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Research Article

BACTERIAL AND FUNGAL DIVERSITY OF THIRUVIDAIMARUTHUR TALUK, THANJAVUR DISTRICT, TAMILNADU, INDIA

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ABSTRACT

The soil of Thiruvidaimaruthur near the east coast of Thanjauvr District have been investigated to study the seasonal changes in soil moisture, soil pH, organic carbon, available nitrogen and macronutrients during the period of one year (2015-2016) at four different seasons viz monsoon, post monsoon, summer and pre monsoon. Physico-chemical analyses were performed to study the soil characteristics related to fertility and chemical nature. It was noticed that the regular addition of fertilizers from agricultural runoff, sewage contaminated water out falls, rain water and other anthropogenic activities contribute major changes in soil physiochemical properties that in turn significantly manifest the microbial populations. Determination of microbial diversity by culture method showed the predominance of bacterial genera such as *Micrococcus luteus, E.coli, Enterobacter spp, Pseudomonas aeroginosa, Rhizobium spp, Azospirillum spp, Azotobacter spp, Bacillus spp Staphylococcus spp, Streptococcus spp, Proteus spp, Neisseria spp, Rhizobium meliloti.* The result showed the predominance of fungal genera in Thiruvidaimaruthur taluk such as *Penicillum spp, Fusarium spp, Alternaria spp, Enterobacter spp, Aspergillus spp, Candida albicans, Rhizopus oryzae, Trichoderma spp, Verticilum spp, Gilocladium virens.*

INTRODUCTION

Biodiversity encompasses all living species on earth and their relationship to each other. This includes the difference in genus, species and ecosystem. Having many different living things allow nature to recover from change. If too much biodiversity is lost, there is a problem because we depend on it to survive. Ecosystems, for instant, are extremely important because they carry out processes such as producing oxygen and cleaning soil and water. Biodiversity is considered a cornerstone to the health of environment.

Biodiversity is the variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems". The soil environment is one of the most complex biological communities on earth and niche to an even larger share of biodiversity then tropical forest. Soil biodiversity takes care of the management of soil health, structure and composition which in turn provides the needed base for successful plant life. However, various studies have been made to estimate the economic value of the different services soil biodiversity provides. Microbial diversity of soil is affected by both the plant and soil types (Smith and goodman 1999).

Soil is the upper layer of most of earth's surface and varies in depth from inches to over twenty feet. It is a product of weathered rock, but quite distinct in its characteristics. Soil is excellent cultural media for growth of many types of organisms (Angeiov, 2008). Soil organic matter is a fundamental determinant of fertility of soils, contributing to nutrient sink and nutrient cycling and buffering against adverse chemical impacts (Bardy and Weil, 2008). Improvement in agricultural sustainability requires optimal use and management of soil fertility and soil physical properties, both of which rely on soil biological processes and soil biodiversity. An understanding of microbial diversity perspectives in agricultural context is important and useful to arrive of measures that can act as indicators of soil quality and plant productivity. The coupled cycling of carbon, nitrogen and other nutrients like phosphorus processes, including carbon sequestration in soil and vegetation (Tongway *et al.,* 1996).

Recycling of organic wastes is considered to be one of the most important uses of soil biodiversity. Mankind produces more than 38 billion metric tons of organic waste on a global scale annually. Were it not for the decomposition/recycling activity of soil organisms, much of the globes land surface would be literally covered with organic debris. The economic value of the service represents approximately 50 % of the total benefits

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of soil biotic activity worldwide (>USS 760 billion) (Gardi *et al.,* 2009).

Soil microorganisms are viable but not cultivable that cannot be detected as colonies in nutritional cultivation (Colwell *et al.,* 2000).There are billions of soil microorganisms in a mere handful of a typical, garden soil. That single handful might well contain thousands of different species of fungi and bacteria. Almost all of these countless soil organisms are not only beneficial, but essential to the life giving properties of soil. Soils microorganisms are promote plant growth, create soil structure and control pest and disease.

MATERIALS AND METHODS

Study Area

Thiruvdaimathur is a Taluk in Thanjavur District of Tamil Nadu State, India. About 9 km (5.6mi) north east of the Temple City Kumbakonam, this is one of the taluk Head Quarters in the Thanjavur District. Thiruvidamaruthur has a rich heritage of fertility and people have habit of harvesting thrice in a year. Sometimes the River Cauvery makes a fourth harvest possible.

