

**VARIATION OF FUNGAL POPULATION OF RHIZOSPHERE AND SOIL MYCOFLORA  
AT DIFFERENT GROWTH PERIOD OF *CAPSICUM ANNUUM* LINN.**

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**Abstract**

The various soil born fungal disease on *Capsicum annumm* plants which cause loss of chilli production. Present examination variation of soil fungi isolated from rhizosphere and soil mycoflora of *Capsicum annumm* during the month January to April. Different soil born fungal species and variable soil born fungal population was recorded in rhizosphere and soil mycoflora at different 15, 30, 45, 60, 75, 90 days growth period. In 45, 60 and 75 days the maximum number of fungal populations was recorded than another. *Cladosporium herbarum* was reported only 45 and 60 days growth period . The fungal species *Alternaria alternata* was reported 15, 30, 45, 60 and 90 days. *Aspergillus carbonarius*, *Aspergillus niger*, *Aspergillus petrakii*, *Fusarium moniliforme*, *Fusarium oxysporum*, *Penicillium funiculosum* and *Trichoderma viride* fungal species recorded at all different growth period.

**Key word**-Variation, Soil fungi, *Capsicum annumm*, rhizosphere

**Introduction**

The major consumers of chilli in the world are India, China, Mexico, Thailand, and United State of America, United Kingdom, Germany and Sweden. The major chilli exporting countries with their percentage share in world total exports are India (25%), China (24%), Spain (17%), Mexico (8%), Pakistan (7.2%), Morocco (7%), and Turkey (4.5%). The world trade in chilli accounts for 16 % of the total spice trade in the world, occupying the second position after black pepper. The major chilli importing countries are the United Arab Emirates, European Union, Sri Lanka, Malaysia, Japan and Korea. Number and types of fungal species change with the season, geographical location and the presence of local spore sources and different growth period of plant. Aarti and Ranjana 2013 by investigation mycoflora recorded were not much differing from previously reported soil fungi in different habitat. In Warcup (1955) reported a simple method for isolation of hyphae from soil. Shilpkar et al., (2010) investigated the dominance of different types of microbial communities at different monsoon seasons in rhizospheric soils of *Aegle marmelos* tree.

Gomathiet al. (2011) studies the monthly variation of the fungal population in chilli field of four different Taluka Thiruvarur, Nannilam, Kudavasal and Valangaiman of Thiruvarur (DT). Bhagwat and Saler (2016), studied by the status of diversity taxonomy of Soil fungi from Nashik Tehsil. The importance of mycological studies of different habitat has been emphasized by Rane and Gandhe (2006), Ramarao (1970) etc. Present study the different fungal species and variable fungal population was recorded in rhizosphere and soil mycoflora at different growth period of *capsicum annumm* L.

**Methodology**

Seeds were sown in earthen pots using garden soil. They were observed for the germination after 15<sup>th</sup> days. Plants were collected to study variation of fungal population of rhizosphere (R) and soil (S) mycoflora. R/S referred as Rhizosphere effect. The soil samples were collected at different (15, 30, 45, 60, 75, 90 days) growth period of *Capsicum annumm* L. plants. The samples were taken in polythene bags and brought to the laboratory within 12 hours. The soil samples were properly labeled. The pH of the soil samples was determined. Soil dilution and pour plate method were used for isolation of fungal pathogens. In this method rhizosphere soil sample were transferred to sterilized distilled water kept in 250 ml. conical flasks to make spore suspension. About 10 ml. of prepared Czapek - Dox agar medium at about 35°C to 45°C were poured in the petridishes. One ml.

of the spore suspensions was transferred to sterilized petridishes in aseptic conditions. Petri plates were allowed to cool down, solidify and transferred to an incubator and were kept for 10<sup>th</sup> days at 25°C to 27°C. Observations of the number and type of fungi present on the plate. Fungal materials were stained with the help of cotton blue and lacto phenol. The temporary slides were prepared for identification of diseases.

The identification of fungal organism was done by referring various monographs, research papers and other literature such as a manual of Soil fungi Gilman (1957), Fungi of Agricultural soils Domsch and Gams (1972), The Genus *Aspergillus* Raper and Fennell (1965), Taxonomy of fungi imperfecti Kendrick (1971), A manual of the Penicillia Raper and Thom (1949), Hypomyces Subramanian (1971), Hand book of Soil fungi Nagmani et al., (2006) etc.

To analyze the data obtained from studies of fungal diseases of Rhizosphere and soil Mycoflora of *Capsicum annum* L., during the research work, appropriate statistical tests were applied such as Two-way ANOVA - Testing variation of the fungal population at different growth period and other data displayed by tables and charts by using Microsoft excel. All statistical analysis had been done by using statistical software. The test of significance was considered at the level significant at  $p < 0.05$ .

