REVIEW
OF
LITERATURE...

III - REVIEW OF LITERATURE

I) Study of soil fungi :-

Adametz (1886) was the first person who studied the mycoflora of two soils but the method of isolation was not mentioned. Reinitzer (1900) studied the fungus flora of soils and its biochemical activities. Hagem (1910) isolated Mucorales from superficial layers of soils and a large numbers of Mucorales, Penicillia, Aspergilli, and Cladosporia were found by him in cultivated and forest soils. Dale (1912-14) reported the fungi from neutral, alkaline and sandy soils containing very little organic matter.

Goddard (1913) isolated from a rich clay-loam Michigan soil many species of fungi, but did not find any variability as to their occurance at different depths. On the other hand, Waksman (1916) observed that, the number of fungi decreased rapidly with depth, so that at 12"-20" below the surface, very few fungi were found, the largest number occuring within the upper ten cms. of the soil. Warkenthin (1916) isolated a number of fungi from Texas soils. He did not find any variation between cultivated and virgin soils. He concluded that there was a constant characteristic fungal flora in each soil. Aspergilli seemed to be the predominent fungi in the south, while

Penicilli and Mucorales were found more extensive in the Northern soils.

Waksman (1917) also did not find much difference in soil fungi of cultivated and virgin soils, like Warkenthin (1916). He stated that more fertile soil contained more fungi in both number and species than those in the less fertile soils. Acidic, water-logged soils were richer in number and species of Trichoderma, than the normal agricultural soils. Waksman (1922) observed that Potassium salts and Phosphate stimulated the development of microorganisms and more so in the presence of lime, than in its absence. The addition in lime resulted in a decreases in the number of fungi and increases in the number of bacteria and actinomycetes. Manure also exerted a decided stimulating effect on all groups of microorganisms. LeClerg and smith (1928) showed that fewer species of fungi are isolated from soils containing high quantities of soluble salts than from the soils with low salt content greater number of Penicilli were found in soils of high salt content than that of any other fungus. LeClerg (1931) studied 13 soils of different physical conditions supporting different crops. He reported that alkali salts tend to reduce fungal flora, although Fusarium sp. were abundant in this type of soil. Jensen (1931) has reported the number of fungi in

Denish soils of different types and of reactions varying from P^H 3.34 to 8.35. He did not observe any clear relationship to the type of soil, except that, very heavy clay soils were poor in fungi. There was also no relation between the number of fungi and soil reaction. The addition of lime to acid soil did not markedly depress the number of fungi, but addition of farm yard manure increased the microbial population. Timonin (1935) has reported that the A-horizon of virgin manitoba soils showed the highest count of each group of microorganisms, and the C-horizon lowest. This has been later confirmed by Jefferys et al., (1953) and Blue et al.,(1955).

Farrow (1954) observed that soils of Costa Rica and Panama contained a large number of Aspergillus and Chaetomium sp. Whereas Mucor and Rhizopus were rarely observed in this tropical region. Miller et al.,(1957) found that the total number of fungi as compared with the number of bacteria and actinomycetes was greater in forests soils than in cultivated soils of Georgia. Secondly it varied more with soil types than with geographical region. Penicillium was the chief genus in forest soils, while Aspergillus was dominant in cultivated soils.

The climatic factors are the powerful ecological

determinants in distribution of microorganisms in general. Earlier worker Stevenson and Chase (1957) have worked out the seasonal distribution of soil microorganisms in various parts of the world. Various seasons influence the microfungal component of the soil organisms presumably by bringing variation in moisture and temperature and food supply affect the microbial activity fundamentally, the number and activity of different microorganisms in the soil have been thought to more or less closely follows the seasonal trends of moisture and temperature of soil. Szilvinyl (1948) concluded that both soil temperature and humidity influence the soil microorganisms and that particularly fungi are first influenced by temperature. Moisture provides a very broad range for optimum growth and survival of fungi in general. The moisture content and fungal number in different soil type have already been reported to have a direct correlation by Tresner et al., (1954). Mekhtiew (1959) has shown that the richest in microflora are the bottom land meadow soils, followed by chernozem soils and grey forest soil respectively in descending order. In representative soils of different climatic zones of chile.

Medina De Wernil (1968) found that volcanic ash soils of the Southern region to contain larger number of

bacteria than actinomycetes and fungi. On the other hand, in the alluvial desert of Northern region the bacterial population increased with depth in the profiles of Zululand, possibly because of decrease in soils moisture content. In the lower horizons of some profiles he observed that the increase in the colonies and the species are associated with increase in carbon content.