It is located 47 KM towards East from District head quarters Thanjavur. 287 KM from state capital Chennai towards North. It is bounded by Kumbakonam taluk towards west, Thiruppanandal Taluk towards North, Valangaiman Taluk towards South, T. Palur Taluk towards North. Thiruvarur city, Sirkali city, Tanjavur city, Tharangabadi city are the near by cities to Thiruvidaimaruthur. This place is in the border of the Thanjavur District and Nagapattinam District, Kuttalam is East towards this place. Also it is in the Border of other district Thiruvarur.

Sample Collection

Soil samples were collected from the three villages, viz Ammachathram, Govindapuram, Thirubuvanam at Thiruvidaimarthur Taluk, Thanjavur District – Tamil Nadu. The soil samples were taken during four seasons such as monsoon, post monsoon, summer and pre monsoon in Agricultural field and Uncultivated soils. Samples were collected from 10 – 15 cm deep pits dug in the area to be sampled. The samples were collected in polythene bags. Soil from 8 – 10 pits was pooled together and mixed in the same polythene bag.

Isolation of Fungai

Fungal population present in the soil sample were determined by plating the soil dilution of 10^{-2} to 10^{-5} dilution over solidified Rose Bengal Agar medium. Rose Bengal Agar medium was prepared and sterilized at 121°C for 5 minutes. Then it was supplemented with 1% streptomycin to prevent bacterial growth.

Conidial Population

The number of Colony Forming Units (CFU) present in 1 gram of the soil samples were determined by multiplying the number of colonies with dilution factors.

$$\text{Number of CFU's of fungi per gram dry weight of soil} = \frac{\text{Mean no.of colonies} \times \text{dilution factor}}{\text{Dry weight of the soil.}}$$

Identification of Fungi (Gillman, 1957)

The fungi were made by single spore culture methods. A portion of the growing edge of each colony was picked up with the help of a pair of needles and mounted on a clean slide with lacto phenol cotton blue.

The slide was gently heated over the flame so as to remove air bubbles. The excess stain was wiped off with the help of tissue paper and then the cover slip was sealed with transparent nail polish for semi permanent. The slide was observed under microscope to examine individual fungal species and identified by their morphology. The fungal culture was identified by using manual such as Manual of Soil Fungi (Gillman, 1957).

Isolation and Identification of Bacteria

The bacterial species present in soil sample were isolated by inoculating the diluted soil sample into nutrient agar plate. The bacterial populations grown in plate were identified by morphological and biochemical analysis.

Morphological analysis was done by performing gram staining and motility test. Biochemical characters were analyzed by performing Indole test, Methyl- red test, Voges- proskauer test, Citrate utilization test, Catalase test, Oxidase test and Triple sugar Iorn test.

RESULTS

Identification of Bacteria

Different species of soil bacteria were observed from soil samples. The bacterial species are identified by their morphological character and using Bergey's manual of determinative bacteriology. The identified predominant bacterial genus are *Enterobacter spp, Streptococcus spp, Staphylococcus spp, Pseudomonas spp, Bacillus spp,* and *E.coli* In the monsoon season, *Bacillus spp, Micrococcus luteus, E.coli, Enterobacter spp, Pseudomonas alkaligens* and *Rhizobium spp, were* noted predominantly

In the post monsoon season *E. coli, P. aerogens, Azospirillum spp, Azotobacter, Staphylococcus epidermidis, Enterobacter spp* and *Bacillus spp.* were noted predominantly.

In the summer season *staphylococcus spp, streptococcus spp, Bacillus spp, proteus spp, Pseudomonas aerogenosa, E. coli* and *Nesseria spp* were noted predominantly

In the pre monsoon season *Pseudomonas striata, Micrococcus, E. coli, Enterobacter spp, Streptococcus spp, Staphylococcus spp, Bacillus spp* and *Rhizobium meliloti* were noted predominantly.

Identification of Fungi

Different species of fungi where observed from the soil samples collected from three different villages. The colonies showed a characteristic color of black, green, white, brown, yellow and they were confirmed by identifying their morphological characters by Ellis manual. Among the fungal species identified *Aspergillus spp, Trichoderma spp, penicillium spp, A.oryzae, Fusarium spp, Trichoderma spp,* were predominant in the soil samples.

Table 1 Physico- chemical parameter of Thiruvidaimaruthur soil sample (Ammachathram (S_1), Govindhapuram (S_2), Thirubuvanam(S_3)).