## **Result and Discussion**

The fungal species population is variable in soil and rhizosphere mycoflora in different growth periods. Fungal population is found more in 60 days of entire growth periods, 15, 30 and 45 days have less fungal population compared to 60 days. After growth periods of 75 and 90 days very less fungal population is found both in rhizosphere and soil mycoflora. Total 24 fungal species were noted in 15 to 90 days of growth periods of *Capsicum annum* plant (Table No.2).

In 15 day 12 and 9 fungal species appeared from rhizosphere and soil individually. They were: *Alternaria alternata* (R), *Aspergillus flavipes* (R), *Aspergillus flavus* (S), *Aspergillus niger* (R and S), *Aspergillus sclerotiorum* (R and S), *Aspergillus carbonarius* (R), *Curvularia lunata* (S), *Fusarium moniliforme* (R), *Fusarium oxysporum* (R and S), *Mucor* sp. (R), *Penicillium funiculosum* (R and S), *Penicillium verrucosum* (S), *Rhizoctonia bataticola* (R), *Rhizoctonia solani* (S) *Rhizopus stolonifera* (R) and *Trichoderma viride* (R and S)

In 30 days, 15 and 11 fungal species appeared from both rhizosphere and soil mycoflora. They were: *Alternaria alternata* (S), *Aspergillus carbonarius* (R), *Aspergillus flavipes* (R and S), *Aspergillus niger* (R and S), *Aspergillus petrakii* (R), *Aspergillus sulphureus* (R and S), *Aspergillus ustus* (R and S), *Aspergillus zonatum* (R and S), *Aspergillus carbonarius* (R), *Cladosporium oxysporum* (R and S), *Curvularia lunata* (S), *Fusarium moniliforme* (R and S), *Fusarium oxysporum* (R), *Mucor* sp. (R), *Penicillium funiculosum* (S), *Penicillium verrucosum* (R), *Phoma glomerata* (R), *Rhizopus stolonifera* (R) and *Trichoderma viride* (S)

In 45 days, 17 and 15 fungal species appeared from rhizosphere and soil mycoflora. They were: *Alternaria alternata* (R and S), *Aspergillus carbonarius* (S), *Aspergillus flavipes* (R), *Aspergillus flavus* (R and S), *Aspergillus niger* (R and S), *Aspergillus sclerotiorum* (R and S), *Aspergillus sulphureus* (S), *Aspergillus ustus* (R), *Aspergillus carbonarius* (R and S), *Cladosporium herbarum* (R and S), *Cladosporium oxysporum* (R and S), *Curvularia lunata* (S), *Fusarium moniliforme* (R and S), *Fusarium oxysporum* (R and S), *Mucor* sp. (R), *Penicillium verrucosum* (R and S), *Phoma glomerata* (R), *Rhizoctonia solani* (R and S), *Rhizopus stolonifera* (R) and *Trichoderma viride* (R and S)

In 60 days, 20 and 17 fungal species appeared from rhizosphere and soil mycoflora. They were: *Alternaria alternata* (R and S), *Aspergillus carbonarius* (R and S), *Aspergillus flavipes* (R), *Aspergillus flavus* (R and S), *Aspergillus niger* (R), *Aspergillus petrakii* (R and S), *Aspergillus sclerotiorum* (S), *Aspergillus sulphureus* (R and S), *Aspergillus ustus* (S), *Aspergillus zonatum* (R), *Aspergillus carbonarius* (R and S), *Cladosporium herbarum* (R and S), *Cladosporium oxysporum* (S), *Curvularia lunata* (R) *Fusarium moniliforme* (R and S), *Fusarium oxysporum* (R and S), *Mucor* sp. (R) *Penicillium funiculosum* (R and S), *Penicillium verrucosum* (R and S), *Phoma glomerata* (R)

*Rhizoctonia bataticola* (R and S), *Rhizoctonia solani* (R and S), *Rhizopus stolonifer* (R), *Trichoderma viride* (S)

In 75 days, 16 and 14 fungal species seemed from rhizosphere and soil mycoflora. They were: *Aspergillus carbonarius* (R and S), *Aspergillus flavipes* (R and S), *Aspergillus flavus* (R and S), *Aspergillus niger* (R and S), *Aspergillus petrakii* (R and S), *Aspergillus sclerotiorum* (R), *Aspergillus sulphureus* (R and S), *Aspergillus ustus* (S), *Aspergillus zonatum* (R), *Aspergillus carbonarius* (S), *Cladosporium oxysporum* (R), *Fusarium moniliforme* (R and S), *Fusarium oxysporum* (R and S), *Penicillium funiculosum* (R and S), *Penicillium verrucosum* (R and S), *Phoma glomerata* (S) *Rhizoctonia bataticola* (R), *Rhizoctonia solani* (R), *Trichoderma viride* (R and S)

