

STUDIES ON RHIZOSPHERE MYCOFLORA OF SOME ORNAMENTAL PLANTS INFECTED WITH POWDERY MILDEW (*ERYSIPHE CICHORACEARUM* DC. EX.MERAT.)

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Rhizosphere mycoflora of *Dahlia variabilis*, *Dimorphotheca sinuata* and *Helianthus annuus* infected with powdery mildew (*Erysiphe cichoracearum* DC. ex. Merat.) was studied. Quantitatively more fungal population were recorded from the rhizosphere of diseased plants, in comparison to healthy plants. *Aspergillus niger*, *Botrytis cinerea*, *Rhizopus spp.*, *Trichoderma viridae* (from *D.variabilis*); *Colletotrichum sp.*, *Mucor sp.*, *Penicillium spinulosum* (from *D. sinuata*); *A.flavus*, *Penicillium sp.*, *Rhizopus arrhizus* and *R. oryzae* (from *H. annuus*) were isolated from the rhizosphere of diseased plants, while *Fusarium oxysporium*, *Penicillium sp.* (from *D.variabilis*); *Cladosporium elatum* (from *D. sinuata*); *F.oxysporium* and *Sclerotinia rolfsii* (from *H. annuus*) from the rhizosphere of healthy plants.

Keywords: *Dahlia variabilis*; *Dimorphotheca sinuata*; *Erysiphe cichoracearum*; *Helianthus annuus*; Powdery mildew; Rhizosphere mycoflora.

Introduction

It is a common phenomenon in plant pathology that rhizosphere micro-organisms are generally associated with the occurrence of various diseases in plants. Rhizosphere mycoflora of diseased plants affected by different pathogens has been studied by several workers¹⁻⁴. In the present communication rhizosphere mycoflora of three ornamental plants infected with powdery mildew (*Erysiphe cichoracearum* DC.ex.Merat) has been described.

Materials and Methods

Seeds of *Dahlia variabilis*, *Dimorphotheca sinuata* and *Helianthus annuus*, were surface sterilized with 0.1% Mercuric chloride, washed with distilled water and sown in pots of 6" size which were filled with sandy loam soil. For the isolation of rhizosphere fungi, few plants naturally infected with powdery mildew were carefully removed from their respective pots

and brought to the laboratory in sterilized containers. Healthy plants were taken as control. The plants were shaken to remove the superfluous soil from the root system under aseptic conditions, each plant was taken from its container and was placed in sterile glass petriplate. The root portion was then spread out and the soil particles sticking to the root surface were removed and the amount of soil thus obtained was mixed and placed in sterilized petriplates. The soil was then transferred with the help of sterilized flattened tip of the needle in petriplates containing 10 ml of sterilized melted and cooled potato-dextrose rose bengal-agar medium⁵. These petriplates were rotated before the solidification of agar in order to disperse the soil particles evenly. There were 25 replicates for each treatment. The inoculated petriplates were then incubated at $28 \pm 2^\circ\text{C}$ and the fungi which developed after one week were examined and identified. The frequency and relative abundance of various fungi were also calculated.

Results and Discussion

Total 128 fungal species were isolated from the rhizosphere of *D. variabilis*, *D. sinuata* and *H. annuus*, infected with powdery mildew (*E. cichoracearum*), as well as from the healthy plants.

Rhizosphere mycoflora of *D. variabilis* : From the rhizosphere of infected as well as the healthy plants 42 fungi were recorded. The high frequency (F = 45 and 50) and relative abundance R. A. = 9.98 and 10.15) was noted for *Colletotrichum* sp. and *Rhizoctonia solani* respectively. The frequency in the remaining fungi was below 35 percent and relative abundance varied considerably (Table 1). Infected plants harboured more fungi (twenty two) than those of healthy plants (twenty). *Aspergillus niger*, *Botrytis cinerea*, *Rhizopus* sp. and *Trichoderma viridae* were isolated from the

rhizosphere of infected plants, while, *Fusarium oxysporium* and *Penicillium* sp. from healthy plants (Table 2).

Rhizosphere mycoflora of *D. sinuata* : Forty four fungal species were isolated from infected and healthy plants. High rate frequency (F = 40, 40 and 45) and relative abundance (R.A. = 8.19, 9.16 and 11.15) was recorded for *Penicillium spinulosum*, *Penicillium* sp. and *Rhizopus oryzae* respectively. While, in rest of the fungal species frequency and relative abundance varied from 10-35 and 0.78-6.17 respectively (Table 1). Plants infected with powdery mildew harboured more fungi (twenty three) than those of the healthy plants. *Colletotrichum* sp., *Mucor* sp. and *Penicillium spinulosum* were isolated from the rhizosphere of infected plants and *Cladosporium elatum* from healthy plants (Table 2).

Table 1. Frequency and Relative abundance of fungi in the rhizosphere of infected plants of *D. variabilis*, *D. sinuata* and *H. annuus*.