Season	Soil type	pH	Moisture (%)	Temperature (°C)	O.C (kg/ac)	N (kg/ac)	P (kg/ac)	K (kg/ac)	Mg (kg/ac)	Ca (kg/ac)	Zn (ppm)	Fe+ (ppm)	Cu (ppm)	Mn (ppm)
	S_1	7.39	37.2	24	0.85	90.6	3.74	132	9.5	10.6	0.87	5.79	0.96	3.86
Monsoon	S_2	7.74	30.2	24	0.85	97.8	2.74	128	8.3	11.1	0.85	5.79	0.92	3.45
	S_3	7.48	33.1	25	0.95	97.8	3.48	137	9.3	11.3	0.83	6.92	0.98	4.27
	S_1	7.14	40.57	38	0.25	88.9	3.25	145	9.2	10.8	0.61	7.66	0.72	4.08
Post monsoon	S_2	7.32	40.06	32	0.68	84.2	3.65	145	8.4	10.4	0.74	8.45	0.76	3.35
	S_3	7.26	40.5	38	1.02	82.2	3.48	125	8.2	10.2	0.82	4.65	0.77	3.47
	S_1	7.35	41.06	47	1.65	88.06	3.24	128	8.9	10.9	0.89	6.95	0.98	3.43
Summer	S_2	7.63	33.09	48	0.87	89.02	1.7	142	8.4	11.6	0.84	6.47	0.84	4.12
	S_3	7.12	42.05	49	0.29	82.02	3.26	140	7.72	10.4	0.72	5.63	0.88	3.39
	S1	6.93	39.57	31	0.8	85.4	2.14	141	0.82	10.6	0.82	8.23	0.87	3.39
Pre monsoon	S_2	7.39	40.05	35	0.7	88.3	4.35	147	0.85	11.2	0.85	7.33	0.75	3.25
	S_3	6.88	35.56	36	0.85	87.2	2.2	145	0.87	10.8	0.87	7.62	0.77	3.26

Table 2 Biochemical test of soil sample

Name of the Organism	Gram staining	Motility	Indole	MR	VP	Citrate	Catalase	Oxidase	Urease	TSI
Enterobacter spp	-	+	+	-	-	+	+	-	+	-
Azospirillum spp	-	+	+	-	+	+	+	-	-	+
Azotobacter	-	+	+	-	+	+	+	-	-	+
B.cogulans	+	+	-	+	+	-	-	+	-	+
B.plvifaciens	+	+	-	+	+	+	+	-	-	+
Bacillus subtilis	+	+	-	+	+	+	+	-	-	-
Bacillus cereus	+	+	-	-	+	-	-	+	+	+/_
Bacillus licheniformis	+	+	-	-	+	+	+	+	+	-
E.coli	-	+	+	+	-	-	+	-	-	-
Enterobacter spp	-	-	+	-	-	+	+	-	+	_
Micrococcus luteus	+	-	-	-	-	+	-	-	+	+
Neisseria spp	-	-	-	+	+	+	+	+	-	+
P.Alkaligens	-	+	-	-	-	+	+	+	+	+
Proteus spp	-	+	-	+	-	+	+	+	-	-
Pseudomonas aeruginosa	-	+	+	-	-	-	+	+	+	+
Pseudomonas striata	-	-	+	-	-	+	+	+	+	+
Rhizobium meliloti	-	+	-	+	-	+	-	+	-	-
Rhizobium spp	-	+	-	+	-	+	-	+	-	-
Staphylococcus epidermis	+	-	-	-	-	+	+	-	+	+
Staphylococcus spp	+	-	-	-	-	+	+	-	+	+/-
Streptococcus spp	+	+	-	+	-	-	-	-	-	+/-

Table3 Predominant bacterial species of Thiruvidaimaruthur taluk

Name of the Bacteria	Monsoon	Post Monsoon	Summer	Pre Monsoon
Micrococcus luteus	+	-	-	-
E.coli	+	+	+	+
Enterobacter spp	+	+	-	+
Pseudomonas aeroginosa	-	+	+	+
Rhizobium spp	+	-	-	+
Azospirillum spp	-	+	-	-
Azotobacter	-	+	-	-
Staphylococcus epidermis	-	+	-	-
Bacillus spp	-	+	+	+
Staphylococcus spp	-	-	+	+
Streptococcus	-	-	+	+
Proteus spp	-	-	+	-
Neisseria spp	-	-	+	-

Table 4 Predominant fungal species of Thiruvidaimaruthur taluk

Name of the Fungi	Monsoon	Post Monsoon	Summer	Pre Monsoon
Penicillum spp	-	+	+	-
Fusarium spp	-	+	+	-
Alternaria spp	-	+	-	-
Aspergillus spp	-	+	-	+
Candida albican	-	+	+	-
Rhizopus oryzae	-	-	-	-
Trichoderma spp	-	-	-	+
Verticilum spp	+	-	-	+
Tourula allii	+	-	-	-
Gloocladium virens	+	-	-	-

In the monsoon season predominant fungal species were noted include *penicillium turbatam, Torula alli, Trichoderma lignorum, Gliocladium virens* and *Aspergillus flavus*.

