

## **Chapter: II**

# **REVIEW OF LITERATURE**

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Biodiversity is a multidisciplinary subject as it is concerned with conservation of wild life, biological resources, floristic, ethnobotanical, endemic and ecological studies.

A review of literature reveals floristic, ethnobotanical work, information on survey of medicinal and endemic plants in Maharashtra State and India. Most of the surveys are in the form of enlistment of plants and description of species, keys for classification, identification of plants and a few studies are also concerned with ecological aspects.

Credit of earlier floristic work goes to Graham (1837), Dalzell and Gibson (1861), Hooker (1872-1897), Cooke (1967): Nairne (1993). Cooke studied 'Flora of the Presidency of Bombay' in three volumes. It is most important floristic work for identification of the species. This flora includes 162 varieties, 2513 species under 999 genera belonging to 147 families of the flowering plants. Flora of Purander compiled by Santapau (1956). He reported ca.592 species belonging to 101 families. Flora describes detailed floral diversity of the fort.

Botanical Survey of India (BSI) made planned efforts for studying flora and plant diversity in the state. A series of floras were published by BSI from 1953. Santapau (1953) studied the flora of Khandala. BSI Published two district floras in 1988. The flora of 'Akola district' (Kamble and Pradhan) with 651 taxa and Flora of 'Sindhudurg district' by Kulkarni, with 1123 taxa; Flora of 'Nasik district' by Lakshminarasimhan and Sharma, (1991) with 952 taxa, Flora of 'Raigad district' (Kothari and Moorthy, 1993) with 1248 taxa; Flora of 'Yavatmal district' (Karthikeyan and Anand Kumar, 1993) with 579 taxa; Flora of 'Buldhana district' (Diwakar and Sharma, 2000) with 584 taxa; Recently 'Flora of Maharashtra State: Monocotyledons' by Sharma *et al.* (1996) has been published which included 34 families, 956 genera, 904 species, 2 subspecies, 39 varieties, 1 sub variety and 1 forma of wild plants. 'Flora of Maharashtra State: Dicotyledons' was published in 2 volumes Sharma *et al.*, (vol. I, 2000) and Singh *et al.*, (vol. II 2001), which includes 153 families, 832 genera, 2123 species, 18 subspecies and 107 varieties.

Publications other than BSI concerned with floristic diversity include, 'Flora of Melghat' by Patel (1968). Almeida (1983-1986) submitted a 'Report on the Flora of Ratnagiri district' which comprises ca 1000 species and 'Flora of Savantwadi (1990) which includes ca 1685 vascular plants. In this flora, she discussed diversity of vegetation at sea level, open plains and foot hills, hill slopes and plateaus. Among all

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these regions open plains and foot hills showed maximum diversity which includes 86 species of trees, 56 species of shrub, 25 species of climber and 112 species of herbs. Ugemuge (1986) has contributed a book on the 'Flora of Nagpur district' with 1163 species. 'Flora of Marathwada' (Naik, 1998a) described 1718 taxa of flowering plants. Flora of 'Kolhapur district' (Yadav and Saradesai, 2002) reported 2227 species, 5 subspecies, 30 varieties belonging to 1023 genera and 182 families of flowering plants.

Hill floras in the state have been worked out by many workers. Santapau (1953) contributed the flora of Sinhgad hill from Poona district. Mahabale and Karnik (1960) have published the Flora and vegetation of Satpura mountains from Dhule and Jalgaon districts while Deshapande (1963) has published the Flora of Chandmari hills in Wardha district. The flora of Ulhasnagar in Thane district was studied by Dabhade, (1966), Janardhanan (1966) dealt with 838 species from Bhimashankar and surrounding. Reddy (1969, 1970) enumerated 850 species from Sakarpathar and Ambavane areas while Hemadri (1970) reported 986 species from Junnar and surroundings. Floristic Studies on Sacred grooves From Sinhgad Hills in Pune was studied by Nipunage *et al.* (2004).

