Chapter THREE

Review of Literature
REVIEW OF LITERATURE

The earlier records of Indian fungi are difficult to trace because the collections were sent abroad for identification. The regular collections were started by Cunningham (1871) and Barclay (1886) on Mucoraceae of Bengal and Uredineae of Simla hills respectively. Among the Indian Mycologists, Lt. Col. Kirtikar (1885) of Indian Medical service appears to be the first, who collected and identified mushrooms and the coloured plates of which are still available at R.G. Kar Medical college, Kolkata. The work on aerobiology was first started in India by Cunningham (1871) while exposing the grease covered slide to the atmosphere to catch the germs of cholera and along with these germs, he collected many spores of Rhizophus and rusts etc. Systematic study of Mycology in India was started by Sir Edwin, John Butler in 1901 and he is rightly regarded as "Father of Indian Mycology", one of the most noteworthy contribution of Butler was the creation of H.C.I.O. (Herbarium Cryptogame Indiae Orientalis) in 1905 at Pusa (Bihar). Butler also worked extensively on Pythium, Phytophthora, Sclerospora and Rhizophagus apart from several hundred collections of various groups of fungi especially rusts and smuts. He wrote monographs on sugarcane diseases, wheat rusts, Fusarium wilts, Sclerospora and rice diseases. To summarise the work on Indian Mycology in 1931, he published a book jointly with Bisby "The fungi and diseases of plants". Butler in 1922 succeeded in producing the first number in "Review of Applied Mycology" now known as "Review of Plant Pathology" from the Common Wealth Mycological Institute, Kew, England.

In early part of nineteenth century after Butler, Mitter published a series of papers on the fungus flora of Allahabad, Nainital and Mussoorie. Mitter and Tandon, R.S. recorded several damaging diseases of plants and new taxa from 1930 to 1938. Seven flourishing schools of mycological excellence emerged under the able leadership of Thind, K.S. (Chandigarh, Punjab), Subranian, C.V. (Chennai, T.N.), Dasgupta (Lucknow, U.P.), Kamat, M.N. (Agharkar research Institute of Pune, M.S.), Saksena, S.B. (Allahabad, U.P.), Bose (Kolkata) and Mundkur, B.B. (I.A.R.I., New Delhi) who laid a foundation of Indian Mycology and Plant Pathology.

Considerable work had accumulated in the knowledge of mycology from the middle of 19th century as per group-wise is as follows in brief:
**Myxomycotina (Slime mould fungi):**

In India, Wight collected *Physarum cinereum* (Batsch) Persoon on grass in Madras before 1830 and this is perhaps the first record of Myxomycetes from India (fide Thind, K.S., 1971). Arthur Lister (1925) reported in his revised monograph, eighteen different Myxomycetes from different parts of India. Drake (1911-1927) was the first who made a systematic collection of Indian Myxomycetes and our early knowledge of the group is largely due to her efforts, particularly from Himalayas and these were deposited in Natural History Museum, U.K. and also in the Royal Botanical Garden, Kew, Surrey, England. Thirty six species collected by her formed the basis for the paper entitled, "Mycetozoa from Northern India", by G. Lister Lodhi (1934) in his publication "Indian Slime Molds" described forty three species including five species of Bruhl and Gupta (1927). Agnihothrudu (1954) did an excellent piece of work and added eighty six species from South India. Later, Ghosh and Dutta (1961-1963), Kar (1964), Singh and Pushpavathi (1965-66) have described and added a few more species respectively of Myxomycetes from North and Eastern India. Thind, K.S. published a series of twenty five papers comprising of one hundred and eighty six species and three varieties and published monograph "Myxomycetes of India" (1977). Patil, S.D. (1956-84) and Nanir, S.P. (1972-94) and their students systematically worked out the Myxomycetes from Maharashtra State. So far about 55 genera comprising of four hundred and fifty species have been described from the world (Hawksworth, D.L., 1998). In India only two hundred and fifty belonging to forty three genera recorded from India. (Sarbhoy, A.K., et al., 1996).

