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# Rhizosphere mycoflora of some leguminous crop plants

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**ABSTRACT**

*The rhizosphere and non-rhizosphere mycoflora of thre different leguminous crop plants viz. Cicer arietinum L. (Bengal gram), Vigna radiata (L.) R. Wilczek (green gram) and Vigna mungo (L.) Hepper (black gram) were studied in relation to age of plant growth. The rhizosphere mycoflora were higher than the non-rhizosphere in all the three crop plants. Rhizosphere mycoflora increased with increase in plant age and after flowering (young stage) it decreased at old stage. The most dominant fungal species were Aspergillus, Penicillium, Rhizoctonia and Cladosporium. V. radiata attracted more fungi than the remaining to crop plants.*

***Key words:*** *Rhizosphere, mycoflora, leguminous crop plants.*

## INTRODUCTION

In 1904, Hiltner introduced the term "rhizosphere" to designate that portion of the soil which is subject to the specific influence of the plant root system, and noted that this soil supported greater microbial activity than soil more distant from the roots. The area of the soil influenced by root varies with the type of the plant, age of the plant, soil conditions, pH of the soil, environmental conditions and moisture content of the soil. Sadasivan[10] has given an excellent review of the importance of the study of rhizosphere microflora.

## METERIALS AND METHODS

Blocks of soil containing plant roots were cut out and gently crushed with a little tearing as far as possible. The roots of *Cicer arietinum* L. (Bengal gram), *Vigna radiata* (L.) R. Wilczek (green gram) and *Vigna mungo* (L.) Hepper (black gram) taken out carefully and were then shaken to remove the superfluous soil. They were placed, along with the adhering soil particles in flasks containing 100 ml of sterile water. Tile roots were then thoroughly shaken on a rotatory shaker. Later, suitable dilutions of the above soil suspension (1/100, 1/1000, 1/5000) were prepared by adding sterile distilled water. Isolation of rhizosphere and non-rhizosphere mycoflora was done on peptone dextrose agar medium containing Rose Bengal (1:30,000) and streptomycin[7].

One ml of each of the above dilutions was poured into each of the Petri dishes containing the above sterilized media. The dishes were then incubated for 5-7 days at room temperature. During this period all the fungi appearing in the Petri dishes were picked up. Pure cultures were obtained by single spore culture for hyphal tip cutting and the identifications were made with the help of the relevant literature[3,4,12]. The same procedure was employed for isolating these molds from soil away from rhizosphere. The pH and water moisture content of both rhizosphere and non-rhizosphere soils was determined[13].

## RESULTS AND DISCUSSION

Table 1 shows the occurrence of fungi in the rhizosphere and non-rhizosphere soils of different leguminous crop plants at different stages of plant growth, *viz,*. seedling stage, young stage (at the time of flowering) and old stage (at the time of crop maturity). Table 2 shows the changes in pH and % moisture content at three different stages of rhizosphere and non-rhizosphere soils.

The number of fungal species higher in number than non-rhizosphere soil in case of all the three plants studied. It is clear from the Table 1 that is total 24 fungal species were isolated from the rhizosphere and non-rhizosphere soil of three leguminous crop plants *viz. C. arietinum, V. radiata* and *V. mungo* at three different stages of plant growth. In case of rhizosphere soil 20 fungal species were isolated from *C. arietinum*, 24 from *V. radiata* and 19 the from rhizosphere soil of *V. mungo.* It was observed that the most dominant fungal species were *Aspergillus, Penicillium, Rhizoctonia* and *Cladosporium.* The largest number of fungi was obtained from the rhizosphere of *V. radiata.* On the other hand a lesser number of fungi were found in *V. mungo.* Changes in pH and moisture content in rhizosphere and non-rhizosphere soils during the different stages of plant growth of the different leguminous crop plants, are depicted in Table 3. It is clear that the soils had an alkaline reaction with pH ranging from 6.5 to 9 and that the pH of rhizosphere soils varied slightly during the different stages of plant growth. In all the cases decrease in pH was recorded with the gradual aging of the plant and also accompanying drier and warmer weather conditions. Moisture content also decreased with the gradual aging of the plant.

In the present study it is observed that the fungal population increases with increase in the age of the plant[11]. Minimum number of fungi was observed at seedling stage and maximum at young stage (flowering stage) of plant growth. After that decline in number was observed. The similar results were observed by some workers with different crop plants[1,2,5,8]. It is well known that in the rhizosphere the microorganisms are more abundant than in the soil free from the influence of roots[6]. The present studies also supported the above view as the number of fungi in the rhizosphere were found to be greater than in the soil away from it. The increase in rhizosphere mycoflora with age, may be due to various factors like increased root exudations, decomposition of moribund root hairs, epidermal cells and cortex accumulation of cell materials[9,14,15]. The lowering of pH in the rhizosphere soil has been generally ascribed to the decomposition of sloughed off epidermal cells. It may also be due to the presence of organic and amino acids in the root exudates.