Floristics of Some wild life sanctuaries and National Parks have been explored such as Nagzira (174 species) and Nawegaon (301 species) in Bhandara district have been published by Malhotra and Rao, (1980, 1981), Dhore and Joshi (1988) compiled the 'Flora of Melghat Tiger Reserve' comprising 648 species. 'Taroba National Park' (Chandrapur Dist.) comprising 667 species by Malhotra and Moorthy (1992).

Satara has attracted taxonomist since long back due to its floristic diversity. It lies on the border of Konkan and Desh. Hooker (1872-1897), Nairne (1894), Cooke (1887, 1896), Vartak (1956) are the pioneer workers in the field of Taxonomy in the Satara region. Floristic studies in Panchgani region compiled by Birdwood (1896) and Father Blatter (1909). Father Blatter reported 367 species belonging to 89 families. Growth of forest trees of Mahabaleshwar studied by Gadgil and Vartak (1977). Bole and Almeida (1980 - 1989) has published materials for the Flora of Mahabaleshwar in a series of articles.

Flora of Kas area of Satara District extensively studied by Chavan *et al.* (1973) and reported 128 species belonging to 54 families. Patil (1987) surveyed flora of Koyananagar. The flora of Ajinkyatara was surveyed by Kanase (1991). He reported 640 species belonging to 120 families. A preliminary flora of Khatav Taluka studied by

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Patil (1991) and represents 525 species from 357 genera and 88 families. Deshpande *et al.* (1993 and 1995), wrote Flora of 'Mahabaleshwar and adjoining'. It includes 141 families, 647 genera and 1398 species. Floristic Studies on Vasota and Surroundings were worked out by Cholekar (1996).

Grasses of Marathwada region studied by Patunkar (1980). He represents 76 genera and 167 species. Grasses of Maharashtra State' comprising c 400 species has been published by Deshpande and Singh (1986); Salunkhe (1995) studied grasses of Southwestern Maharashtra. Recently Taxonomical studies on Grasses of Maharashtra were conducted by Potdar (2007). He reported 123 Genera 413 species, 41 varieties and 2 subspecies of grasses.

Resource of medicinal plants is the most important significance of Plant diversity. Many researchers around and in the country studied the medicinal plants from the various regions. Significant contributors were Dey (1896); Anonymous (1948-74, 1994); Kurup, Ramdas and Joshi (1979); Satyavati, (1976-1987); Shivarajan and Balchandran (1994).

Work on medicinal plants in Maharashtra was initiated by Agharkar (1953). He compiled detailed account of medicinal plants of Bombay, which describes about 350 flowering plants with their medicinal uses, habit, habitat, localities, parts used, local uses and chemical constituents. Vartak (1957, 1959a, 1959b, 1959c, 1962, 1979 and 1982) made valuable contribution to the studies of medicinal plants of Pune and surrounding area. Similarly Karnick (1966), Sawant (1974), Malhotra and Moorthy (1976), Kamble and Pradhan (1980), Vartak and Mandavgane (1981), Shah *et al.* (1983), Sharma and Lakshminarasimhan (1986), Upadhye *et al.* (1986, 1994), Ved Prakash and Mehrotra (1987), Yadav and Bhamare (1989) have worked on local medicinal plants in the state.

Deokule and Magdum (1992) enumerated 103 plant species of medicinal interest distributed over 48 families. Recently Upadhye and Kumbhojkar (1994) described 424 medicinal plants while Recently, Naik (1998b) published an account of 350 medicinal plant species of Marathwada region in Marathi. Mahekar and Yadav (2007) reported 618 species of medicinal plants from Maharashtra. She has concluded that, 34 species are rare in occurrence and 15 species are under threat of extinction. Samant and Mohinder (2003), recorded 701 species of medicinal plants of these 138 species were trees, 135 species were shrubs and 421 species were herbs.

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Mahekar (2004) identified 11 bark samples used in folk medicines. Little known or unnoticed medicinal uses of some flowering plants of south western Maharashtra were studied by Shimpale *et al.* (2004). Biodiversity of medicinal plants of the Marundualmalai Hills, Kanyakumari District, Tamil Nadu State studied by Parthipan (2006). He reported 113 plants belonging to 34 families. Magendrian and Ramkrishnan (2006) studied the medicinal plant diversity in and around the Tiruvannamalai Hill, and reported 141 herbal plant species of which 132 species were from 42 dicotyledonous families and remaining species were from 6 monocot families. Bhattacharya *et al.* (2007) reported 47 herbal plant species belonging to 33 families. These are used to cure 26 diseases in the area of Manas National Park.

