

Studies on Rhizosphere Mycoflora of Groundnut IV. A List of Fungi Isolated from Rhizosphere, Rhizoplane and Soil

L. V. Gangawane and K. B. Deshpande

Department of Botany, Marathwada University, Aurangabad, India

Introduction

A number of plants have been examined for quantitative and qualitative determinations of rhizosphere mycoflora. List of fungal taxa isolated from rhizospheres and rhizoplanes of various plants have been compiled by many workers: (1) Plants in sand dunes (Panwar *et al.*, 1969); (2) Mesophytic plants (Chinnayya and Agnihothrudu, 1953); (3) Forest plants including pteridophytes (Thornton, 1958; Ramchandra Reddy, 1959); (4) Crop plants (Adati, 1939; Agnihothrudu, 1958; Rangaswami and Venketesan, 1964; Rao, 1962; Youssef and Mankarios, 1968; Parkinson and Thomas, 1969). In the present investigation while studying the effect of agronomic treatments on rhizosphere mycoflora, fungal taxa isolated from the rhizosphere, rhizoplane and soil of groundnut (*Arachis hypogaea* L.) have been reported.

Materials and Methods

The rhizosphere mycoflora was studied by soil dilution plate count method (Timonin, 1940). Plants were carefully removed from the soil, shaken to remove excess soil and cut at the crown to separate the roots from the rest of plants, and were transported to the laboratory in sterile polythene bags. The roots were put into 500 ml distilled sterile water in 1000 ml conical flasks. The soil still clinging to the roots was removed by shaking the flasks. 20 ml of Waksman's synthetic agar (pH 4.5) was plated in triplicate with one ml of this dilution. Plates were incubated at room temperature ($26 \pm 3^\circ \text{C}$) for 10 days. Unidentified species were isolated on PDA (Potato dextrose agar) slants. Further observations for rhizoplane mycoflora were made by the serial root washing technique (Harley and Waid, 1955). Original root system was removed from the dilution flask. The root pieces (1 cm) randomly selected from different root regions were placed in a sterile test tube. They were washed 10 times with sterile water and were plated (5 pieces in each plate) on Waksman's synthetic acid agar medium to allow fungi to grow on the root surface. Soil mycoflora was studied by taking soil samples between two rows of groundnut crop up to the depth of 6 inches in sterile polythene bags. Approximately one gram of soil was added to the 1000 ml conical flask containing 500 ml distilled sterile water.

Table 1. Appearance of fungal species in the rhizosphere (R), rhizoplane (RP) and soil (S) of groundnut

Species	Isolated from		
	R	RP	S
Lower fungi			
* <i>Absidia corymbifera</i> (IMI 140380)	+	+	+
<i>Rhizopus stolonifer</i>	+	+	+
<i>Zygorhynchus moelleri</i> (IMI 148118)	+	-	-
<i>Mortierella</i> sp. (IMI 140381)	+	+	-
<i>Cunninghamella verticillata</i>	+	-	+
<i>C. echinulata</i> (IMI 140377)	+	+	+
<i>Syncephalastrum racemosum</i> (IMI 137652)	+	+	+
** <i>Phytophthora rubra</i>	+	+	+
<i>P. marathwadensis</i>	+	+	+
Ascomycetes			
<i>Thielavia terricola</i> (IMI 148109)	+	-	-
<i>Chaetomium jodhpurensense</i> (IMI 148104)	-	-	+
** <i>C. longirostrae</i> (IMI 137648)	+	-	+
<i>C. arcuatum</i> (IMI 148106)	-	-	+
<i>C. globosum</i>	+	-	+
<i>Sordaria bosensis</i> (IMI 140363)	+	-	-
<i>Neocosmospora vasinfecta</i> (IMI 137647)	+	+	+
<i>Aspergillus chevalieri</i> (IMI 148121)	+	-	-
<i>A. nidulans</i>	+	+	+
<i>Penicillium brefeldianum</i>	+	-	+
Deuteromycetes			
* <i>Phoma epyrena</i> (IMI 140362)	-	-	+
** <i>P. herbarum</i> (IMI 137650)	+	-	-
<i>P. glomerata</i> (IMI 148124)	-	-	+
** <i>Macrophoma minuta</i> (IMI 140369)	+	-	-
<i>Peyronellaea indianensis</i>	+	-	+
<i>Chaetomella raphigera</i> (IMI 137649)	+	-	+
** <i>Colletotrichum capsici</i> (IMI 148115)	+	-	-
** <i>Pestalotiopsis versicolor</i> (IMI 148114)	+	-	+
§ <i>Cephalosporium sclerotiorum</i>	+	-	+
<i>Trichoderma lignorum</i> (IMI 140374)	+	+	+
<i>Aspergillus flavus</i>	+	+	+
* <i>A. kanagawaensis</i>	+	+	+
<i>A. aculeatus</i>	+	+	+
<i>A. fumigatus</i> (Strain I)	+	+	+
+ <i>A. fumigatus</i> (Strain II)	+	-	+
<i>A. sclerotiorum</i>	+	-	+
<i>A. sulphureus</i>	+	-	+
** <i>A. petrakii</i>	+	-	+

