REVIEW OF LITERATURE

A comprehensive taxonomic treatment of the family Acanthaceae was done at the global level by Nees (1847), Bentham (1876) and Lindau (1895). The other important regional contributions were those of Nees (1832), Anderson (1867), Clarke (1884-1885) and Bremekamp (1944, 1960, 1965).

Nees (1832) undertook the first comprehensive treatment of the Indian Acanthaceae and a monograph of the whole family (Nees, 1847). He described a number of genera allied to *Stobilanthes* Blume, namely *Aechmanthera*, *Stenosiphonium*, *Phlebophyllum*, *Endopogon*, *Leptacanthus*, *Buteraea*, *Adenacanthus*, *Goldfussia* and subsequently described three more, namely *Triaenacanthus*, *Mackenziea* and *Hemigraphis*. Nees (1847) divided the family into two suborders, Anechmatacantheae and Echmatacantheae, based on the absence and presence of retinacula.

Anderson (1867) worked on the enumeration of the Indian species of Acanthaceae. His views regarding the delimitation of the family are different from those of Nees (1847) hence divided the family into three suborders: Thunbergideae, Ruellideae and Acanthideae. Anderson overcame the difficulties which arose from the generic delimitation of Nees (1832, 1847) by adopting a broad concept of *Strobilanthes*, which included all those species from Nees' allied genera having four or fewer ovules, while retaining the three allied genera (*Aechmanthera* Nees, *Stenosiphonium* Nees, *Hemigraphis* Nees) having more than four ovules. His approach to generic delimitation recognizing a broad *Strobilanthes* and three allied genera, has been followed to a large extent by Bentham (1876), Clarke (1884-1885), Gamble (1924), Wood (1994, 1995), Carine & Scotland (1998) and Scotland & Vollesen (2000).

Bentham (1876) divided the family into five tribes viz., Thunbergieae, Nelsonieae, Ruellieae, Acantheae and Justicieae, based on aestivation of corolla, form of corolla, number of seeds and absence or presence of retinacula, with special emphasis to anther morphology.

Lindau (1895) used pollen morphology, particularly in his tribal delimitation, when classifying the family and on the basis of pollen morphology distinguished four subfamilies viz.: Nelsonioideae, Mendoncioideae, Thunbergioideae and Acanthoideae. Acanthoideae which constitutes about 95% of the species of Acanthaceae characterised by the presence of explosive fruits with retinacula, he also illustrated the pollen types in Acanthaceae.

Bremekamp (1944) in his monograph of the Strobilanthinae proposed a radically different classification based primarily on pollen and seed morphological characters. Instead of recognizing Anderson's (1867) large *Strobilanthes* and three allied genera, he split the group into 54 genera, arranged in 27 informal groups. Bremekamp (1965) transferred Lindau's Nelsonioideae to the Scrophulariaceae and elevated the remaining three subfamilies into families, viz. Thunbergiaceae, Mendonciaceae and Acanthaceae. He further divided Acanthaceae into two subfamilies, Acanthoideae and Ruellioideae. Bremekamp's classification and nomenclature has been followed in many recent Indian accounts (Santapau, 1952; Ramamoorthy, 1976; Manilal, 1988; Ramachandran & Nair, 1988; Almeida, 1990).

The taxonomic importance of the pollen character in the classification of Acanthaceae was first observed by Radlkofer (1883), wherein he distinguished several acanthaceous pollen types. Work on pollen morphology was also carried out by Lindau (1893, 1895) and Bremekamp (1944). Important pollen studies of the family in India are by Raj (1961), who investigated 260 species belonging to 103

genera of Acanthaceae, Raj (1973) studied 143 species belonging to 63 genera mostly from India and Chaubal (1966) investigated 154 species representing 42 genera of the family, distributed in parts of Western India. Carine & Scotland (1998) presented the pollen morphology of *Strobilanthes* sensu Anderson from Peninsular India and Sri Lanka. They recognised 22 pollen types belonging to two pollen shape classes - spheroidal and prolate/subprolate, whereas Wang & Blackmore (2003) presented eight pollen types of *Strobilanthes* from China, of which five were similar to those from Carine & Scotland (1998).

A more refined classification of Acanthaceae based on molecular and phylognetic studies seems to be emerging out. Scotland *et al.* (1995) undertook parsimony analysis using *ndh*F and *rbc*L chloroplast gene sequences for species of Acanthaceae of which *ndh*F has more informative characters and greater systematic resolution at hierarchical level than *rbc*L. Scotland & Vollesen (2000) presented a new classification of Acanthaceae based on a synthesis of morphological and molecular data from 221 accepted genera and divided Acanthaceae into three subfamilies, viz. Nelsonioideae, Thunbergioideae and Acanthoideae. Carine & Scotland (2002) carried out a morphological cladistic analysis of the southern Indian and Sri Lankan Strobilanthinae in order to provide an informative formal classification. The results showed that all previously recognised taxa are in synonymy of an expanded *Strobilanthes*. Moylan *et al.* (2004) analysed phylogenetic relationships among members of the subtribe Strobilanthinae using morphology, chloroplasts *trn*L-F and nuclear ribosomal internal transcribed spacer (ITS) sequence data in which *trn*L-F indicated that Strobilanthinae are a monophyletic group.

