Study of Aphyllophorales from Jalgaon District

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By

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I N D E X

Chapter I
Introduction

INTRODUCTION

The present study has been undertaken especially with a view to give a detail account of the wood rooting mycobiota. For this present study jalgaon district is selected where timber valued trees are grown in more numbers.

Jalgaon district

Location- Jalgaon district lies in the northern part of the Maharashtra state.

Boundries- Jalgaon district is bounded by Buldhana district to the east, Aurangabad district to the south and Nasik and Dhule district to its west. The state of Madhya Pradesh is to the north.

Land forms- There are various land forms in jalgaon district. A major part of the tapi basin is a plain. The hills of Chandor, Shirsoli, Ghodasgaon and Hasti lie in the district. The district also has the hill rangeof satmala and Ajanta and the Satpudamountains in the north.

The different land form in the constitute its physical setup. If we consider the physical setup of jalgaon district, we see that there are three physical division.

Physical Divisions-

1. **The region of the Satpuda mountains**-

This covers the northern part of the district. The northern part of Chopda, Yawal and Raver Talukas lies in this region.

2. **The plains of the tapi basin-**

A major part of the district comprises plains which lie in the Tapi basin.

3. **The hilly region of Satmala and Ajanta**-

This region covers the southern part of the district. The satmala hills lie in Chalisgaon taluka and Ajanta hills lie in the southern part of Jamner taluka.

Climate-Jalgaondistrict is away from sea. Therefore, its climate is generally hot and dry. The northern part of the district is high and hilly. So it is cool even in summer.

Temperature- it ranges from 11.3°c to 47°c

Humidity- it ranges from 35 to 87%

Rainfall- 150 to 280 mm

Natural wealth- There are forests in the hilly region of the satpudas in the northern part of jalgaon district. These forests lie in Chopada, Yawal and raver talukas.

Teak (*Tectona grandis*, Linn F.), Sisoo (*Dalbergia sisoo*, Roxb.),Dhavda (*Anigissus latifolia*, wall), Ain(*Terminalia tomentosa*, W&A). Palas (*Butea frondosa*, Konig), Khair (*Acasia catechu*, willd), Babul(*Acasia nilotica*, Linn.), Haldu (*Chloroxylon swietania*, DC), and Anjan (*Hardwekia binata*, Roxb.)are some of tree such as Mango (*Mangifera indica*, Linn.), Bor (*Zyzyphus jujuba*, Lam.) and Custerd apple (*Anona squamosa*, Linn.) Grass and bamboo also grow in some parts.

Map of Jalgaon District
showing the places of study area

The original vegetation of this district is quite rich but has been somewhat altered through human interference. Therefore the flora is so to say an artificial complex.

The forest is dry deciduous and is rich in angiospermic vegetation, and suitable climate and humidity providing the most favorable condition for the development of a variety of saprophytic and parasitic fungi on their dead and living parts respectively.

It is well known that floristic work on mycoflora of this region is the most neglected part of mycological studies. However the basic knowledge of their occurrence and distribution in any other particular region is of immense important for the proper understanding of the economically important fungi.

HISTORICAL ACCOUNT ON DECAY

Members of the polyporaceae are generally wood –inhabiting and grow either on trees or on timbers. In the wood, the mycelium ramifies in the tissue deriving nutrition from the cell wall by breaking down its components and thus causing decay in wood. The fruiting body is formed after some time, may be year or more, thus, indicating that the fungus is established in the wood.

Decay in wood is caused by wood destroying fungi among which members of polyporaceae are most important. Polypores mainly inhabit wood which is a rich organic substrate and thus provides a suitable food base. They draw their nourishment from the cell wall material, which they break down by enzymatic activity.

The most common fungi which causes unsoundness in the heart wood of standing teak are *Fomes lividus*(Kalchhr) Sacc. and*Polyporus zonalis,* Bork. Unsoundness in the bole often extends up to 4 meters from the

base.(Purkayashta, 1985); Joshi (1984); Vaidya (1991) described the common rots due to Aphyllophorales.

Teak is valuable indigenous tree in India and grows naturally and also planted in Satpuda and Sahyadri ranges of the Western Ghats in Maharashtra. It is a large deciduous tree with a tall cylindrical bole and rounded crown, Strong light demander. Sensitive to frost and drought, possesses a great power of resisting the effects of fire; coppice and constitute an important in southern sub tropical deciduous forest in Maharashtra.

In Maharashtra, teak is occurred in natural stand mixed with dry deciduous members like *Lagerstoemia* and *Hardwickia* spps. mainly along the Western ghats. In Satpuda ranges up to Chanda division it is associated with sal (*Shorea robusta* Linn.) The natural stands are usually maintained by copied system were rotation age is normally about 80-100 years.

Contribution by Maharashtra Govt.-

Recently due to high demand of Teak, Maharashtra forestry Development Corporation (MFDC), has started raising plantation in hilly tracts of the Western Ghats and Satpuda over 1000 hectors of land per year since 1975. Plantation raised by MFDC maintains continuity of biosphere in hilly tracts. Plantation by MFDC has achieved a considerable gain and wide attention to layman in Maharashtra.

Very recently, since 1985, teak has started as on Agroforestry plants, mainly in the regions of Kolhapur, Icchalkaranji. Teak under irrigated agro forestry system will change entire economic status of the rural people in Maharashtra, who otherwise were worried due to salinity problem caused sugarcane cultivation. It is estimated that Teak under Agroforestry can fetch income ranging from 20,000 to

40,000 per acer, except farmer need patience to mature tree or he has to give teak plantation- as a bonus to their next generation. Work for obtaining vigour seedlings of teak using tissue culture technique is in progress. It is collaboration with NCL, Pune

Chapter II
Material and Methods

MATERIALS AND METHODS

All the material incorporated in this dissertation was collected from various places in the jalgaon district in the state of Maharashtra, India. The map of the jalgaon district indicated the various places, which were frequently visited throughout the year and especially in the monsoon season. Collected Aphyllophorales were growing on various logs.

The methods used for collection of these forms varied with the nature and the habitat of the organisms. Forms occurring on living or dead logs were collected in paper bags or polythene bags. Specimen who was either fleshy or succulent or delicate was collected along with their substrate (logs) in paper or polythene bags. Identification of the host was carried as far as possible on the spot and the same was noted.

Mature and healthy sporophores of the Aphyllophorales were collected from some localities and from varied substrates (logs). Immature, weathered and insecteaten specimens were discarded. The positionof the specimens whether on living or dead trees or logs or wood or timber was noted carefully. The colors of the specimen were noted when fresh in field and also after the lapse of sometime, when they became dry under laboratory conditions. Where the specimens found growing, was also noted. The specimens after being brought to the laboratory were dried in shade.

The fungi collected were studied by the usual laboratory methods. A zoom binocular microscope (Bausch and Lamb Model) was used for studying habit and external characters. For Microscopic study, slides were prepared by blade (Free-hand section).

The section were stained with cotton blue, if necessary, and mounted in lactophenol. The slides were made semi-permanent by sealing them with wax.

Freehand section was made using a razor blade. Small piece from a fresh pileus soaked in water was used for the free hand section. After cutting, the section were brushed into watch glass containing water, and then mounted on slides in this way the relative positions of hymenial elements, the structural details of the hymenium, the arrangement and orientation of the hyphae and the presence or absence of a cuticle, or surface hairs were observed.

The hyphal structures were studied by taking rather thick sections of a fruit body soaked in 10% potassium hydroxide solution for 5-10 minutes. The hyphal structures then were examined easily under a binocular dissecting microscope after teasing the tissue with very fine needles.

To study the microscopic characters of the Aphyllophorales members, a minute small piece of tissue from the hymenial surface wascut and placed it on a glass slide in a drop of 10% potassium hydroxide solution, cover it with a cover glass. After 10-20 seconds, the cover glass gently tapped to spread out the tissue, so the spore, basidia, custidia, gloecystidia, etc. were easily observed. If the spore were absent at that time the hymenium surface is cut and put on the sticky side of the cellophane piece. The cellophane transparent was mounted on the slide. This slide was kept in a petriplate containing the little water on the glass rods. After 24-48 hours the slide were examined for the spores, spores nature. With these characters the fungal members are identified.

Accurate camera –lucida drawing were made with Erma Camera Lucida, at stage level. Photographs were made with Sony cyber shot 10.1 mp lens during day light.

The identification of all Aphyllophorales is done by referring Bakshi (1971). The exsiccate of the fungus material have been deposited in the Botany Department, Bhusawal Arts, Science and P.O.Nahata Commerce College, Bhusawal -425201.

Chapter III
Review of Literature

Review of Literature

The Polyporaceae have attracted great attention from both the mycologist and the plant pathologists from very early times due to their habits, their large sized fruiting bodies (Basidiocarps) by their timber destructing properties. They exhibit a great diversity of attractive forms which are often colored. They are characterized by development of a porous hymenium consisting of cavities or tubes on the under surface of their basidiocarp. The Polyporaceae are included under the Aphylophoralles within the sub class holobasidiomycetidae belonging to the class basidiomycotina. They comprise a thousand species mostly of lignicolous of terrestrial forms distributed amongst 105 genera. They are composition in their distribution and are found all over the world.

The literature on the ployporaceae is vast and can be conveniently divided into four parts according to its period.

PART –I :- this mainly consists of the work of Linnaeus 1753, Persoon 1825, fries 1849 and Cooke 1880. their work deals mainly with the broad external characters of these fungi on the basis which they were broadly classified into different groups.

PART II :- During this period (1881-1930) workers like Bresadola (1890,1897), Kartsten (1870-1885,1889), Patauillard (1900), Lloyd (199-1925) and Murreill (1903-1921) Studied for the first time the microscopic characteristics of these fungi.

PART III :- This period is of great activity and Corner(1932-1953), Cunningham (1947-1965) brought out significance of the hyphal organization in the identification of the fungi belonging to the polyporaceae.

PART IV ;- This part which is the most recent one consists the work of Pegler (1973) Anjali Ray (1972-1983), Nobels (1958) and Thind et al (1956-1983) etc.. which deals with the details of the external and internal characters, hyphal configuration of the basidiocarp under natural and culture conditions.

HISTORY :- The polyporaceae were not recognized as a distinct group by the early workers like Linnaeus etc. and place then with other flashy fungi. The Linnaeus (1753) described 12 species belonging to the polyporaceae under the generic limits of *Boletus* and *Agaricus*. Then Persoon (1825) was the first segregate the polyporus fungi with their porus hymenium into a separate section called by him the "Porodermei".

In 1821 Fries (1821) placed all the fungi with a hymenium under his class the hymenomycetes which included event the ascomycetes fungi. He created the suborder "Pileati", which included the genera such as *Agaricus, Schizophylum, Daedalea, Merulius* and *Favolus* as the sub genera of the genus *Polyporus.* Later, *Favolus* was raised by him (Fries 1828) to the generic status during this period. The genus *Cyclomysis* was established by Keinze (1830) and the genera *Trametes, Hexagonia* and *Polystictus* were established by Fries (1836). Fries (1821) who considered *Poria* and *Fomes* as of subgeneric level were raised to the general level by Cooke and Quelel (1886).

In 1851 fries (1851) classified the polyporaceus fungi in to the following four divisions :

1. *Fomes* - Perennial, Pores in strata.
2. *Polyporus* - Fleshy Annuals.
3. *Polystictus* - Coriaceous annuals.
4. *Poria* - Resupinate.