* First report from the soils of India

** Reported from the rhizosphere soil for the first time

+ New strain of the species

§ New species

Species	Isolated from		
	R	RP	S
<i>A. carbonarius</i>	+	+	+
<i>A. niger</i>	+	+	+
<i>A. asperescens</i>	+	-	+
<i>A. ustus</i>	+	+	+
<i>A. flavipes</i>	-	-	+
<i>A. terreus</i>	+	+	+
* <i>Penicillium charlesii</i>	+	-	+
<i>P. vinaceum</i> (IMI 140368)	-	-	+
<i>P. funiculosum</i> (Strain I)	+	+	+
+ <i>P. funiculosum</i> (Strain II)	+	-	-
* <i>P. verruculosum</i>	+	+	+
<i>P. varians</i>	+	-	+
+ <i>P. duclauxi</i>	+	-	-
<i>Gliocladium roseum</i> (IMI 148100)	+	-	+
<i>Paecilomyces varioti</i> (IMI 140367)	+	-	+
<i>P. fusisporus</i> (IMI 140357)	+	-	+
* <i>Cladosporium oxysporum</i> (IMI 140355)	+	-	+
** <i>Nigrospora sacchari</i> (IMI 140373)	+	-	+
<i>Pullularia pullulans</i> (IMI 148113)	+	-	+
<i>Hormiscium bruennesporium</i>	-	-	+
<i>Curvularia lunata</i>	+	-	+
** <i>Helminthosporium proliferatum</i>	+	-	+
<i>H. tetramera</i>	+	+	+
<i>H. halodes</i> (IMI 140364)	+	-	+
* <i>Acrospira fluctuata</i> (IMI 140354)	+	-	+
<i>Fusarium moniliformae</i> (IMI 140390)	+	+	+
<i>F. semitectum</i> (IMI 140384)	+	+	+
<i>F. solani</i> (IMI 140386)	+	+	+
<i>F. oxysporum</i> (IMI 140389)	+	+	+
<i>Myrothecium roridum</i> (IMI 140382)	+	-	+
<i>Mycelia sterilia</i>			
<i>Rhizoctonia bataticola</i> (IMI 140361)	+	+	+
<i>R. solani</i> (IMI 140360)	+	+	+

* First report from the soils of India

** Reported from the rhizosphere soil for the first time

+ New strain of the species

§ New species

Observations and Results

Altogether 69 species belonging to 35 genera were isolated from the rhizosphere, rhizoplane and soil of groundnut (Table 1). They include 9 Phycomycetes, 10 Ascomycetes and 50 Deuteromycetes. Of the total species isolated, 63 were isolated from the rhizosphere, 27 from the rhizoplane and 59 from the soil. Quantitatively species of the genus *Aspergillus* and *Penicillium* were prevalent both in the rhizosphere and soil whereas

species of the genus *Rhizoctonia* and *Trichoderma* were frequently isolated from the rhizoplane. *Aspergillus chevalieri*, *Colletotrichum capsici*, *Macrophoma minuta*, *Thielavia terricola* and *Sordaria bosensis* were confined to the rhizosphere while *Aspergillus flavipes*, *Chaetomium jodhpurense*, *C. arcuatum*, *Penicillium vinaceum* and *Phoma glomerata* confined only to the soil. A new species of *Cephalosporium sclerotiorum*, a new strain of *Aspergillus fumigatus* and two new strains each of *Penicillium funiculosum* and *P. duclauxi* (Gangawane and Deshpande, 1971) were isolated from the rhizosphere or soil of groundnut crop.

Discussion

Different numbers of fungal taxa have been recorded by various workers from the rhizosphere and rhizoplane of different plants. Joffe (1969) recorded 157 species of fungi from the rhizosphere, geocarposphere and soil of groundnut in Israel whereas Rao (1962) noted only 16 species from the rhizosphere of 8 groundnut varieties in India. Most of the workers recorded the maximum number of the species of the genera *Aspergillus* and *Penicillium* in the rhizosphere and soil of various plants. The dominance of the species of these two genera in the rhizosphere of groundnut is also reported by Joffe (1969) and Rao (1962). Their dominance is explained on the basis of their heavily sporulating habit and their capacity to produce antibiotics. The maximum number (250) of fungal species is reported by Montegut (1956) from soil and by Simmonds and Ledingham (1937) from the rhizoplane (27 genera) of wheat. All these variations in the number of fungal taxa in the present studies and in the studies of different workers account for the variation in the nature of a plant, soil as well as the methods and media employed. The species of *Absidia corymbifera*, *Acrospeira fluctuata*, *Aspergillus kanagawaensis*, *Cladosporium oxysporium*, *Penicillium charlesii*, *P. verruculosum* and *Phoma eupyrena* are the first records from the soil of India while *Aspergillus petrakii* (Vörös, 1957), *Chaetomium longirostrae* (personal communication from Director, CMI), *Colletotrichum capsici* (Butler and Bisby, 1931; Dastur, 1934), *Helminthosporium proliferatum* (Deshpande, 1968); *Macrophoma minuta* (Saccardo, 1892), *Nigrospora sacchari* (personal communication from Director, CMI), *Phoma herbarum* (Saccardo, 1884) and *Phytophthora rubra* (Mantri, 1968) are the first records from rhizosphere or soil of groundnut as they are not reported from the soil by earlier workers.

