I. INTRODUCTION
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"Compositae has attracted, fascinated and even repelled botanists of over two centuries" (Heywood et al., 1977). This clearly indicates the complexity and diversity of the family, which comprises about 1302 genera and 20,000 species (Turner, 1977) with striking concentration in the temperate regions, especially in the new world. The family Compositae (Asteraceae) is noted as the largest of all the families of flowering plants.

The Heliantheae is one of the largest and most morphologically diverse tribes of the Compositae comprising about 211 genera, distributed mostly in the New World (Stuessy, 1977). Hooker (1881); Gamble (1921); and Mathew (1983) have studied 14, 17 and 25 genera respectively from India.

The members are primarily herbaceous, and the leaves are mostly opposite, without a strong or pungent smell, with entire margin, divided or lobed, and with various types of vesture. The involucre is bi-to multiseriate and without a calyculum. The phyllaries are herbaceous, imbricate and sub or unequal. The receptacle is convex to conical, conspicuously paleaceous and with the chaff scarious to sub herbaceous and conduplicate around the disc florets. In features of the disc
corollas, the tube tends to be broad and shorter than or as long as the throat. The pappus of the disc and ray florets is of scales, awns, or lacking (rarely setose). The style branches of the disc florets are markedly bifid (except in genera with rudimentary ovaries), with truncate, rounded and tapered apices. The anthers are characteristically dark brown to black and ridged abaxially.

Taxonomy – the oldest and conventional branch of Botany is an unending synthesis of data obtained from different disciplines of biology solely with the objective of refining the circumscription and delimitation of taxa at different levels of taxonomic hierarchy. The earlier works on taxonomy were mainly based on external and internal morphology viz., trichomes, stomata, palisade ratio, leaf venation pattern, vessels, etc. Modern trends in taxonomy have been directed towards holistic studies, leading to the accumulation of data from several fields such as anatomy, embryology, cytology and palynology. The newer aspects such as numerical taxonomy, chemotaxonomy, and biosystematics have greatly clarified the confusions in the systems devised by the classical taxonomists. A perusal of literature will prove how these studies have contributed greatly in solving the taxonomic problems in general.

Among the earlier workers on stomata, the names of Hilderbrand (1866); Strasburger (1866-1867); Vesque (1889); Togninini (1897) and Porsch (1905) deserve special mention. Vesque (1889) was the first to classify the stomata into four types viz.,
"Ranunculaceous", "Cruciferous", "Caryophyllaceous" and "Rubiaceous". Metcalfe and Chalk (1950) replaced these stomatal terms by Anomocytic, Anisocytic, Diacytic and Paracytic respectively. Since the publication of these two stomatal classifications, a number of classifications are proposed by different authors.

Of all plant organs, leaves are highly polymorphic and provide sites of diverse features. Moreover, there are many taxa with similar leaf forms and therefore it seems rather difficult for plant taxonomists to rely upon this character. However, in recent years the leaf venation pattern has attracted the attention of paleobotanists and morphologists. Kerner and Oliver (1895) proposed a classification of venation pattern. Levin (1929) and Strain (1933) in their work have stressed the taxonomic importance of vein-islets and vein endings. Carlquist (1959); Dede (1962); Varghese (1969) have shown the relevance of venation pattern in the study of evolution. Hickey (1971) studied the evolutionary significance of leaf architecture and published a classification of architecture of dicotyledonous leaves in the year 1973. Later Melville (1976) proposed the terminology of leaf architecture of angiosperms. The leaf architecture and venation pattern studied in different dicotyledonous families are: Acanthaceae (Chaudhari and Inamdar, 1984); Aceraceae (Banerji and Das, 1972; Tunai Toshimasa, 1978); Apocynaceae (Mohan and
Inamdar, 1982); Asclepiadaceae (Mohan and Inamdar, 1984); Asteraceae (Solbrig, 1960; Ravindranath and Inamdar, 1982, 1985a, 1985b; Lerston and Curtis, 1985; Banerjee and Deshpande, 1973); Brassicaceae (Rao and Inamdar, 1983); Convolvulaceae (Shenoy and Inamdar, 1985; Inamdar and Shenoy, 1981); Dilleniaceae (Rury and Dickson, 1977); Euphorbiaceae (Sehgal and Paliwal, 1974); Magnoliaceae (Pray, 1954; Tucker, 1964); Malvaceae (Bhatt et al., 1988); Paeoniaceae (Inamdar et al., 1983); Passifloraceae (Inamdar and Shenoy, 1982); Ranunculaceae (Avita et al., 1981c); Solanaceae (Gupta, 1961; Murthy and Inamdar, 1978) and Bignoniaceae (Jain, 1978).

The pharmacognostic value of epidermal features and palisade ratio has long been recognised (Datta and Mukerji, 1952; Wallis and Forsdike, 1938) and is relevant even today (Metcalf and Chalk, 1979; Baranova, 1992). Zorning and Weiss (1925) for the first time suggested that the relationship between the cells of the epidermis and those of the subjacent mesophyll might be of taxonomic interest. Later, Wallis and Dewar (1933) introduced the term palisade ratio. Studies in palisade ratio were carried out by scientists viz., Bensen, (1962); Brown (1958); Dewar (1933, 1934a, 1934b); Wallis and Forsdike (1938) and Merlee (1989) in eighteen species of Polygala.

