



ANTIFUNGAL ACTIVITY OF SOME PLANT EXTRACTS AGAINST ROOT-BORNE FUNGI OF LIQUORICE (GLYCYRRHIZA GLABRA L.)

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ABSTRACT: Glycyrrhiza glabra is a most important cultivated drug plant grown in India. They are found to be heavily infected with variety of fungi in field and storage. These associated fungi are known to deteriorate the plant parts and its chemical contents. These associated fungi isolated from the roots during storage in gunny bags in store houses. The efficacy of aqueous extracts of some plants was tested against the growth of the fungi. Poisoned food technique was employed. The plant extracts were found to be inhibitory for the growth of the test fungi. Considering this situation the present studies on effect of different plant extracts on liquorice plant used to control fungal infections instead of chemical fungicides.

Key words :Antifungal activity, plant extract, liquorice plant, poisoned food technique

1. INTRODUCTION

Glycyrrhiza glabra is one of the most important drug plant cultivated extensively throughout India. The roots of liquorice after harvesting they stored in store houses or godowns in gunny bags. They are found to be heavily infested with variety of fungi, these associated fungi are known to deteriorate the root and root contents. The aim of the study was to evaluate the antifungal activity of extracts of different plant species against the pathogenic fungi. The plant were selected on the basis of their ethnomedicinal uses. Different Fungal pathogens present on the liquorice plant have significant threat to parts of the plants that requires use of chemical fungicides. The use of chemical fungicides for drug plants has increasingly, The use of the fungicides is not only expensive, but also hazardous to the environment this in turn has created a need for alternative sourcing of fungicidal agents that can be developed for treatment of fungal diseases. Now days, plants are being used against many plant pathogenic fungi. The plants serve as ecofriendly and economic biocontrol agents. In order to control the diseases of liquorice plants due to fungi, some plant extracts were tested to control the plant diseases. 10% aqueous extracts of fresh leaves of 10 different angiospermic plants specially *Calotropis gigantea* (R.Br.), *Ocimum sanctum* (Linn.), *Azadirachta indica* (A.Juss.), *Withania somnifera* (Dunal), *Vinca rosea* (Linn.), *Lantana camera* (Linn.), *Adathoda vasica* (Nees.), *Tagetes erecta* (Linn.), *Vitex negundo* (Linn.) *Polyalthia longifolia* (Benth. and Hook.), rhizome and bulbs of 4 different medicinal plants *Curcuma longa*, *Zingiber officinale*, *Allium cepa*, *Allium sativum* and 3 gymnospermic plants *Thuja orientalis*, *Cupressus sp.*, *Araucaria araucariana* were tested against six fungi like *Aspergillus flavus* (Link.), *A. niger* (Tieghem.) *Fusarium oxysporum* (Schle.), *Curvularia lunata* (Wakker)Boed, *Alternaria alternate* (fr.)Keissler. *Phytophthora sp.*, these six fungi isolated from liquorice roots during storage. Keeping this in view, the present study the efficacy of some plant extracts against the fungi isolated from the roots of liquorice from stored houses and ayurvedic shops.

2. MATERIAL AND METHODS

Fungitoxicity of plant extracts was studied by the poisoned food technique described by Nane and Thapliyal (1997). Rose Bengal Agar medium was prepared in flasks and sterilized. To this medium, was added the requisite quantity of the plant extract to get 1:1 final concentration. The plant extract was thoroughly mixed by stirring. The medium was then poured into petriplates. Small disc (0.7 cm) of the fungus culture grown on Potato Dextrose Agar for 7 days was cut with a sterile cork borer and transferred aseptically in the center of the petridish containing the plant extracts. Suitable checks were kept where the culture discs were grown under the same conditions on Rose Bengal Agar without plant extract. The fungus colony diameter compared with check, was taken as a measure of the fungitoxicity. Per cent inhibition was calculated by using the formula suggested by Bliss, (1934).

Percent inhibition was calculated by using the formula.

$$\text{Percent inhibition} = \frac{\text{Control} - \text{Treatment}}{\text{Control}} \times 100$$

3. RESULTS & DISCUSSION

i) Effect of leaf extracts on growth of roots fungi :

Ten fresh angiospermic plant leaf extracts at 10% (aqueous) concentration were tested against six root fungi for inhibition of growth in solid medium. They were added in the solid medium to get 1:1 final concentration. The fungi were grown on this medium. The medium without plant extract served as control and the result are summarized in Table 01.

