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Extracts of selected medicinal plants against seed mycoflora, seed germination and seedling growth of Cotton (*Gossypium arboreum* L.)

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The objective of the present study was to determine effect of medicinal plants viz., *Nyctanthes arbor-tristis, Strychnos nux-vomica, Wrightia tinctoria, Syzygium cumini, and Ocimum tenuiflorum* were collected from Kanpur dehat (U.P). The effect of different medicinal plant extract on seed mycoflora, seed germination and seedling growth were studied. Leaf extract of *Ocimum tenuiflorum* showed much reduced incidence of mycoflora and the seed soaked in the root, and leaf extract of *Syzygium cumini* showed more incidence seed borne fungi. The medicinal plant extract of *Ocimum tenuiflorum* was found to be stimulatory effect towards seed germination root length, shoot length and seedling growth of cotton. *Wrightia tinctoria* had shown inhibitory effect while *Nyctanthes arbor-tristis, Syzygium cumini, Strychnos nux-vomica* showed moderate inhibitory effect. Distilled water was used as control. The result demonstrated that seed germination and seedling growth were influenced by inhibitory or stimulatory effect of compounds present in the medicinal plant extract.

Key words: medicinal plant extract, cotton, seed germination, seedling emergence

INTRODUCTION

Cotton (*Gossypium arboreum*) plants suffer from diseases caused by various kinds of pathogens such as bacteria, fungi, viruses, nematodes, mycoplasma etc. Among these, fungi are considered as more aggressive. The plant diseases have significant role in agriculture in terms of reduction of yield and economy. One of the most widely used strategies to control plant diseases is the use of chemical agents. However, overuse and abuse of these chemical agents resulted in certain hazardous effects. These chemicals suffer from drawbacks such as high cost, toxicity to non-target organisms, residual problem and development of resistance in pathogens. This situation triggered interest in searching alternates for disease control. Natural products, in particular from plants, can be the potential candidates which can be used against phyto pathogenic fungi. (Kushwaha, 2017).

Overuse of synthetic herbicides to control weeds lead to an increased risk of herbicide resistant weed biotypes and harsh environmental pollutions. Alternative weed management strategies that are ecofriendly and cost-effective are therefore a time demanding issue throughout the world. In this backdrop, phytotoxic plants might help in resolving the problems created by synthetic herbicides as they possess growth retarding substances. Recently, there has been an increasing interest shown by the researchers on phytotoxic medicinal plants. The increasing interest on medicinal plants could be due to either (i) the easier screening process of phytotoxic plants from medicinal plants or (ii) the possibility to have more bioactive compounds in medicinal plants than other plants. These phytotoxic plants could be used in several ways to control weeds, for example, (i) sowing/transplanting them as relay or cover crops with main crops, (ii) direct application of their crude extracts as bioherbicides, or (iii) isolation and characterization of their active substances and using them as a tool for new natural and biodegradable herbicides development.

Therefore there is urgent need to undertake detailed study of different medicinal plants of the crop field and their proper utilization particularly in the

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welfare of the crop plants. The objective of this study was to determine the effect of extract of different medicinal plants on seed mycoflora, seed germination and seedling growth of Cotton (*Gossypium arboreum*).

MATERIAL AND METHODS

Preparation of Plant Extracts

Root/Fresh leaves (20 gm) of five different plant species (Table 1) were collected and surface sterilized with 0.02% $HgC1_2$ and repeatedly washed with sterilized water. The surface sterilized leaves along with 20 ml of distilled water were macerated to pulp. The sap thus extracted was first passed through four layers of muslin cloth and then filtered through Whitman's filter paper No.41 in 50 ml Pyrex flasks. The flasks were tightly wrapped with aluminum foil and autoclaved at 15psi for 20 minutes and kept in UV light for one hour.

Germination Experiments

From preliminary screening it was found that root and leaf extracts had the strongest effect on seed mycoflora. Root and leaves of the medicinal plants were thus selected for the detailed experiment. 100 ml water with 10 gram of powered plant parts were extracted separately by Soxhlet method and a series of solutions with different strengths (2, 4, 6, 8, and 10%) were prepared by dilution of 100 ml extract. Ten seeds of cotton were kept for germination in sterilized Petri-dishes lined double with blotting paper and soaked with 10 ml of different concentrations of aqueous extract of (2 to 10%) , with each treatment being repeated 10 times (Total Number of test seeds- 10 X 10 = 100). One treatment was run as control with distilled water only. The Petri-dishes were incubated under laboratory condition (room temperature) for one week, equal volume of d/w was added in the dishes when moisture content of the blotting paper declined. After seven days of incubation number of germinated seeds was counted and the root length, shoot length were measured and the seed mycoflora were observed.

