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STUDIES ON THE INFLUENCE OF ROOT SYSTEM OF *ABELMOSCHUS ESCULENTUS* AND *SORGHUM VULGARE* ON THE RHIZOSPHERE AND RHIZOPLANE MYCOFLORA OF *CAJANUS CAJAN*

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Influence of roots of three crops grown in earthen pots in sequence of *Abelmoschus esculentus* (L.) Moench. *Sorghum vulgare* Pers and *Cajanus cajan* (L) Millps. on rhizosphere effect was studied. The results indicated that the fungal population in the rhizosphere and non-rhizosphere soil varied with crop and age. The positive rhizosphere effect was found with *A. esculentus* and *C. cajan* while negative effect recorded in case of *S. vulgare*. A total number of 53 fungal species isolated from rhizosphere and non-rhizosphere soils during this study. However, 35, 40 and 36 fungi were reported from *A. esculentus*, *S. vulgare* and *C. Cajan*, respectively against 38 species when *C. cajan* grown alone (control). Hence it is suggested that the rhizosphere of *C. cajan* was influenced by other two crops.

Keywords : Crop sequence; Mycoflora; Rhizosphere; Non-rhizosphere; Rhizoplane.

Introduction

Soil supports a very complex microbial community living in a state of dynamic equilibrium. Rhizosphere is a metabolically active region with conspicuous variation on its mycoflora depending upon the root exudates, genus, species, varieties, age and phase of growth of plants, soil conditions and environmental condition.

Age of the plant has an important bearing on rhizosphere population as it alters the soil mycoflora (Mishra and Kamal 1970; Deoray and Bhide, 1981; Dubey and Dwivedi 1988). Menon and Williams (1957) obtained differences in the mycoflora of soils after successive cropping of alfalfa, corn, oats or wheat. There is a little information regarding the different patterns of crop sequence (Prasad, 1968; Wajidkhan *et al*, 1973). Cultivation of crops favours the build up of some soil borne pathogens which are either pathogenic on specific crop or aggressive secondary invaders. Therefore the present paper deals with the

rhizosphere ecology and rhizoplane mycoflora of *C. cajan* under the influence of root system of two crops.

Material and Methods

Three crops viz., *Abelmoschus esculentus* (L) Moench., *Sorghum vulgare* Pers. and *Cajanus cajan* (L) Millsp. were selected for the present study. The healthy seeds of all the selected crops were surface sterilized with 0.1% mercuric chloride and washed with distilled water throughly. *A. esculentus* seeds were sown in earthen pots (10" X 12") as the first crop and each pot watered at regular intervals of three days. Care was taken to see at no time the water leaked out of the pots. Samples of the rhizosphere, non-rhizosphere and rhizoplane were collected from 10th, 20th, 30th, 40th and 50th day plants. After completing the collection of data on rhizosphere, non-rhizosphere and rhizoplane, the same soils (pots) were used for the second crop, *S. vulgare*. Similarly the third crop *C. cajan* was raised in the same pots. In all cases collection of the data was similar as in the case of *A esculentus*.

Two media namely Czapek-Dox Agar (CZA) medium and Potato Dextrose Agar (PDA) medium were used. For rhizosphere studies, the soil adhering to the root system was removed using a sterile brush under asceptic conditions. To obtain soil suspension basically the method of Timonin (1940) and Agnihothrudu (1953) were followed. Serial dilutions were prepared by transferring one ml of the solution to the test tube containing 9 ml of sterile distilled water and obtained dilution up to 1:10,000 as this dilution was found satisfactory. Dilution plates were prepared by transferring 1 ml of soil suspension (1:10,000) asceptically into sterile petriplates containing 10 to 15 ml of CZA and PDA media and left for solidification. Later the plates were incubated at 25±2°C. A total of ten replicates were maintained for each sample (5 replicates for each medium). The plates thus prepared were observed uptil 7 days for mycoflora and the fungi appeared were isolated and maintained them for further study.

For the isolation of rhizoplane mycoflora "root washing" technique of Harley and Waid (1955) was adopted. After excess of water was removed from roots with sterile filter paper, they were then cut into small pieces (2mm) and each segment was placed in petriplates containing CZA and PDA media with streptopenicillin. Ten replicates with 5 segments per plate were maintained. Plates were incubated at 25±2°C and observed for mycoflora uptil 7 days.