Table:01 Effect of leaf extracts on growth of roots fungi:

Plant extract	Diameter of fungal growth (mm)					
	<i>Alternaria alternata</i>	<i>Aspergillus flavus</i>	<i>Curvularia lunata</i>	<i>Fusarium oxysporum</i>	<i>Phytophthora sp.</i>	<i>Rhizoctonia solani</i>
<i>Calotropis gigantea</i>	35 (48.5)	42 (46.1)	36 (48.5)	34 (47.6)	48 (40.0)	40 (48.0)
<i>Ocimum sanctum</i>	30 (55.8)	38 (51.2)	33 (52.8)	40 (38.4)	36 (55.0)	35 (54.5)
<i>Azadirachta indica</i>	32 (52.9)	30 (61.5)	30 (57.1)	38 (41.5)	35 (56.2)	43 (44.1)
<i>Withania somnifera</i>	31 (54.4)	35 (55.1)	40 (42.8)	36 (44.6)	32 (60.0)	30 (61.0)
<i>Vinca rosea</i>	34 (50.0)	28 (64.1)	29 (58.5)	30 (53.8)	36 (55.0)	28 (63.6)
<i>Lantana camera</i>	37 (45.5)	35 (55.1)	40 (42.8)	45 (30.7)	32 (60.0)	30 (61.0)
<i>Adathoda vasica</i>	36 (47.0)	31 (60.2)	33 (52.8)	30 (53.8)	29 (63.7)	38 (50.6)
<i>Tagetes erecta</i>	28 (58.8)	35 (55.1)	41 (41.4)	29 (55.3)	42 (47.5)	46 (40.2)
<i>Vitex negundo</i>	29 (57.3)	32 (58.9)	37 (47.1)	31 (52.3)	36 (55.0)	42 (45.4)
<i>Polyalthia longifolia</i>	34 (50.0)	32 (58.69)	43 (38.5)	30 (53.8)	29 (63.7)	40 (48.0)
Control	68	78	70	65	80	77

(Figures in parentheses indicate percent inhibition of mycelial growth over control)

The data given in table 01 reveals that 10% aqueous fresh leaf extracts of *Calotropis gigantea*, *Ocimum sanctum*, *Tagetes erecta* and *Vitex negundo* proved inhibitory for the mycelial growth of *Alternaria alternata*. Similarly *Azadirachta indica* for *Aspergillus flavus* and *Curvularia lunata*, *Withania somnifera* and *Vinca rosea* for *Rhizoctonia solani*, *Lantana camera*, *Adathoda vasica* and *Polyathia longifolia* for *Phytophthora sp.* Were found to inhibit the mycelial growth.

Table:02 Effect of rhizome and bulb extracts on growth of roots fungi:

Fresh rhizome and bulb extracts at 10% (aqueous) concentration were tested for inhibition of mycelial growth of the six roots fungi in solid medium and results or summarized in Table 02

Table:02 Effect of rhizome and bulb extracts on growth of roots fungi :

Plant extract	Diameter of fungal growth (mm)					
	<i>Alternaria alternata</i>	<i>Aspergillus flavus</i>	<i>Curvularia lunata</i>	<i>Fusarium oxysporum</i>	<i>Phytophthora sp.</i>	<i>Rhizoctonia solani</i>
<i>Curcuma longa</i>	28 (54.0)	30 (55.8)	25 (61.5)	29 (58.5)	46 (22.0)	35 (53.3)
<i>Zingiber officinale</i>	30 (55.8)	28 (58.8)	46 (29.2)	26 (62.8)	I	40 (46.66)
<i>Allium cepa</i>	46 (24.5)	38 (44.1)	40 (38.4)	50 (28.5)	41 (30.5)	37 (50.6)
<i>Allium sativum</i>	38 (37.7)	41 (39.7)	39 (40.0)	55 (21.4)	40 (32.2)	31 (58.6)
Control	61	68	65	70	59	75

(I-Induction of mycelial growth over control)

It becomes clear from table that, *Zingiber officinale* for *Fusarium oxysporum* and *Aspergillus flavus*, *Curcuma longa* for all fungi, except, *Phytophthora sp.* , *Allium cepa* for *Rhizoctonia solani* and *Aspergillus flavus*, *Allium Sativum* for all fungi, except *Fusarium oxysporum* showed strong inhibition of mycelial growth. However *Zingiber officinale* for *Phytophthora sp.* proved to be stimulatory.

