

RHIZOSPHERE AND PHYLLOSPHERE MICROFLORA OF *SESAMUM INDICUM* OF GANGA VARIETY AT DIFFERENT STAGES OF PLANT GROWTH

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ABSTRACT

A comparative study of microflora at different stages of sesame (*Sesamum indicum*) plant growth was studied. In the rhizosphere, bacterial numbers increased with the age of the plant. Bacterial population was higher than fungi in the rhizosphere. Non – pigmented gram (-) ve rods were dominant. The following fungi were identified in the rhizosphere. *Aspergillus flavus*, *A. fumigates*, *A. japonicus*, *A. niger*, *Fusarium oxysporum*, *Rhizopus nigricans*, *Trichoderma harzianum*, *T. viride*. In the Phyllosphere, the microflora increased gradually with the age of the plant. Phyllosphere of younger and smaller leaves contained less microbial population than the old and broader leaves. Gram (-) ve rods bacteria were dominant over gram (+) ve bacteria. The following fungi were isolated from the Phyllosphere of sesame plant. They are *Alternaria alternata*, *A. tenuissima*, *Aspergillus japonicus*, *A. niger*, *Curvularia lunata*, *C. geniculata*, *Fusarium oxysporum*, *F. equiseti* and *Trichoderma viride*. *Aspergillus flavus* did not occur on leaf surface but occurred in the rhizosphere and soil.

Keywords: Sesame Plant, Phyllosphere, Rhizosphere, Soil Microflora, Environmental Microbiology

INTRODUCTION

Phyllosphere (Ruinen 1956) is an external leaf surface forming an environment for Micro-organisms. The Micro-organisms reach the leaf surface through air currents, water and by insects. The leaf exudates are one of the chief reasons for the growth of microorganisms. The gradual changes in the nutritional and physiological conditions of the leaf lead to the succession of organisms (Ruinen 1961). These microorganisms include both saprobes and parasites.

The Rhizosphere represents the region in the vicinity of roots (Hitner 1904). The Rhizosphere microfloras are influenced by the kind of root exudates and material sloughed off by the growing roots. The Rhizosphere microbes are in turn represented both by saprobes and parasites.

In the present study enumeration of microflora in the phyllosphere and rhizosphere of sesame plant (*Sesamum indicum*) was carried out on gowri variety a recently developed sesame variety to know the microbial diversity in relation to the host organ environments.

MATERIALS AND METHODS

Source of the Seed Material

The seeds of *Sesamum indicum* were obtained from Directorate of oil seeds Research, Rajendranagar, Hyderabad, A.P.

Growth of Sesamum Plants in Garden

Sesame seeds of 'Gowri' variety were sown 7 seeds per plot. Earlier the earthen pots were filled with soil mixed with manure (3:1).

Enumeration of Phyllospheric Microflora

The bacterial and fungal population were enumerated by serial dilution methods (Aneja, 1996) by using nutrient Agar (NA agar containing per litre peptone : 5g, NaCl: 5g, Beef extract : 3g, Agar 15g, D.W. : 1l pH 7.0 – 7.2) for bacteria and Martin Rose Bengal Agar Medium (MRBA medium containing per litre : Dextrose : 10g, Peptone : 5g, KH₂ PO₄ : 0.5g, K₂ HPO₄: 0.5g, Mg SO₄ 7H₂O : 0.5g, Agar : 15g, Streptomycin : 0.03g, Rose Bengal 0.03g).

Enumeration of Soil Microflora

The microflora of soil was enumerated on the respective media by following the serial dilution methods.

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Enumeration of Rhizosphere Microflora

Rhizosphere microflora was enumerated by using roots of 10 days, 20 days and 40 days grown sesame plants by serial dilution techniques plated on nutrient agar and Martins Rose Bengal Agar (ref. Previous para).

RESULTS

The results of microflora of Phyllosphere of Sesame is as presented in table (1 to 1C). The phyllosphere bacterial populations increased with the increase in age of the plant (Figure 1).

Among the fungal flora *Aspergillus*, *Alternaria*, *Fusarium*, *Curvularia* and *Trichoderma*, (Table 1a). *Aspergillus* dominated.

In the Rhizosphere higher numbers of bacteria were observed than fungi (Table 1 a). Among fungi *Aspergillus*, *Fusarium*, *Rhizopus* and *Trichoderma* were present in sesame plant rhizosphere. Of these *Aspergillus flavus* dominated.

Table 1: Phyllosphere bacterial population of *S. indicum* at three different stages /gm fr.wt*.

S. No	Bacteria	Stage of the Plant		
		I	II	III
1.	Light Pink	1000	3300	2900
2.	Orange Red	2000	4600	9300
3.	Yellow	9100	22900	55000
4.	White	3600	4600	8300

* Average results of two expts.

Table 1(b): Estimation of microbial population in Phyllosphere of *S. indicum* at three different stages /gm fr.wt*(x10⁴)

S. No	Bacteria	Stage of the Plant growth		
		I	II	III
1.	Bacteria	1.80	3.54	7.55
2.	Fungi	0.13	0.32	0.34

* Average results of two expts.