In 1874 fries published his "Hymenomycetes Europaei" in which he recognized nine genera including the non-polyporus gerera *Laschia* and *Merulias* and excluded the genus *Polystictus*.

Cooke (1871-1878) placed his Polyporus species under the four divisions recognized by Fries (1851) and later Saccardo in 1888 also accepted Cooke's classification of the polyporus fungi. Some wokers like Gillet(1878), Quelet (1886) etc. made some changes in the taxonomic ranks given by Fries (1851) and others. Thus Gillet (1878) divided the genus *Polyporus* into *Fomes*. *Morisma* and *Physisporus*, giving them the subgeneric rank while Quelet (1886) raised all the eleven sections of *Polyporus* (Fries,1851) and named them as *Caloporus, Ceriporus, Cladomeris, Coriolus, Indodermus, Leptoporus, Pelloporus, Phellinus, Placodes* and *poria.*

Later Karsten (1871-1889) subdivided a number of genera recognized earlier by Fries (1851). He (Karsten, 1879) divided the genus Polyporus into *Antradia, B.Jerkanderma, Hansenia, Indoderma, Inonotus, Ischnoderma and Polyporellus* and (Kartsten 1881) split the genus *Fomes* into *Fomitopsis, Ganoderma*. In his later work Karsten (1881) again rearranged the genus *Polyporus* in to subgenera *Haplopileus, Piptoporus, Polypilus, Postia, Pycnoporus* and *Tyromyce.* In the following year Karsten (1882) raised his subgenera *Glaccophyllum*, *Meripilus*, and *Hylopilus* to the generic level and still a year later (Karsten 1883) raised the subgenus *Phyllodontia* to the generic level.

In years 1907 and 1908 are important as Murril for the first time classified the polyporaceous genera into a well recognized family. This included some 78 genera of which 29 more monotypic and 39 were new to science. Subsequently, these appeared several taxonomic publications dealing with the polyporaceous

genera. Chief amongst them are the publications by Donk (1933), Pilat (1936-1957), Bondarzew and Singer (1941) Imazeiskei (1943), Kotbala and Pouzar (1957-1958), Cunningham (1965), Bakshi (1971), and Pegler (1973). Thus, the history of polyporaceous species is also the general history of mycology (Loyed, 1915).

Taxonomy of polyporaceae

Many aphylophorales which are the fruit bodies of polyporaceous fungi, are very large, variously coloured and variously shaped and more or less persistent that they must have been among the first fungi noticed by people. Lowe (1963) gave a general account of the world wide flora of the polyporaceae. In 1675 appeared sterbeeck's THEATRUM FUNGORUM (1675), which was the first book to be devoted exclusively to the fungi, included an account of Fomes Officinalis, and about eight recognizable polypores. Even 78 years latter Linneaus knew not more than eight species which were different from these mentioned by Sterbeeck (1675). In 1801 Persoon (1801) in his monumental SYNOPSIS METHODICA FUNGORUM which marks the beginning of the taxonomy of the Hymenomycetes, mentioned over seventy species of the polyporaceous fungi. In the SYSTEMA MYCOLOGICUM (Fries, 1821) only about half a dozen new polyporaceous genera were added to those mentioned in the earlier works.

The publication of Saccardo's wok in the 1888 marked a great event for the taxonomy of the polyporaceae. He gave the description of over 1400 polyporaceous fungi. Later, this work gave stimulus to the study of the polyporaceous fungi which is evidenced by the recognition of over 3,000 species by the year 1925. However, Ainsworth and Bisby (1971) in their A DICTIONARY OF THE FUNGI recognized only about 1,000 species as being valid.

The progress of the work on fungi in general and the polypores in particular went hand in hand with the development of better instruments such as the simple and compound Microscopes.

Berkeley (1836) was probably the best amongst the old masters who did their observations without this aid which was available to their successors. Karsten (1870-1885) and Bresadola (1897) have used microscopic characters in their descriptions of these fungi. Patouillard (1900) gave an exact account of the species of Hymenomycetes known to him, while Lloyd (1908-1925) described in detail numerous polypores thus giving an invaluable information of these fungi to the taxonomists who were to follow him. His monographic work on a number of genera including *Hexagonia, Microporus, Tabacinus, Polystictus* etc. is invaluable even today. Later Corner (1932a, 1932b) for the first time took into consideration the character of the hyphal organization in the identification of the species and the genera belonging to the polyporaceae. Based on this, he (Corner, 1953) described three types of hyphal systems occurring in the basidiocarps the polyporaceae and designated them as monomatic, dimitic and trimatic. Cunningham (1947-1965) accepted Corner's classification of the basidiocarps and extended it further to include the colour of the hyphae as a character of fundamental importance in delimiting the genera of the polyporaceae. Thus, he subdivided the genus *Fomes* and *Polysticus* – Polyporus group based on the forms of pores, the presence or absence of setae, type of basidia, the colour of the hyphae and the nature of the sporewall has been observed while going through the history of the taxonomy of the polyporaceae that the use of more and more précised characters such as microscopic observations, chemical tests like KOH reaction in the sporophore, the iodine test carried on the spores etc. by

later workers gave a very correct and scientific basis to the identification of the genera and species of the polyporaceae and therefore to its taxonomy. Thus Cunningham's work (Cunningham,1947-1965) was followed by many of his successors and soon a considerable amount of literature was available for the characterization of polyporaceae .In 1962 Teixiera (Teixiera,1962) gave a review on the microstructures used in the taxonomy of the polyporaceae.

WORK IN INDIA:-

Bose (1919-1946), Thind (1956-1983) and Anjali Roy (1972-1983) were the chief amongst the Indian workers working on the polyporaceae. Bose (1919-1946) was probably the first to actress the importance of anatomical characters in addition to the other characters such as the structure of Basidia and basidiospores in the identification and delimitation of genera and species of the polyporaceae.

The Characters he used are as follows :-

A. Encrusted cystidia
B. Simple cystidia
C. Encrusted hyphae.
D. Setae in the hymenial layer.
E. Absence of setae in hymenial layer.
F. Setae Embedded in the trama.
G. Presence of curved setae on the upper surface of the pileus.
H. Hyaline Cellular interrupted layer on the upper surface.
I. Resinous palisade like tissue on the upper which is non-resinous.
J. No palisade like tissue on the upper surface which is non resinous.
K. Indented or lacerated margins of the gills and pore mouths.

L. Hyphal Pegs.

M. Elongated thick walled conducting cells in the context and trama.

N. Thick walled and dead fringe hyphae covering the hymenium.

Anjali Roy, (1972) has discussed the modifications of three kinds of hyphae and their distribution within the basidiocarps. She consideres the regenerating hyphae as the basis type which is derived from the secondary mycelium giving rise to the skeletal and binding hyphae and other structures found in the basidiocarp. In 1979, Thind in his presidential address (Mycological Society of India.) reviewed in detail the anatomy of the basidiocarp and its importance in the systematics of the Aphyllophorales. Here he mentioned the modified hyphae and the other hyphal systems as a proposed by Teixiera (1956), Maas Geeteraus (1962,1963 a,b,c), Donk (1964), Corner (1966), Smith (1966), Pouzar (1966) and Lenhz (1954,1971).

Nobeles (1958) provided an artificial a key for the identification of the genera and species of the polyporaceae and carried out cultural studies on the same.

In conclusion one can say that unfortunately there is no one classification proposed to this date which has been accepted universally in spite of the fact that a lot has been said about the diagnostic character and the generic and the specific concepts pf the Aphyllophorales.

The taxonomy of the aphyllophorales, therefore, is in a state of flux. In this work the taxonomic key given by Bakshi (1971) has been followed for the identification of the specimens.

BASIDIOCARP ANATOMY

Croner (1932) was the first to bring out the importance of the microstructures of the basidiocarp to the taxonomy of the Aphyllophorales. In a series of publication he (Corner, 1932) described the anatomy of the

basidiocarp in five polyporoid fungi namely polystictus xanthopus Fries (1932a), Fomes levigatus Corner (1932b) and Fomes lameensis (Murr.) Sacc. Trott, F.noxius Corner F. Pachyphloeus Pat. (1932c). Later, he further brought out the importance of the microstructureds of the sporosphore in the systematics of the higher basidiomycotina, through his several publications (Corner, 1948,1950,1953a,1953b). Cunningham (1946, 1965) realized the significance of Corner's (Corner, 1948, 1950, 1953a, 1953b) findings and confirmed his results through a series of publications.

He (Cunningham, 1946, 1965) further brought out the importance of the hyphal configurations in the understanding of specific limits in the polyporaceae. This line is investigation was actively followed in India by Thind et al. Anjali Roy etc. from about 1956 onwards and also in the other parts of the world by workers like Pegler, Teixiera and others. In 1962, Teixiera (Teixiera, 1962) reviewed in details the taxonomic value of the microstructures in the basidiocarps of the polyporaceae. All the above studies has shown that a thorough knowledge of the microstructure of the basidiocarp in the Aphyllophorales in necessary to resolve their taxonomic structure.

HYPHAL TYPES

Three different types if hyphae and hyphal systems are distinguishable in the polyporaceae as follows :

1. The Generative Hyphae: - these are the original, basic types of nyphae in the basidiocarps. They are either Hyaline or coloured, usually thin walled, Rarely thick walled, freely branched, septate, often with clamps. Generally they get readily stained. They are produced directly from the secondary mycelia and are of unlimited growth. They give rise to the skeletal hyphae,

binding hyphae and the other hyphae structure found in the basidiocarps. When dried these hyphae collapse and are therefore difficult to find in dried specimens.

2. The skeletal hyphae :- these originate from the generative hyphae and are one of the two principle types of elements in the polyporaceae. They are either hyaline or coloured , thick walled or solid, unbranched or rarely terminally branched, unsepted or with pseudosepta and lacking clamps. They do not stain easily. They are aligned longitudinally in the growing region and their tips usually protrude into the hymenium or subhymenium in the basidiocarps. They impart strength and rigidity to the basidiocarps.
3. The binding Hyphae :- these originate from the generative hyphae. They usually form the slide branches which is their turn are profusely branched. They are usually slender, rarely septete, without clamps and thick walled or solid. These hyphae are of limited growth and usually develop from below the growing point. They usually do not take any stain. The do the function of binding of all the hyphal elements and are therefore responsible for the toughness of the basidiocarps.

Hyphal Systems:-

Basically there are three main hyphal systems.

1. Monomitic hyphal system:- this system mainly comprises the generative hyphae and is spread throughout the basidiocarp. In species having the monomitic hyphal system, the hyphae get thick walled and occur in cohering condition which imparts toughness to the basidiocarps.

2. Dimitic hyphal system : this system comprises two types of hyphae. The generative hyphae and the the skeletal hyphae. In some species the skeletal hyphae are sometimes replaced by the binding hyphae.
3. Trimitic hyphal system :- in this type the bsidiocarps contain all the three types of hyphae namely the generative , the skeletal and the binging hyphae.

In addition to the three systems mentioned above, Corner (1932a) recognized a fourth system if intermediate nature which he named as the mediate system. This system according to him comprises the intermediate of transitional hyphae which is their characers lie between the generative, the skeletal and the binding hyphae. This system is however difficult to detect in the basidiocarps and therefore, this system has been ignored by almost all workers.