Results and Discussion

Quantitative analysis – The positive rhizosphere effect observed in *A. esculentus* gradually decreased from

Table 1 : Influence of Root System of Three Crops on Rhizosphere and Nonrhizosphere Soil Mycoflora
Crop sequence : *Abelmoschus esculentus*, *Sorghum vulgare* and *Cajanus cajan*

Name of the crop	Age of the plant (in days)	Number of fungi in rhizosphere soil (10^{-4}/g O.D.S.)	Number of fungi in nonrhizosphere soil (10^{-4}/g O.D.S.)	R:S ratio	Number of fungal species	
					Rhizo spere	Non-rhizosphere
Cajanus cajan (Control)	10	16.00	13 20	1.212	13	10
	20	14.90	13.60	1.095	9	8
	30	7.10	6.30	1.126	9	9
	40	17.80	14.90	1.194	9	9
	50	18.70	15.60	1.198	8	8
Abelmoschus esculentus	10	12.40	8.00	1.550	8	7
	20	15.90	12.20	1.300	11	9
	30	16.90	13 10	1.290	12	9
	40	18.00	16.10	1.110	9	8
	50	15.55	14.00	1.110	10	12
Sorghum vulgare	10	28 80	23.30	1 236	13	14
	20	37.50	39.80	0.942	16	5
	30	25.20	25.40	0.990	15	8
	40	18.60	22.80	0.815	12	8
	50	16.50	19.00	0.868	15	12
Cajanus cajan	10	13.00	11.00	1.120	15	9
	20	31.10	30.50	1.019	17	8
	30	29.00	28.30	1.024	11	8
	40	11.55	9.50	1.215	12	6
	50	27.90	24.60	1.134	10	7

O.D.S : Oven dried soil

10th to 15th-day. More fungi species were recorded in the rhizosphere than the non-rhizosphere up to the 40th day (Table 1).

S. vulgare grown in the same pots used for *A. esculentus* recorded a negative rhizosphere effect except on 10th-day. The maximum and minimum fungal populations were recorded on 20th and 50th-day of both rhizosphere and non-rhizosphere soils, respectively and as regard to number of species, the same was recorded on 20th and 40th-day of rhizosphere and 10th- and 20th-day of non-rhizosphere soils, respectively (Table 1) *C. cajan*, grown in the same set of pots showed a positive rhizosphere effect and it increased gradually from the 20th-to 40th-day which later decreased (Table 1).

Control *C. cajan* rhizosphere also showed a positive rhizosphere effect at all stages of plant growth. The maximum rhizosphere effect was observed on 10th day which later decreased on 20th-day. However the rhizosphere effect gradually increased with the increase of the plant growth from 20th to 50th-day. But *C. cajan* grown in this sequence of crops expressed maximum and minimum rhizosphere effect on 10th-day and 40th-day, respectively. As regards to the number of species the maximum was recorded on the 10th-day in both rhizosphere and non-rhizosphere soils of control *C. cajan* where as minimum number of species was observed on the 50th-day rhizosphere and 20th and 50th-day of nonrhizosphere soils (Table 1). Both rhizosphere and non-rhizosphere soils recorded maximum number of fungal population on 20th-day where as minimum was recorded on the 40th day of *C. cajan* in the sequence. However when *C. cajan* grown alone (control) recorded maximum fungal population on 50th day and minimum fungal population on 30th day rhizosphere and nonrhizosphere soils.

Qualitative analysis—A total number of 53 fungi were isolated from the rhizosphere and nonrhizosphere soils of 3 crops grown in a sequence. But 35, 40 and 36 fungal species were observed from *A. esculentus*, *S. vulgare* and *C. cajan*, respectively (Table 2). It is interesting to note that *Actinomucor elegans*, *Bipolaris tetramera*, *Drechslera halodes*, *Oedocephalum* sp. and *Penicillium expansum* which were isolated from *A. esculentus* were absent in both soils of *S. vulgare*. However *A. mellus*, *Cylindrocarpon* sp., *Rhizopus arrhizus* and *Torula herbarum* were exclusively present in both soils of *S. vulgare*, and not reported with *A. esculentus* (Table 2).

