CHAPTER 1

INTRODUCTION
The present topic "Leaf spot Fungi from the Forest flora of Madhya Pradesh - A survey and Mycotaxonomic study" is based on the study of the Hyphomycetous fungi occurring on chiefly living leaves and is confined to the Madhya Pradesh state. The climatic condition as rainfall, temperature, soil, humidity are very much favourable for the growth of the plant life. These conditions also favor the growth of the wide range of the plant parasites especially on the leaves, which affect plants greatly. The leaf system of the plant is chief centre of food synthesis and provides large surface area which remains moist through the year and also provides a good substratum for the fungi to colonise. In different seasons different types of fungi colonize and their growth is favoured by different climatic conditions.

(The term phyllosphere is proposed by Last (1955) indicating the leaf surface and immediate adjacent area) The leaf surface of the plant is colonised by variety of epiphytic micro-organisms. Laben (1965) classified these epiphytes into two groups as Epiphyllae - The micro-organisms as lichens, ferns, liverworts and angiosperm and microbial epiphytes which are chiefly Bacteria, Algae and Fungi. They live and multiply on the leaf surface. There are a number of micro-organisms mainly fungi which grow and multiply on living leaves are called as parasite, while those which grow and multiply on dead or decaying leaves or on dead part of the plant often referred
as saprophytes.

On such a vital possession of nature, micro-organism in general and fungi in particular play chief destructive role. A variety of the fungal micro-organism parasitize the plant leaves which are the seat of photosynthesis. Fungal infestation, sometimes result in colossal loss in biomass production. Most of the historically important epiphytotics in the past have been due to these leaf infecting fungi leading to disaster and death of the plants. Thus they have proved to be big curse by causing epiphytotics of various economically important crops. The forest plant which are our green gold and our natural reserves have been at the disposal of these causing serious diseases, sometimes even leading to death of plants. The loss to these plants is indirectly affecting our society undoubtedly and hence their detailed study did not get attention till recent past. However, Govt. of India state Govt. and International organization are giving a call to conserve nature and protect environment to increase the productivity of biosphere.

Forests are the most important natural resources for the living organism including man also. They play important role in economic development and growth in various ways and maintain the environment and stability of nature. Forests play vital role by providing fodder, firewood, wood for agriculture implements, shelter for wild animal and people, hut and houses, edible fruits and flower
and roots as nutritious food, honey, wax, oilseeds etc. and above all the fruitful employment for rural masses. In fact the forests are indispensable for soil and water conservation as they maintain the soil fertility by adding the litter and humus every year. Forest conserve the soil cover besides, regulating water and purifying the air. Moreover they absorb solar energy through photosynthesis and exert a direct beneficial effect on the biosphere. The forest also play chief role in making proper balance of our environment. It is obvious that forest in their natural and / or man influenced ecosystem are affected by various abiotic and biotic factors which interfere with their normal growth and developmental process.

The geographical distribution of fungi depends on two major requirements firstly local conditions should satisfy the need of the species and secondly its migratory ability and habit should enable it to reach the regions congenial to it.

Fungi have diversified nature and best adaptability. They occur on different substrates such as soil, water, dung of various animals, leafy litter of all kind with different degree of decomposition, on decaying wood & bark of various tree, on various plant as plant pathogen on organic matter of all kinds and on insect, protozoa, and other animals including man too. The actual number and even the total number of biomass of earth's fungi is too difficult to estimate but it is sure that their
number is several times larger than the total number of plants existing on this planet.) The knowledge of pathogenic activities of these organisms on man, crop plant has been important since the dawn of Agriculture. It also can not be over looked that none of the plant has been left without fungal attack irrespective of its part as root, stem, leaf, flowers, fruit etc. Besides, the harmfuly activities, the fungi in the modern age have got their key importance proving their benificial potentialities either directly or indirectly.

