

REVIEW OF LITERATURE

Class- Ascomycotina

The fungal biodiversity of India is estimated about 22,000 different fungi. Out of which, Deuteromycotina represents 45%, Basidiomycotina 25%, Ascomycotina 20%, Zygomycotina 10% and Mastigomycotina are 5% (Sarbboy, 1994). Large no. of fungi are exploited and the number is still increasing day by day, and large number of fungi are yet to be known.

The study of Ascomycetous fungi dates back, in the beginning of the 19th century when, the first list of the Ascomycetous fungi was published on 1st January 1821. The ideas of the early taxonomists were summarized by Fries (1822, 1823) in his second volume 'Systema Mycologia'. The second sub-class Pyrenomycetes covers the bulk of Sphaeriales and Loculoascomycetes. Saccardo (1882-1926) established a scheme of classification and described different fungi including bitunicate Ascomycetous fungi in his monumental work "Sylloge Fungorum". Desmaziers (1849-1926) and Rehm (1898) have established large number of bitunicate Ascomycetous genera and laid the foundation in the field of taxonomy of this group.

As far as Dothideales or bitunicate ascomycetous fungi, (Loculoascomycetes) are concerned number of workers in 20th century, contributed a lot viz. Zog (1962), Hohnel (1907, 1909, 1910, 1917), Arnould (1918), Patouillard (1897 and 1918), Theissen (1912, 1913, 1914, 1916) etc. They studied the families viz. Dimeriaceae, Asterinaceae and other members of the order-Hemisphaeriales. Theissen and Sydow, H. (1915, 1918) worked out the orders-Dothideales and Pseudosphaeriales.

Sydow, H. (1912-14, 1916-17, 1925-27, 1930, 1934, 1938-39) mainly concentrated on the taxonomy of various genera of Dothideales. He worked with Sydow, P. (1915, 1916, 1917, 1920) and also with Butler (1911). He studied the different Indian fungi. Sydow, H. and Petrak (1916, 1927, 1929 and 1930), studied and classified the collections made by Prof. M. Bruner from S.America.

Patouillard (1897, 1918) established number of genera of the bitunicate Ascomycetous fungi. Hohnel (1907, 1909, 1910, 1917) accounted the order-Phacidiales. Number of workers viz. Clements (1903), Beeli (1923), Mendoza (1925) have contributed in the study of these fungi, especially belonging to the order

Hemisphaeriales. The monographic work was published by some workers as Zog (1962) and Arnauld (1918 and 1921).

The contribution of Petrak, in the field of the taxonomy of the bitunicate Ascomycetous fungi is remarkable and valuable one. Petrak's work (1923, 1927, 1947, 1948, 1950, 1955, 1959) was published under the title 'Mykologische Notizen' in 13 volumes. Petrak and Ciferri (1932) studied, the fungi from S. Africa and Tanganika.

Batista (1953, 1954, 1959, 1963, 1966), Batista and Ciferri (1959, 1962, 1963), von Arx and Muller (1954, 1959, 1963, 1966), extensively worked and established a school of Mycology in Brazil. He independently and jointly worked with Cavalcanti, Maiya, Peres, Nascimento, Holland and Ciferri and accounted the fungal systematics study in the different orders and families of bitunicate Ascomycetous fungi and established large number of genera. His main contribution is the monograph of the family Micropeltidaceae. Batista and Ciferri (1962 and 1963) published the monograph of the orders Chaetothyriales and Capnodiales.

Ciferri (1959, 1962, 1963) has raised a good number of genera independently and jointly with Batista. He (1959) has worked extensively on the pycnidial forms of the order Hemisphaeriales.

von Arx and Muller (1950, 1954, 1964, 1963, 1970, 1975) established number of genera of the bitunicate Ascomycetous fungi along with other fungi. They have made a revisionary work of all the Ascomycetous fungi and published it in two volumes viz. "Diattungen der Didymosporen Ascomyceten" and "Diattungen der Amerosporen Ascomyceten", which account two-celled and one celled ascospores producing genera respectively. von Arx (1963) published the monographs on the order-Myriangiales and the family-Leptopeltaceae. Muller (1950, 1957, 1959, 1962, 1963, 1965, 1975) too recorded large number of genera independently and jointly with von Arx and other workers.