Many other kinds of hyphae systems have been recognized by different workers as occurring in the basidiocarps. These are as follows:

1. Sclerified generative hyphae (Donk, 1964). These are considered as intercalary in narure and are said to form a part of the generative and the skeletal hyphae.
2. Sarcidimitic hyphae (Corner, 1966) these hyphae serve the functions of the skeletal hyphae but different from them in having clamp connections.
3. Sarcotrimitic hyphae (Corner, 1966). These are usually thin walled generative hyphae which secondarily produce thick walled septate hyphae. The latter stimulate the binding hyphae in the trimitic polyporous.
4. Physalomitic hyphae 9Smith, 1966). In this system the hyphal cells are inflated. However, this type cannot be regarded as a hyphal system as defined by Corner (1966).

5. Legative hyphae (Pouzar, 1966).This is only another name given to the binding hyphae and therefore, it has not been accepted by majority of the workers.
6. Connecting hyphae (Mass Geensteranus, 1962, 1963b). These hyphae arise at the right angles from the main generative hyphae. They are either short or very long and are of the weaving type. Teixiera (1960) used the term 'Bridge Hyphae". Designated the short connecting hyphae mentioned above.

Hyphal Element

These elements are either modified generative hyphae or elements which are products of generative hyphae (Lentz, 1954 and Talbot, 1954). Thus the pleiferous hyphae (Lentz,1971), the conducting hyphae (Talbot, 1954), the vascular hyphae (Lentz,1954) , gloeovessels (Singer,1962) the gloeplerous hyphae and laticiferous hyphae (Donk,1967) are some of the examples are such hyphae.

Badioles :-

These are hymenial elements which is their morphological characters are like the basidia but unlike them they lack the sterigmata and are permanently sterile.

It is unfortunate that the tern basidioles and cystidioles have been many a times used to designate one and the same element and therefore, these term have not been accepted by many workers.

Nomeclature and Classifitaction :-

The credit for the pioneering work in the morphology and taxonomy of fungi in general goes to Persoon (1801-1825). He published his ' observations Mycoloceae" and later his valuable and monumental work the Synopsis Methodica Fungorum' which laid the foundation for the further work on fungi.

The latter also contains the nomenclature of the Gasteromycetaceae which includes the Aphyllophorales. Fries who followed him and who earned the title of 'The Leanneaus Mycology" published his "Systema Mycologicum" in three volumes between the years 1821 to 1833 and his 'Elenchus Fungorum' in two volume in the year 1821-1828. the former work is considered even today as one of the most authentic works of systematic mycology in general and taxonomy of the Hymenomyceteaceae in particular. However, banal concept of the Hymenomycetaceae is included in another outstanding work, 'Hymenomycetes Europaie' which was published in 1874. In this work he included the poroid Aphyllophorales many revisions of the fungi appears between the years 1933 to 1973. Donk (1933, 1960). Pillat (1937, 1957) Cooke (1940), Bondarzewan (1941), Imazekai (1943), Cunning Ham (1965), Kotbala and Pouzar (1957-1958), Peglar (1973), Bakshi (1973) were among the principal workers who contributed a lot in this direction.

In spite of all this, in general the classification of fungi remained in a state of confusion as there were several workers during this period that followed their own systems. This laid to an unfortunate situation compelling many of the mycologists working on the polypore fungi in different parts of the world to arrange their genera and species according to the old and mostly outdated system of classification proposed by Gillet in the year 1878. Obviously this system did not take into consideration the microscopic characters because such facility did not exist during his time. In 1958 Hansen (1958) realized this and discussed the importance of suitable criteria in building up an acceptable system of classification of the poroid Aphyllphorales.

Indian Work of Aphyllophorales. :

History of the studies on the Indian Aphyllophorales is as old as the history of the studies on Indian fungi. The first Indian record on the Aphyllophorales goes as far back as 1832 when Koltzsch (1832) published his paper on the Indian polyporaceae. Later Berkeley (1839) described a few Indian polyores which were collected by W.J. Hooker. Belanger (1825-1829) made several collections of fungi from the Nilgiri Hills which were reported later by Montagne (1842-1846). The famous botanist and an active field worker Victor Jacquemont (1829-1832) made several collections from different parts of India which were described later by Laville. In addition to the above, Collections of the Indian Aphyllophorales were made by several foreign missionaries and naturalists. They sent these collections to their respective countries to be included in their herbarium. Many such collections are mentioned by Corda (1837-1854) in his 'Icongraphia'. Berkeley (1850-1856) also described many such collections if Indian fungi were geven by Cooke (1881, 1884, 1891), Currey (1874), P. Hennings(1901) based on the collections of Sulpiz-Curz, Blandford, Ryan W. Gollan.

During the first quarter of presence century Massey (1901,1906,1908,1910) published several accounts to Indian fungi based on the collections sent to the Kew herbarium by several workers, and notably so by Sir E.J. Butler. Several Indian Aphyllophorales were also reported by Sydow et.al. (1906-1929), Lloyd (1898-1925) etc. Theissen (1911) was the most prominent amongst these who studied Indian fungi. He reported many poroid Aphyllophorales collected from the Bombay Presidency by E. Blatter who sent them to him.

S.R. Bose (1919-1928) was the first Indian mycologists who gave a comprehensive account of the Indian polypores collected by him from Bengal and

its surroundings. In 1925, Sundararaman and Madurajan reported some members of polyporaceae from Madras, and by the end of first quarter (upto 1925) there were more than 300 reports on the aphyllophorales published in the different journals.

Butler and Bisby (1931) for the first time made a complation of the Indian fungi in their classic work 'The Fungi of India'. This important work certainly stimulated the study of Indian fungi including the aphyllophorales. Thus, Mitter and Tandon (1932-1938), Agharkar and Banarjee (1933) , Banarjee (1935,1946-1947) Banerjee and Ghosh (1942-1943), Mundkar (1938), Dastur (1940-1946) , Venkarnarayan (1949-1950), Bagchee and Bakshi (1950-1951), Vasudeva (1960) revised and brought uptodate our knowledge of the Indian fungi. Similarly our knowledge about the Indian Aphyllophorales increased greatly between 1825 todate by the contributions of Thid et al., Puri et al. Rehill and Bakshi Dhanda and Thind, A. Roy Sathe and Rahalkar, etc.

In 1971, Bakshi (1971) published a monographic account of the Indian polyporaceae. This is the only monographic treatment of this group and is the most uptodate treatment making it wok of great value to other workers in this field.

However, in comparison with the work on the Aphyllophorales in the other states of India, there is very little or almost no work on this group in the state of Maharashtra. Joshi, P.G. (1984) Fungi of Maharashtra with special reference to Raigad district and succession of some fungi Vaidya, J.G. (1991) published a paper on Valid names for some common wood rotting Polypores, their synonyms and authenticity. Joshi,P.G. and Mahajan,S.R. (2000) studied the changes in the anatomical elements of wood due to some Aphyllophorales.

Randive et.al (2011) published a Checklist of Aphyllophorales from Western Ghat of Maharashtra,State,India. Bhosle et.al. (2010) published a paper onTaxonomy and Diversityof *Ganoderma* from the Western parts of Maharashtra (India).

The Thesis deals with the Aphyllophorales collected from various parts of the state of Maharashtra, especially from the Jalgaon District.

Taxonomy of Aphyllophorales

The Key to the identification of the genera and species is that given by Bakshi (1971) and the same is as follows:

Key:

A] Sporophore perennial, each year a tube layer added to previous layer so that pore tubes appear stratified, distinctly or indistinctly.

Spores smooth on inner wall ---------- *Fomes.*

Spores rough on inner coloured wall ---------- *Ganoderma.*

B] Sporophore annual, sessile or stipulate or substipitate, pore tubes in an single layer.

Pores deadaloid or lamellate ---------- *Daedalea.*

Pores hexagonal---------- *Hexagona.*

Pore surface with teeth, spine or warts in mature areas, usually poroid near growing region ----------*Irpex.*

Pores circular to angular pore tube sunk into and even depth into context forming a distinct stratum, their base forming an unbroken straight line _____*Polyporus*.

Genus – ***Fomes* (Fries) Fries**

Summa Veg. Scand., 2 : 319-321, 1849

Chapter IV
Taxonomy of Aphyllophorales

The genus *Fome* was established by Fries in 1849. The genus is characterized by sporophore truly perennial usually persisting for a few to many years. At each growing season, the new growth occurs on the under surface of the previous one, by formation of a layer of pore tubes bearing the hymenium. Pore tubes of successive seasons thus appears stratified, either distinctly or indistinctly. The layer of which may be separated by context tissue . sporophore pileate, typically hard and woody.

Type species of genus *Fomes* is *Polyporous fomentarous* (L.) per Fries (Donk, 1960).

As defined in Saccardo (1888), the genus *Fomes embraces* the pileate species with pores which are perennial, forming successive strata of pores each year. *Fomes* are easily known, being mostly hard, woody species that persist for years on trunks of trees. *Fomes* are mostly sessile and persists for several years with a firm attachment to the host.

Some species, such as *F. applanatus* normally sessile, may develop stipe – like bases growing under unusual conditions. The tissue or context of most *Fomes* is far and sub woody, a few species such as *FlLaricis, F. perievis*, *F. floccoses* have soft , friable or spongy tissue. A few species in the tropics have natural tendency to form a stipe.

In shape, *Fomes* are divided into those with ungulated or hoof shapes, and applanate or relatively thin shapes. The general shape is usually characteristics of the species. Thus, *F. applanatus* as its names implies, is generally flat and relatively thin, but sometimes ungulate specimen occur. As a usual thing, *Fomes* grow on standing trees and hence are usually ungulate.

The general colour of the context is the most constant feature of the species of Fomes and has been used as a basis for grouping the species by most workers. The colour may vary a few shaded in the same species, but usually the context colour is the best single character that a species has.

The spores are mostly hyaline. But many species, usually with brown tissue, hae coloured spores. Species with coloured spores nearly always retain their spores in abundance in the dried specimen. It is often difficult to find spores in dried specimen with hyaline spores.

The presence or absence of coloured setae on the hymenium is a strong, though not irrvariable, character of species, but, like most classes of fungi, it is restricted to those with brown context.

Basidia are rarely of ever found in the dried specimen, but some species have a sub hymenial layer that persists and may be mistaken for spores. The spores as found in Fomes specimens are supposed to be basidial spores. Conidial spores or spores borne direct on the hyphae, are known in some species.

Genus –***Ganoderma*** Karst :

Rev. Mycol. 3 No. 9 : 17, 1881

The genus *Ganoderma* was established by Karst as *Polyporus lucidus* 9Leyss.) Per Fr. As its type species.

The recognition of the genus *Ganoderma* is not justifiable according to Overholts(1953), as it is based mainly on spore character. Overholt includes it under *Fomes*. On the basis of hyphal systems, Cunningham (1954) distinguishes 5 well defined genera with *Fomes*. Of these the dimitic hyphal system with brown hyphae without clamps in the generative hyphae characterize *Ganoderma*, represented by *G. lucidum*. Such a division is not supported by Hansen (1958)

who demonstrated the trimitic system and clamps in *G. applanatum*, Lioyd (1912) grouped this genus under 'Stipitate polyporoid'.

Coleman (1927) who studied the structure of the spore wall *Ganoderma* considered that all forms showing basidiospores brown, with a hyaline outer wall projecting at the base as apiculus and a brown inner wall which is spiny, spine coloured, distinct and remaining within the wall thickness, apiculus usually collapses and pores appear truncate, should be brought under the genus *Ganoderma* Karst.

Furtado (1965,1967a,1967b) studied the relation of microstructures to the taxonomy of the Ganodemoideae with special reference to the structure of the cover of the pilear surface and some species of *Ganoderma* with pale and lactate appearance.