The fungi are saprophytic or parasitic member of thallophyta. Since fungi never possess chlorophyll they depend for their food on some sort of relation with other organism. As saprophyte they may utilize organic matter or waste product or they may break up dead tissues as a source of supply; as parasites they may prey upon living cells with consequences to the host that vary from trifling inconveince to complete distruction or as symbionts they may establish a relationship with other organism in which the advantages are not all on one side; Fungi are largely confined to the top six inches of soil where the form most frequently met with in temperature climates are species of Penicillium and Mucor; Aspergillus and such Hyphomycetales as Fusarium and Cladosporium also bound.

(The Hyphomycetes are a group of the fungi imperfecti. They include besides the mycelia sterilia, conidial fungi in which the conidiophores are
free and are borne on the mycelium or in sporodochia, or synemata, but not whitin pycnidia or acervuli. The majority of hyphomycetes lack sexual reproduction (stage).

The microflora vary from plant to plant, season to season and also vary at different age of the leaf. Thus, the leaf spot fungi are those micro-organism, which grow and colonies on the leaf surface may be parasites, saprophyte or epiphytes and include the fungi such as (Ascomycetes, Teliomycetes and Deuteromycetes ones).

The leaf parasites must obtain their nutrition from the leaf tissues and as these are entirely enclosed by an impermeable cuticle except for stomatal opening. These fungi need to penetrate the cuticle and the leaf epidermis directly, through stomata or through wounds. Once penetration has taken place further development may be entirely within the leaf. Where the development is mainly external well developed haustoria or numerous specialized absorbing organs, the hyphopodia are invariably present. Hyphopodia are a specialized kind of appresoria (Emmett and parbery 1975) whose constant morphology is of taxonomic value.

The hyphomycetes colonizing living leaves of plant form interesting ecological group of remarkable diversity in their mode of entry and colonization of the leaf, special relationship to the leaf surface and leaf tissues, and growth and sporulation there on. Entry into a leaf may be through stomata, with or without
appresoria or by directly penetration of the cuticle and the epidermis usually proceeded by formation of an appresorium. The extent and kind of development within the leaf is also very variable and may be intercellular usually with haustoria or intracellular and intercellular. Intracellular development may be the result of penetration of host cell walls or cell wall may be enzymically degraded. Host tissue may be killed in advance of spread of the fungus or may not be and toxins and enzymes may be involved in the interaction. Mycelium development may be chiefly internal, some times completely superficial sometimes both. The fungus may or may not develop a stroma; a stroma when present may be internal or superficial or erumpent. the majority of hyphomycetes produce dry conida; quite natural considering the fact that these must get disseminated by wind. Where a teleomorph is known, it develops either in the living leaf or more commonly on the fallen and usually moribund leaf.

Some of the Foliicolas hyphomycetes are represented by epiphyllous species typically producing hyphopodia. The mycelium of Clasterosporium caricinum form a repent net work of branching and anastomosing hyphae with distinct lobed hyphopodia on leaves of a Curex sp. and in others quite different mode of development are seen in different foliicolous hyphomycetes.

The Septodium state of several tropical leaf spot causing Ascomycetes such as Paradiopsis,
develop their characteristic yellow to yellowish brown reticulate mycelium on the surface of leaf host.

Primary subcuticular development is characteristic of some leaf spot hyphomycetes. In case of Spiloceapomi on apple leaves and Fusicladium pyrorum on pear leaves, a germ tube is formed by a germinated conidium on the surface of leaf from a disc like appresorium, the centre of which is a small bulge penetrating the cuticles.

Where in case of leaf spot of banana due to Pseudocercospora musae, during infection, the germ tube grows on the leaf surface for several days before it enters the leaf tissue through a stoma. Cercospora sorghi causes the grey leaf spot of several spp. of Sorghum and other grasses. Upon conidial germination, the germ tube enters the leaf through the stomata and produces typical red spotting of the leaf. Hyphae are firstly intercellular and later intracellular.

The effect of fungal infection on leaves vary from plant to plant, and often on the some plant differences between the spots caused by different fungi are often characteristics enough to be diagnostic, for instance on banana leaves infected by Pseudocercospora musae, initial visual symptoms consist of short yellow streaks where as those infected by the Pseudocercospora state of Mycospherella chinesis, give the symptom as light brown streaks (Trujullo and Goto 1983).