In India, S.K. Jain is a pioneer worker in the field of ethnobotany, (Mahekar, 2002) He has made significant contribution to the field of pharmacognocny and ethnobotany. Ansari and Nayar (1978) studied plants from Western Ghats useful for essential oil industry. Floristic and ecological studies on legumes from hilly regions of Pune and Satara districts were studied by Tosh, *et al.* (1988), contributed to our knowledge of economic plant wealth; Malhotra and Moorthy (1973) described importance and the need for ethnobotany. Gadgil and Vartak (1980) initiated the study of sacred groves and its relation to ethnobotany. Endemic flora of Peninsular India and its significance was studied by Nayar (1980).

Other major contributions dealing with general ethnobotany of the region include those of Sharma and Lakshminarasimhan (1986), Kumbhojkar and Vartak (1988) and Ved Prakash and Mehrotra (1987). Information on wild food plants used by the tribals from Western Ghats of Maharashtra has been compiled by Kulkarni and Kumbhojkar (1992) and Upadhye *et al.* (1994).

Sanjappa, (2007) concluded that, Apart from over 8000 species of ethnobotanical interest, 320 species of wild relatives of crops belonging to 116 genera in 48 families occur in India.

Observations of wild edible plants from hilly region of Poona were studied by Vartak (1980). Ethnobotanical survey in the village Chhitkul of Sangla valley was conducted by Negi *et al.* (2002). He reported 25 edible species with agricultural values, 17 plant species of medicinal importance, 14 species with cultural and religious importance. Badave and Kothari (2007) studied 119 Wild edible plants from Koyana region, of Satara District. Wild edible plants from Simlipal Biosphere reserve surveyed by Rout and Pandey (2007), this area reports 182 plant species which have

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been identified as wild edible. Gajurel *et al.*, (2007) studied wild edible plants of Dibang Biosphere Reserve, Arunachal Pradesh, It has been found that 150 wild plant species used for various purposes of which 80 species are wild edible. Ghosh, and Das (2007) studied Plants of ethnobotanical Significance for the tea Garden Workers in Terai and Duars of Darjeeling. They reported 133 dicotyledonous and 33 monocotyledonous and 4 pteridophytic plants of ethnobotanical significance. Ethnobotanical observations in Pench National Park (Maharashtra) were recorded by Chaturvedi and Panhi Kumar (2007).

Information about the fuel, wood, fodder, non-wood and socioeconomic plant resources used by the tribal's have been provided by the work of Singh *et al.* (2000), Negi *et al.* (2003) and Gajurel *et al.* 2007. The work on endemism of Indian flowering plants by Chatterjee (1940) opened a new vista in Indian Botany, especially in the discipline of Taxonomy. There are too many references dealing with endemic species. Rao, (1972, 1979), Subramanyam and Nayar (1974); Lucas and Synge (1978); Nayar (1980); Sharma and Kulkarni (1980); Sundara Raghavan (1983); Karthikeyan (1983); Ved Prakash and Jain (1983) and Singh and Sundara Raghavan (1986) studied the endemic plants of Indian region. Deshpande (1993) reported 108 endemic species from Mahabaleshwar and adjoining. Yadav, (1994) studied endemic plants from the Western Ghats. He reported 12 species are endemic to Mahabaleshwar hills and 123 taxa exclusively endemic to Maharashtra. Flora of Maharashtra State (Sharma *et al.* 2000) reported 694 species which are endemic to Maharashtra. According to annual report of BSI (2001), out of about 17500 species, 5285 species of 140 genera of angiosperm are endemic to India. Yadav and Sardesai (2002) compiled 340 endemic plants in the flora of Kolhapur District. Observations on rare, imperfectly known endemic plants in the Sacred grooves of the western Maharashtra by Vartak, (2004). Mitra and Mukharji (2007) reported 121 genera are endemic to India. Critical analysis by Narsimhan (2007), shows only 77 genera are strictly endemic to India belonging to 53 dicot, 24 monocotyledonous plants.

