the plant parts were weighed to study there effects at different concentrations, they were suspended / mixed separately in 100ml sterilized distilled cold water, hot water in 250 ml conical flasks. They were thoroughly shaken and then the conical flasks were allowed to stand for 12 hours at room temperature. The contents were filtered through Whattmann filter paper No.1. The filtrates were used as 2.5 %, 5 %, 7.5 % and 10 % plant extracts respectively.

Assessment of plant extract on incidence of seed mycoflora, seed germination, root length, shoot length, root rot and shoot rot

During the present studies, the test seed Wheat var.local was soaked separately in the cold water, hot water, alcoholic (ethanolic) and ethyl acetate extracts of leaves, rhizomes and roots (10%) of the selected plant parts / organs for twelve hours. All 10% plant part extracts only was used for soaking seeds because these extracts exhibited antifungal properties in terms of percent inhibition of spore germination of test fungi, and 10% extracts showed maximum inhibition of spore germination and further dilutions showed decrease in inhibition of spore germination (By spore germination method). The effect of extracts on percent incidence of seed mycoflora of test seeds was studied by blotter methods. Similarly, the seed germination, root length, shoot length, root rot and shoot rot of the soaked seeds of the test seed were studied by seed germination methods. The seeds soaked in sterile distilled water served as control.

Application of plant extracts on seed borne mycoflora.

1.Effect of leaf extracts of *Cymbopogon citratus* on Seed mycoflora, germination, Root and Shoot length, Root and Shoot rot of Wheat

In the present studies, the seeds of Wheat var. local were soaked in 10 % extracts of leaves of *Cymbopogon citratus* for 24 hrs. The soaked seeds were placed on moist blotters in Petri plates, incubated for seven days at room temperature and the incidence of percent seed mycoflora, percent seed germination, root length, shoot length, root rot, and shoot rot were recorded. The seeds soaked in sterile distilled water for 24 hrs served as control. The results obtained are presented in Table 1.

RESULT

Results presented in the Table show that all the extracts (cold water, hot water, ethyl acetate, alcoholic) of leaves of *C. citratus* were found to be inhibitory for the seed mycoflora, root and shoot rots while all the extracts were found to be stimulatory for seed germination, root and shoot lengths..

Alcoholic extracts showed highly reduced incidence of seed mycoflora (40%) followed by ethyl acetate extract (60% control 100 %). All the extracts of leaves showed increased seed germination, root and shoot elongation than control.

The highest seed germination (84 %) was recorded in alcoholic extract (control 60 %) and increased root length (56.2 mm, control 34.3 mm) and shoot length (57.1 mm, control 36.1 mm) was also recorded.

Root and shoot rots were not observed in germinated seeds treated with alcoholic extract.

2.Effect of rhizomes extracts of *Curcuma amada* on Seed mycoflora, germination, Root and Shoot length, Root and Shoot rot of Wheat

RESULT

It is evident from the results presented in Table that all the extracts (cold water, hot water, ethyl acetate, alcoholic) of rhizomes of C. *amada* were found to be inhibitory to seed mycoflora, root and shoot rots, while all the extracts were found to be stimulatory for seed germination, root and shoot lengths.Highly reduced incidence of seed mycoflora (20%) was observed in alcoholic extracts followed by ethyl acetate extract (40%, control 100 %). All the extracts of rhizomes showed

Table 1

Solvent extract (10%)	Incidence of seed mycoflora (%)	Seed Germination (%)	Root length (mm)	Shoot length (mm)	Root Rot	Shoot Rot
CW	80	63	35.6	36.3	+++	+++
HW	80	72	35.9	36.8	++	++
EA	60	78	48.6	49.7	+	+
AL	40	84	56.2	57.1	-	-
Control (SDW)	**100**	**60**	**34.3**	**36.1**	+++	+++

CW - Cold water
HW - Hot water
EA - Ethyl acetate
AL - Alcohol (ethanol)
SDW - Sterile distilled water

+ = Low rot
++ = Moderate rot
+++ = High rot
- = No rot

Table 2

Solvent extract (10%)	Incidence of seed mycoflora (%)	Seed Germination (%)	Root length (mm)	Shoot length (mm)	Root Rot	Shoot Rot
CW	70	70	34.8	37.2	++	++
HW	70	70	36.7	39.1	++	++
EA	40	80	46.2	48.3	++	++
AL	20	80	53.1	54.2	+	+
Control (SDW)	**100**	**60**	**34.3**	**36.1**	+++	+++

CW - Cold water + = Low rot
HW - Hot water ++ = Moderate rot
EA - Ethyl acetate +++ = High rot
AL - Alcohol (ethanol) - =No rot
SDW - Sterile distilled water

Table 3

Solvent extract (10%)	Incidence of seed mycoflora (%)	Seed Germination (%)	Root length (mm)	Shoot length (mm)	Root Rot	Shoot Rot
CW	70	70	36.1	36.4	++	++
HW	70	70	37.2	37.6	++	++
EA	40	80	49.2	51.2	+	+
AL	20	90	53.4	54.8	-	-
Control (SDW)	**100**	**60**	**34.3**	**36.1**	+++	+++

CW -Cold water + = Low rot
HW -Hot water ++ = Moderate rot
EA -Ethyl acetate +++ = High rot
AL -Alcohol (ethanol) - =No rot
SDW - Sterile distilled water

increased seed germination, root and shoot elongation than the control.Maximum seed germination (80 %) was recorded in alcoholic extract (control 60 %) and increased root length (53.1 mm, control 34.3 mm) and shoot length (54.2 mm, control 36.1 mm) was also recorded.

Root and shoot rots were not observed in germinated seeds treated with alcoholic extract.

3.Effect of tuberous root extracts of *Asparagus racemosus* on Seed mycoflora, germination, Root and Shoot length, Root and Shoot rot of Wheat.

RESULT

It is clear from the results that all the extracts (cold water, hot water, ethyl acetate, alcoholic) of roots of *A. racemosus* were found to be inhibitory for the seed mycoflora, root and shoot rots while all the extracts were found to be stimulatory for seed germination, root and shoot lengths.Highly reduced incidence of seed mycoflora (20%) was observed in alcoholic extracts followed by ethyl acetate extract (40% control 100 %). All the extracts of roots showed increased seed germination, root and shoot elongation than control.

The highest seed germination (90 %) was recorded in alcoholic extract (control 60 %) and increased root length (53.4 mm, control 34.3 mm) and shoot length (54.8 mm, control 36.1 mm) was also recorded.Germinated seeds treated with alcoholic extract showed no root and shoot rot.

CONCLUSION

The results obtained during the present investigation gave an idea that the plant extracts can successfully control the percentage incidence of seed mycoflora, root and shoot rot. The plant extracts stimulated seed germination, of Wheat var. Local. Of all the plants. *Asparagus racemosus* plant extracts were found to be more effective against seed borne pathogens compared to other plant extracts. Many seeds are being treated to avoid losses due to diseases by seed borne pathogens. Though other methods are available, biological methods should be preffered for management of seed borne pathogens as it facilitates environmental friendly agriculture system.

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