RESULTS AND DISCUSSION

Effect of extract of medicinal plants on seed mycoflora of cotton

It was observed that the seed treated in root and leaf extract of *Ocimum tenuiflorum* showed much reduced incidence of mycoflora and the seed soaked in the root, and leaf extract of *Syzygium cumini* showed more incidence of seed borne fungi. More than 50% of *Alternaria* spp. is observed particular in *Alternaria alternata* and *Alternaria brassicicola* than other fungi like *Aspergillus, Botrytis, Drechslera rostrata*, etc. as compared to the seed soaked in sterile distilled water.

Effect of extract medicinal plant on seed germination of cotton

Except in *Ocimum tenuiflorum*, there was complete lack of seed germination of test species in 8 and 10% medicinal plant extracts (Table 2). Seed germination of cotton (*Gossypium arboreum*) was completely inhibited at >2% and >4% root extract of *Wrightia tinctoria* and *Syzygium cumini* (Table 2). It was further observed that except in *Ocimum tenuiflorum*, there was complete absence of seed germination of test species in 8 and 10% medicinal plants leaf extract of *Nyctanthes arbor-tristis, Strychnos nux-vomica, Wrightia tinctoria and Syzygium cumini* (Table 3).

Table 1: Medicianl plants used in study

Plant name	Family	Part used	Place of collection
Nyctanthes arbor-tristis	Oleaceae	Root/Leaf	Kanpur Dehat
Strychnosnux-vomica	Loganiaceae	Root/Leaf	Kanpur Dehat
Wrightia tinctoria	Apocynaceae	Root/Leaf	Kanpur Nagar
Syzygium cumini	Myrtaceae	Root/Leaf	Kanpur Naga
Ocimum tenuiflorum	Lamiaceae	Root/Leaf	Kanpur Dehat

Table 2: Seed germination percentage of cotton under different concentration of medicinal plants root extract.

Plant species	Percentage of seed germination					
Plant extract concentration	2%	4%	6%	8%	10%	Control
Nyctanthes arbor-tristis	72	14	05	-	-	93
Strychnosnux-vomica	68	21	06	-	-	100
Wrightiatinctoria	45	-	-	-	-	100
Syzygiumcumini	40	07	-	-	-	94
Ocimum tenuiflorum	70	80	79	83	95	93

Table 3: Seed germination percentage of cotton under different concentration of leaf extracts of medicinal plants

Plant species	Percentage of seed germination					
Leaf extract concentration	2%	4%	6%	8%	10%	Control
Nyctanthes arbor-tristis	75	66	09	-	-	100
Strychnos nux-vomica	79	63	17	-	-	100
Wrightia tinctoria	50	29	15	-	-	095
Syzygium cumini	76	50	07	-	-	098
Ocimum tenuiflorum	85	78	85	79	83	091

Effect of extract of medicinal plant on seedling growth of Cotton

Among the plant species there was highest growth of shoot and root length in root and leaf extract of *Ocimum tenuiflorum* (Tables 4-7). Different concentrations of both root and leaf extracts of medicinal plants when applied to cotton seeds, it was observed that root length was somewhat larger than the shoot length as compared to control.

Table 4: Root length of cotton seedlings after treatment with different concentrations of root extracts of medicinal plants

Treatment	Root length (cm.)				
	Nyctanthes arbor-tristis	*Strychnos nux-vomica*	*Wrightia tinctoria*	*Syzygium cumini*	*Ocimum tenuiflorum*
Control	13.3	11.7	16.0	14.4	09.3
2%	02.3	03.3	0.5	0.9	08.3
4%	02.4	02.7	-	0.7	07.4
6%	0.5	1.3	-	-	07.5
8%	-	-	-	-	07.8
10%	-	-	-	-	07.1

Table 5: Shoot length of cotton seedlings after treatment with different concentrations of root extracts of medicinal plants.