Soil is the suitable substratum for the growth and multiplication of microbes. Many research papers and review articles have contributed much to understand the inter-relationships of soil factors, crop remains, root exudates and microflora (Waksman, 1944); Saksena, 1969; Sadasivan, 1965; Park, 1968; Garrett, 1970; Rama Rao, 1970; Alexander, 1971; Subramanian 1973). Although investigations of fungi of Indian soils were initiated by Butter in (1907). Significant contributions on the microfungi of forest communities were made by Shetye (1954), Saksena (1955), Bakshi and Singh (1956, 1957) and Misra (1963). Shrivastava (1966) worked out the microfungi of Eugenia heyne soil of Gorakhpur. Different forest soils of Himalayan as well as sub-himalayan tracks giving their chemical composition and distribution of microfungi at various depths during different seasons of the year have been studied, Kamal and Bargava (1969, a and b) studied, soil fungi from Teak forests of Gorakhpur.

Investigations on soil fungi in India is worth mentioning. The fungal flora of Varanasi (Dwivedi, 1958), Banaras (Gangnani and Lal, 1962), West Bengal (Ghatak and Roy 1939; Roy and Divedi, 1962), Orissa (Ghosh and Dutta, 1960), Allahabad (Saksena and Mehrotra, 1952; Saksena and Sarbhoy, 1963), Sagar (Saksena and Murty, 1953), South India (Manoharachary et al., 1978), A.P. (Reddy and Manoharchary, 1977), have been recorded. Verma et al., (1965) and Ramaswami and Nair (1966) have studied the relative soil fungi of Narmada Valley in Madras state. Phycomycetes in Agricultural soils with special reference to pythiaceae studied by Soumini Rajgopalan and K.Ramkrishnan (1963). Some fungi in forest soil Vikarabad, Hyderabad studied by C. Manoharachary and Rao (1974), soil fungi of Hyderabad studied by Manoharachary and Rama Rao (1973). In India seasonal trend of fungi distribution in soil has been studied by Saksena and Sarabhoy (1963), Dwivedi (1965) and Rama Rao (1970), Kamal and Bhargawa (1971) both in quality and quantity in rainy, winter and summer seasons. Seasonal variation in fungistasis in some soils studied by Dutta and Isaac (1979). Soil fungi of Bansipaharpur (Rajasthan) observed by Sharma and Mishra (1977).

Soil fungi in Maharashtra state have not received sufficient attention although in other state of the country

they are being extensively studied. Mujumdar (1966, 1967) has studied the population study of soil microflora of Maharashtra state. Pawar (1978) has studied on Rhizosphere of Parthenium. Rudraksha (1972) have also studied the soil fungi of four Agroclimatic regions of Maharashtra. Ursekar (1975) has studied the soil and Rhizosphere fungi. Patil et al. (1976) have studied the soil fungi of Poona; Mishra (1980) observed the Myxomycetes and soil fungi of Maharashtra. The soil fungi of Western Maharashtra were studied by Kale (1981). Sawant (1984) has carried out the cultural and fundamental studies of soil fungi from Kolhapur.

II) Methods of study of soil fungi :-

Different workers have applied different techniques for qualitative and quantitative determination of soil fungi each with its own advantage. During the course of present study, dilution plate method was used for this purpose. Several workers such as Jensen (1931), Cobb (1932), Ellis (1940), Niethammer (1935), Jefferys et al., (1953), Mehta (1966), Ursekar (1975) have employed the dilution plate method successfully. Of course the enumeration of fungi in soil remains always hypothecial, so one has to be critical while using a particular method of isolation, in order to obtain a reliable picture of fungal population in the soil. Usually the total number and types of fungi per unit of soil are determined by the appearence of fungal colonies on one or more media by soil

dilution plates. The population of fungi obtained by this method may be more than the true population due to heavy sporulation, or may be less since some fungal spores germinates more slowly than others or are subjected to the antagonistic effects of other fungi. But inspite of its limitations, for the purpose of enumeration, the conventional plate counts have been most widely used and are considered to be a standard method for large scale studies of soil fungi.

The control of bacterial contamination in plates is of greater significance.

Smith and Dowson (1944) studied the bacteriostatic action of Rose Bengal in the medium for isolation of soil fungi for the first time and reported that Glucose-nitrate soil extract agar containing 65 mg/litre Rose Bengal was the best. It eliminated all the actinomycetes, most of the bacteria and also reduced the spread of fungal colonies to a minimum. Only bacteria that tolerate the dye appeared on this medium.

Littman (1947) used crystal violet as bacterial inhibitor. Martin (1950) was the first to suggest the use of antibiotics in the isolation medium. He reported that combination of 33 mg. of streptomycin per litre was

better than acidification in soil dilution plate for fungal isolation. The number of fungi and their types isolated in some cases with this medium was increased. Also the spread of bacteria and rapidly growing fungi was reduced.

Miller et al., (1957), Durell and Shield (1960), Ghosh and Datta (1962) and Goos (1962) screened several soil samples and Rose Bengal agar with streptomycin sulphate as one of the components. They reported that the bacterial growth was inhibited and the fungi formed discrete colonies.

According to many workers, combination of Rose Bengal and streptomycin sulphate is best for avoiding bacterial contamination in the medium. In the present investigation experiments were carried out by using different cultural media.