

Introduction

The biological study of the soil is always important and interesting. It is well known that the distribution of micro-organisms in soil varies according to the type of soil. The soil is the depositary of all kinds of micro-organisms which bring about the changes that enable the life to continue. Soil is the upper layer of most of the earth's surface and varies in depth from centimeters to several meters. It is a product of weathered rock, but quite distinct in its characteristic. Soil is not a single unit, because there are different kinds of soils. Each kind of soil has some profile, which consists of a series of layers, different from one another, in colour, texture, composition etc. Each layer is called a horizon. In the upper most layer most of the living organisms are present. In the second horizon most of the organic matter is present. Next to that horizon is weathered rock and below it is solid rock.

Man depends upon the soil for his food and is a parasite upon vegetable. But vegetable is molded by the remains of many vegetables from years past. These vegetable remains, become quite different from the plants due to the action of soil micro-organisms. In fact, soil is the beginning of life, and of course, the end of it.

It seems obvious that micro-organisms are in the soil because there is food. Soils are excellent cultural media for the growth of many types of organisms.

A spoonful of soil contains billions of micro-organisms. In general the majority of microbial population is found in the upper six to twelve centimeters of the soil and the number decreases with depth. The number and kinds of organisms found in soil depend upon the nature of soil, depth, season of the year, state of the cultivation, reaction, organic matter, temperature, moisture, aeration etc.

Due to the activities of all these micro-organisms the soil forms dynamic ecosystem. Micro-organisms bring about important chemical and physical changes in the soil by their actions and interactions. Soil microbes play a key role in soil ammonification, nitrification and nitrogen fixation. Some of the fungi are capable of attacking cellulose and hemicellulose, and consequently they contribute to the formation of humus in the soil.

Although some of the soil fungi are known to inhibit the growth of bacteria and other soil micro-organism. There are many others which are influenced by the growth of other micro-organisms that produce fungistatic and fungicidal substances. In any case, a definite state of equilibrium is established between the growth and the activity of fungi and that of other micro-organisms. On the otherhand, however, the same soil also supports the growth of a countless number of harmful micro-organisms, which are potential sources of many soil borne diseases.

The fungi found in the soil inhabit the soil as their natural ecological habitat. The term soil fungi is generally applied to the heterogenous collection of fungi isolated from soil or the fungi which have been observed as growing in the soil. Some of these are unquestionably soil fungi in the most restricted sense and play an important role in the break down of organic debris. Others are transient, and are transported by wind, water or some other agent to an essentially foreign habitat.

In most well aerated and cultivated soils, the fungi account for the largest part of the total microbial population. Most of the fungal organisms present in the soil have filamentous organization, but lower groups of fungi like Myxomycetes, chytridials are lacking in typical hyphal organisation. In many soil fungi, the hyphae are aggregated into rope like structures called rhizomorphs. Similarly number of fungal organisms remain in soil as thick-walled chlamyospores or sclerotia.

The abundance and the physiological activity of the fungus flora of different habitats vary considerably. Both the generic composition and the size of the flora vary with the type of soil and with its physical and chemical characteristics. The major external influences imposed upon the fungus flora includes the organic matter status, hydrogen ion concentration, organic and inorganic fertilizers, the moisture content, aeration,

temperature, position in the profile, season of the year, and the composition of the vegetation.

Most isolates from soil are placed in one of three classes, Phycomycetes, Ascomycetes, or Fungi Imperfecti. The most frequently isolated fungal forms on agar media are the strains belonging to the fungi imperfecti. The commonest soil numbers from fungi imperfecti are the species of Aspergillus, Cephalosporium, Monilia, Penicillium, Trichoderma, Verticillium, Alternaria, Cladosporium, Fusarium etc. Amongst Phycomycetes the species of Absidia, Cunninghamella, Mortierella, Mucor, Rhizopus. And from Ascomycetes species of Chaetomium are the most common ones. Very few Basidiomycetes have been isolated from soil. From Myxomycetes species of Dictyostelium are found to be occurring frequently.