Treatment	Shoot length(cm.)				
	Nyctanthes arbor-tristis	*Strychnos nux-vomica*	*Wrightia tinctoria*	*Syzygium cumini*	*Ocimum tenuiflorum*
Control	07.4	08.5	12.1	13.3	07.4
2%	02.6	02.5	0.4	0.8	06.6
4%	02.1	01.6	-	0.6	06.3
6%	0.7	0.9	-		0504
8%	-	-	-		05.6
10%	-	-	-		06.2

Table 6: Root length of cotton seedlings after treatment with different concentrations of leaf extracts of medicinal plants

Treatment	Root length (cm.)				
	Nyctanthes Arbor - tristis	*Strychnos Nux- vomica*	*Wrightia tinctoria*	*Syzygium cumini*	*Ocimum tenuiflorum*
Control	12.3	10.5	14.6	13.2	6.3
2%	03.5	03.1	03.4	05.1	4.1
4%	03.0	02.4	03.1	03.4	6.5
6%	02.0	0.9	02.5	01.2	3.1
8%	-	-	0.7	-	5.5
10%	-	-	-	-	5.6

These results were in agreement with many earlier workers who studied antifungal characteristics of *Ocimum sanctum* L. and found that its leaf extract completely inhibited the growth of *Sclerotium rolfsii* and other related fungi. Use of bark and corks of commonly grown trees and shrubs is also an eco-

Table 7: Shoot length of Cotton (*Gossypium arboreum*) seedlings after treatment with different concentrations of leaf extracts of medicinal plants

Treatment	Shoot length(cm.)				
	Nyctanthes arbor-tristis	*Strychnos nux-vomica*	*Wrightia tinctoria*	*Syzygium cumini*	*Ocimum tenuiflorum*
Control	06.5	07.3	10.3	11.2	06.3
2%	03.3	0.2.9	03.3	04.3	04.1
4%	02.1	02.1	02.3	03.1	05.5
6%	0.9	01.0	01.8	0.09	03.1
8%	-	-	-	-	04.5
10%	-	-	-	-	04.5

nomical artifact and a feasible way of controlling major plant diseases. Leaf decoction of *Acacia nilotica, Colotropis procera, Datura stramonium, Dodonia vicosaand Rhazya stricta* were found to be effective in processing uredospore germination on detached leaves of wheat. The volatile fraction of two medicinal plants; *Azadirachta indica* and *Eucalyptus globules* were more effective in suppressing the sclerotia. The use of fungicides of synthetic origin is the most important method of protecting the plants against the fungal infections. However, toxicity and non-biodegradability of fungicides and the development of resistance in pathogenic fungi stimulated search for eco-friendly measures for control of fungal diseases (Tapwal *et al*. 2011; Vivek *et al*. 2013). Plant extracts, their metabolites and plant based pesticides represents one of the best alternatives for fungal disease management. The solvent extracts and essential oil of *Magnolia liliflora* were found to exhibit antifungal activity against *C. capsici* (Bajpai and Kang, 2012). Green gram, black gram, chickpea and pigeon pea for isolation of common borne fungi and study their effects on seed germination as well as length of shoots and roots of seedlings in different tested plants. Six seed borne fungi, i.e. *Aspergillus flavus, Aspergillus fumigatus and Aspergillus niger, Drechslera tetramera, Fusarium moniliforme, Rhizopus stolonifer* were common isolated mycoflora. (Kandhare, 2020).

CONCLUSION

Ocimum tenuiflorum root and leaf stimulatory effect of seed germination and seedling growth and inhibitory effect of seed mycoflora of cotton (*Gossypium arboreum*) crop. But among the four medicinal plants *Nyctanthes arbor-tristis, Strych*

nos nux-vomica, Wrightia tinctoria, Syzygium cumini had more inhibitory effect on cotton (*Gossypium arboreum*) seed germination and seedling growth and stimulatory effect of seed mycoflora as compared to *Ocimum tenuiflorum*. The leaf extracts of *Wrightia tinctoria* had somewhat medium effect on seedling growth. However, more research needed to confirm the effects of medicinal plant extracts on seed germination and seedling growth of cotton (*Gossypium arboreum*) in a natural environment

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