**Table 1: Isolation of rhizosphere and non-rhizosphere (soil) fungi from some leguminous crop plants at different stages [seedling stage (SS), young stage (YS) and old stage (OS)] of plant growth**

| Sr. No. | Name of fungus | *Cicer arietinum* | | | | | | *Vigna radiata* | | | | | | *Vigna mungo* | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Rhizosphere | | | Non-rhizos. | | | Rhizosphere | | | Non-rhizos. | | | Rhizosphere | | | Non-rhizos. | | |
| | | SS | YS | OS | SS | YS | OS | SS | YS | OS | SS | YS | OS | SS | YS | OS | SS | YS | OS |
| 1 | *Alternaria alternata* | - | + | - | - | + | - | + | + | - | - | - | - | - | + | - | - | - | - |
| 2 | *Aspergillus flavus* | + | + | + | + | + | + | + | + | + | + | + | + | - | + | - | + | + | + |
| 3 | *A. fumigatus* | - | + | - | - | - | + | - | + | + | - | + | - | + | + | + | - | - | - |
| 4 | *A. niduans* | + | + | + | - | - | - | - | + | - | + | - | + | - | + | - | - | - | - |
| 5 | *A. niger* | + | + | + | + | + | + | + | + | + | - | + | + | + | + | + | + | + | + |
| 6 | *A. terrus* | - | - | - | - | - | - | + | + | - | + | + | - | - | - | - | - | - | - |
| 7 | *A. oryzae* | - | - | - | - | - | - | - | + | - | - | - | - | + | + | + | - | - | + |
| 8 | *Cladosporium herbarum* | + | + | + | + | + | + | + | + | + | - | + | + | + | + | - | + | + | - |
| 9 | *Curvularia lunata* | - | + | - | - | + | - | - | + | - | + | + | - | - | + | + | - | - | - |
| 10 | *Drechslera tetramera* | + | + | - | - | - | - | + | + | + | - | - | - | + | + | + | - | + | + |
| 11 | *Fusarium oxysporum* | + | - | + | + | - | - | + | + | - | + | + | + | - | + | - | + | - | - |
| 12 | *Fusarium* sp. | - | + | - | - | - | - | - | - | + | - | + | - | - | - | + | - | + | - |
| 13 | *Mucor* sp. | - | + | + | + | + | + | + | + | - | - | + | - | + | - | - | - | + | - |
| 14 | *Nigrospora* sp. | - | + | - | - | - | - | - | + | + | + | - | - | - | - | - | - | + | - |
| 15 | *Penicillium citrinum* | + | - | + | - | - | - | + | + | - | - | - | - | - | + | + | - | - | + |
| 16 | *P. islandicum* | - | + | - | - | - | - | - | - | + | - | - | - | - | - | - | - | - | - |
| 17 | *Pythium* sp. | - | + | + | - | - | - | - | + | + | - | - | - | + | - | - | - | + | - |
| 18 | *Rhizoctonia solani* | + | - | - | - | + | - | - | + | + | - | - | - | - | + | + | - | - | - |
| 19 | *Rhizopus stolonifer* | + | + | - | + | + | - | + | + | - | + | + | + | - | - | + | + | - | + |
| 20 | *Talaromyces* sp. | - | - | - | - | - | - | - | + | + | - | - | - | - | - | - | - | - | - |
| 21 | *Trichoderma viride* | + | + | + | - | - | - | + | + | - | - | - | + | - | + | - | - | - | - |
| 22 | *Trichoderma* sp. | - | - | - | - | - | - | - | - | + | - | - | - | + | - | - | + | + | - |
| 23 | Brown sterile mycelium | + | + | - | - | + | + | + | + | + | + | + | + | + | + | + | - | - | + |
| 24 | White sterile mycelium | - | + | + | - | - | - | - | + | - | - | - | + | - | + | - | - | + | - |
| | **Total** | **11** | **17** | **10** | **06** | **09** | **05** | **12** | **21** | **13** | **08** | **11** | **09** | **09** | **15** | **10** | **06** | **10** | **07** |

Note: + = Present, - = Absent

**Table 2: pH and moisture content of rhizosphere and non-rhizosphere soils from some leguminous crop plants at different stages of plant growth**

| S. No. | Name of plant | Different stages of plant growth | Rhizosphere soil | | Non-rhizosphere soil | |
|---|---|---|---|---|---|---|
| | | | pH | Moisture content (%) | pH | Moisture content (%) |
| 1 | *Cicer arietinum* | Seedling stage | 7.8 | 20% | 8.0 | 23% |
| | | Young stage | 7.5 | 12% | 7.6 | 19% |
| | | Old stage | 6.5 | 8% | 7.0 | 10% |
| 2 | *Vigna radiata* | Seedling stage | 8.5 | 25% | 9.0 | 25% |
| | | Young stage | 7.8 | 19% | 8.8 | 20% |
| | | Old stage | 7.0 | 10% | 7.9 | 12% |
| 3 | *Vigna mungo* | Seedling stage | 8.0 | 25% | 8.5 | 25% |
| | | Young stage | 7.6 | 20% | 7.8 | 18% |
| | | Old stage | 7.0 | 12% | 7.5 | 10% |

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