Luttrell's contribution (1946, 1951, 1955, 1973) in this field of Loculoascomycetes is monumental one. He was the first to arrange the families of the Loculoascomycetous fungi on the basis of different characters as ascostrmatic ascocarp, bitunicate asci and septation of the ascospores into five orders viz. Dothideales, Hysteriales, Pleosporales, Myriangiales and Hemisphaeriales.

Luttrell (1951, 1955) described four developmental types in the Loculoascomycetes and on the basis of which, he classified the Loculoascomycetes into different orders viz. Myriangiales, Dothideales, Pleosporales and Patellariales.

Hansford (1914, 1943-48, 1955-56) has worked extensively in the field of taxonomy. His work was published in number of volumes of "Proceedings of Linnaeus Society" and in "Kew Bulletin", since 1940. The paper (1946) entitled "Foliicolous Ascomycetes, their hyperparasites and the associated fungi" in an ideal study of the members of the family Chaetothyriaceae, Capnodiaceae and other fungi. In 1961, he published a monograph on Meliolales.

The work of ascomycetous fungi continued due to keen and deep interest of the investigators viz. Jellis, G.J. and Punith (1991), Barr, M.E. (1993), Gomer, H.D. and Lopez, A. (1995), Wei, C.Z. and Harada, Y. (1998) and Japanese Mycologist Hyde, K.D. and Wong, S.W. (1999), Crous and Wingf, M.S. (2004), Reynolds, D.R. and Gilberts, G.S. (2005 and 2006) and Baber and Burgees, T.J. (2007). All these mycologist studied different genera from the class-Loculoascomycetes (Dothideales). The other groups of a Ascomycetous fungi were also studied. Alexopolous, Mims and Blackwell (2004) treated fungi as a separate kingdom and classified class-Ascomycotina. He accordingly classified Ascomycotina into different order and families.

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 sps. were examined critically. Later Hasagoudar (1985), added a few more sps. of *Phyllachora* from South India. The genus-*Elsione* and its conidial state *Sphaceloma* have been studied by Wani and Thirumalachar (1968-1975) from Maharashtra. Tilak, S.T. (1964-1977) alone and with co-workers, studied different genera of ascomycetes from Aurangabad. The "Black mildew" fungi have been studied by Thite and Kulkarni, U.K. (1975). Most notable contributions from Shivaji University, Kolhapur (M.S.) by Patil, M.S. and his students who worked out the systematic study on different groups of Ascomycetes and other fungi from South-West Parts of Maharashtra (Western Ghats) since from 1972. His own contribution added many taxa to the fungi of India. Thite, A.N. and Patil, M.S. (1982), worked on the family Meliolaceae. The studies in ascomycetes has been further continued by his students viz. Jagadale, S.V. (1984), Pawar, A.B. (1987), Ghadge, D.N. (1987) who especially worked in lignicolous and foliicolous ascomycetes fungi. He worked

extensively in "Black mildew" fungi from South-West Maharashtra. He studied the Meliolaceae members from West Maharashtra. Studies on Marine ascomycetes has been initiated by Dasgupta and Raghukumar (1973). Coprophilous ascomycetous fungi from Maharashtra was contributed by Patil and Bose (1982-89). Saksena et al. (1967, 1968) published series of papers on the soil fungi including several Ascomycetes sps. Kar, A.K. and Ghosh, S.N. (1968) worked on *Asterina* sps. from West Bengal. Ramesh, C.H. (1968-1991) worked on some Loculoascomycetes from Maharashtra. Rao, V.G. and Pandey, Alka (1970-81) worked on the various genera of Dothideales. Shinde Tejaswini (1995) studied the family Meliolaceae and their hyperparasites from Maharashtra. Borse, B.D., Borse, K.N. and Pawar, N.S. (2001) worked on Marine fungi from Orissa. Sivan and Shivas, R.G. (2002) studied various genera of Ascomycetous fungi.

