

## CHAPTER II - REVIEW OF LITERATURE

### 2.1 India

Systematic floristic exploration in India started by Europeans who came to the Malabar Coast for spice trade. *Coloquis dos Simples* (Garcia de Orta, 1565), a checklist of the medicinal plants of India, is the first published botanical work on the plants of Western Ghats. After a century Hendrik Adriaan Van Rheede Tot Draakenstein, the Dutch Governor of Cochin surpassed all the previous work by compiling his monumental and historic work in 12 volumes of the *Hortus Indicus Malabaricus* (1678-1703), which is considered to be the most comprehensive printed work on the natural wealth of Asia and of the tropics. Mentioned in these volumes are plants of the Malabar region (which stretches from Goa to Kanyakumari, about 900 km in length and varying from 74 to 200 km in width) and the work describes plants with multiple uses as well as with medicinal properties and also includes modes of preparation and application, based on pre-Ayurvedic knowledge of the ancient, renowned, hereditary physicians of Malabar (Mohan Ram, 2005).

Notable plant collections in Peninsular India were made by Louis Theodore Leschenault, W. Roxburgh and Robert Wight. *Icones Plantarum Indiae Orientalis* (1838-1853) and *Illustration of Indian Botany* (1840) is the most important contributions made by Wight. He along with Arnott described several new taxa which featured in their published work *Prodromus Florae Peninsulae Indiae Orientalis* (1834). Hugh Francis Clarke Cleghorn made extensive explorations in Madras Presidency and in and around Calcutta. Beddome (1858a, 1858b, 1861-1862, 1876 and 1880) extensively and intensively collected the plants from different parts of the Madras presidency and the Eastern Ghats. Amongst his significant contributions are the *Flora Sylvatica* of Southern India in three volumes (1869-1874) and *Icones Plantarum Indiae Orientalis* (1868-1874). Woodrow (1891-1901) published a series of papers in Journal of Bombay Natural History Society on the '*Flora of Western India*'. During the same period the publications of '*Flora of British India*' under the leadership of Hooker (1872-1897) exhibited the extensive documentation on floristic wealth of India.

Most significant explorations in Peninsular India were made by T. Cooke (1901-1908), Talbot (1909-1911) and Gamble (1915-1936) published 'The Flora of the Presidency of Bombay', 'Forest Flora of Bombay presidency and Sind' and 'Flora of the Presidency of Madras' respectively. Till date these floras are used/ referred as the base line data on the plant resources of Peninsular India. After independence Botanical Survey of India was reorganized in 1955 and various parts of the country were explored. In 1966 a significant publication by Santapau and Kapadia came in the form of 'The orchids of Bombay'. Blatter S. J. (1926) came up with 'The Palms of British India and Ceylon', Matthew (1982-1990) is another stalwart in the field of Indian plant taxonomy. His notable publication is 'The Flora of Tamilnadu Carnatic and Illustrations on the Flora of Tamilnadu Carnatic'. These floras are known for their critical descriptions and very fine illustrations. Recently Ansari and Balakrishnan (1994) have published Family Eriocaulaceae in India which so far was a neglected group as family has very minute flowers. This has been revised in 2009.

From Western circle of BSI, Pune, Karthikeyan et. al., (1981) and Karthikeyan and Sharma (1983) have compiled the lists of such new additions since the publications of Cooke's (1901-1908) and Gamble's (1915-1936) floras. Similarly southern circle also carried out many explorations that have resulted in discovery of new taxa. Apart from these many Indian taxonomists, from different circles of Botanical Survey of India and few Universities and research institutes conducted intensive plant exploration studies in different regions or districts of India adding to the existing knowledge.

Since the Peninsular India being the part of the Gondwanaland in the remote past, the flora have many similarities with that of S. America, Africa, Malaysian Islands, Madagascar, Australia which were parted off from the Gondwanaland around 100 million years ago. Many species of plants are found common with these countries especially South Africa, Sri Lanka and Malaysia and many plants seen in Peninsular India are true poly topic species (Wood, 1974). Nayar (1980) had brought out several examples to substantiate this view and the origin of Indian Flora, and he was of the view that characteristic Flora of India is that of Peninsular India. The Flora of Western Ghats stands significant in Indian Flora because of high species diversity even in small areas of the total number of 17,000 species of Angiosperms in India, Western Ghats possesses more than 4000 species including many paleo-endemics (Nayar, 1982).

India has about 48000 species of plants representing about 10% of the world's flora (Hajra and Mudgal, 1997). Of the 20,074 taxa of angiosperms reported from India (Karthikeyan, 2009), 5752 (29%) taxa are endemic and are distributed in three major phytogeographical regions, viz., Indian Himalaya, Peninsular India and Andaman and Nicobar Islands (Nayar, 1996).

