INTRODUCTION...

II - INTRODUCTION

All regions of the earth that contain living organisms are known collectively as the biosphere. This includes principally soil, water and air. Soil is the upper layers of most of the earth's surface and varies in depth from centimeters to over 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 microorganisms. In fact, soil is the beginning of life, and of course, the end of it.

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

Bacteria, Fungi, Algae, Actinomycetes and Viruses. In addition, various lower animals like Protozoons, Worms, Insects, Rotifers and various Nematodes are also present. A spoonful of soil contains billions of microorganisms. 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 depends 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 microorganisms, the soil forms a dynamic ecosystem. Microorganisms bring about important chemical and physical changes in the soil by their actions and interactions. For example, inorganic compounds of iron, phosphorus, manganese etc. which are not readily absorbed by the higher plants, are made available to them by the oxidation - reduction reactions of the soil microorganisms. Moreover, 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. Certain fungi like Agaricus compestris and Coprinus sp. are known to be capable of decomposing lignin and resistant humus complexes. Soil humus is not considered

to be absolutely resistant to further decomposition, as evidenced by the fact that some microorganisms are capable of bringing about gradual destruction of the humus resulting in the liberation of CO_2 and ammonia.

Although some of the soil fungi are known to inhibit the growth of bacteria and other soil microorganisms (through the liberation of bacteriostatic and bactericidal substances), there are many others which are influenced by the growth of other microorganisms 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 microorganisms. On the other hand, however, the same soil also supports the growth of a countless number of harmful microorganisms, which are potential sources of many soil borne diseases. In view of this ecological and economic importance, selected groups of such soil microorganisms have been studied extensively by various workers. Such studies have dealt with factors determining the composition of soil mycoflora.

Till the dawn of the twentieth century, bacteria were thought to be responsible for most of the soil processes and other constituent groups, such as fungi and algae not given due consideration in the systemic study of the soil

populations. During the last few decades, however it has been fairly well established that besides bacteria, fungi and algae also exert a great variety of synergistic and antagonistic effects and that there activities have a definite role in soil fertility.

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 breakdown of organic debris. Others are transient, and are transported by wind, water, or some other agent to an essentially foreign habitat. Some are facultative parasites, rain washed from their hosts or released by slow decay. About many of these we have little knowledge. Association of all soil fungi is not always beneficial to the plant.

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 hypal 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 chlamydospores or sclerotia. For the purpose of population estimates, several techniques have been developed. Such estimates, of microbial density reveal the presence of fungal populations in soil ranging from as few as 20,000 to as many as 1,000,000 fungal units per gram of soil (Alexander, 1961) the unit being defined as any spore, hyphae, or hyphal fragment which is capable of giving rise to a colony.

The abundance and the physiological activity of the fungus flora of different habitats vary considerably. Both the generic composition and the size of flora vary with the type of soil and with its physical and chemical characteristics. The major external influence 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 imperfect. The commonest soil numbers from Fungi imperfecti are the species of Aspergillus, Cephalosporium, Moniia, Penicillium, Trichoderma, Verticillium, Alternaria, Cladosporium, Fusarium etc. Amongst Phycomycetes the species of Absidia, Cunninghamella, Mortierlla, Mucor, Rhizopus, Zygorhynchus, 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 occuring frequently.

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 and Biochemistry etc.

Fungi are being utilized as test agents for determinating the nature and concentration of a number of organic compounds in the soil ranging from available phosphorus and potassium to vitamins like thiamine and pyridoxine. On account of their varies 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 microorganisms, their abundance, extent of growth, varied physiology, make them essential for carrying out a large number of life processes which are mainly 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 undertaken to study the effect of the soil type, its physico-chemical properties and the plant cover on the distribution of microfungi.

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 effect of other factors.

As the climate in different part of Maharashtra is heterogenous, the state is broadly divided into three climate zones. First is the Western zone which includes coastal belt and extends Eastward up to the top of the Western range of hills. It experiences semihumid or humid climate. Second zone is the transition tract which lies 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 Yeotmal 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 soil from a large portion of the state are alkaline.

The types of parental rock is often deciding factor in soil formation. The great geological formation known as the Deccan trap covers nearly three-fourths of the state and this has given rise to black soils. Another important geological formation found in the state is the laterite which is seen in the South Konkan including Southern part of Ratnagiri, Northern part of Satara and Western part of Kolhapur district. The laterites have

given rise to red soils showing acid reaction.

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

Maharashtra lies between 16^0 to 22^o North latitude. East West breadth is upto 800 Km. and North South breadth is upto 700 Km. and has an area of 560,000 Sq.Km. It comparises 31 districts. The present investigation is confined to Karad region only of Satara district. It lies between 17.3 North latitude and 74.11 East longitude. The climate in these parts is hot and dry. The average rainfall of Karad region during year 1989-90 was 850 mm. 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 season from February to June.

Of the total land, 3,07,58300 hectares of soil are under cultivation in Maharashtra, of which 10,58,200 hectares belong to Satara district and 1,04,200 hectares to Karad region. (Record 1989-90 Agricultural Dept.Z.P.Satara). There are various agricultural crops grown in Maharashtra.

Sugarcane is one of the most important cash crop, which is grown over 3,65,900 hectares in Maharashtra, 32,800 hectares in Satara district and 11,270 hectares in Karad region.

Recently Banana cultivation is being undertaken in Maharashtra. Like Sugarcane, Banana also belong to the cash crop cadre. Out of 7,500 hectares of Banana cultivation in Maharashtra, 300 hectares belong to Satara district and 100 hectares to Karad region.

From the above data, it is clear that there is an extensive area of sugarcane while there is beginning in the cultivation of banana. Therefore, present investigation is confined to the studies of soil fungi from sugarcane and banana fields of Karad region.