The genus *Ganoderma* is characterized by basidiocarps being annual or perennial, sessils or stipitate, hard, woody and heavy or light and corky, upper surface with crust, context brown, corky to hard and woody, basidiospores brown, with a hyaline outer wall which projects at the base as apiculus and a brown inner wall which is spiny, Spines coloured, distinct and remaining within the wall thickness, apiculus usually collapses and spores appear truncate, setae, cystidia absent.

Key to the species of ganoderma described in this work.

Upper surface red, laccate, shiny sporophore.

Usually stipitate ---------- *G. lucidum*.

Upper surface not laccate ---------- *G. applanatum*.

***Ganoderma applanatum* (Pers. ex. Wallr.) Pat.**

Ann. Mycol., 35 (2) : 119-137, 1937

Fig. 64 : Plate figs. 11 : 65 A and B

Sporophore perennial, sessile, or rarely substipitate, applanate, reflexed, single or imbricate, corky soon becoming hard and woody, 20-30 x 8-17 x 3-7 cm. sometimes very large. Upper surface dull brown to blackish, zoned, uneven, crusty, context deep brown, intersperse with whitish lint like material or absent, colour fibrous with a silky sheen, transversely zoned. 3-4 cm. thick, hyamenial surface white when fresh, turning light yellow or light brown on drying, pores round, 4-6 per mm, pore wall thick, pore tubes distinct from context, colour gray or ashy gay, distinctly stratified, context about 1.5-2.5 mm broad, pore tubes 2-3mm long, basidiospores brown, broadly ellipsoid, thick walled with outer wall smooth, inner wall slightly echinulate, truncate, 5-8.5 x 4-6 mm, huphal nature trimitic, skeletal hyphae brown, thick walled with narrow lumen or absent, unbranched, 4-8 um broad, binding hyphae faint brown, thick walled, lumen broad, branched 1.6-4.8 um broad, generative hyphae hyaline, thin walled with clamp 1.7 to 2.5 um broad.

Collected on dead wood of *Tamarindus indica, Erythrina indica,*from Langadaamba,Yawal forest depo.

G. applanatum is world wide distributed and polymorphic. Bakshi, Reddy, Puri and Sujan singh (1972) reported *G. applanatum* from U.P. on various hosts like *Artocarpus lakoocha*, *Cassia fistula*, *Cassia nodosa*, *Lasobema retusum*, *Morus alba, Querucs sp. Shorea robusta Sterculia urens, Tectona grandis, Toona ciliate.* Banerjee (1947), Bagchee and Bakshi (1950), Anonymous (1950), Saxena (1960) Thind and Chatrath (1960) reported this fungus from different parts of India on different hosts.

Genus – ***Daedalia Persoon* ex. Fries.**

Syst. Mycol. 1 : 331, 1821

The genus *Daedalia* was established by Persoon in 1821 as *D. quercina* L. ex. Fries as its type species. The genus is characterized by annual , pileate, sessile or effuso- reflexed, coriaceus to corky, context whitish or brownish, hymenial surface typically deadaloid, with radially elongated pore mouth anastomosing or connecting freely, sometimes labyrinthiform of lamellar or sinuous or even poroid at places particularly towards margin, pore tubes deep, broad and never layered, homogenous with the substance of the pileus and not forming a distinct stratum, basidiospores oblong to cylindric, hyaline cystidia usually absent or inconspicuous when present, setae none.

About 15 species of this genus have so far been recorded from India, and most of them are saprophytic in habit on the dead wood of various host plants.

***Daedalea Flavida* LeV.**

Ann. Sci. nat. ser. 3, 2 : 198, 1844

Fig. 67 : Plate Fig.12 : 69, 70

Sporophore annual, sub-sipitate with a short, thick nodular stalk, sometimes sessile, dimidiate, fan shaped to circular, 4-20 x 4-30 x 0.3-1 c.m., upper surface whitish when fresh pinkish buff to yellow brown, becoming reddish brown near the base, faintly zonate, sulcate, tomentose becoming glabrous when old, thin towards margin, margin irregular and wavy, sometimes serrate, context yellowish brown, floccose, 0.1-0.3 cm. thick, hymenial surface whitish when fresh, grayish coloured, becoming yellowish brown poroid in young basidiocarps, becoming daedaloid of lamelloid with maturity, sometimes poroid near the base, lamelloid of daedaloid near periphery, pore tubes cocolorous with hyamenial surface, 0.1-2.3 cm long. Hyphae trimitic, skeletal hyphae light yellow, thick

walled, aseptate unbranched, 4-6.5 um diameter, binging hyphae light yellow to almost hyaline, thick walled, acetate, profusely branched with short branches, 1.2-4 um diameter, generative hyphae hyaline, thin walled, branched, septate, 1.6-4.8um in diameter.

Collected on dead wood from Hirapur, Jamnya, Kurha.

D. flavida is very polymorphic species and widespread throughout India, occur on dead wood belonging to variety of hosts.

Bagchee, Puri and Bakshi (1954) stated that it is a common destroyer of various hard woods.

Present specimens coincides with Bose (1919-1928), Lloyd (1898-1925), Banarjee (1947), Banerjee and Ghosh (1942). Saxena (1960) has described from various parts of India.

***Daedalea gollani* massee**

Kew Bull 217,1908

Fig. 68, Plate fig. 12:71,72.

Basidiocarp annual, imbricate, dimitic 5-7 x 3-5 x 0.4-0.7 cm, upper surface light brown, glabrous, smooth, zonate context cream to whitish coloured,to light brown, upto 3-4 nm thick, hymenial surface deep brown in old basidiocarps, pores daedaloid to irregular, with narrow sterile incurved margin, upto 5-6 mm, deep 1-2 per mm pore wall thick, basidia clavate, 3-3.5 um broad and 6-8 um long basidiospores not observed, hyphal nature dimitic, skeletal hyphae pale brown, thick walled with obliterated lumen, branched nature is not observed, aseptate, 2.2to 5 um diameter, binding hyphae hyaline, thin walled, branched septate with common clamp connections, 1.5 to 3 um diameter.

Collected on dead branches of *Erythrina indica* lam. and *Mangifera indica* Linn.

Masee (1908), Thind, Bindra and Chatrath (1957) recorded this species from Mussoorie hills on dead woods and stumps of deciduous trees. According to Masee (1908) this species is very close or resembles with *Daedalea Unicolor*. But Bose (1946) Showed the trimitic nature of the hyphae in *Daedalea unicolor* as against dimitic nature in the *D. gollani*

Key to the species of *Hexagona* described in this work.

Sporophore upper surface with dense, coarse, branched and rigid hairs ---------- *H. apiaria*.

Sporophore upper surface with reddish stain developed at the base and becoming two coloured _---------- *H. tenius* var. discopoda.

Sporophore of one colour with larger pores _---------- *H tenius* var, polygramma.

***Hexagona apiaria* pers.**

In gaud. Bot. freyc.voyage de uranie, P. 169, 1826

Fig. 70 Plate fig. 13 ; 75,76

Sporophore sessile of sub-stipiate. With a knob like short stalk, dimidiate to applanate, leathery to rigid and brittle on drying 8-12 x 5-7 x 1.2-1.5 cm, upper surface light brown to reddish brown to almost blackish brown near the base, indistinctly zonate, radiately wrinkled, densely covered with coarse, branched brown hair, becoming glabrous at places in old specimens, margin wavy, context reddish brown, fibrous, upto 6-7 mm thick, hymenial surface yellowish brown, pores large, hexagonal 3-6 per cm. 5-8 mm deep, basidiospores not observed , hyphal nature trimitic. Skeletal hyphal yellowiwish brown, slightly thick walled to

thick walled with lumen or obliterated, unbrached, aseptate, 3-5.5 um broad, binding hyphae yellowish brown, thick walled with lumen narrow or obliterated, profusely branched, aseptate, 1.5-3 um broad, generative hyphae hyaline, thin walled, Branched, septate with clamp connections, 1.7-4.5 um broad.

Collecting on dead wood from Pal forest area.

It is a common species in the Philipines, India, Ceylon, Australia, etc. occur as a saprophyte on branches, twigs and logs of various woody plants.

Banerjee (1947), Saxena (1960), Saxena and Vyas (1962,1964) Bagchee (1953) reported *H. apiaria* pers. From different localities on logs of *Mimusop elengi* Linn. *Magnifera indica* Linn., *Bambusa arundinaceae* willd.

1. *H. polygramma* Mont.
2. *H. Pulchella* Le'V.
3. *H. Thwaitesii* Berk.
4. *H. Discopoda* Pat. & Har.
5. *H. Umbrinella* Fr.
6. *H. Tricolour*.

In my collection there are two forms of *H. tenius* hooker ex Fries are reported Viz.

1] *H. tenuis* Var. Discopoda Fig. 71 Plate fig. 13:79

2] *H. tenuis* var. polygramma Fig. 72 : plate Figs. 13 : 77,78.

H. tenuis Var. discopoda Pat. & Har. Ws recorded by Banerjee and Ghosh (1942), Butler and Bisby (1931), Anonymous (1950), Parndekar (1964) on different hosts. Anjali Roy (1975) gave a detailed study of H. tenuis var. discopoda. Matrix for *H. tenuis* var. discopoda is careya arborea roxb. *Ficus bangalensis* Linn. dead twigs from different localities of Jalgaon district.

H. tenuis var. polygramm

Genus – *Irpex Fries*.

Elench. Fung., 1 : 142 : 1828

The Genus Irpex was established by Fries in 1828 based on the type species I. lacteus Fries. The genus is characterized by resupinate, effuso-reflexed, or reflexed , sessile imbricate or solitary corky to coriaceous sporosphore, hyamenial surface spiny or irpiciform due to pore tubes becoming torn into teeth, and poroid , near the margin, basidia clavate, basidiospores, Hyaline, Ellipsoid, Oval, Smooth, Cystidia present or absent.

Important contributions on this genus are those of Cunning ham (1949) and Mass Eesteranus (1974). 10 species of this genus have been recorded from India. 4 species are recorded from the state of Maharashtra.

Key to the species Irpex described in this work.

Cystidia present.

Cystidia capitate incrusted ----------*I. flavus*.

Cystidia incrusted ----------*I. velleraus*.

Cystidia Present.

Gleocystidia present ---------- *I. Consors.*

***Irpex Consors* Berk.**

J. Linn. Soc. Bot., 16 : 51, 1878

Fig. 74 : plate Fig. 14 : 81, 82

Sporophore sessile, reflexed, dimidiate, corly, imbricate margin thin, wavy, involute, when dry, brittle upper surface white soon becoming light yellow, smooth, convex, zonate, minutely wrinkled, context, light coloured, fibrous upto 1mm thick, hymenial surface light yellow, irregurly, poroid at margins, soon becoming spiny, spines marrow, conical, 1-3 mm lon, 2-3 per mm, hymenious

continuous between adjacent spines, basidia clavate, 7-10x 2.5-3.7 um, basidiospores hyaline, thin walled, round to oval, 4-7.5 x 3.5-5 um, gleocystidia hymenial, thin walled, with hyaline granular contents, 27-38 x 8-12um hyphal nature dimitic. Skeletal hyphae hyaline to pale, thick walled, lumen narrow, branched 3-5 um broad, binding hyphae hyaline, thin walled with clamp connections, 3-4.5um broad.

Collected on the dead log of *Magnifera indica* Linn. from Raver forest and Yawal forest.

Bakshi , Reddy, Puri, and sujan singh (1972), Collected this fungus on timber of Quercus sp. Deharadun, U.P.