**Ascomycotina:**

This is a largest and most heterogenous group of fungi and very difficult to work taxonomically, but a most fascinating group to work on. The mode of development of the ascocarp, mechanism of sex, life cycles, cultures and cytology besides purely taxonomic aspects. This was done through collections and descriptions of a large number of fungi especially those belonging to the class Discomycetes, notably by Thind and his associates in Punjab. Kamat and his co-workers in Maharashtra, Kar and his collaborators in West Bengal in Eastern India, Patil, S.D. at Pune, Tilak and his co-workers at Aurangabad. Notable contributions have also made by Pavgi and his students at Banaras (U.P.). Bose and Muller (1953) also contributed to the Ascomycetes of Himalayas, Narayanswamy and
Ramkrishnan from Madras, Ramkrishnan, S. and K. have contributed to the Ascomycetes from Madras (Chennai). The family Chaetomiaceae has been studied intensively by Mukerji and his associates at Delhi. The family Gymnoascaceae studied by Ghose. Kamat and Anahosur (1973) have proposed a new type to ascocarp development, the ‘Lecanidian type’ and the family Clavicipitaceae has received great attention to Govindu and Thirumalachar (1963, 1969), Srinivasan (1963), Kulkarni, U.K. (1963) and Mhaskar (1974). Ullasa (1971) established the ‘Claviceps type’ of ascocarp development distinct from the ‘Xylaria type’ to which this group was referred by Luttrell (1971).

The Sphaeriaceous genus *Phyllachora* has been monographed by Kamat, Seshadri and Alka Pande (1978) who recognized 88 valid species, out of the total 107 Indian species examined critically. Later Hosagoudar (1985) added a few more species of *Phyllachora* form south India. The genus *Elsione* and its conidial state *Sphaceloma* have been studied intensively by Wani and Thirumalachar (1968-1975) from Maharashtra. ‘Black mildew’ fungi have been studied by Thite and Kulkarni, U.K. (1975). Most notable contribution from Kolhapur (M.S.) by Patil, M.S. and his students who worked out the systematic study of the different localities from S.W. parts of Maharashtra especially the Western Ghats and substantial number of fungi of all groups except Myxomycets were worked out since from 1972, his own contribution is in ascomycetes and added many taxa to the fungi of India and the same work has been further continued by his students who worked out in Ascomycetes viz. Jagadale, S.V. (1984), Pawar, A.B. (1987), Ghadge, D.N. (1987) and Patil, S.B. (1997) who specially work in lignicolous, foliicolous and coprophilous ascomycetes. Further he worked extensively in “Black mildew” fungi and added genera like *Diportheca*, *Ophioirenina* and *Chaetomeliola*, the very rare genera of the family Meliolaceae which were not known in India even though Hosagoudar (1996) published a monograph on the “Black mildew” fungi from India.

Studies on the group of marine Ascomycetes have been initiated by Dasgupta and Raghukumar (1973). Coprophilous Ascomycetes have been studied by Lodha (1971) from Rajasthan and Narendra (1974), and Patil and Bose (1982-89) from Maharashtra. Saksena et al. (1967, 1968) published a series of papers on soil fungi including several Ascomycetous species.

So far 3800 Ascomycetous fungi comprising of 246 genera have been recorded from India. Out of these, 25 new genera have been proposed based on the
study of Indian materials by different workers which are today except a few unfortunately synonyms.

**Basidiomycotina:**

The first phase of the notable contribution on mushrooms was made by Barclay (1856-1882) who dealt with 162 species of mushrooms, mostly collected from Assam, Darjeeling and Sikkim (N.E. India) and ten from Kashmir, Kolcutta, Masulipatanam, and Madhya Pradesh (fide Sathe, A.V. 1979, 1984); Massee (1898-1912) has added 32 species to the list. Hennings added 72 species to the list of Indian mushrooms. Bose and his co-workers (1919-1951) mostly worked out the mushrooms from West Bengal. The most notable contributions during this period were by Sathe, A. V. (1965), Patil, M. S. (1978), Singh, B. (1961), Mehrotra, B. R. (1969), Bakshi, B. K. (1976), Kapoor (1963), Munjal, R. L. (1960), Pathak, V. N. (1970), Natarajan, K. and M.J. Narsimhan (1971) are worth mentioning (Bilgrami, et al. 1979, 1991; Sarbhoy et al. 1996).