## **2.2 Historical Account of floristic Studies on Gujarat**

Plant diversity in Gujarat state vary greatly due to diverse ecological conditions like desert in Kachchh district and moist deciduous forest in the Dangs district. The floristic and vegetation studies in Gujarat received much attention since the later part of the nineteenth century. Dalzell and Gibson (1861), Palin (1880), Nairne (1894), Woodrow (1897-1901), Cooke (1901- 1908), Thakar(1910), Talbot (1909-1911), Saxton and Sedgwick (1918), Blatter (1926-1935), Thakar (1926), Blatter and McCann (1934) and Dixit (1940) have worked out flora and vegetation of different parts of Western India, including Kachchh and Saurashtra, but Gujarat region has been poorly represented in many of these works.

After independence of India workers have made important contributions in the field of flora and vegetation of some selected localities in Gujarat. These significant contributions includes floras like Contribution to Flora of Dangs Forests (Santapau, 1955), Plant Systematics (Sutariya, 1958), Flora of Devgad Hills (Chavan, 1961), Flora of Saurashtra Vol. I (Santapau, 1962), Flora of Pavagadh Hills (Chavan and Oza, 1966), Flora of Khedbrahma Region (Bhatt, 1969), Vegetation of Dangs district (Jain, 1963), Flora of Gora range of Rajpipla (Bhatt, 1971): Flora of Gujarat state (Shah, 1978); a sketch of the Flora of Gujarat (Shah et. al., 1981); and Flora of Saurashtra Vol. II and III (Bole and Pathak, 1988). Isolated but important information about the plant resources of Gujarat are also available from the works of Vaidya (1952), Chaudhari (1959) and Jodhani (1955-1956, 1958).

Detailed checklist was brought by Shah (1978) in Flora of Gujarat state, it gives description of 153 families, 788 genera, 1580 species, 124 varieties and 14 subspecies, probably a simultaneous work and published latter on "A checklist of the plants of Gujarat" by Raghwan et. al., (1981) gives a detail of 155 families, 861 genera, 1964 species and 87 varieties.

In addition some of other research contribution to Flora of Gujarat state were as follows. In Kachchh region, Rao (1981) worked on Flora of South-Eastern Kachchh, Bhatt (1993) worked on Flora of Western Kachchh and Raole (1993) worked on endemic desert taxa.

In Saurashtra region, Rao (1968-74) worked on Ecological studies of Saurashtra coast and neighbouring islands, Malohotra and Wadhwa (1973) worked on botany of Jamnagar District, Raizada (1967) worked on Flora of Gir forest, Toby Hodd and Patricia Hodd (1982) worked on Grasses of Western India, Yogi (1970) worked on Flora of Saurashtra. Menon (1979) worked on Floristics and phytosociological studies on some parts of Saurashtra, Thakrar (1987) worked on Flora of Rajkot, Oza (1991) worked on Flora of Bhavnagar, Chavan (1993) Vegetation of Gir, Taxonomical Study of Angiosperms of Palitana (Mehta, 1997) Nagar (2000) worked on Biodiversity of the Barda Hills and its surroundings.

In North Gujarat region, Yogi (1970) worked on Flora of North Gujarat and Bhatt (1971) worked on Flora of Khedbrahma.

In Central Gujarat region, Sabnis (1967) worked on Flora of Baroda and its environs including an account of the Cyperaceae of Gujarat, Bedi (1968) worked on Flora of Ratanmahal, Padate (1973) worked on Flora of Savlitaluka, Karatela (1973) worked on Floristic of Chotaudepur, Thaker (1974) worked on Kawant, Bhatt (1975) worked on Panchmahal, Patil (1980) worked on urban vegetation of Baroda, Joshi (1994) worked on Floristic of Cambay, Anjaria (2002) worked on Flora of Anand and Gohil (2013) worked on Floristic of Baroda and Panchmahal.

In South Gujarat region, Suryanarayana (1968) worked on Flora of Dangs, Patel (1971) worked on Flora of Valsad, More (1972) worked on Flora of Palnera Hill, Pardi and Udawada, Parabia (1974) worked on Cyperaceae of Gujarat, Desai (1976) worked on Flora of Basda, Yadav (1979) worked on Floristic of South Gujarat, Vashi (1985) worked on Floristic of Umarpada, Contractor (1986) worked on Floristic of Vapi and Umargaon, Bhatt (1987) worked on Flora of Navsari, Mac (1987) worked on Flora of Surat, Reddy (1987) worked on Flora of Dharampur, Pradeepkumar

(1998) worked on the Flora of Shoolpaneshwar Wildlife Sanctuary and Desai (2013) worked on Sedges and Grasses of South Gujarat.

Further in last few years many additions to the Flora of Gujarat has been made by Pandey and Padhye(1997, 2005, 2006), Pandey (2001, 2002), Meena (2004, 2005, 2007, 2012, 2013), Meena and Pandey (2004), Gohil (2006), Gohil and Patel (2006) and Raole and Desai (2008, 2011, 2012, 2013).