Ecological emphasis is now being given to the study of functional aspects of nature. The immediate need, therefore, is to educate people in the basic principles of ecology, so that they may understand the undercurrents of the environment. (Misra, 1968). Sukumar *et al.* (1992) reported 71 species of woody plants above 1cm gbh (girth at breast height) from tropical deciduous forest of Mudumalai. Ganesh *et al.* (1996) studied Assessment of plant biodiversity at a midelevation evergreen forest of Kalkad-

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Mundanthurai Tiger Reserve, Western Ghat. He reported 173 plant species from 58 families; of these tree species are more dominant. Species diversity of tree species was 487 ranking highest in the Western Ghats. Seetharam *et al.* (1999) studied the diversity of dry deciduous forest of Sandur. They reported 95 woody plant species belonging to 31 families. According to them, the diversity of forest is 1.73 (Shannon index), Simpson index (0.749), Menhincks index (3.0), Margaleff index (24.75). Kaduwal and Parthasarthy (1999) studied woody species diversity and conservation of tropical semi evergreen forest in the Shervarayan hills of western Ghats, they recorded 3260 stems (mean density 815 ha<sup>-1</sup>) covering 80 species from 71 Genera and 44 plant families.

Attenuated tree species diversity in human-impacted tropical evergreen forest sites at Kolli hills. Eastern Ghats, was studied by Chittibabu and Parthasarthy (2000) they recorded, a total of 3825 individuals and 78 species from 61 genera and 36 families in the 8 ha area. Shannon, Simpson Hill Diversity and evenness indices revealed a progressive reduction in diversity with increasing disturbance in Tree density from 1151 to 651 trees ha<sup>-2</sup>. Jayanarayanan and Menon (2002) studied IVI value, Floristic Diversity and Phytosociological aspect of tree species from the moist deciduous forest of Central Kerala, An average IVI value of tree species was 15.57 CI (Continuum index) value was estimated to be 20.51, MI (Maturity index) 46.94 and Menhincks index is 0.19. Tropical dry evergreen forest of Coromandel Coast was studied by Parthasarthy and Karthikeyan (1997), they reported 46 species from 43 genera belonging to 25 families. Diversity indices of this place reported Shannon (1.82-2.33), Simpson index (0.16-0.22) Stand Density (4101) and Basal Area 44.93.

Impact of invasive plants on the structure and composition of natural vegetation of northwestern Indian Himalayas was studied by Kohli *et al.* (2004). They concluded that the distribution and species richness pattern in this region largely depends on the altitude and climatic variables like rainfall and temperature. They remarked that, Density and Diversity of native flora was adversely affected because of invasive exotics. Kharkwal *et al.* (2005) recorded 2487 species of which 276 were trees, 355 shrub, 112 climbers and 1744 herbs from the central Himalayan region of India. Tree species diversity and distribution pattern in tropical forest of Garo hills studied by Ashish Kumar *et al.* (2006). They analyzed Density, Basal area, Shannon index, Menhincks index and evenness index from the study area. Structure and composition of woody species in tropical semi evergreen Forest of Kalrayan hills studied by Kaduwal (2006) and reported 89 species from 79 genera and 39 families. This area

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represents Shannon index from 2.31 to 2.87 and stand density from 367 to 667 stems/ha. Changes in composition, structure and altitudinal distribution of low forest at the upper limit of their growth in the northern rural mountains was studied by Kapralov *et al.* (2006). Pawar *et al.* (2006) studied floristic composition and quantitative assessment of plant resources of Western Ghats from Dhule and Nandurbar District. Quantitative assessment of plant resources from Parner and Sangamner Tahsils of Ahmednagar District was studied by Shendage *et al.*, (2007).

Review of literature reveals that, research work in biodiversity is related to either one or two aspects. The need of the hour is holistic approach for such type of work. This will help us in solving conservation problems of biodiversity.