Table:03 Effect of gymnospermic plants on growth of roots fungi :

Fresh gymnospermic leaf extracts at 10% (aqueous concentration) were tested for their effect on mycelial growth of root fungi in solid medium and results are summarized in Table 03

Table:03 Effect of gymnospermic plants on growth of medicinal plant parts fungi :

Plant extract	Diameter of fungal growth (mm)					
	<i>Alternaria alternata</i>	<i>Aspergillus flavus</i>	<i>Curvularia lunata</i>	<i>Fusarium oxysporum</i>	<i>Phytophthora sp.</i>	<i>Rhizoctonia solani</i>
<i>Thuja orientalis</i>	I	48 (17.2)	52 (25.7)	I	46 (23.3)	58 (25.6)
<i>Cupressus sp.</i>	40 (31.0)	49 (26.8)	52 (25.7)	60 (11.7)	43 (28.3)	65 (16.6)
<i>Araucaria araucariana</i>	47 (18.9)	51 (23.8)	49 (30.0)	52 (23.5)	51 (15.0)	53 (32.0)
Control	58	67	70	68	60	78

(Figures in parentheses indicate percent inhibition of mycelial growth over control)

(I-Induction of mycelial growth over control)

It is clear from the results that gymnospermic leaf extracts were less inhibitory than that of angiospermic leaf extracts. *Thuja orientalis* for *Aspergillus flavus*, *Curvularia lunata*, *Phytophthora sp.* and *Rhizoctonia solani*, *Cupressus sp.* For all fungi, except *Fusarium oxysporum* and *Rhizoctonia solani*, *Araucaria araucariana* for all fungi were inhibitory for mycelial growth. *Thuja orientalis* for *Alternaria alternata*, *Fusarium oxysporum* proved stimulatory for mycelial growth.

In the present investigation studies were carried out to understand the qualitative and quantitative pathogenic and non pathogenic fungi on liquorice plants during their developmental stages in field and also during storage and transport of drug plants to market. The findings are mainly on I) Isolation of fungi from different medicinal plants in field and under storage condition, II) Biodeterioration of medicinal plant parts during pathogenesis due to artificially infested fungi

In order to control the diseases of liquorice plant due to fungi, some plant extracts were tested to control the plant disease. 10% aqueous extracts of fresh leaves of 10 different angiospermic plants and 4 fresh gymnospermic leaf extracts were used. All these extracts were found to be inhibitory for the mycelial growth of all the tested fungi. Among these plant extracts, gymnospermic leaf extracts were less effective than angiospermic plants. This study reveals that, these plant extracts offer much scope for further exploitation as a promising material for use in plant disease control. In the present study, growth of some fungi was found to be stimulatory by some of the plant extracts. Much work has been done on the use of plant extracts against plant pathogenic fungi. Advesh Narain and Satapathy (1977) observed that root, stem, leaves and flower extract of two varieties of *Vinca rosea* effective against *Fusarium oxysporum*, *Aspergillus niger*, *Allium cepa*, *Allium sativum*, *Azadirachta indica*, *Calotropis procera*, *Ocimum sanctum*, *Polyathia longifolia*, *Datura stamonium*, *Vinca rosea*, *Tagetes erecta* and *Withania somnifera* showed fungicidal property against *Fusarium oxysporum* and *Rhizoctonia solani* (Shivpuri et al, 1997). *Azadirachta indica*, *Ocimum basilicum* and *Lantana camara* against *Fusarium oxysporum* (Bansal et al, 2000). Abraham and Prakasan (2001) noted that ten percent concentrations of *Azadirachta indica*, *Ocimum sanctum* and *Vite xnegundo* were inhibitory for *Fusarium solani*, *Cladosporium oxysporum* and *Geotrichum candidum*.

5. CONCLUSION

All 10% aqueous extracts of angiospermic leaves, rhizome, bulb and gymnospermic leaves were found to be inhibitory for mycelial growth of all the fungi. While, *Zingiber officinale* for *Phytophthora sp.* and gymnospermic plant *Thuja orientalis* for *Alternaria alternata* and *Fusarium oxysporum* proved non inhibitory.

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7. REFERENCES

- [1].Abraham S and Prakasan V, 2001. Efficacy of botanicals on post-harvest pathogens of carrot. J. Mycol. Pl. Pathol. 31(2): 257-258.
- [2].Advesh Narain and Satapathy JN, 1977 Anifungal characteristics of Vinca rosea extracts. Indian Phytopath. 30(1): 36-40. 4.
- [3].Bliss, C.I. 1934.The methods of probits. Sci., 79: 38-39.
- [4].Nene YL and Thapliyal PL, 1979. Fungicides in Plant Disease Control. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi. pp 413-414
- [5].Shivpuri Asha, Sharma OP and Jhamaria SL, 1997. Antifungal property of plant extract against pathogenic fungi. J. Mycol. Pl. Path. 27(1): 29-31.