### **2.2.1 Ethnobotany in Gujarat**

Although term ‘ethno-botany’ coined by Harshburger (1895), the main definition of ethnobotany was provided by Jones (1936): “the study of the interrelations of primitive man and plants”.

15% of the population of Gujarat is tribal. Tribal population in and around forest since generations and developed strong economic, social, cultural, religious and spiritual relationship with forests. All the tribal population of the state has great depository of traditional wisdom. In most of the tribal villages, there are usually one or two practitioners of the traditional medicine, locally known as Vidyas or Bhagats.

Ethnobotanical studies in Gujarat were initiated by Jai Krishna Indrajai (1910), wherein he has given details of 684 plant species which are used by the tribes of Barda hills and its surroundings. Very few botanists have been attracted towards this discipline initially however, after the studies made by Jain (1963) gradually the work started peaking up. Yogi (1970) reported 61 species from Mahudi in Mahesana district, Thaker (1974) reported 38 species from Kawant range forest of Vadodara district, Vora (1980) reported 151 species from Dharampur taluka of Valsad district, Gopal (1983) reported 722 species from Gujarat, Vashi (1985) reported 183 species from Umerpada forest of Surat district, Contractor (1986) reported 83 species from Vapi and Umargaon forest of Valsad district, Bhatt (1987) reported 189 species from Navsari district, Reddy (1987) reported 281 species from Dharampur taluka of Valsad district of ethnobotanical interest. (Gopal, 1983; Reddy, 1987; Umadevi, 1988; Joshi, 1994). Punjani (1997) carried ethnobotanical studies on tribal areas of Sabarkantha district. Plants used by the tribe Rabari in Barda Hills of Gujarat (Jadeja, 1999) and Ethnomedicinal plants of Shetrunjaya Hills of Palitana, Gujarat (Bhatt, et al. 1999).

### **2.2.2 Medicinal Plants of Gujarat**

Post-independence one of the major work on medicinal plant was by Ahluwalia (1964, 1965) who worked on medicinal plants of Jamnagar. Joshi (1983) studied floristic phytochemical survey of South-Gujarat Forest with special reference to medicinal plants. Mac (1987) reported 35 medicinal plants from Surat district. Umadevi (1988) have worked on medicinal plants of Gujarat and noted 745 plants species. Nagar (2008) worked on medicinal plants of Saurashtra. A detail survey for medicinal plants of Gujarat was carried out by Gujarat Ecological Education and Research (GEER) Foundation which resulted in documentation of 1315 medicinal plant species from Gujarat of which 1308 are angiosperms (Pandey et al., 2005). Among 1308 angiosperms medicinal species, 1121 species are dicots while the rest 187 species are monocots. Out of seven non angiosperms medicinal plant species, five are Pteridophytes and two are Gymnosperms.

### **2.3 Flora of Dangs - Historical Account of floristic Studies on Dangs**

“Dangs” cited as locality by Cooke (1908) where collection were made by Bhiva, Dalzell and Woodrow. Dastur and Saxton (1922) also made collection from Dangs. However Santapau (1954-55) was the first author to give a systematic account of the Botany of Dangs Forest, based on his collection from Waghai and Unai made in month of October, 1954 and March, 1955. Later on Jain (1963), Santapau and Shah (1965), Chavan and Oza (1966), Santapau and Kapadia (1966) and Chavan and Sabnis (1967) also made their contribution to the Flora of Dangs.

The major contribution to our knowledge of Flora of Dangs was done by Suryanarayana (1968) who carried out his Ph.D. on “Contribution to Flora of Dangs Forest” and listed 655 plant species of which 507 were dicot species and 148 were monocot species. He reported 198 new plant species from Dangs district of which 87 plant species were addition to Flora of Gujarat State, 10 plant species were new to East while Bombay and 28 plant species were not sited in Cooke’s flora. He carried out his work during 1965 to 1968. He gave detail vegetation of Ahwa, Waghai, Bhavandagad, Subir, Mahal and Malegaon-Saputara. He describes each recorded species in detail with phenology and locality. Later on addition to the Dangs flora were done by Shah and Suryanarayana (1969) which results in addition of another 223 species. Recently Desai (2013) has added further knowledge regarding the

grasses and sedges of South Gujarat and reported 139 grasses and 42 sedges from Dangs.

### **2.3.1 Review of Ethnobotany of Dangs District**

Detail study on phyto-sociology and medico- ethnobotany was carried out by Parabia (1980, 1990, 1992 and 2002). Ethnobotanical survey reveals 73 plant species utilized by people of Dangs (Pandey et. al., 2005). A total of 50 ethno-botanically important plant species belonging to 40 genera and 28 families have been reported from Dang district (Nirmal Kumar et. al., 2007). A total of 207 field nos. comprising 621 ethno-botanically important specimens, 36 exhibits for Museum and about 20 specimens (bulbs & corms) for garden were collected from Dang district, Gujarat (MOEF- Annual report , 2012-13).