***Irpex flavus* Klotzach**

Linnaea 8: 488, 1833.

Fig. 75: Plate Fig, 14: 84, 85.

Basidiocarp effuso-reflexed or resupinate, imbricate, reflexed portion dimidiate to applanate, corky to leathery, 5-9 x 2-4.5 x 0.3-0.5 cm, upper surface pinkish buff to light yellowish brown, sometimes becoming blackish at the base, matted tomentose, concentrically zonate, soft to touch, context yellowish brown, fibrous upto 2 mm thic, hymenial surface sulphur yellow when fresh, cream coloured to yellowish brown with age, spiny to irpiciform, poroid near the margin, pores 1-2 per mm pore tubes upto 3-5 mm long , basidia clavate 8-10 x 4.5-5.5 um broad, basidiospores hyaline ellipsoidal, thin walled, 5-6x 2-3.2 um broad, cystidia cylindrical to suclavate, capitate, incrusted, thick walled 8-13 x 3-5um, 3.5 to 5.7 um at the cap, hyphal nature dimitic. Skeletal hyphae pale yello to sulphur yellow with lumen narrow, unbranched, aseptate, 2.8-5 um diameter: binding huphae

hyaline, to sulphur yellow, thin to slightly thick walled, branched, septate, 2-3.5 um diameter.

On the living wood of *Dabergia sissoo* G. and P. *Vitex negunda* Linn. from Yawal, Adgaon.

***Irpex Vellereus* Berk. & Broom**

J Linn. Soc. London 14 : 61, 1875

Fig. 76 : plate Fig. 14 : 83

Sporophore diffuse reflexed of resupinate, imbricate, leathery to corky, 4-6.5x2-4x0.3-0.5cm, upper surface pinkish buff. Matted tomentose, fainly zonate, margin thin, hymenial surface pinkish, brownish to brown in old basidiocarps, irpiciform, poroid near the margin, pores 1-2 per mm pores tubes upto 3-4 mm long, basidia clavate, 7-9 x 3-5.7 um. Broad.

Bassidiospores hyaline, ellipsoid to ovoid, thin walled, 3.8-6 x 2.2-3.2 um, cystidia cylindrical to subclavate slightly incrusted, 8-13 x 5-6.4um, hyphae thin to thick walled, branched, simple septate, 3.5-6.5 um broad.

Collected on the dead log of *Tamarindus indicus* Linn. From Hingona.

Theissen (1911) recorded this fungus on dead wood from Khandala.

Genus – *Polyporus micheli* ex. Fries.

Syst. Mycol. 1 : 341, 1821

The genus *Polyporus* was established by Micheli (1821) with the type species *P. tuberaster* Jacq. Ex Fries. The enus is characterized by typically annual, pileate, sporophores effuso-reflexed, sessile or stipitate, rarely resupinate and then they sometimes exhibit reflexed portions soft, fleshy, ciriaceous or corky to wood, pilei variously shaped, mainly orbicular, with or

without cortex glabrous or almost so, context white or coloured, composed of hyphae wither radiately arranged, or interwined, hyphal system monomitic of dimitic,hyphae with hyaline walls, generative hyphae with or without clamp connections, hyamenial surface with pore tube typically in a distinct layer, seldom favoloid, pores circular to angular, hyamenial layer composed of palisade of basidia and paraphysases, basidia bearing 2-4 spores on short sterigmata, basidiospores hyaline or colored, variously shaped, walls hyaline, smooth or in a few species tuberculate, non amyloid, cystidia setae of setal hyphae present or absent.

The genus is cosmopolitan. So far about 200 species have been reported by various workers from India. Only 13 species are recorded so far from the state of Maharashtra.

Key to the species of *Polyporus* described.

(A) Sporophore stalked

1. Upper surface bright maroon coloured with concentric zones representing colour

   shadeds --------- *P. xanthopus*.

2. Upper surface dark black ----- *P. xanthopus* VAr. florideus.

3. Upper surface minutely pubscent, hyphae trimitic with clamps------- *P. fabelliformis.*

(B) Sporophore stipitate or substipitate

1. Upper surface grayish –black, zonate, smooth glabrous --------- *P. Luteo umbrinus.*

(C) Sporophore Sessile

1. Upper surface with zones -------- *p. Zonalis*.

2. Upper surface tomentose and spongy ------- *P. Weberianus*.

3. Upper surface brown, deep brown to blackish with hairs-------- *P. nothofagi.*

4. Upper surface finely tomentose, golden brown------ *P. radiatus*.

5. Upper surface rough, occasionally wrinkled, glabrous with shades of brown colour—---*P. bicolour.*

6. Upper surface dirty white to pale pinkish, pale brown to sometimes grayish -----*P.ostreiformis*.

7. Upper surface white to light buff, villose to villose tomentose ------- *P. tulipiferae.*

8. Upper surface light pinkish chocolate to buff brown, zonate-------*P. rubidus.*

***Polyporus fabelliformis* Klotzsch.**

Linnaea 8 : 483, 1833.

Fig. 78 ; Plate figs. 15 : 88,89.

Sporophore stipitate, growing singly or in groups adjacent pilei sometimes fusing together when they grow in groups, leathery, drying hard, fibelliform to semi circular an to sometimes reniform, 3-6.3 x 3-5 x 0.1-0.3 cm, stalk lateral, black, expanded at base into flat globular disc, brownish yellow to almost black, upper surface yellowish pinkish brown, radish brown to almost black with sometimes yellow margin and pubscent zones , becoming glabrous when old, narrowly concentrically zonat, margin entire, sometimes irregular, Context pale yellow, floccose, 0.1-0.3cm thick, hyamenial surface cream coloured to light pinkish brown, margin sterile upto 2mm, pores globose to subglobose, 6-8per mm, pore tubes 0.1 cm long, basidia clavate, 8-10 x 3-4.5um,

basidiospores brownish, oval 2.5-4 um diameter, skeletal hyphae hyaline to nearly hyaline, thick walled with usually narrow lumen, aseptate, unbranched, 4-4.8um diameter, binding hyphae thick walled, branched, with narrow diameter.

Collected on dead wood of unidentified host from Chopada area.

P. fabelliformis was originally from Maurititus (Lloyd,1910). It is common over a wide territory and particularly in the Pacific Islands. *P. fabelliformis* may be considered the extreme form at the other end of the arc from *P. xanthopus*, and all the intermediate 'species' between can be held to be connecting forms.

***P. Gilvus* (schw.) Fries.**

Var. licnoides (mont.) Lloyd.

Elench. Fung., p. 104, 1928.

Fig. 79 : plate Fig. 16:91,92.

Sporophore annual, usually reflexed, leathery when fresh, drying hard, single hard, single or imbricate, measures 7-8 x 3-5 x 0.5-2cm, upper surface with shades of yellow, brown and red, smooth with concentric zonations, context yellow or yellowish brown, corky when fresh to woody when dry, 2-2.5mm thick, hyamenial surface yellowish brown, pores round, regular, small 6-8mm, walls thick, margin sterile, pore tubes 3-8mm long, in one or more layers, basidia not observed, basidiospores hyaline, oval or oblong ellipsoid wit ha globule, 2.7-3.5 x 2-3.2 um setae common, mostly projecting into the pore tubes, dark brown, subulate, 25-30x4-7um, hyphal nature dimitic. Skeletal hyphae yellowish brown, usually slightly thick walled, 3-5um broad, generative hyphae hyaline or nearly so, thin walled or slightly thick walled, branched with simple septa, 1.8-3um broad.

Lloyd (1915) considered forms of *P. gilvus*. The fungus is identified from its usually parasitic habit, brown colour, zonate surface, minute pore tubes and subulate setae in the hymenium. Banerjee (1947), Bose (1946), Mitter and Tandon (1938) recorded the fungus from Calcutta, W.B. and Nainital, U.P.

The present fungus is being recorded for the first time from the state of Maharashtra and host constitutes an additional new record.

***P. xanthopus* Fr.**

Syst. Mycol. 1 : 505, 1821.

Fig. 87; Plate Figs. 17 : 98,99

Sporophore centrally stipitate, single of confluent, funnel shaped, flexible, corky, circular 5-7 cm or more in diameter, stipe yellow or yellowish brown, indistinctly pubscent to glabrous, smooth or occasionally lightly furrowed to appear variegated, 1-4.5 cm long, 2-3 mm thick, base expanding, upper surface yellowish red, chestnut to dark maroon, margin faint in colour, concentrically zoned with shaded of colour, glabrous slightly radiately cracking, shiny, context whitish, fibrous upto 1mm thick, hyamenial surface with shades of pink to brown, zoned, margin lighter, thin, sterile, pores regular, round, 6-8 per mm, pore tubes light pink upto 0.2 mm long, basidia clavate, 8-11 x 3.4 um, basidiospores not observed. Hyphal nature trimitic, skeletal hyphae hyaline to nearly hyaline thick walled with lumen narrow, unbranched, aseptate, 2-5.4 um diameter, binding hyphae thin to thick walled, much branched, aseptate, 2.5 -3 um diameter, generative hyphae thin to slightly thick walled, branched, with clamp connections, 1.5-2.5 um diameter.

This is the most frequent species in Africa, India East indies, The philipines, Pacific Islands, Australia, and Ceylon Bose (1937), Lloyd (1910). It was probably

first published by Ehrenberg as *Polyporus katui* Fries named as *xanthopus* and Persoon published it, from Rawak, as *Polyporus saccatus*.

It is widely distributed in tropics. Berkeley (1856), Butler and Biaby (1960), Lloyd (1904-1919), Reichardt (1870), Theissen (1911), Montagne (1842), mitter and Tandon 91932), Saxena (1961) reported in from various localities from India as *Polystictus xanthopus*. Bakshi et al (1970) recorded *Polyporus xanthopus* from Deharadun. U.P. sathe and Rahalkar (1976) reported from Maharashtra.

***P. Xanthopus* Fr. Var. Florideus Lloyd,**

Mycol. Writ., 3: 51, 1910

Plate Figs. 17 : 10 A and B.

It resembles with *P. xanthopus* in all respects but the colour of the sporophore is dark black. It may be held as a dark form of *P. Xanthopus*. It has a short thick yellow stem and a smooth dark bay pileus.

It is widely distributed. The fungus is first time recorded from the state of Maharashtra and host constitutes an additional new record.

***P. Zonalis* Berk.**

Ann Mag. Nat. Hist. 10 : 375, 1843.

Fig. 88.

Basidiocarp sub-stipitate to sessile, usually attached by narrow base, diamidiate to flabelliform,, imbricate, leathery when fresh, hard and rigid when dry, 1-6.5 x 1-4.5 x 0.1-0.4 cm.Upper surface pale or pinkish buff when young, becoming raddish brown with age , concentrically zonate, tomentose , becoming somewhat glabrous and with radiasting wrinke drying, margin thin or rounded, incurved of drying, context white or llight coloured, fibrous, upto 4 mm thick , hyamenial surface white to pinkish, with a silky sheen, with upto 3mm sterile

margin, pores round, oval to somewhat angular, 6-9 per mm, pore tubes concolorous with the context or slightly deeper, upto 2-2.5 mm long, basidia clavate to sub clavate 10-12 x6-8 um, Basidiospores hyaline, subglobose to globose, apiculate, one guttulate, 3-4.5 x 3-3.5um cystidia clavate, incrusted thin to thick walled, 12-15 x 6-10 um, hyphae dimitic, skeletal hyphae thick walled with lumen usually narrow or obliterated, simple septate, 5-7.5um diameter generative hyphae thin walled of slightly thicker walled simple septate.