C. cajan grown as a third crop recorded the presence of 16 fungal species from the rhizosphere soils whereas 6 fungi were recorded from the nonrhizosphere soils. Fungi such

as *A. restrictus*, *Helminthosporium* sp., *Mortierella* sp., *Rhizopus stolonifer*, *Sporothrix* sp. and *Trichothecium roseum* were restricted to the rhizosphere soils of *C. cajan* and not found with *A. esculentus* and *S. vulgare* whereas *Phoma* sp., was isolated from the nonrhizosphere soils only. It is interesting to not that *Absidia gluaca*, *Actinomucor elegans*, *Alternaria* sp., *Aspergillus candidus*, *A. chevalieri*, *A. oryzae*, *A. phoenicis*, *A. sclerotiorum*, *A. terreus*, *Bipolaris tetramera*, *Curvularia lunata*, Mucorales member, *Oedocephalum* sp., *Paecilomyces* sp. and *Torula herbarum* present in the two crops studied were found absent in both soils of *C. cajan*. (Table 2).

In all 38 fungi were recorded in control *C. cajan*, of which *Absidia gluaca* *Acremonium* sp., *Aspergillus unguis*, *Bipolaris specifera*, *Chaetomium* sp., *Fusarium poae*, *Penicillium nigricans*, *P. rubrum*, *Rhizopus oryzae*, *Torula* sp., *Bipolaris tetramera*, *Cunninghamella echinulata* were recorded exclusively and not reported with the crop grown in the sequence (Table 2).

Rhizoplane studies— The rhizoplane fungi comprised of 34, 23 and 29 fungal forms in case of *A. esculentus*, *S. vulgare* and *C. cajan*, respectively. A total of 44 fungal species were recorded from the rhizoplane of 3 crops studied in a sequence. In this crop sequence *A. esculentus* rhizoplane represented by *Absidia gluaca*, *Aspergillus alutaceus*, *A. chevalieri*, *A. japonicus*, *A. oryzae*, *Cylindrocarpon* sp., *Mucor* sp., *Phoma* sp., and *Rhizopus nigricans* and were not recorded from the rhizoplane of *S. vulgare* and *C. cajan*. The fungal species present in the rhizoplane of *A. esculentus* and *S. vulgare* but absent in *C. cajan* were *Acrophialophora* sp., brown sterile mycelium, *Drechslera halodes*, *Fusarium oxysporum* and *Penicillium citrinum*. *A. flavipes*, *Curvularia lunata*, *Verticillum* sp. and white sterile mycelium present in the rhizoplane of *A. esculentus* and *C. cajan* were absent with *S. vulgare* rhizoplane. The rhizoplane fungi of control *C. cajan* differed by having *Aspergillus alutaceus*, *A. phoenicis*, *A. ustus*, *Bipolaris tetramera*, *Chrysosporium* sp. *Cylindrocarpon* sp. *Fusarium oxysporum*, *F. semitectium*, *Oedocephalum* sp., muscorales member, *Paecilomyces* sp , *Phoma* sp., *Penicillium citrinum*, *P. digitatum* and *Rhizopus nigricans*. This observation indicated that those species are specific to *C. cajan* but not occurred on account of the influence of other crops grown earlier. Hence the root system of each crop might have its specificity in controlling the fungi. This may be due to differences in the chemical nature of root surface that influence the occurrence of fungal flora and hence the variation (Table 3)

However this needs further study in this direction.

Tiwari and Mehrotra (1968) and Dayal and Srivastava (1973) reported the abundance of Aspergilli and Penicillia in the rhizosphere of various crops. Later Dubey and Dwivedi (1988) also reported that Aspergilli were dominant followed by Penicillia and Fusaria in the non-rhizosphere and rhizosphere regions of Soybean. In the present study species of *Mucor*, *Rhizopus*, *Syncephalastrum*, *Alternaria*, *Aspergillus* and *Fusarium* were found to be the most common fungi in rhizosphere and nonrhizosphere soils of 3 crops studied. However the dominant fungi in both rhizosphere and nonrhizosphere soils of 3 crops include *Aspergillus*, *Penicillium* and *Fusarium*. Of these *Aspergillius* was *recorded* in greater abandance followed by *Fusarium*. Similar observations were made by Patil and Thite (1987) who isolated *Aspergillus*, *Penicillium*, *Fusarium*, and *Trichoderma* from rhizosphere and nonrhizosphere soils of *S. vulgare*. In the present study increase in the rhizosphere mycoflora with the age of the plant was observed. It seems that the increase was due to various factors like increased exudation, decomposition of morbund root hairs, epidermal cells and cortex accumulation of cell materials as observed by earlier workers (Rovira, 1965 a, b Tiwari and Mehrotra, 1968) In the present investigation roots in early stages of plant growth were chiefly colonized by mucorales, Hyphomycetes and sterile mycelia. Ascomycetes started colonizing the roots only during the flowering of plant. This pattern of colonization of different fungi on the plant roots in succession corroborate the findings of previous workers (Parkinson and Clark, 1961; Dickinson and Pugh, 1965).