The history of Aphyllophorales is quite old in India. Wight collected some of these, which were later on described by Klotzch (1932-33) who made several collections from Nilgiri hills. Several Indian fungi of this group were published by Cooke (1881, 1884) and Currey (1874). Towards the turn of the century, Gollan made several collections from uttar Pradesh and these were later described by Hennings (1900-01). “The Resupinate Aphyllophorales of the North Western Himalaya’s” by Rattan (1977) have made valuable contributions. Kundalkar, B.D. (1984) studied mostly the members of Aphyllophorales, Tulasnales the soft fleshy gelly fungi-especially terricolous and lignicolous of which several genera have been reported new to India, collected from western Ghats of the Maharashtra.

Thind, K.S. a pioneered, an extensive exploration of mycoflora of North Western Himalayas from 1952-1956 and Eastern Himalayas from 1977-1986. His studies encompass Xylariaceae, Pezizales, Helotiales, Clavaroids and Hydnoids, Thelephoroids and Polyporoids. Thind’s entire collection of more than 7,000 specimens is housed at present in a Herbarium, Botany Department, Punjab University, Chandigarh. Thind and his associates published two comprehensive accounts on Myxomycetes and Clavariaceae of India (1971).

Bose (1919-1928) gave a comprehensive account of Indian Polypores collected from Bengal in a series of papers. Sundaraman and Marudarajan (1925)
also reported several Polypores from Chenai (Madras). In Fungi of India published by Sarbhoy et al. (1984) more than 500 Aphyllophorales were listed Bakshi, et al. (1972) published a monograph on “Indian Polyporaceae” whereas very little work has been done on Cantharelloids and Hydnoid fungi in India. Vaidhya, J.G. (1975-1985) is working on this group of these fungi i.e. wood rotting fungi from Pune (M.S.).

Puccinia, the most important and largest genus of rust infecting a number of cereals and other plants studied in great detail in India. Mundkur, B.B. and Thirumalachar, M.J. (1940, 1949, 1952) have made impressive and extensive contributions to our knowledge of rust and smuts, particularly to the life histories of rust fungi. More than 160 genera of rust have been recorded from India so far comprising of 4958 species (Sarbhoy et al., 1994), not an authentic number.

Karnal bunt of wheat Neovossia indica which was recorded from India by Mitra (1931) as a minor disease has become a major one within a short span of a few years (Joshi et al., 1984). Hosagoudar (1985) studied Teliomyces of South India and reported several uredinial stages on different host plants from Coimbatore (T.N.) while Rao, Rama (1987) reported several new rust from Andhra Pradesh.


Deuteromycotina:

The earlier record known of a Hyphomycetous fungus from India is Sporidesmium polymorphism recorded by Corda (1931). Butler studied the fungi of all the groups quite extensively. Several hyphomycetous fungi were described by Mitter and Tandon before 1930 from Allahabad (U.P.).

Significant contributions to this group came from Cooke (1825-1914), Hansford (1900-1960) and Subramanian, C.V. (1956-1994). Till to 1930, only 204 species of hyphomycetous fungi comprising of 55 genera were recorded from India.
Out of these, sixty-six belonged to the genus *Cercospora*. Subramanian, C.V. (1971) monographed more than 500 genera in his book "Hyphomycetes". In all, thirty one new genera were described. Till to date, more than 75 genera were recorded representing more than one thousand new species from India (Sarbhoy, 1994). In "Dictionary of fungi" (1983), there are 1030 genera and more than 17,000 species. In India so far 714 (50 genera synonyms) representing 6000 species have been so far reported (Sarbhoy, 1994).