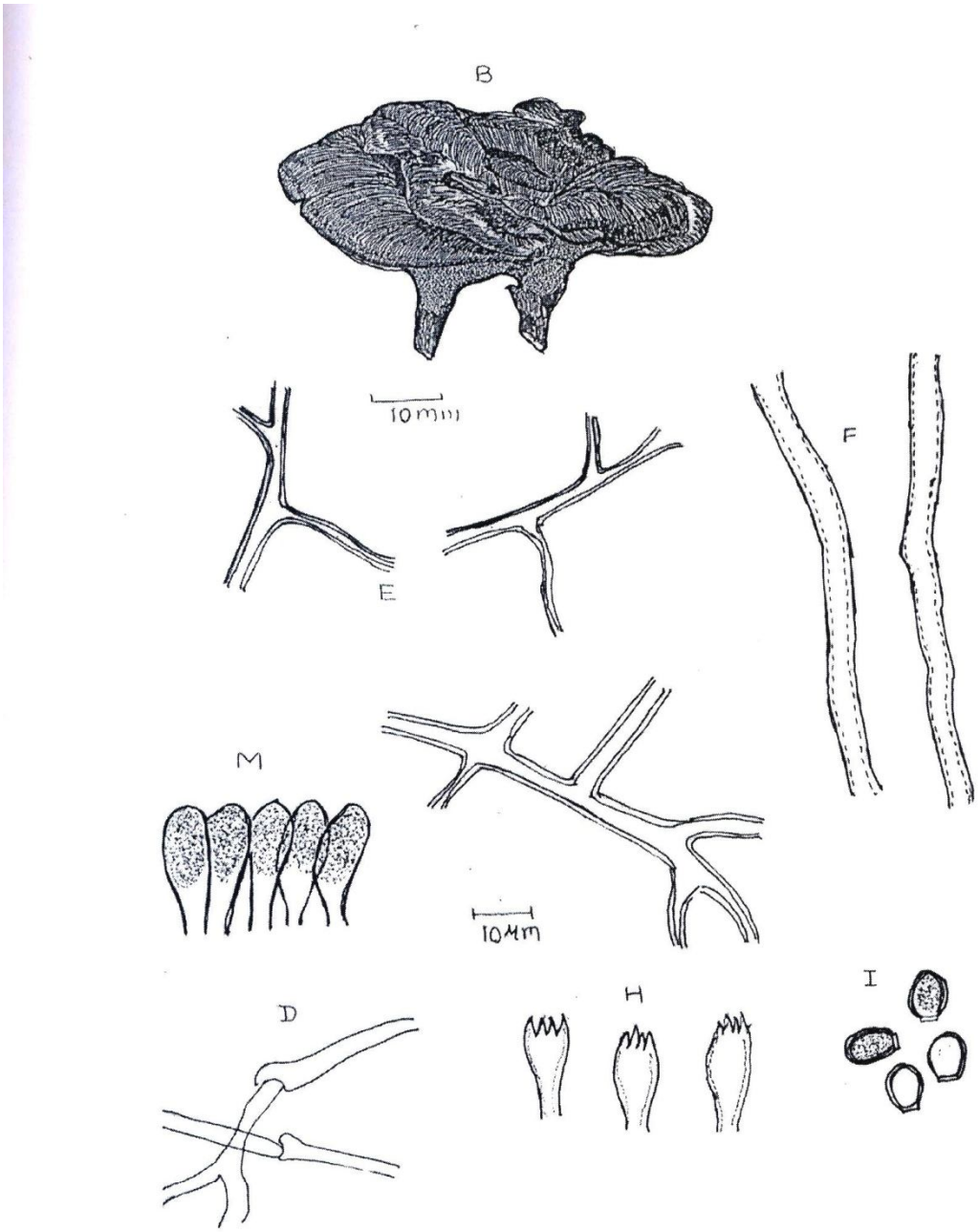

Fig.1 *Ganoderma lucida* (Leyss.) Karst.

B: Hymenial surface D: Generative hyphae E: Binding hyphae F: Skeletal hyphaeH: BasidiI: Basidiospore M: palisade hypha

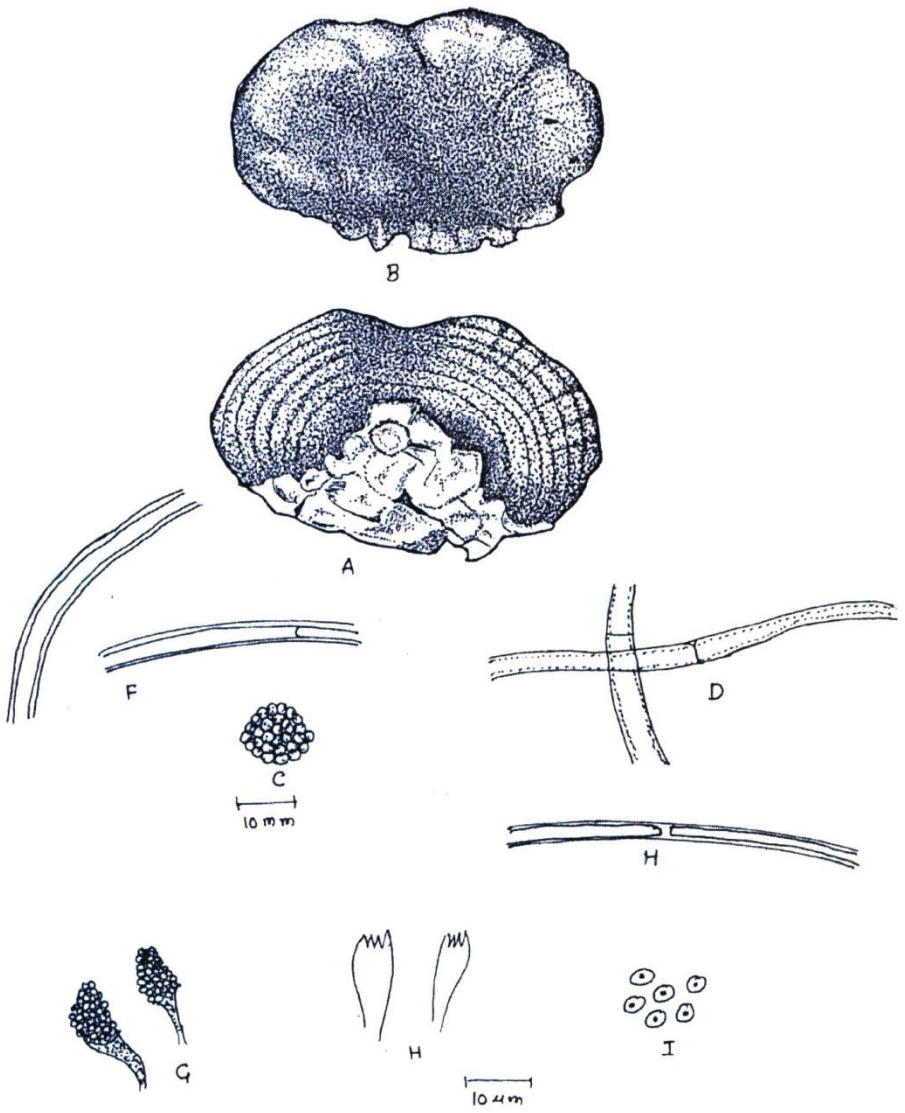

Fig. 2 *Polyporus zonalis* Bark.

A: Upper surface B: Hymenial surface C: Pores (enlarged) D: Generative hyphae E: Binding hyphae F: Skeletal hyphaeG: Cystidia H: Basidia I: Basidiospores