Srivastava and Dayal (1982) found that *A. fumigatus* in rhizosphere through out from seedling to senescence of the plant though certain forms appear for short duration. In the present study it is clear that different stages of plant growth had marked influence on the fungi in the rhizosphere. It is of interest to note that in the present study there was a significant difference in the number of different fungi on rhizoplane at different stages of plant growth. Some fungi established themselves on the root surface where as others were confined to rhizosphere only. At the same some fungi were resticted to nonrhizosphere soil and were not isolated either from rhizosphere or rhizoplane. They include *Aspergillus japonicus*, *A. parasiticus* and *Phoma* sp. This behaviour may be attributed tentatively to the degree of sensitivity of fungi to their response to the amount of exudates in the soil from the sites of exudation along with roots as suggested by Dix (1967). Earlier workers have

Table 2 : Influence of *Abeimoschus esculentus* and *Sorghum vulgare* on the Rhizosphere Mycoflora of *Cajanus cajan*

Name of the fungi	10th day								20th day								30th day								40th day								50th d		
	Co		Ae		Sv		Cc		Co		Ae		Sv		Cc		Co		Ae		Sv		Cc		Co		Ae		Sv		Cc		Co		Ae	S
	N R		N R		N R		N R		N R		N R		N R		N R		N R		N R		N R		N R		N R		N R		N R		N R		N R	N R
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5
Absidia gluaca	–	*	–	*	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–	–
Acremonium sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Actinomucor elegans	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–
Alternaria sp.	–	•	–	–	–	–	–	–	–	–	–	*	–	–	–	–	*	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	•	*	–	–
Aspergillus alutaceus	–	–	–	–	•	•	•	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	*	–	–	–
A. candidus	•	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
A. carneus	–	–	–	–	–	–	–	–	*	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–	–
A. chevalieri	–	–	–	–	–	–	–	–	–	–	*	*	–	•	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–	–
A. erythrocephalus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	*	*	–	–	–	–	–	–	*	*	–	*	–	–	–	–	–
A. flavipes	*	–	–	–	–	–	*	*	–	–	–	–	–	–	–	*	*	*	–	*	–	*	–	*	*	–	–	•	–	–	–	*	–	*	*	–	–
A flavus	*	*	*	–	*	*	*	*	–	–	*	*	*	*	*	*	*	*	*	–	*	–	*	*	*	*	*	*	*	*	*	*	–	*	–	*	*	*
A. fumigatus	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	–	–	*	–	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
A. japonicus	–	–	–	–	*	–	–	*	–	–	–	–	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
A. melleus	–	–	–	–	*	–	–	*	–	–	–	–	*	*	–	*	*	–	–	–	–	–	–	–	*	–	–	–	–	–	–	–	*	–	–	–	*
A. nidulans	*	–	*	–	*	–	–	–	–	–	–	–	–	–	*	–	–	–	*	*	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
A. niger	*	*	*	*	*	*	*	*	*	*	*	–	*	*	*	*	*	–	*	–	–	–	*	*	*	–	–	*	–	*	*	–	*	–	*	*	*
A. oryzae	–	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–	–	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
A. parasiticus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–	–	–	–	–	*	–	–	–	–	–	–	–	–
A. phoenicis	–	–	–	–	•	–	–	–	–	–	–	*	–	*	–	–	–	–	–	*	–	*	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–
A. restrictus	*	–	–	–	–	–	–	•	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
A. sclerotiorum	–	*	–	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–	*	–	–	–	–	–	–	–	–
A. terreus	–	–	–	–	–	–	–	–	–	–	*	–	–	•	–	–	–	*	–	*	–	*	–	*	–	*	–	–	–	–	–	–	–	–	–	–	–
A. ustus	–	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	•	–	–	–	–	–	–	–	–	–	–	–	–	–
A. versicolor	–	–	–	–	–	–	*	–	–	–	–	–	–	–	*	*	–	*	–	–	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–
Bipolaris tetramera	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–	–	–	*	–	–	–	–	–	–	–	–	–	–	*	–	–	–
B. specifera	–	*	–	–	–	–	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–
Brown sterilemycelium	*	–	–	*	–	*	–	*	–	–	–	–	–	–	*	–	*	–	*	*	*	*	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–
Chaetomium sp	–	•	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Cunninghamella echinulata	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–
Curvularia geniculata	–	–	–	–	–	*	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–	–	–	–	–
C. lunata	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–	–	*	–	–	–	–	–	*	–	–	–	–	–	–	*