Name of fungi	<i>D. variabilis</i>		<i>D. sinuata</i>		<i>H. annuus</i>	
	F	RA	F	RA	F	RA
<i>Alternaria alternata</i>	20	1.82	20	2.30	10	3.15
<i>Aspergillus flavus</i>	25	3.20	30	3.15	10	2.16
<i>A. fumigatus</i>	20	5.60	10	2.16	35	2.16
<i>A. niger</i>	15	6.50	20	6.14	05	3.18
<i>A. terreus</i>	10	2.76	20	4.13	45	10.16
<i>Botrytis cinerea</i>	10	8.50	10	3.15	10	5.15
<i>Cladosporium elatum</i>	10	3.20	-	-	30	0.79
<i>Colletotrichum</i> sp.	45	9.98	15	2.10	30	1.57
<i>Curvularia lunata</i>	20	2.75	30	6.15	40	7.18
<i>Fusarium oxysporium</i>	-	-	35	5.12	-	-
<i>F. roseum</i>	30	0.69	30	3.18	05	1.19
<i>Mucor</i> sp.	10	2.16	30	1.84	10	4.72
<i>Penicillium spinulosum</i>	20	2.18	40	8.19	30	3.71
<i>Penicillium</i> sp.	-	-	40	9.16	30	2.98
<i>Rhizoctonia solani</i>	50	10.15	20	4.16	25	1.05
<i>Rhizopus arrhizus</i>	20	5.48	10	3.14	10	3.30
<i>R. oryzae</i>	25	3.97	45	11.15	50	10.82
<i>Rhizopus</i> sp.	10	2.75	35	4.00	30	2.74
<i>Sclerotinia rolfsii</i>	20	9.02	35	2.10	-	-
<i>Trichoderma viridae</i>	25	6.15	10	0.78	10	9.09
<i>T. lingorum</i>	35	2.16	30	3.18	50	13.1
White sterile mycelium	30	7.15	20	6.17	30	4.95
Grey sterile mycelium	15	3.20	30	3.12	20	2.05
Dark sterile mycelium	15	2.86	35	1.16	25	0.68

Table 2. Frequency and Relative abundance of fungi in the rhizosphere of healthy plants of *D. variabilis*, *D. sinuata* and *H. annuus*

Name of fungi	<i>D. variabilis</i>		<i>D. sinuata</i>		<i>H. annuus</i>	
	F	RA	F	RA	F	RA
<i>Alternaria alternata</i>	30	1.96	35	1.16	15	2.16
<i>Aspergillus flavus</i>	30	3.16	40	2.15	-	-
<i>A. fumigatus</i>	10	4.64	20	1.19	15	1.19
<i>A. niger</i>	-	-	15	4.18	25	2.15
<i>A. terreus</i>	40	3.76	20	5.10	35	1.18
<i>Botrytis cinerea</i>	-	-	35	3.00	10	3.16
<i>Cladosporium elatum</i>	30	7.15	30	3.19	30	1.10
<i>Colletotrichum</i> sp	20	2.12	-	-	25	2.65
<i>Curvularia lunata</i>	35	1.16	25	7.10	50	6.18
<i>Fusarium oxysporium</i>	45	2.16	30	5.26	20	1.09
<i>F. roseum</i>	10	1.05	20	3.13	15	2.18
<i>Mucor</i> sp.	25	0.96	-	-	35	5.18
<i>Penicillium spinulosum</i>	20	2.16	-	-	35	3.92
<i>Penicillium</i> sp.	10	1.16	10	1.60	-	-
<i>Rhizopctonia solani</i>	20	5.14	25	3.18	35	3.00
<i>Rhizopus arrhizus</i>	30	6.16	35	3.14	-	-
<i>R. oryzae</i>	35	3.12	25	4.15	-	-
<i>Rhizopus</i> sp.	-	-	20	1.08	35	1.16
<i>Sclerotinia rolfsii</i>	30	4.26	25	3.19	20	3.89
<i>Trichoderma virida</i>	-	-	30	1.00	25	6.16
<i>T. lingorum</i>	25	0.98	10	2.16	10	1.05
White sterile mycelium	20	5.15	15	8.16	10	5.15
Grey sterile mycelium	40	2.16	25	4.12	30	3.10
Dark sterile mycelium	50	1.80	20	2.00	25	6.19

Rhizosphere mycoflora of H. annuus : *Fusarium oxysporium* and *Sclerotinia rolfsii* were isolated from the rhizosphere of healthy plants, while, *Aspergillus flavus*, *Penicillium* sp., *Rhizopus arrhizus* and *R. oryzae* from infected plants (Table 2). In all, 42 fungi were isolated from both infected and healthy plants. *Trichoderma lingorum*, *Rhizopus oryzae* and *A. terreus* were found with higher frequency (F = 50, 50 and 45) and relative abundance (R.A. = 13.15, 10.82 and 10.16)

respectively. In the remaining fungal population frequency remains below 40 percent and R.A. varied from 0.68-9.09.

Quantitatively more fungal population was isolated from the rhizosphere of diseased plants, in comparison to that of the healthy plants. This higher fungal population could be due to the difference in root exudates which favours fungal growth. The metabolic activity in higher plants infected with different micro-organisms

results in the formation of more amino acids and carbohydrates, etc., which favours more fungal population in the rhizosphere of a particular plant^{3,6}. So, from the above results it can be concluded that higher fungal population harboured the rhizosphere of *D. variabilis*, *D. Sinuata* and *H. annuus* infected with powdery mildew (*E.cichoracearum*, DC.ex.Merat.) pathogen. Mukhopadhyay and Nandi⁷, Prakash *et al*⁸, Tyagi and Dublith⁴ and Ansari and Prakash⁹ have also reported higher fungal population in the rhizosphere of diseased plants in comparison to healthy one.

References

1. Powell K J 1969, Nat.Hull. 10 89
2. Wadhvani K and Mehrotra N 1982, *Indian Phytopath.* 35 722.
3. Gangwane L V and Deshpande KB 1973, *Indian Phytopath.* 26 325
4. Tyagi D K and Dublith PK 1983, *Indian Phytopath.* 36 550
5. Martin J P 1950, *Soil Sci.* 69 215
6. Wood R K S 1967, *Physiological plant pathology* Black-well Sci.Pub, Oxford and Edinburgh.
7. Mukhopadhyay D and Nandi B 1974, *Curr. Sci.* 43 590
8. Prakash D, Naqvi Q A and Ansari AR 1978, *Acta Bot.Indica* 6 198
9. Ansari A R and Prakash D 1986, *Indian Phytopath.* 39 380