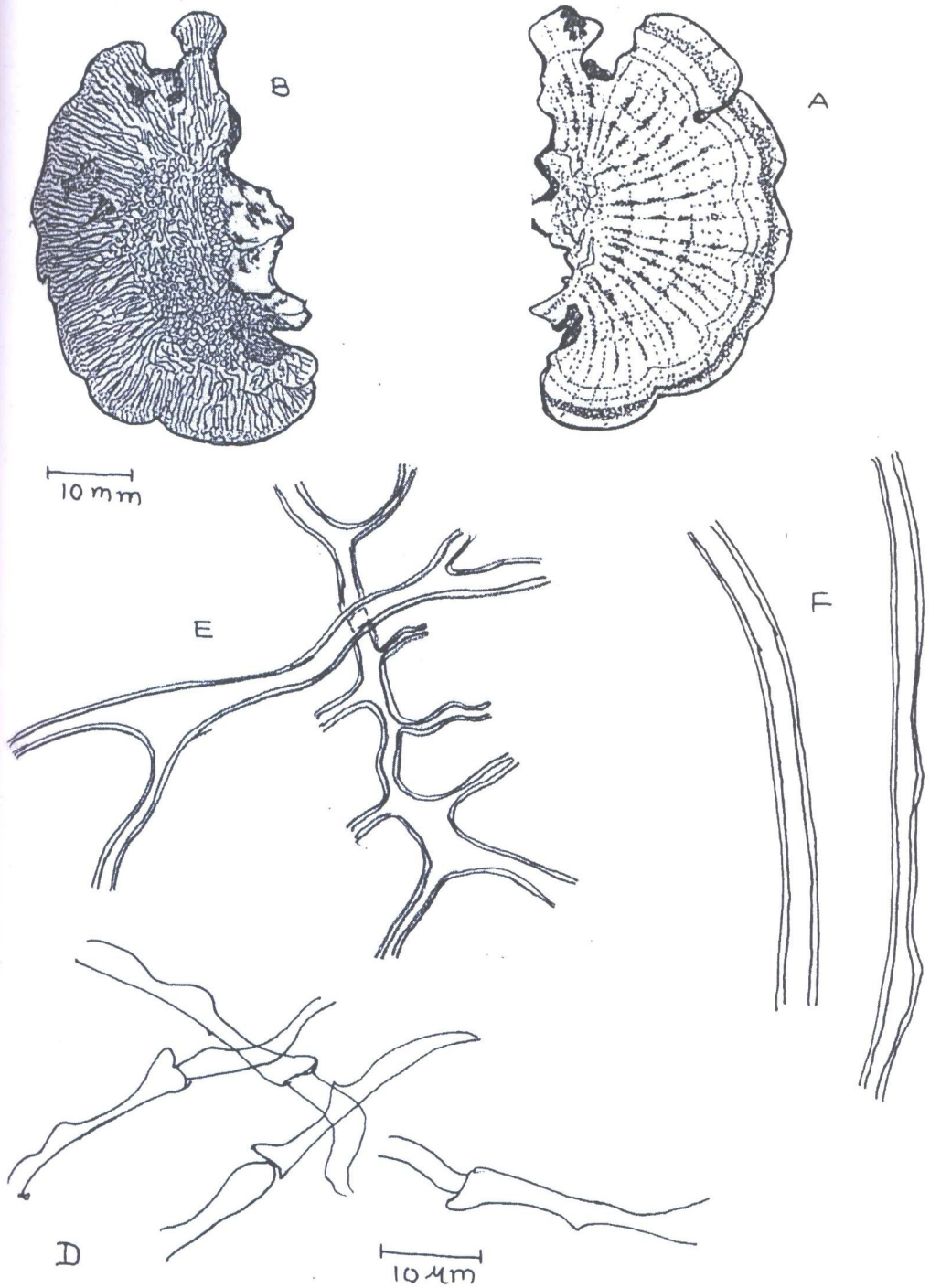

Fig. 3 *Daedalia flavida* Le'V

A: Upper surface B: Hymenial surface D: Generative hyphae E: Binding hyphae

F: Skeletal hypha

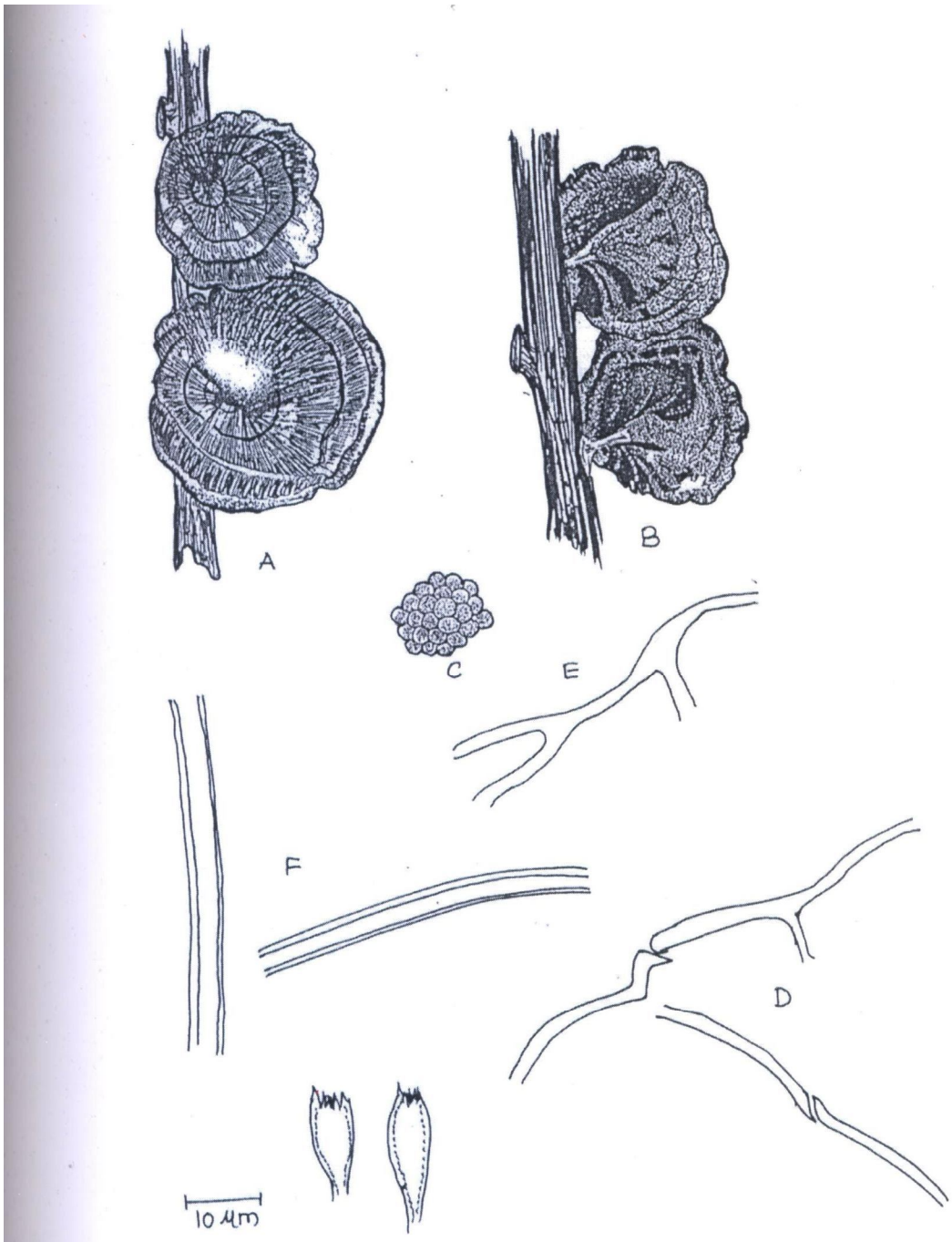

Fig.4 *Polyporus xanthopus* Fr.

A: Upper surface B: Hymenial surface C: Pores(enlarged) D: Generative hyphae E: Binding hyphae F: Skeletal hyphae H: Basidia

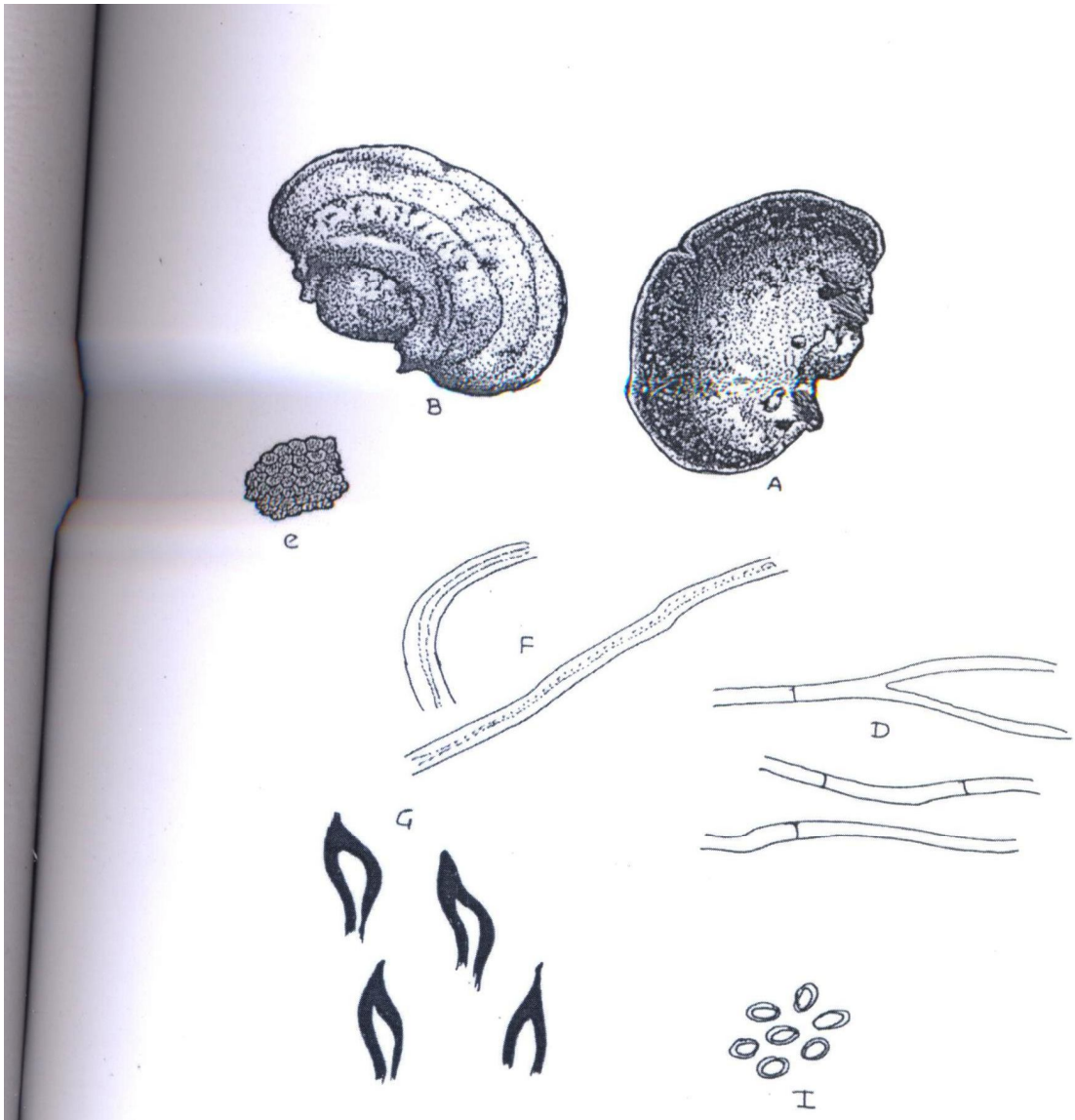

Fig. 5 *Polyporus gilvus* (Schw.) Fries

A: Upper surface B: Hymenial surface C: Pores(enlarged) D: Generative hyphae E: Binding hyphae F: Skeletal hyphae G: Cystidia I: Basidiospores

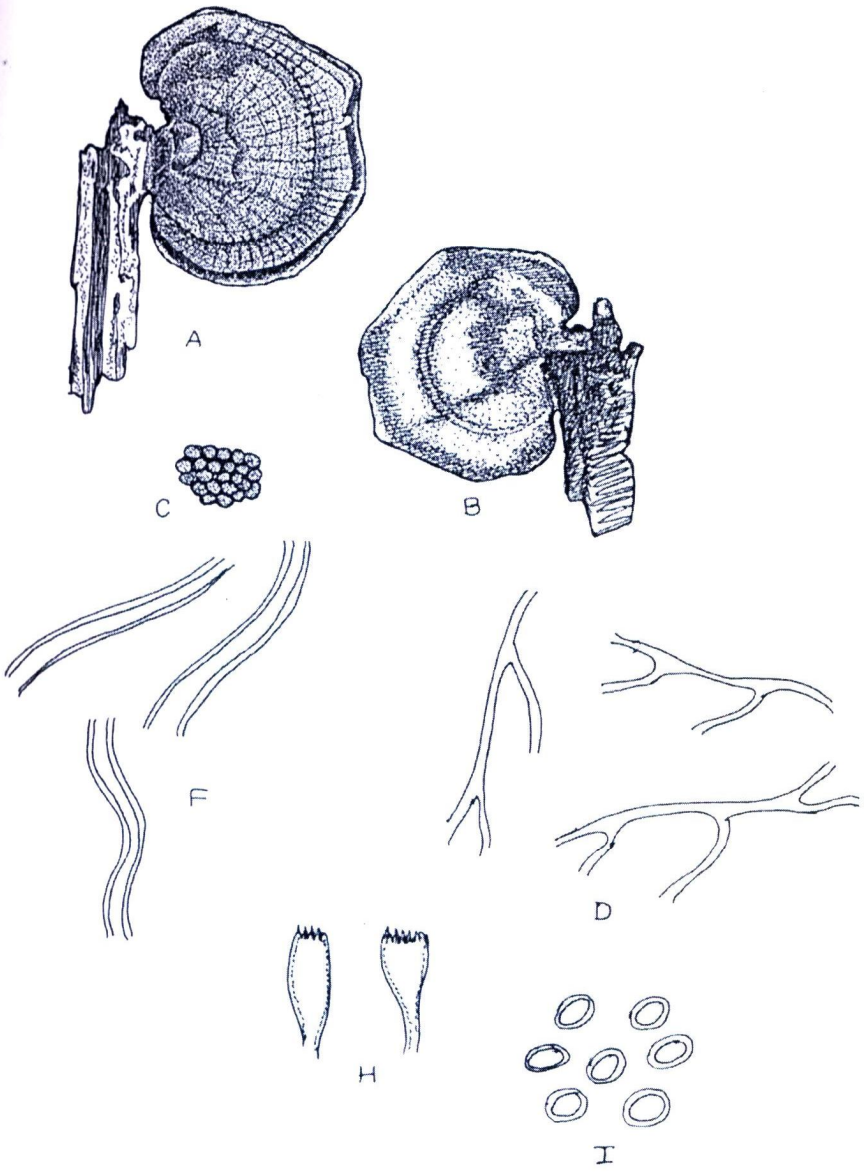

Fig. 6 *Polyporus flabelliformis* Klotzsch.