Occasional monographs and revisionary works have come out on the family Acanthaceae. Bremekamp (1944) prepared a monograph on Strobilanthinae

describing 54 genera; Santapau (1952) prepared a critical monograph on the Acanthaceae of Bombay, in which he dealt with over 130 taxa spread over 42 genera. From these 42 genera, 22 species and four varieties belonging to 14 genera that are endemic to the Western Ghats are from the present study area; Wood (1994) in his account of *Strobilanthes* for the Flora of Ceylon recognized 30 species, of these 25 are endemic to the island and the remaining five are accepted as occurring in both India and Ceylon. Venu (2006) in his monograph on *Strobilanthes* from Peninsular India has described 59 species and three varieties of which 18 species and three varieties that are endemic to the Western Ghats are from the present study area.

Other floristic works of importance at regional level are those of Dalzell & Gibson (1861), Cooke (1905), Talbot (1909-1911), Gamble (1924), Blatter (1930), Santapau (1952; 1953), Mathew (1983), etc. "Bombay Flora" (Dalzell & Gibson, 1861) was the only work for reference for a long time giving short description for 82 species belonging to 36 genera. This work was greatly augmented by Cooke (1905) who added new plants to Dalzell's list. Twenty two species and four varieties, belonging to 12 genera endemic to Western Ghats are dealt by Cooke (1905) are present in the study area. Talbot (1909 - 1911) described eight genera and 38 species from the Bombay area. His classification of Acanthaceae is similar to Heine's (1962) based on number of stamens and corolla shape. Twenty five species and seven varieties that that are endemic to Western Ghats and dealt by Gamble (1923) are present in the study area. Blatter (1930) made substantial additions to the family as distributed in parts of Western India. Santapau (1952) continued the work of revising Bombay plants started by Blatter. Santapau has clarified some important points in the morphology and nomenclature of the plants of Bombay. Mathew (1983) in his Flora

of Tamil Nadu Carnatic gave the descriptions for 77 taxa of Acanthaceae of which only four are from the present study area.

Detailed illustrations of the flowering plants mainly from Peninsular and Southern India were made by Wight (1850), Beddome (1868-1874) and Mathew (1982, 1988) which are of great taxonomic significance.

Some of the noteworthy works at the state and district level which include Acanthaceae from the Northern and Central Western Ghats are those of Birdwood (1897); Santapau (1958, 1966); Vartak (1966); Ramamoorthy (1976); Yoganarasimhan *et al.* (1982); Bole & Almeida (1985); Rao (1985); Kulkarni (1988); Almeida (1990); Keshava Murthy & Yoganarasimhan (1990); Lakshminarasimhan & Sharma (1991); Kothari & Moorthy (1993); Deshpande *et al.* (1995); Moorthy (2001); Ramaswamy *et al.* (2001) and Almeida (2003).

Several works on systematics of Acanthaceae including species delimitation were carried out by Wood & Scotland (2003), Wood *et al.* (2003) and Carine *et al.* (2004).

Work on endemic plants was carried out by Jain & Sastry (1980) who published a state of the art report including 134 threatened plants of India; Raghavan & Singh (1983, 1984) reported 207 endemic and threatened plants of Western India and prepared an inventory of endemic and vulnerable species of Western India deserving conservation. From the 35 taxa of Acanthaceae dealt by them 23 taxa endemic to Western Ghats are present in the study area. Sharma *et al.* (1984) prepared a checklist of the plants of Karnataka that include Acanthaceae. Singh & Raghavan (1986) dealt with the distribution and status of 227 vulnerable and threatened taxa as well as conservation studies in Western India, which included 17 taxa of Acanthaceae endemic to Western India of which 11 are from the present study area. Checklists for

endemic plants giving the distribution pattern for each family were prepared by Ahmedullah & Nayar (1986) for the plants from Peninsular India and by Nayar (1996) for Peninsular India Andaman & Nicobar Islands and the Himalaya. The Red data book of the Indian plants by Nayar & Sastry (1987, 1988 & 1990) have enlisted 14 taxa of Acanthaceae among others as red-listed, of which only four are from the present study area. Mishra & Singh (2001) listed 14 taxa as endemic to Maharashtra and Joshi (2000) listed eight endemic Acanthaceae while dealing with taxonomic and phytogeographic investigations on endemic plants of Western Ghats with special reference to Goa. Mitra & Mukherjee (2007) worked out the reassessment and diversity of endemic angiospermic genera of India, where an attempt to find the genera confined to the country along with their distribution and species number, was made.

Santapau & Henry (1973) listed 57 genera for Acanthaceae in India. Kumar & Subramaniam (1986) enumerated chromosome number of 18 genera of Acanthaceae. Metcalf & Chalk (1950) gave anatomical details of dicotyledenous including that of Acanthaceae. Stem anatomy and its taxonomic significance in the family were established by Remadevi *et al.* (2006).

A large number of distributional records, rediscovery and re-evaluation of taxonomic status (Malhotra & Moorthy, 1981; Punekar *et al.*, 2003; Carine *et al.*, 2004) have been published. Calder *et al.* (1926) and Razi (1959) had published two lists as additions to species in Hooker's Flora of British India. Srinivasan & Agarwal (1963) have attempted at supplementing and amending the lists of Calder and Razi with reference to families Acanthaceae, Verbanaceae and Lamiaceae under two separate lists.