Acknowledgement

Authors feel pleasure in expressing their grateful thanks to the Director and his staff, C. M. I., Kew, Surrey, England for confirmation of some of the species.

References

- Adati, M. (1939): Studies on the rhizosphere of plants. Second report. On the influence of various cultivated plants on the incidence of microorganisms in different Formosan soil types. *J. Soc. Trop. Agric. Taiwan* 11: 57-65.
- Agnihotrudu, V. (1958): Fungi isolated from rhizosphere V. *J. Madras Univ.* 29: 155-181.
- Butler, E. J. and Bisby, (1931): The Fungi of India - Scientific monograph No. 1, Govt. of India - Central Publication branch, Calcutta.
- Chinnayya, E. J. and Agnihotrudu, V. (1953): Rhizosphere microflora of plants growing in different ecological habitats. *J. Madras Uni. Sec. B.* 23: 182-192.
- Dastur, J. F. (1934): Cotton anthracnose in the central provinces. *Ind. J. Agri. Sci.* 4: 100-120.
- Deshpande, K. S. (1968): Taxonomy and Physiology of *Helminthosporium* species from Marathwada. Ph. D. Thesis, Marathwada Uni. Aurangabad, India.
- Gangawane, L. V. and Deshpande, K. B. (1971): Two new records of penicillia from rhizosphere of groundnut. *Curr. Sci.* 41: 78.
- Harley, J. L. and Waid, J. S. (1955): A method of studying active mycelia on living roots and other surfaces in the soil. *Trans. Br. Mycol. Soc.* 38: 104-118.
- Joffe, A. Z. (1969): The mycoflora of groundnut rhizosphere, soil and geocarposphere on light, medium and heavy soils and its relation to *Aspergillus flavus*. *Mycopath. et. Mycol. Appl.* 37: 150-160.
- Mantri, J. M. (1968): Studies on physiology of *Phytophthora* species from Marathwada. Ph. D. Thesis, Marathwada Uni. Aurangabad, India.
- Montegut, J. (1956): Preliminary observations on the mycoflora of the soil of Gascony lands. *C. R. Acad. Paris* 243: 1144-1146.
- Panwar, K. W., Panwar, S. and Bilgrami, K. S. (1969): Rhizosphere mycoflora in the sand dunes of Western Rajasthan. *Proc. 56th Ind. Sci. Cong.* III, 280-281.
- Parkinson, D. and Thomas, A. (1969): Studies on fungi in the root region VIII. Qualitative studies on fungi in the rhizosphere of dwarf bean plants. *Plant and Soil* 31: 299-310.
- Ramchandra Reddy, T. K. (1959): Rhizosphere microflora of Pteridophytes. *Curr. Sci.* 28: 113-114.
- Rangaswami, G. and Venkatesan, (1964): The rhizosphere microflora of rice plants as influenced by soil depth and root maturity. *Curr. Sci.* 33: 181-183.
- Rao, A. S. (1962): Fungal population in the rhizosphere of peanuts (*Arachis hypogaea* L) *Plant and Soil* 17: 260-266.
- Saccardo (1892): *Sylloge fungorum* 10: 191.
- (1884): *Sylloge fungorum* 3: 133.
- Simmonds, P. M. and Ledingham, R. J. (1937): A Study of the fungus flora of wheat roots. *Sci. Agric.* 18: 49-59.
- Ttmonin, M. I. (1940): The interaction of higher plants and soil microorganisms I. Microbial population of the rhizosphere of seedlings of certain cultivated plants. *Canad. J. Res.* 18: 307-317.
- Thornton, R. H. (1958): Biological studies of some tussock grassland soils. I. Introduction, soils and vegetation II. Fungi. *H. Z. J. Agric. Res.* 1: 913-921.
- Vörös (1957): *Sydovia, Ann. Mycol. Series II. Beihefte*, 1: 62-63.
- Youssef, Y. A. and Mankarios, A. T. (1968): Studies on the rhizosphere mycoflora of broad bean and cotton I. The fungal flora of the rhizosphere. *Mycopath. et Mycol. Appl.* 35: 389-400.

ZOBODAT - www.zobodat.at

Zoologisch-Botanische Datenbank/Zoological-Botanical Database

Digitale Literatur/Digital Literature

Zeitschrift/Journal: [Sydowia](#)

Jahr/Year: 1973/1975

Band/Volume: [27](#)

Autor(en)/Author(s): Gangawane L. V., Deshpande K. B.

Artikel/Article: [Studies on Rhizosphere Mycoflora of Groundnut IV. A List of Fungi Isolated from Rhizosphere, Rhizoplane and Soil. 312-316](#)