A: Upper surface B: Hymenial surface C: Pores(enlarged) D: Generative hyphae D: Generative hyphae F: Skeletal hyphae H: Basidia I: Basidiospores

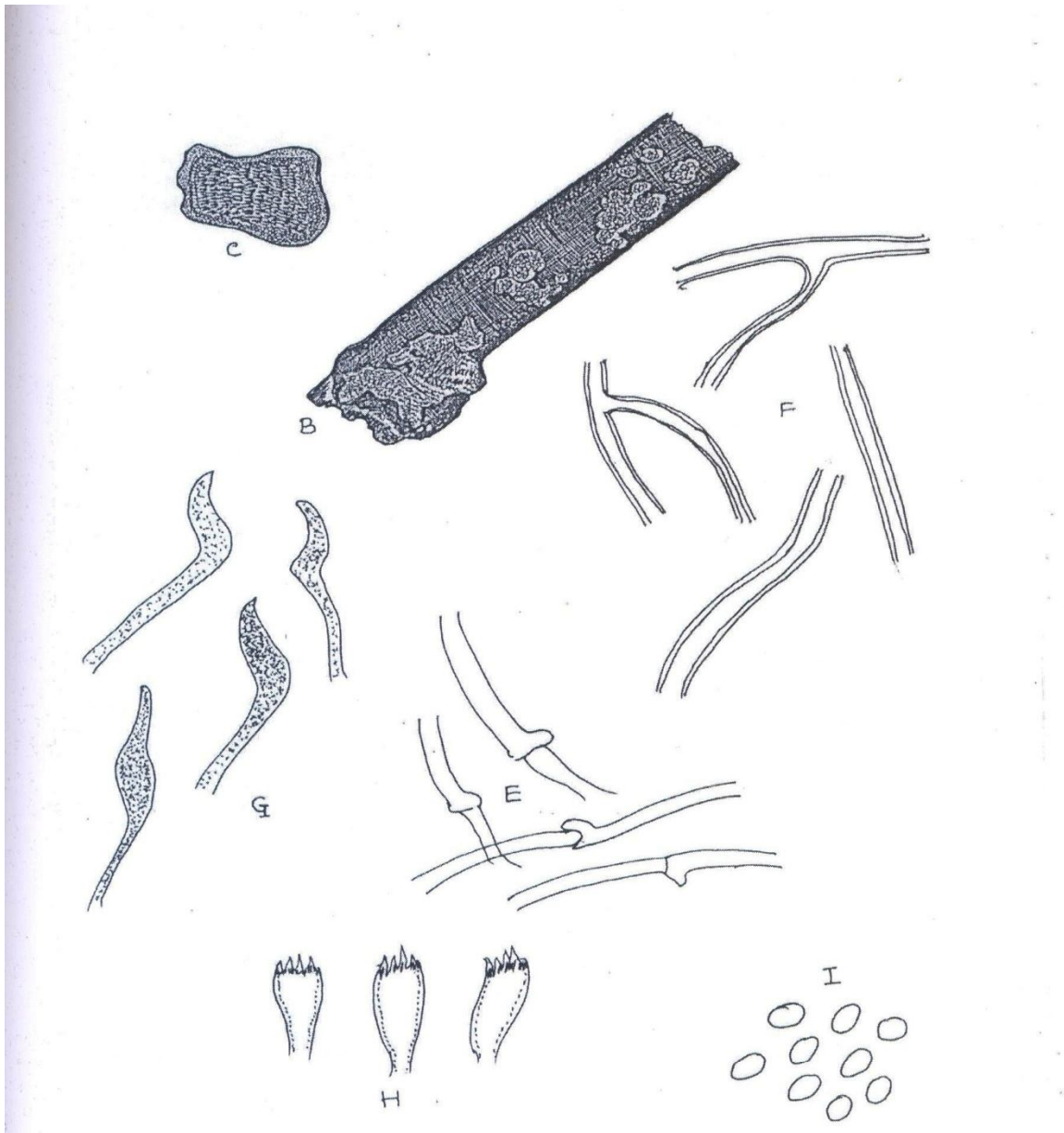

Fig. 7 *Irpex consora* Bark.

B: Hymenial surface C: Pores(enlarged) E: Binding hyphae F: Skeletal hyphae G: Cystidia

H: Basidia I: Basidiospores

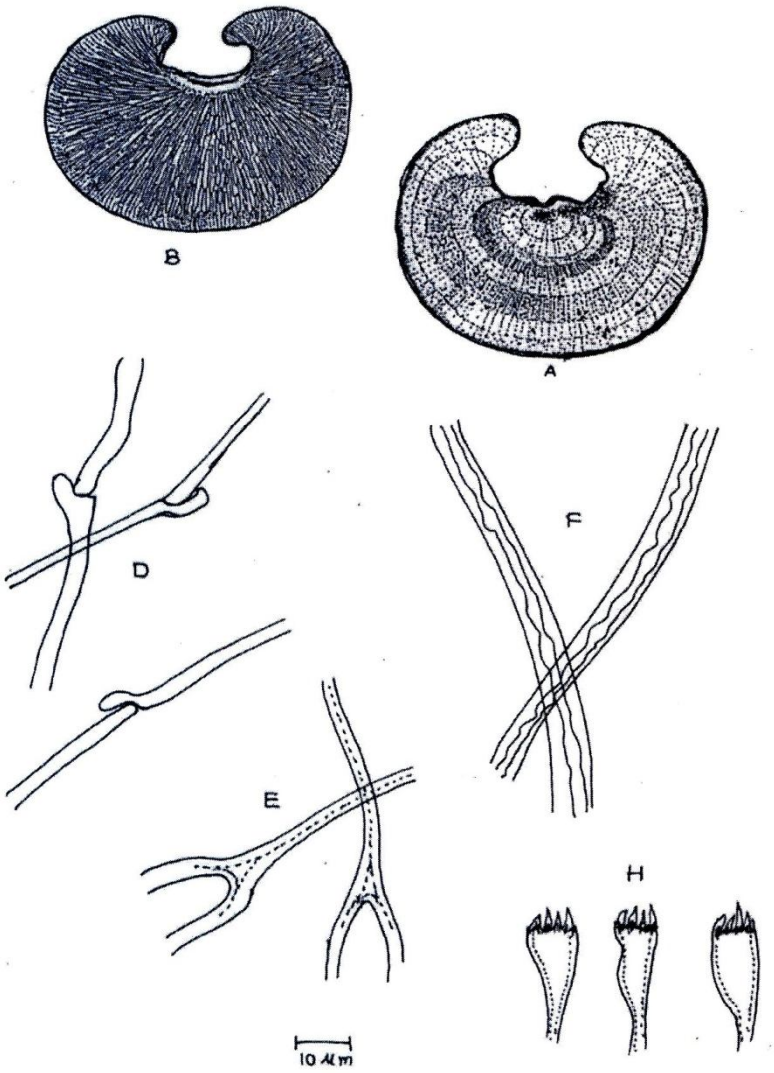

Fig. 8 *Daedalia gollani* Massee

A: Upper surface B: Hymenial surface D: Generative hyphae E: Binding hyphae F: Skeletal hyphae H: Basidia

Plate1

Ganoderma applanatum Fries

Plate 2

Daedalia flavida Le'V

Hexagonia apiaria

Plate 3

Irpex consora Berk

Irpex vellareus Berk

Plate 4

Daedalia gollani Massee

Plate 5

Ganoderma lucida

Polyporus zonalis Berk.

Plate 6

Polyporus xanthopus Fr.

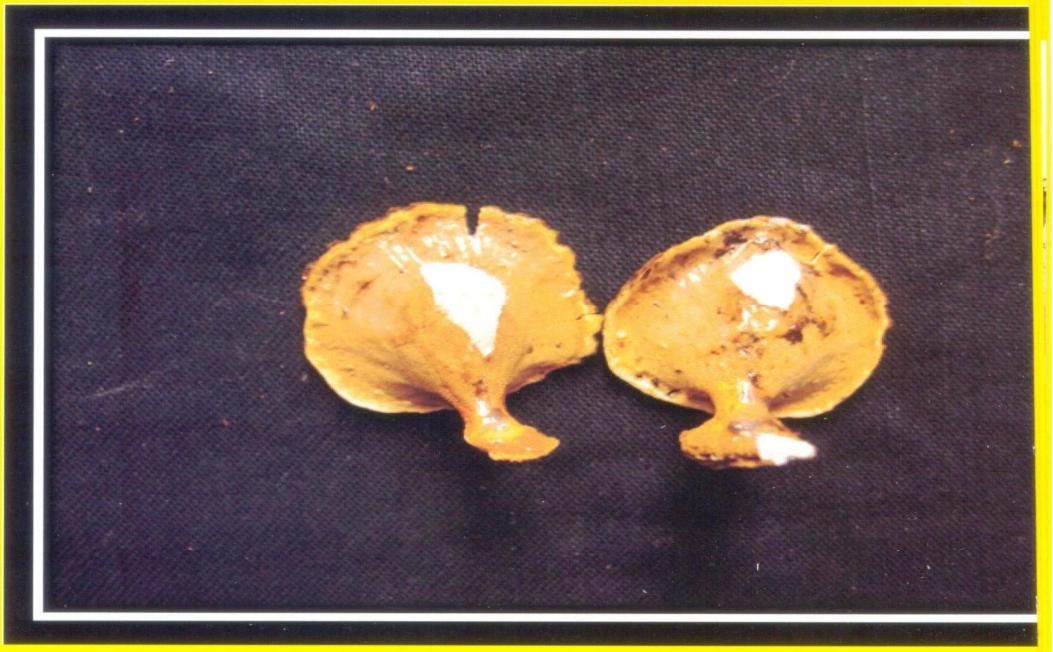

Plate 7

Polyporus gilvus Schaw

Polyporus gilvus var Licnoides

Plate 8

Fomes sensex (Nees and Monte.)

Boletus sps.

Satpuda of Jalgaon District

Tribal couple living in the Satpuda

Chapter V
Summary and conclusion

Summary and Conclusion

Extensive collections were made in different seasons , particularly rainy season and after that at different localities in jalgaon district especially northern part which is a hilly and having rich vegetation. Localities visited are Bhusawal,Pal, Yawal, Langadaamba, Satrasen, Waghzira, Hirapur, Chopada,etc. as shown in the map. These collection were quit fruitful as a good number of fungi belonging to the Basidiomycetes (Aphyllophorales) which are screened as the wood rotting fungi.

From the collection *Daedalea gollani, Hexagonia apiaria, Irpex consore, Polyporus gilvus* and *Polyporus zonalis* have been worked out with other Basidiomycetes. These are found on *Tectona grandis,Mangifera indica, Acasia arabica, Dalbergia sissoo, Terminalia arjuna*,etc.

Fungi belonging to the Aphyllophorales are quite common in the Jalgaon district.

Over five genera and 12 species mentioned have been studied in detail.

The genera *Daedalea , fomes, Ganoderma, Irpex*, and *Polyporus* are abundantly found in this area as compared to the other genera.

A few genera have been reported for the first time from this area

Thus, the present work provides detailed information about the mycoflora of the Jalgaon district, quite; a good number of these are reported for the first time from this area and majority of them constituted a new record from this area. Consequently, the number of fungal taxa known from this area (Jalgaon district) has increased.

Evidently, one can hopefully look for a better future for such type of studies in this direction which will prove quite fruitful.

Chapter VI
Literature cited

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