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Mycoflora of some vegetable growing soils of Bagepalli and their nutrient status

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Soil microorganisms play an important role in improving physical and chemical properties of the soil. Vegetable growing soils are artificial ecosystem maintained by human. Fungal biodiversity in cabbage, carrot and tomato growing soils of four villages in Bagepalli taluk of Kolar district in Karnataka viz., Mittemmari, Griyapalli, Chokkampalli and Gollapalli were screened and micronutrient status along with organic carbon content, pH and electrical conductivity were determined. A total of 16 fungal genera of which *Aspergillus* followed by *Penicillium* and *Cladosporium* in three of the vegetable growing soil reported with the least occurrence of *Pestalotia.* Four minor nutrient status (zinc, copper, manganese and iron) had been analysed in cabbage, carrot and brinjal growing soil at four villages of Bagepalli. Significant positive correlation occurred between Zn and Cu, Mn and Fe and low organic carbon content favoured Cu and Mn.

Key words: Bagepalli, soil, fungal biodiversity, micronutrients

INTRODUCTION

India is a developing country which depends mainly on agriculture. The agricultural management practice often leads to depletion of soil fertility, micronutrient and change in soil microorganisms' flora. Human impact through agricultural practice leads to adverse effect on soil process. Soil microorganisms carry out biochemecal transformations, thereby res-ponsible for mineral nutrient status of soil (Jenkinson and Ladd, 1981). Fungi are principal decomposers of organic matter in the soil. Hence soil microorganisms have role in sustainable productivity (Lee and Frankhurst, 1992). Continuous use of soil for monoculture may result in poor nutrient status of soil and may result in poor crop production. Studies on soil borne fungi in intensive cropping system are very much required to know the soil borne patho-genic and non pathogenic fungi. Our knowledge of soil microbial diversity is limited in part, due to inability to study soil microorganism. Very little work has been done on the study of fungal diversity of agricultural soil. Present study has been carried out in 2007 to know the fungal diversity in soil of four villages of Begapalli taluk, Kolar District under monoculture of carrot, cabbage and tomato. The micronutrient status of the soil has also been studied.

MATERIALS AND METHODS

Bagepalli taluk of Kolar district has soils coming under Lakkur series, comprising mainly of red soil type. Soils used for growing cabbage (*Brassica oleraceae* var. capitata), carrot (*Daucus carota*), and tomato (*Lycopersicon esculentum*) were selected to study fungal biodiversity, micronurient status and physico-chemical properties. A total of 48 soil samples for fungal and 48 samples for micronutrient analysis, four each in carrot, cabbage and tomato growing soils from four villages of Bagepalli taluk used for monoculture of carrot, cabbage and tomato were collected.

Standard serial dilution agar plating technique of Pramer and Schmidt (1965) employed for isolation of fungi from soil samples and then cultured. The Potato Dextrose Agar and Martin's Rose Bengal Agar Medium supplemented with 0.003% Streptomycin sulphate were used in the experiment. The fungal types were identified by mounting the culture in Lacto phenol cotton blue stain. Isolated fungi were identified on basis of colony characteristics and microscopic morphology (Domsch *et al.,* 1980).

Soils were processed and subjected to analysis.

Electrical conductivity, pH and organic carbon were determined by the method as described by Jackson (1967). The available status of iron (Fe), manganese (Mn), copper (Cu) and zinc (Zn) was determined by extracting the soil using DTPA as an extractant (pH 7.3) (0.005M DTPA + 0.01M $CaCl_2$ $2H_2O$ + 0.1M TEA) in 1:2 soil: extractant ratio, shaken for 2 hrs, filtered and fed to an Atomic Absorption spectrophotometer under appropriate instrument conditions as prescribed for the respective element (Lindsay and Norwell, 1978).

RESULTS AND DISCUSSION

Sixteen fungal genera were isolated from cabbage, carrot and tomato growing soils of four villages of Bagepalli taluk of Kolar district in Karnataka state (Table 1). In all the three types of soils *Aspergillus* occurrence was most frequent followed by *Penicilium* spp. while least occurrence recorded was of *Candida* sp. (0.12%) in carrot growing soils. *Pestalotia* sp. and *Trichothecium* sp. were not recorded in tomato soils at Mittemmari site. At Griyapalli *Candida* sp. in cabbage and carrot soils; *Drechslera* sp. in cabbage soils; *Pullularia* sp. in cabbage and carrot soils were not recorded. *Candida* sp. was not recorded in carrot and tomato soils of Chokkampalli site and *Drechslera* sp. and *Pullularia* sp. were not recorded in cabbage soils at Gollapalli site. Further number of colonies of fungal genera isolated was highly variable. Biodiversity of fungal species in soil depended on the macro– and micronutrients and other microorganisms and factors. Such variations in fungal genera occurrences might be related to varied agriculture practices and also attributed to repeated culture of single type of crop.