Table 1(c): Estimation of pigmented & non – pigmented bacteria in Phyllosphere of *S. indicum* /gm fr.wt*(x10⁴)

S. No	Bacteria	Stage of the Plant growth		
		I	II	III
1.	Pigmented	1.27	3.08	6.72
2.	Non pigmented	0.33	0.46	0.83

* Average results of two expts

Table 1(a): Phyllosphere fungal population of *S. indicum* at three different stages /gm fr.wt*

S. No	Soil Fungi	Stage of the Plant growth		
		I	II	III
1.	<i>Alternaria alternata</i>	100	200	-
2.	<i>Alternaria tenuissima</i>	100	260	-
3.	<i>Aspergillus japonicus</i>	130	330	430
4.	<i>Aspergillus niger</i>	200	300	500
5.	<i>Aspergillus sps</i>	-	300	400
6.	<i>Aspergillus sps</i>	300	460	500
7.	<i>Curvularia lunata</i>	-	190	300
8.	<i>Currularia geniculata</i>	190	200	400
9.	<i>Fusarium oxysporum</i>	200	360	260
10.	<i>Fusarium equiseti</i>	130	300	360
11.	<i>Trichoderma viride</i>	100	330	300

* Average results of two experiments

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Discussion

The existence, activity and interaction of saprophytic and parasitic microflora on Phyllosphere and rhizosphere have been studied extensively in recent times. As very little work was done on the saprophytic flora and their antagonism against the pathogen *Alternaria alternate*, causing leaf blight of sesame. It was carried out for quantitative and qualitative study of the microflora of sesame at different stages of plant growth.

The present work results revealed that the phyllosphere microflora increased with the increase of age of sesame plant, thus the mature leaf was found to be important feature in influencing the composition and abundance of microorganisms. According to Godfrey (1976) the leaf leachates will influence the plant surface microbial populations which are very complex as they vary from plant to plant and also with the age of the plant organ being leached.

The intermittent flow of nutrients to and from the leaf as well as from the phyllosphere forms a steady nutritional state may result in the gradual changes in the age of the leaf and in composition of the microbial population (Ruinen 1961).

From the results it was found that *Aspergillus* was the dominant fungus.

In the rhizosphere, microbial population increased with the growth of the plant. Most of bacteria were gram negative rods. *Trichoderma* sp. Occurred only in the rhizosphere of sesame plant at 20 days growth. The rate of root exudation is influenced by the age of root, environmental and cultural factors and hence the microbial populations.

A comparative account of fungal population on leaf and rhizosphere is given in Table 2.

Table 2: Estimation of Gram-bacteria in Rhizosphere, Phyllosphere of *S. indicum* and soil in three different stages /gm fr.wt*(x10⁴)

S. No	Gram Bacteria	I Cocci	Rods	II Cocci	Rods	III Cocci	Rods
A	Phyllosphere						
	G+ve	Nil	3300	Nil	4500	Nil	8300
	G-ve	1600	11000	3300	27500	2900	64300
B	Rhizosphere						
	G+ve	Nil	5900	Nil	14200	Nil	27900
	G-ve	Nil	14100	Nil	61300	Nil	122100
C	Soil						
	G+ve	Nil	900	Nil	15200	Nil	17600
	G-ve	Nil	1600	Nil	24500	Nil	42400

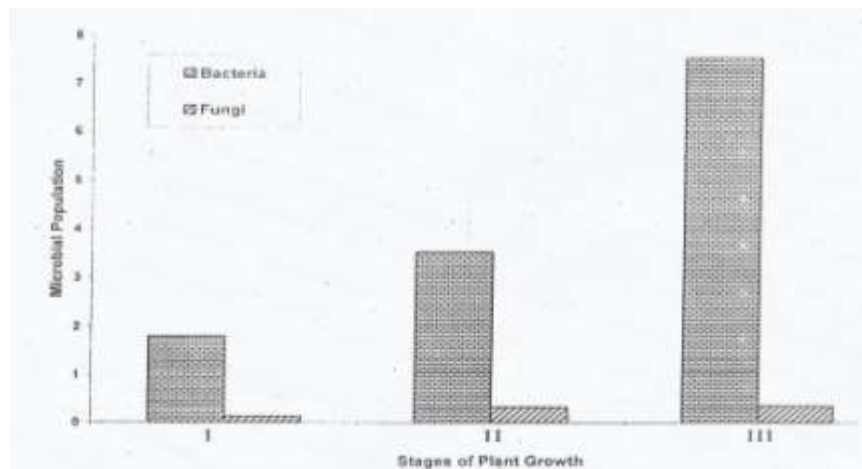


Figure 1: Estimation of microbial population in Phyllosphere of *S. indicum* at three different stages

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The pathogen, *Alternaria alternate* was tested for antagonism against the saprophytes of phyllosphere and rhizosphere isolates. None of the isolates showed antagonism against the pathogen by the methods (streaking) tested.

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