**Table No. 2: Appearance of fungal species in the Rhizosphere (R) and Soil (S) fungi of *Capsicum annuum* L.**

Sr. No.	Fungal species	15 days		30 days		45 days		60 days		75 days		90 days	
		R	S	R	S	R	S	R	S	R	S	R	S
1	<i>Alternaria alternata</i>	3	-	-	3	3	2	4	3	-	-	-	2
2	<i>Aspergillus carbonarius</i>	-	-	4	-	-	1	2	2	1	2	3	2
3	<i>Aspergillus flavipes</i>	2	-	2	1	3	-	2	-	3	3	-	-
4	<i>Aspergillus flavus</i>	-	1	-	-	4	2	3	2	1	1	1	-
5	<i>Aspergillus niger</i>	4	3	6	3	4	2	4	-	3	1	4	2
6	<i>Aspergillus petrakii</i>	-	-	1	-	-	-	3	2	4	3	2	1
7	<i>Aspergillus sclerotiorum</i>	5	1	-	-	3	1	-	2	1	-	-	-
8	<i>Aspergillus sulphureus</i>	-	-	2	1	-	1	1	2	2	1	2	-
9	<i>Aspergillus ustus</i>	-	-	3	2	2	-	-	1	-	2	-	-
10	<i>Aspergillus zonatum</i>	-	-	1	1	-	-	3	-	1	-	3	-
11	<i>Aspergillus carbonarius</i>	6	-	5	-	4	2	3	2	-	2	-	3
12	<i>Cladosporium herbarum</i>	-	-	-	-	4	5	4	2	-	-	-	-
13	<i>Cladosporium oxysporum</i>	-	-	1	3	4	2	-	1	1	-	-	-
14	<i>Curvularia lunata</i>	-	2	-	1	-	1	5	-	-	-	-	-
15	<i>Fusarium moniliforme</i>	2	-	3	1	5	1	2	3	2	2	3	2
16	<i>Fusarium oxysporum</i>	3	2	2	-	3	2	4	1	2	3	1	1
17	<i>Mucor</i> sp.	1	-	2	-	2	-	4	-	-	-	-	-
18	<i>Penicillium funiculosum</i>	2	1	-	3	-	-	2	1	3	2	2	1
19	<i>Penicillium verrucosum</i>	-	1	1	-	3	1	3	1	4	2	-	-
20	<i>Phoma glomerata</i>	-	-	1	-	1	-	1	-	-	2	-	-
21	<i>Rhizoctonia bataticola</i>	5	-	-	-	-	-	4	1	2	-	1	-
22	<i>Rhizoctonia solani</i>	-	1	-	-	2	1	3	2	2	-	-	-
23	<i>Rhizopus stolonifer</i>	4	-	2	-	1	-	4	-	-	-	-	-
24	<i>Trichoderma viride</i>	3	2	-	1	5	2	-	3	4	2	3	1

In 90 days, 11 and 9 fungal species appeared from rhizosphere and soil mycoflora. They were: *Alternaria alternata* (S), *Aspergillus carbonarius* (R and S), *Aspergillus flavus* (R), *Aspergillus niger* (R and S), *Aspergillus petrakii* (R and S), *Aspergillus sulphureus* (R), *Aspergillus zonatum* (R), *Aspergillus carbonarius* (S), *Fusarium moniliforme* (R and S), *Fusarium oxysporum* (R and S), *Penicillium funiculosum* (R and S), *Rhizoctonia bataticola* (R) and *Trichoderma viride* (R and S)

**Table No.3: Number of fungal colonies (10<sup>3</sup>/gm oven dry soil) in rhizosphere (R) and soil (S) of *Capsicum annuum* L. at different growth period**