	30th day								40th day								50th day							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
llescens	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	–	*	–	*	–
drocarpon sp.	–	–	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–	*	*	–	–	–
hslera halodes	–	–	–	–	–	–	–	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–
ium dimerum	–	*	*	–	*	*	*	*	–	–	–	*	*	*	–	–	–	–	–	–	–	*	–	–
ysporum	–	–	–	*	*	–	–	*	–	–	–	*	–	*	–	*	–	–	*	–	–	–	*	–
ae	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
mitectum	–	–	–	–	–	–	–	*	–	–	–	–	–	–	–	*	–	–	–	–	–	–	–	–
lani	–	*	–	–	–	*	–	–	–	–	*	–	–	–	*	–	–	–	*	*	*	–	–	–
inthosporium sp.	–	*	–	–	–	–	–	*	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–
ierella sp.	–	–	–	–	–	–	–	–	*	*	–	–	–	–	–	*	–	–	–	–	–	–	–	–
r sp.	–	–	–	–	*	–	*	–	*	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–
rales member (unidentified)	–	–	–	–	*	–	–	–	–	–	–	*	–	–	–	–	–	–	*	*	–	–	–	–
cephalum sp.	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–	–
ilomyces sp.	–	–	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
cillium citrinum	–	–	–	–	–	–	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–	*	–	–
pansum	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
gricans	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
brum	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
na sp.	–	–	–	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
ctonia sp.	–	–	–	*	–	–	–	–	–	–	–	–	–	*	*	*	–	–	–	*	–	*	–	–
pus arrhizus	–	–	–	–	*	–	–	–	–	*	*	–	*	–	*	–	–	–	*	–	–	–	–	–
gricans	–	–	*	–	–	–	–	–	–	–	–	*	–	*	–	*	–	–	–	–	–	–	–	–
yzae	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
olonifer	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	*	–	–	–	–	–	–	–
otium sp.	–	–	–	–	–	–	–	–	–	–	*	–	–	–	*	–	–	–	–	–	–	–	–	–
othrix sp.	–	*	–	–	–	–	–	*	–	–	–	–	–	–	–	*	–	–	–	–	–	–	–	–
ephalastrum racemosum	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	*	–	*	–
la herbarum	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–	*	*	–	–
othecium roseum	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	–
cillium sp.	–	–	–	–	–	*	–	*	–	*	–	–	–	–	–	–	–	–	*	*	–	–	–	*
e sterile mycelium	*	*	–	*	–	*	–	–	–	–	*	–	–	–	–	*	*	–	*	*	–	*	*	*

control *cajanus* cajan; Ae = *Abelmoschus esculentus*; Sr = *Sorghum vulgare*: Cc = *Cajanus* cajan N = Nonrhizosphere soil; R = rhizosphere soil

Table 3 : Influence of *Abelmoschus esculentus* and *Sorghum vulgare* on the Rhizosplane Mycoflora of *Cajanus cajan*

Name of the fungi	10th day				20th day				30th day				40th day				50th day			
	Co	Ae	Sv	Cc	Co	Ae	Sv	Cc	Co	Ae	Sv	Cc	Co	Ae	Sv	Cc	Co	Ae	Sv	Cc
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Absidia gluaca	–	*	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–	–	–	–
Acremonium sp.	–	–	–	–	–	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–
Acrophialophora sp.	–	–	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–	*	*	–
Alternaria sp.	*	–	–	–	–	*	–	*	–	–	–	–	–	–	–	–	–	*	*	*
Aspergillus alutaceus	–	–	–	–	–	*	–	–	–	–	–	–	*	–	–	–	–	–	–	–
A. chevalieri	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
A. erythrocephalus	–	*	*	*	–	–	*	*	–	–	–	–	–	–	–	–	–	–	–	–
A. flavipes	*	*	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
A flavus	–	–	*	–	–	*	*	–	*	*	*	*	–	*	*	*	*	–	*	*
A. fumigatus	–	*	*	*	*	–	*	*	*	–	*	–	–	*	*	*	–	*	*	*
A. japonicus	–	–	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–
A. melleus	–	–	–	*	–	*	–	–	–	*	–	–	–	–	–	–	–	–	*	*
A. nidulans	–	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
A. niger	*	*	*	–	–	–	–	–	–	–	–	–	–	–	*	*	*	–	*	–
A. oryzae	–	*	–	–	–	–	–	–	–	*	–	–	–	–	–	–	–	–	–	–
A. parasiticus	–	–	–	–	–	*	–	–	*	–	–	–	–	–	–	–	–	–	–	*
A. phoenicis	–	–	–	–	*	–	–	–	–	*	–	–	–	–	–	–	–	–	–	–
A. restrictus	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–	*	–	–	–	–
A. sydowii	–	–	–	–	–	–	–	–	–	*	*	*	–	–	–	–	–	–	–	–
A. terreus	–	–	–	*	–	–	–	–	–	–	–	–	–	–	*	–	–	–	–	–
A. ustus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–
A. versicolor	–	*	*	–	–	–	–	–	–	–	*	–	–	–	–	–	–	–	*	*
Brown sterile mycelium	–	*	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	–
Bipolaris tetramera	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–	–	–	–	–
Chaetomium sp.	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–
Chrysosporium sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–
Cladosporium cladosporioides	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–	–