Various Mycologist have contributed in the study of Ascomycetous fungi extensively. Kamat and Anahasur (1973), have proposed a new type to ascocarp development, 'The Lecanidian type'. The family Clavicipitaceae has received great attention by Govindu and Thirmalachar (1960, 1964), Srinivasan (1963), Kulkarni, U.K. (1969); Mahaskar and Rao (1972-1976), Ullasa (1971) established the 'Claviceps type' of ascocarp development distinct from '*Xylaria*' type to which this group was referred by Luttrell (1971), Kamat (1962-1971) and his co-workers, Patil, S.D. (1984) and his school also worked on many Loculoascomycetous fungi from Western Ghats.

Class- Deuteromycotina

The major contribution in Deuteromycetous fungi was made by Saccardo (1886). He published the scheme of classification and described the various genera of monumental work "Sylloge Fungorum" time to time. In the group Deteromycotina (imperfect fungi), the order Moniliales were studied by Hughes (1953), Tubaki 1958), Subramanian (1962) and Barron (1968), and distinguished into eight sections on the basis of conidia development and conidia bearing apparatus. Guba (1961) published a monograph of *Pestalotia* de Notaris. Ellis, M.B. (1971 and 1976) published the various genera of Hyphomycetes in two volumes namely "Dematiaceous Hyphomycetes" and "More Dematiaceous Hyphomycetes". Barnet, H.L. (1973)

published "Illustration of Fungi" which is a simple key to identify many fungi at generic level. von Arx, J.A. (1974) also classified different genera of fungi imperfect and published in the "The genera of fungi sporulating in pure culture".

Various British and Japanese Mycologists took keen interest in the study of Deuteromycetes fungi viz. Nees (1816), de Notaris (1839), Montagne (1842), Spegazzini (1876), Boedijn (1933), Sutton, B.C. (1973) and also with co-worker, Hughes (1951), Bessy, E.A. (1953), Tusda (2003), W.H. Chung and Tsukib (2005), M. Zhang and T.Y. Zhag (2005), J.J. Xu and T.Y. Zhang (2006) etc.

The earlier known records of a Hyphomyceteous fungi from India is *Sporidesmium polymorphism* recorded by Corda (1931). Butler (1903-1929) studied the Deuteromycetous fungi quite extensively and listed. Several hyphomycetous fungi were described by Mitter (1930) from Allahabad (U.P.). Significant contributions to this group came from Cooke (1825-1914), Rao, V.G. (1962-1981), Subhedar, A.W. and Rao, V.G. (1975 to 1979) who studied different genera of Hyphomycetes and Coelomycetes from Maharashtra. Vasudeva, R.S. (1963) published a monograph on Indian *Cercosporae*. Subramanian, C.V. (1971) listed more than 500 genera in his book "Hyphomycetes". Gupta, D., Padhi, B. and Chowdhary, P.N. (1985) worked on Coelomycetes and Hyphomycetes fungi from India. Bharadwaj, C.L. (1988), Gaur, R. (1990), Mehrotra, M.D. (1990-1992) worked on the different genera Hyphomycetes from U.P.; Ali, M.S. and Saikia, U.N. (1997) worked on Coelomycetes from Assam. Kumar, P.S. and Kumar, P.R.P. (2000) also worked on *Alternaria* Nees ex Fr. Chaudhary, R.K., Singh, P.N., Srivastava, S. and Singh, M.P. (2001) worked on forest flora of north Eastern India causing foliar blotches. Smita Jain and Kai, A.N. (2004) worked on different genera of Hyphomycetes

Many other Mycologist contributed in the study of Hyphomycetes viz. mundkur(1938), Mitter and Tandon (1930) Subramanian and Ramkrishnan (1956), Srinivasan and Thirumalachar (1961), Kulachara and Singh, S.M. (1979), Patil, M.S. and Sawant, R.S. (1991), Airekar (1931), Patel (1949) etc. The list of fungi of Maharashtra state (Bombay) including Deuteromyceteus was published by Patel, Kamat and Bhide (1949). The 2nd List of Fungi of Maharashtra has been published by Kamat, Patwardhan, Rao and Sathe (1971), in which 1281 fungi have been described. It was revised by Desai and Patwardhan (1974).

Till to date, more than 75 genera were recorded representing more than 100 new sps. from India (Sarbhoy 1994). The "Dictionary of fungi" (1983) contribute