Available micronutrients which are DTPA extractable viz. Zn, Cu, Mn and Fe were recorded from cabbage, carrot and tomato growing soils taking 48 samples in each case (Table 2). Average Zn content was maximum (2.22 mg Kg^{-1}) in tomato soils of Griyapalli site and 0.57 mg Kg^{-1} in cabbage growing soils. High average Cu content 2.74 ppm recorded in cabbage soils of Griyapalli, while low content recorded in carrot growing soil samples of Mittemmari site. Average maximum Mn content in cabbage soil samples at Gollapalli recorded was 41.40 ppm, while 6.55 ppm in tomato growing soil at Chokkampalli. Fe content in cabbage soil at Gollapalli was 21.70 ppm while 9.63 ppm in carrot soil at Gollapali.

Physicochemical properties of three soils recorded in Table 3. The pH recorded was slightly basic in all the samples to an average except in carrot soil at Griyapalli which was slightly acidic. Electrical conductivity of all the soil samples recorded was less than 1 and was normal. Low carbon content was recorded in all the soil samples.

Analysis of correlations (Table 4) of soil micronitrient and physicochemical properties revealed that organic carbon content was positively related to level of Cu. Further significant positive (0.991) relationship between Zn and Cu studied in carrot growing soils. Mn and Fe exhibited positive correlation in cabbage and carrot soils, while negative correlation in tomato soils. Similarly most significant negative correlations recorded between pH and electrical conductivity in cabbage and carrot soils, while significant correlations in tomato soil. Positive correlations existed between Fe and Zn in cabbage and carrot growing soils at Bagepalli.

It is evident from the data of the present investigation that low organic carbon, high level of available Zn, Fe and Mn attibuted to microbial diversity in the soil. Variable occurrences of micronutrients attributed to varied agricultural practices and repeated monoculture. Such human impact and cultural practices influence microbial diversity of the soil, there by changes in mineral nutrients status of soil occur. In forecasting the productivity of soil, analysis of microbial diversity, nutrient status and physicochemical properties are important.

Table 1: Fungal types isolated from cabbage, carrot and tomato growing soils of four villages of Begapalli.

Fungal Type	Crop	No. of colonies isolated				Total colonies	Per cent occurrence
		V1	V2	V3	V4		
Aspergillus spp.	A	55	68	51	69	243	25.63
	B	49	82	57	46	234	29.73
	C	54	106	46	48	254	27.60
Alternaria sp.	A	23	9	27	16	75	7.91
	B	26	16	14	17	73	9.27
	C	29	18	12	8	67	7.26
Cladosporium sp.	A	4	47	43	38	131	13.81
	B	29	43	23	2	96	12.21
	C	40	31	6	27	104	11.30
Curvularia lunata	A	48	10	14	27	99	10.44
	B	25	14	8	50	97	12.32
	C	13	22	38	19	92	10.00
Candida sp.	A	2	0	2	1	5	0.52
	B	5	0	0	3	8	0.12
	C	2	3	0	5	10	1.08
Drechslera sp.	A	3	0	3	0	6	0.63
	B	3	1	1	2	7	0.89
	C	6	3	2	19	30	3.26
Fusarium sp.	A	4	1	1	2	8	0.84
	B	2	1	1	5	9	1.14
	C	8	4	6	14	32	3.47
Geotrichum sp.	A	15	8	7	7	37	3.90
	B	7	4	8	15	34	4.32
	C	1	3	12	6	22	2.39
Lasiodiplodia sp.	A	3	7	9	7	26	2.74
	B	6	2	7	1	16	2.03
	C	5	2	4	4	15	1.63
Nigrospora sp.	A	4	3	4	3	14	1.47
	B	5	3	4	3	15	1.90
	C	2	2	2	4	10	1.08
Pestalotia sp.	A	1	1	3	3	8	0.84
	B	2	1	2	1	6	0.76
	C	0	2	4	1	7	0.76
Penicillium sp.	A	16	67	60	21	166	17.51
	B	35	26	26	9	96	12.21
	C	75	49	4	31	159	17.28
Pullularia sp.	A	2	0	3	0	5	0.50
	B	2	0	1	1	4	0.50
	C	3	1	1	3	8	0.86
Phoma sp.	A	62	4	8	19	91	9.59
	B	13	2	4	24	43	5.47
	C	5	10	32	18	65	7.06
Rhizopus sp.	A	4	4	8	3	19	2.00
	B	5	7	4	3	19	2.41
	C	4	5	8	10	27	2.93
Trichothecium sp.	A	15	4	3	2	24	2.83
	B	3	5	8	14	30	3.81
	C	0	5	10	3	18	1.95

Total Colonies A - 948, B = 787 and C = 920 Colonies

Crop A- Cabbage, B-Carrot C-Tomato; Site V1-Mittemmari, V2-Griyapalli, V3-Chokkampalli V4-Gollapalli

Table 2: Available micronutrient status (mg kg^{-1}) in vegetable growing soils of Bagepalli (Descriptive statistic)