Fungi are adopted to a mode of life
where all nutrients are absorbed as soluble material from the substrate or the host. They utilize a range of organic substances from simple sugar to complex substances such as cellulose, hemicellulose, chitin, and keratin. They utilize inorganic or organic sources of nitrogen.

The ability of these fungi to form extracellular or surface localized enzymes capable of breaking down various substrates has immense ecological significance. With the appropriate enzyme they can break down almost any substrate. Both growing vegetative hyphae as well as germ tubes from germinating conidia can exert mechanical force to penetrate physical barrier such as cuticle of living leaves.

The growth and activity of fungi are a response to physical, chemical and biological factors of the environment. Physical factors involving moisture, temperature, light pH. and aeration. Availability of suitable substrates and nutrients is the most important factor, though the occurrence of toxic substances and recalcitrant molecules and heavy metals in the environment would equally affect the life of these fungi. Biological factors include a range of complex interaction which affect or modify the activity of fungi directly or indirectly.

The fungi have great importance to us, many of them cause diseases of medicinal plant, ornamentals, cereals legumes and fruit. From the attack of these
diseases production is affected. On contrary, some fungi have proved to be boon in saving the life of man and useful animals through the antibiotics against many diseases. They also provide vitamins and mineral rich food delicacies, and other miscellaneous product. Preparation of enzymes the reposing of cheese production of protein and vitamins, certain antibiotic variously used in medical therapy for saving the human and animal life from serious disease, have got their origin from fungi.

The remarkable ability of fungi to produce a variety of enzyme, organic acid, metabolites and their unique ability for biochemical synthesis such as of the steroids which are of importance in medicine have made them indispensible to industry. The use of fungi is in oriental food fermentation and in the production of organic acid, enzyme, antibiotics, steroids gibberelins etc.

Spoilage actives of fungi are, however beneficial soil fungi are important, particularly in acid soils, where bacterial activity is at a minimum in breaking down the cellulose and lignin in plant remain, a first step in humus formation and essential for maintenance of soil fertility. Without this activity shared by bacteria in most soils, the growth of green plant and consequently of animal, would ceases.

As the miraculous drugs and other growth substance are produced by different fungi and their increasing necessity in this modern age made applied
mycologists curious that different new fungi should be explored so that if not all, some of them may again be used in the preparation of even more wonderful drugs which may prove of greater use in the welfare of mankind. Though a very large number of fungal forms have already been reported, additions are being made day and night from the different part of the world and efforts are continuing. This is simple to provide an opportunity to exploit the inherent capabilities of these fungal forms which are not very well known hithereto.

From this country also a large number of fungi have already been described. This number, however, is too small for such a country which, in addition to being vast, is provided with diversified set of climatic condition. Inspite of continuing efforts of mycologist in adding more and more number of newer fungi the end is not yet in sight because of the presence of a vary large number of patches which are yet to be explored. No doubt, these left out areas are situated in most interior and dangerous parts inhabited richly by wild animals.

Keeping all these in mind, the present project was undertaken to explore the forest of Madhya Pradesh (India) which is adorned with heavy turnover of vegetation flourishing under different ecological niches.

This state stands as a paradise for fungal growth and therefore the increasingly new forms can challenge any number of workers for their study. This study,
however aims at the following.

1. A long term survey of forest vegetations situated in various parts of this state, surveys being made at frequent intervals in different seasons.

2. Collection of specimens from all such localities, abundant gathering of specimens being made of fungal forms occurring on various hosts under different ecological niches.

3. Preliminary examination of the specimens collected a fresh by available techniques (Scarap mounting, sectioning).

4. Maintenance of pressed and dried as well as preserved specimens bearing different collection numbers date of collection locality, plant part, age of the plant and specific ecological niches if any for further reference.

5. Detailed Mycotaxonomic treatment to the forms which have proved hitherto unrecorded from the country or new the science.

6. Description and illustration of interesting form with latin diagnosis (if new to science), English description and their comparision with allied taxa.