Fungi are being utilized as test agents for determining the nature and concentration of a number of organic and inorganic compounds in the soil ranging from available phosphorous and potassium to vitamins like thiamine and pyridoxine. On account of their varied physiological behaviour, soil fungi are being utilized industrially for the manufacture of a large number of products like organic acids, diastatic, proteolytic and pectolytic enzymes, antibiotics etc. Although they form a part of the population of the micro-organisms, their abundance, extent of growth varied physiology, make them essential for carrying out

a large number of life processes which are main responsible for the existence of life in this world.

From the above short review, it will be seen that soil fungi constitute an important component of soil microorganisms. They play a significant part in the soil fertility. Soil fungi in Maharashtra state have not received sufficient attention as compared to the other states of the country where they have been extensively studied. Taking these facts into consideration investigations were under taken to study the effect of the soil type, its physico-chemical properties and the plant cover on the distribution of microfungi. The fungi from three type of soil (cultivated, uncultivated and saline soil) are studied in the present investigation. These three soils samples are collected from the following sources. The cultivated from the Kavalapur, uncultivated from Shivaji University Campus, Kolhapur and saline soil from the Sandoli in Sangli district.

Study of soil fungi is of great interest to workers in various fields. It contributes to our knowledge of agriculture and biology. The importance of the role played by fungi in soil fascinates many workers in various fields like Agronomy, Plant pathology, Microbiology, Biochemistry etc.

It is well known that the growth and activity of soil microorganisms including the fungi, are governed by the nature of the environment (habitat) resulting in the same group

exhibiting differential activity under different environmental or soil condition.

TOPOGRAPHY, CLIMATE AND VEGETATION

Soils are formed as a result of weathering of different kinds of rocks. In the process of soil formation, parental rock, climate, vegetation (including macro and microorganisms) and time, play an important part; of all these factors, climate plays dominating role in soil formation and many time it modifies the effects of other factors.

As the climate in different parts of Maharashtra is heterogenous, the state is broadly divided into three climatic zones. First is the western zone which includes coastal belt and extends eastward upto the top of the western range of hills. It experiences semihumid or humid climate. Second zone is the transition tract which lines on the eastern side of the first zone. The climate of this zone is less humid and in some parts less arid. It includes Poona, Satara, Kolhapur and parts of Thana and Nasik districts. Third climatic zone of the state is the largest zone which lies on the eastern side of the second zone. All districts of Deccan, Marathwada, Western parts of Nagpur, Wardha and Yawatmal districts are included in this zone. It can be seen that a very large area of the state has arid or semiarid climate as a result of which soils from a large portion

of the state are alkaline.

The natural vegetation in the Maharashtra state fall under four categories. The evergreen forests occurring in the parts of high rainfall, deciduous forests in the transition zone, grass lands in the dry zone and halophytic in coastal regions where lands are inundated by sea water.

Maharashtra lies between 16° to 22° north latitude. East west breadth is upto 800 Km. and North South breadth is upto 700 Km. and has an area of 5,60,000 Sq.Km. It comprises 27 districts. The present investigation is confined to Kolhapur district only. It lies between $16^{\circ}43'$ North latitude and $14^{\circ}14'$ East longitude. The climate in these parts is hot and dry. The rain fall towards west is more. It decreases towards east. There are three marked seasons in a year viz. (1) Rainy season from June to October (2) Winter season from October to February and (3) Summer from February to June.

The Maharashtra state has been arbitrarily divided into nine zones on the basis of differences in agroclimatic conditions, and it was felt that these differences would be reflected in the nature and the activity of the fungi occurring in the soil of different agro-climatic zones. It has been experiences in the Maharashtra state, that while nitrogen is in short supply in most of the soil regions. There are quite a few pockets of soils where crops have responds to the application of phosphatic

fertilizers. This is particularly so in the case of lateritic soils of the coastal zones in which crops have responded more or less linearly to the application of phosphorus. These are quite a few types of fungi which are capable of solubilizing inert soil phosphates into available forms. It was, therefore, decided to study the phosphorus solubilizing power of fungi occurring in the soil of different agro-climatic zones of the Maharashtra state.