Vegetable growing Soil	Site	Zn (R/M)	Cu (R/M)	Mn (R/M)	Fe (R/M)
Cabbage	V1	0.54-2.05/1.26	2.66-2.98.2.8	2.97-35.9/25.09	9.67-11.90/10.74
	V2	0.50-0.62/0.57	2.66-2.92/2.74	32.4-36.4/34.25	11.5-15.40/13.95
	V3	0.67-1.23/0.94	1.71-2.95/2.37	27.4-43.4/33.12	7.62-12.60/9.93
	V4	0.55-1.54/1.23	1.48-2.49/2.14	29.3-53.6/41.40	10.50-31.50/21.70
Carrot	V1	0.41-1.29/0.83	0.42-0.65/0.55	14.6-26.6/18.90	10.4-25.7/16.00
	V2	0.69-1.69/1.11	0.59-1.17/0.97	25.5-32.2/28.80	11.0-20.7/15.55
	V3	0.48-3.94/1.85	0.88-2.06/1.51	5.26-15.5/8.84	10.0-20.7/14.02
	V4	2.04-2.6/2.28	1.91-2.299/2.08	6.84-10.9/8.51	8.13-11.4/9.63
Tomato	V1	1.66-2.72/2.27	1.74-2.34/1.93	13.1-19.2/16.42	8.48-18.6/13.27
	V2	0.58-3.65/2.22	1.48-2.17/1.96	4.14-16.6/7.93	8.48-15.1/12.69
	V3	0.85-1.56/1.15	1.66-2.80/2.19	4.50-10.0/6.55	11.0-15.20/13.10
	V4	0.38-1.16/0.93	1.40-2.20/1.67	5.58-10.60/7.75	9.85-18.40/15.18

R/M-Range/Mean,
Site V1-Mittemmari, V2-Griyapalli, V3-Chokkampali, V4-Gollapali
Values are mean of triplicate

Table 3: Physicochemical properties of vegetable growing soils of Bagepalli (Descriptive Statistic)

Vegetable growing soil	Site	pH 6.3-8.3 (R/M)	EC <1= Normal >1=Harmful (R/M)	OC 0.5-0.75 Medium (R/M)
Cabbage	V1	7.5-7.8/7.70	0.24-0.67/0.48	0.18-0.29/0.23
	V2	7.0-7.9/7.62	0.51-0.76/0.59	0.18-0.32/0.25
	V3	7.9-8.0/7.95	0.21-0.51/0.34	0.25-0.40/0.33
	V4	7.6-8.0/7.70	0.36-0.61/0.49	0.18-0.21/0.18
Carrot	V1	7.1-7.8/7.60	0.33-1.67/0.73	0.32-0.40/0.35
	V2	6.6-7.2/6.90	0.63-0.69/0.66	0.21-0.44/0.32
	V3	7.1-8.0/7.50	0.47-0.55/0.44	0.25-0.29/0.26
	V4	7.5-8.0/7.77	0.24-0.59/0.44	0.18-0.25/0.22
Tomato	V1	7.6-8.1/7.90	0.27-0.61/0.39	0.18-0.25/0.22
	V2	7.6-8.0/7.72	0.20-0.48/0.31	0.18-0.29/0.20
	V3	7.8-8.0/7.90	0.23-0.51/0.37	0.32-0.44/0.37
	V4	7.8-8.1/7.97	0.30-0.32/0.31	0.18-0.36/0.27

R/M Range/Mean,
Site V1-Mittemmari, V2-Griyapalli, V3-Chokkampalli, V4-Gollapalli.
Values are mean of triplicate

Table 4: Relationship between micronutrients, physicochemical properties of three soil of Bagepalli. (Pearson Correlation)

MN/PP	Zn	Cu	Mn	Fe	pH	EC	OC
	Cabbage Soil						
Zn	—						
Cu	−.333	—					
Mn	−.104	−.819	—				
Fe	.230	−.643	.834	—			
pH	.141	−.400	−.052	−.445	—		
EC	−.422	.367	.185	.428	−.951*	—	
OC	−.435	.152	−.332	−.795	.761	−.602	—
	Carrot Soil						
Zn	—						
Cu	.991**	—					
Mn	−.794	−.714	—				
Fe	.918	−.939	.695	—			
pH	.404	.290	−.689	−.068	—		
EC	−.340	−.214	.768	.085	−.951*	—	
OC	−.104	−.185	−.058	−.488	.761	−.602	—
	Tomato Soil						
Zn	—						
Cu	.166	—					
Mn	.641	−.125	—				
Fe	−.692	−.802	−.140	—			
pH	−.374	−.823	.318	.894	—		
EC	.238	.553	.629	−.371	-.068	—	
OC	−.757	.496	−.510	.117	−.116	.287	—

*Correlation is significant at 0.05 level

**Correlation is significant at 0.01 level.

MN-micronutrient

PP-physicochemical properties

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