Variation of fungal population					
15 day	30 day	45 day	60 day	75 day	90 day

R	S	R	S	R	S	R	S	R	S	R	S
30.0	22.5	37.5	27.5	42.5	37.5	50.0	42.5	40.0	35.0	27.5	22.5
1.33		1.36		1.13		1.17		1.14		1.22	

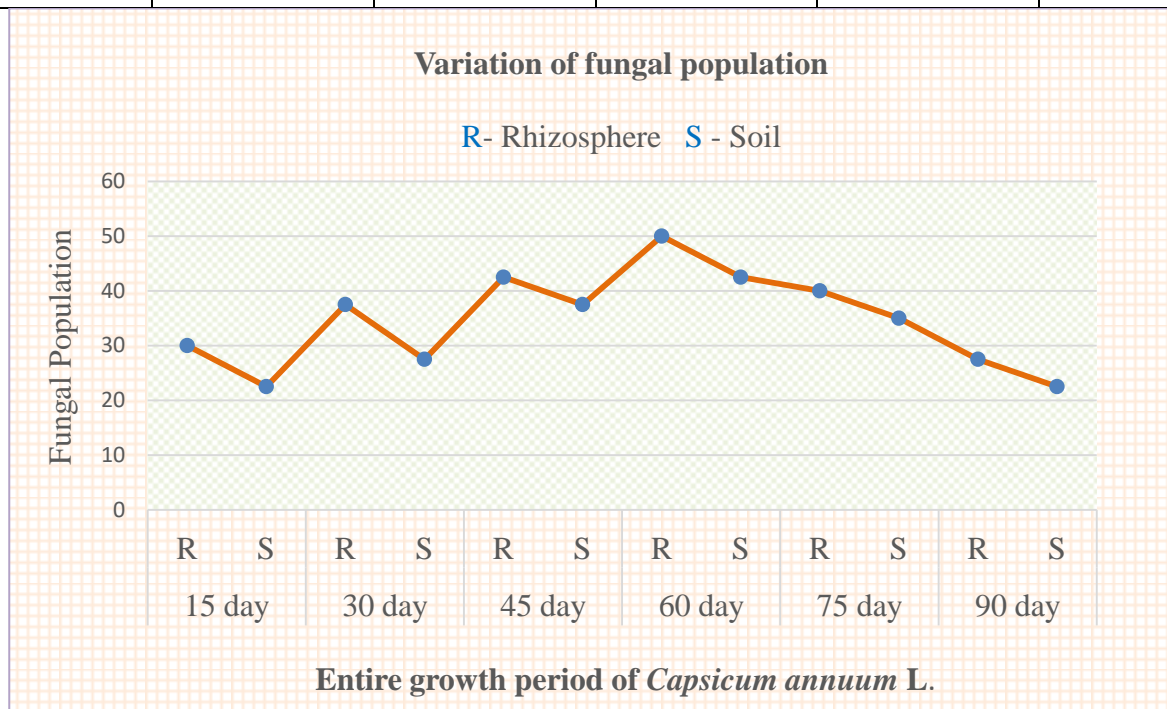


Fig. No. - 1: Fungal Population in different growth period

Table No 4: Anova-Two-Factor without Replication

SUMMARY	Count	Sum	Average	Variance
15 days	2	52.5	26.25	28.125
30 days	2	65	32.5	50
45 days	2	80	40	12.5
60 days	2	92.5	46.25	28.125
75 days	2	75	37.5	12.5
90 days	2	50	25	12.5
<b>Rhizosphere</b>	6	227.5	37.91667	68.541667
<b>Soil</b>	6	187.5	31.25	69.375

Table No 5: Anova Two - Testing variation of fungal population in rhizosphere and soil (S) of *Capsicum annum L.* at different growth period

(R)

Source of Variation	SS	df	MS	F	P-value	F crit
Days	679.1667	5	135.8333	65.2	0.00015	5.050329
Rhizosphere and soil	133.3333	1	133.3333	64	0.000493	6.607891
Error	10.41667	5	2.083333			
Total	822.9167	11				

Interpretation: - From the above table we observe that p value is 0.00015. Since, value < 0.05, therefore we reject  $H_0$ , i.e. there is significant difference between average number of fungal colonies of day wise and also, we observe that p value is 0.000493 < 0.05, therefore we reject  $H_0$ , i.e. there is significant difference between average number of fungal colonies of rhizosphere and soil mycoflora of *Capsicum annum* plant.

### **Conclusion**

The present investigation different fungal species and variable fungal population was recorded in rhizosphere and soil mycoflora at different 15, 30, 45,60,75,90 days growth period of *Capsicum annuum* plant. In 45, 60 and 75 days the maximum number of fungal population was recorded than another. *Cladosporium herbarum* was reported only 45 and 60 days growth period .The fungal species *Alternaria alternata* was reported 15, 30, 45, 60 and 90 days. *Aspergillus carbonarius*, *Aspergillus niger*, *Aspergillus petrakii*, *Fusarium moniliforme*, *Fusarium oxysporum*, *Penicillium funiculosum* and *Trichoderma viride* fungal species recorded at all different growth period.

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