In the post monsoon season predominant fungal species were noted include *Penicillim spp, Fusarium spp, Alternarria spp, Aspergillus spp* and *candida albicans.*

In the summer season predominant fungal species were noted include *Penicillim spp, Fusarium spp, Aspergillus spp, itaconicus* and *candida albicans,*

In the pre monsoon season predominant fungal species were noted include *Aspergillus spp, saccharomyces spp, Rizhopus oryzae, fusarium oxysporam* and *Trichoderma spp.*

DISCUSSION

Soil biodiversity takes care of the management of soil health, structure and composition which in turn provides the needed base for successful plant life. However, various studies have been made to estimate the economic value of the different services that soil biodiversity provides. The present investigation was done for isolation and identification of bacterial and fungal species of different places of Thiruvidaimarthur taluk to analysis the impact of the microbial species on nutrient level of soil. Different groups of bacterial populations observed in this study are uncommon and they

were fewer in summer, because there is a limitation in moisture during summer. So drought might constitute a stress in microbial communities. Soil sample from 4 different seasons representing the Thiruvidaimarthur Taluk were examined for microbial diversity. The study revealed the presence of 20 species of bacteria, among them 6 species were found in all the seasons and also study revealed the presence of 10 species of fungi, among them 4 species were found in all the season. Determination of microbial diversity by culture method showed the predominance of bacterial genera such as *Micrococcus luteus, E.coli, Enterobacter spp, Pseudomonas aeroginosa, Rhizobium spp, Azospirillum spp, Azotobacter spp, Bacillus spp, Staphylococcus spp, Streptococcus spp, Proteus spp, Neisseria spp* and *Rhizobium meliloti.* The result showed the predominance of fungal genera such as *Penicillum spp, Fusarium spp, Alternaria spp, Enterobacter spp, Aspergillus spp, Candida albicans, Rhizopus oryzae, Trichoderma spp, Verticilum spp* and *Gilocladium virens.*

CONCLUSION

In the study physico-chemical parameter, micro and macro nutrients were estimated and predominant bacterial and fungal species were identified to correlate the species with the soil fertility status. The common and uncommon species were taken for correlate and to compare soil fertility status of different areas in different seasons. Through the seasonal analysis we will obtain the details of species variation in different seasons and the knowledge of crop rotation in Agricultural field.

References

Brady, N. C., and Weil, R.R. (2008). The nature and properties of soils, 14th Ed. Pearson/Prentic Hall: Upper Saddle River, New Jersey.

Colwell, R.R., and Grimes, D .J. (2000). Non- culturable microorganisms in the environment. *ASM Press,* Washington DC, USA.

Gardi, C.and Jeffery, S. (2009). Soil biodiversity. JRC Scientific and technical Reports.

Gilman J.C., A Manual of soil fungi, 2nd Indian edition, Biotech Books, Delhi

Griffiths, B S., Ritz, K., Bardgett, R.D., Cook, R., Christensen, S., Ekelund, F.*et al*. (2000). Ecosystem response of pasture soil communities to fumigation-induced microbial diversity Reductions: an examinations of the biodiversity- ecosystem function relationship Oikos, 90, 279-274.

Griffiths, B S., Bonkowski, M., Roy, J.& RiTz, K. (2001). Functions stability, substrate utilization and biological indicators of soils following environmental impacts. *Applied soil ecology,* 16, 49-61.

Nannipieri, P., BAdalucco, S. & Landi, L. (1994). Holistic approaches to study of populations, nutrient pools and fluxes: limits and future research needs. In: *beyond the biomass: Compositional and fictional Analysis of soil microbial Communities* (eds K. Ritz, J. Dighton & K.E. Giller), pp. 231-238. John Wiley & Sons, Chichester.

Smith, K.P., and Goodman, R.M. (1999). Host variants for interactions with beneficial plant associated microbes. Ann. Rev. Phytopathy. 37:473-491.

Tongway, D., and Ludwig, J. (1996). Rehabilitation of semiarid landscapes in Austalia, Restoring productive soil patches. Restora. Ecol.4: 388-397.

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