	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Cunninghamella echinulata	–	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Curvularia geniculata	–	–	–	–	*	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–
C. lunata	–	–	–	–	–	*	–	*	–	–	–	–	–	–	–	–	–	–	–	–
C. pallescens	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–	*	*
Cylindrocarpon sp.	–	–	–	–	–	–	–	–	–	*	–	–	*	–	–	–	*	–	–	–
Drechslera halodes	*	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Fusarium dimerum	*	–	–	–	–	*	*	*	*	–	–	–	–	–	–	–	–	–	–	–
F. oxysporum	*	*	*	–	–	–	–	–	*	–	–	–	*	–	–	–	–	–	*	*
F. semitectum	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–	–	–	–	–
F. solani	–	–	–	*	–	–	–	–	–	*	–	*	–	–	–	–	*	–	–	–
Helminthosporium sp.	–	–	*	*	–	–	–	–	*	–	–	–	–	–	–	–	–	*	*	*
Oedocephalum sp.	–	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mortierella sp.	–	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–	–	*	*	*
Mucor sp	–	*	–	–	–	–	–	–	*	–	–	–	–	–	–	–	–	*	–	–
Paecilomyces varioti	–	–	*	–	–	–	–	–	*	–	–	–	–	*	–	–	–	–	–	–
Penicillium citrinum	–	–	–	–	*	*	*	–	–	–	–	–	–	–	–	–	*	–	–	–
P. digitatium	–	–	–	–	–	–	–	–	*	–	–	–	–	–	–	–	–	–	–	–
P. nigricans	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	*
Phoma sp.	–	–	–	–	–	–	–	–	*	–	–	–	–	*	–	–	–	–	–	–
Rhizoctonia sp.	–	–	–	–	–	–	–	–	*	–	–	–	–	*	–	–	–	–	–	–
Rhizopus arrhizus	–	–	–	–	–	–	–	–	–	*	*	–	–	–	–	*	–	–	–	–
R. nigricans	–	–	–	–	–	–	–	–	*	–	–	–	*	–	–	*	–	–	–	–
Sclerotium sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	
Syncephalastrum racemosum	–	–	–	–	–	–	*	*	*	–	–	–	–	–	*	–	*	*	–	–
Torula sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–
Trichothecium roseum	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–	–	*
Verticillium sp.	–	–	–	–	–	–	–	–	*	–	–	–	–	*	–	*	–	–	–	–
White sterile mycelium	*	–	–	–	–	–	–	*	–	*	–	*	–	–	–	–	*	–	–	*

shown that the composition of rhizosphere microflora differs both quantitatively and qualitatively from that in soil beyond the influence of the root (Krisilinkov 1963; Katznelson, 1965). Similar variations were recorded in the present study. Rangarao and Mukerji (1971) who studied four cultivars of wheat rhizosphere and rhizoplane observed that the peak population levels were attained at different stages of plant growth and rhizosphere and rhizoplane populations differed appreciably in four cultivars of wheat. Earlier workers noticed restricted occurrence of rhizoplane fungal flora in groundnuts (Gangawane, 1972) *Corchorus capsularis* and *Hibiscus cannabinus* (Mishra, 1978), gram (Antique *et al.*, 1982). They also stated that there was significant difference in the number of different fungi on the rhizoplane at different ages of plant growth and observations made in this study are in confirmity with the earlier workers. In the present investigation the three crops grown in a sequence also differed both qualitatively and quantitatively.

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