The progress in histochemical methodologies (Krishnamurthy, 1988) has contributed much in clarifying the systematic disputes of the family. The application of histochemistry to unravel the complexity of plant structure and
function has long been recognised (Arnoldi, 1954, 1959; Arnoldi et al., 1961, 1964; Luneva et al., 1970; Malik and Sethi, 1975 a, 1975 b; Sethi and Malik, 1974, 1975; Patel et al., 1975; Ling Lee et al., 1977; Mckey et al., 1978; Murthy, 1979; Lowther et al., 1987; Mole et al., 1988; Salatino et al., 1988; Theunissen, 1990; Theunissen and Jordaan, 1990; Jordaan and Theunissen, 1992).

The study of the pollen morphology as an effective aid to plant taxonomy and phylogeny has been amply demonstrated through a large volume of publications on the subject, as example of which may be cited "pollen morphology and plant taxonomy - Angiosperms" (Erdtman, 1952), "The Evolutionary significance of the Exine" (Ferguson and Muller, 1976) and "The Palynological basis for the triphyletic theory of angiosperms" (Nair, 1979). Throughout the span of the history of studies in pollen morphology, the Compositae invariably attracted botanical researchers, of which the studies made by Wodehouse (1935), formed the basis of contemporary growth of knowledge. Detailed studies made by Erica Stix (1960) and Skvarla et al., (1977) have added considerably to establish the uniqueness of exine architecture in the family, providing useful information towards the taxonomy and phylogeny of the group. Palynological studies have been conducted in various tribes of Compositae other than Heliantheae by Nair and Lawrence (1985); Salgado et al., (1982); Visset (1974); Clark et al., (1980) and in Heliantheae by Concalves & Barbosa (1976); Horner & Harry (1978). Their studies proved the validity of palynology as a good taxonomic criteria.

Davis and Heywood (1963) say, "Seeds frequently receive summary treatment in floras, and even in detailed taxonomic studies, their potential importance in providing characters of value for comparative and interpretive purposes, is seldom adequately explored". Recently it was realised by the researchers that the character of seeds can be used as an important taxonomic tool. Netolitzky (1926) noticed that the structure of seed coat is characteristic in general and therefore it is of taxonomic value. Takhtajan (1959) pointed out that even for the phylogenetic correlation existing between families and genera, the structure of seed coat ("spermoderm") might be important. Duke (1961) in his study on Drymaria (Caryophyllaceae) demonstrated the importance of seed shape, sculpturing and colour in determining the systematic position of the different species. Obermeyer (1962) used the number and shape of seeds to distinguish two genera - Chlorophytum and Anthericum. In Compositae, development and structure of seeds and fruits have been studied in various tribes such as Inuleae, Eupatorieae, Helenieae and Liguliferae (Pandey et al., 1982).
Pandey and Singh 1983; Pandey et al., 1986; Pandey, 1976; Gurucharan Singh et al., 1972). Recently, a new classification for Heliantheae is proposed by Robinson (1981) based on Achene morphological characters. Some of the recent works done on seed coat of different families are: Asclepiadaceae (Rahman and Wilcock, 1991; Cucurbitaceae (Dalbir Singh and Dathan, 1972); and Papilionaceae (Chopra et al., 1984; Trivedi and Gupta, 1987a, 1987b).

Vessel elements have been considered as a key unit of the xylem from the point of view of evolution (Carlquist, 1962), eventhough earlier literature reveals that only very little work had been done on vessels in general (Bailey and Tupper, 1918; Bailey, 1944; Frost, 1930a, 1930b; Handley, 1936; Shah, 1954; Abbe and Abbe, 1971; Inamdar and Murthy, 1977; Aleykutty and Inamdar, 1978; Murthy et al., 1978; Cheadle, 1943a, 1943b, 1944, 1953, 1955; Shah et al., 1967; Cheadle and Kosakai, 1972, 1973, 1974, 1975, 1976; Rao, 1979).

The progress in microscopy, particularly electron microscopy has its parallel in our understanding of the structure and sculpture of the pollen walls, and fruit walls along with other epidermal characters, which have led to the effective use of new morphological parameters for taxonomic and phylogenetic purposes. Studies of micromorphological characters, such as anther collars, stigma surfaces, style-branch appendages, surface morphology of achenes, and pappus members with SEM have shown that interpretations of characters based on LM alone may be
incorrect simply because the LM does not make certain features prominent or even noticeable. The SEM can be used to discover new characters and to assist in the proper interpretation and taxonomic use of previously known feature. Eventhough, electron microscopes have become widely available in the last decade, our accumulated experience is still relatively limited, the total range of characters made visible by EM has not been thoroughly exploited (Tomb. 1979) and the extent of variability of the characters which EM reveals has not been explored thoroughly. In recent years researchers have proved that SEM can be used in conjunction with numerous other characters in making taxonomic decisions at the generic (or any other) rank.

Recently the need for a re-evaluation of generic and subtribal relationship in the Heliantheae has been emphasized by several workers (Torres, 1963; Solbrig et al., 1972; Stuessy, 1973). Nevertheless the work done on the various aspects of this tribe is very little. However, within the limits of a thesis, the present work is an attempt to gather structural, chemical and numerical informations representing the vegetative and reproductive parameters respectively. The present work was therefore, undertaken with the following objectives.

1. To utilize the observations on epidermal features, leaf architecture, palisade ratio, vessel elements and external morphology of pollen grains and achenes for taxonomic purposes.
2. To reveal the role of histochemistry in identifying the subsidiary cells.

3. To bring forth the correlation, if any, between the vegetative and reproductive characters in the systematics of the tribe.

4. To utilize the variation of all possible characters in the analysis of evolutionary trends and in the circumscription and determination of taxa at different taxonomic hierarchy.

5. To utilize the methods in numerical taxonomy for the classification of the tribe.