The aspects of mature epidermis, structure, distribution and frequency of stomata; structure and types of trichomes; leaf architecture; nodal, internodal, mid rib and petiolar vessel elements and xylem fibres of 32 genera and 52 species belonging to eleven angiosperm families viz. Asclepiadaceae, Campanulaceae, Caricaceae, Cochlospermaceae, Combretaceae, Lecythidaceae, Lythraceae, Myrtaceae, Papaveraceae, Punicaceae and Sapotaceae form the subject of present discussion. The cross section of the reviewed literature shows that these aspects in eleven families have drawn very little attention of researchers. The aspects of epidermis, trichomes, stomata, leaf architecture, vessel elements and fibres as compiled by Metcalfe and Chalk (1950) for the members of these families are as under:
**EPIDERMIS**

The epidermal cells are rectangular, polygonal, isodiametric elongated and large with thick or thin; straight or sinuous (deeply or slightly) anticlinal walls; cuticle thin or thick.

**TRICHOMES**

Trichomes may be eglandular or glandular. Glandular trichomes have not been discussed in any of the studied species. The eglandular trichomes are unicellular or biseriate, tufted, stellate or branched, uniseriate with uni or bi or multicellular foot and sometimes shaggy type.

**STOMATA**

Mostly anamocytic; paracytic, hemiparacytic, anisocytic; diacytic, staurocytic, cycloptic, polocyic also occur rarely. Stomata are mostly confined to the lower surface but occur on the upper surface also in some of the species investigated.

**VESSEL ELEMENTS AND XYLEM FIBRES**

They are variable in size from extremely short to medium sized with simple, scalariform perforation plates and intervascular pitting alternate, opposite, sometimes both
observed in the same element and same organ. Scalariform pitting also observed in many taxa. Spiral and reticulate pitting observed in the primary vessel elements.

The fibres also vary in size and shape. They are very short to moderately long. Usually they are uniseptate, but the sepetate fibres are also found in many of the taxa.

LEAF ARCHITECTURE

Leaf architecture has not been described by Metcalfe and Chalk (1950).

EPIDERMIS

Structure of the epidermis has been described by several researchers in most of the angiosperm families in the previous years; however, their attention was meagre in the presently investigated families. To enlighten the present literature the author described the epidermal studies in the above mentioned families. The present findings are in accordance with those of Metcalfe and Chalk (1950). According to Metcalfe and Chalk (1950) the epidermal cells over the veins are elongated in the families investigated. The epidermal anticlinal cell walls are greatly thickened in the members of Combretaceae, Myrtaceae, Lecythidaceae, Lythraceae and Sapotaceae.
STOMATA

Metcalfe and Chalk (1950) described the stomata in all the families studied which are nearly always confined to the lower surface, surrounded by a rosette of numerous epidermal cells. A survey of literature reveals that stomata in these families have not been reported by any of the previous workers.

From our observations on about 52 different taxa, it is evident that the epidermal cells are longest on both the surfaces in *Eucalyptus citriodora* and smallest in *Rotala serpyllifolia*. The highest epidermal cell density is observed in *Myrtus communis* and lowest in *Terminalia* spp. The stomatal index (SI), stomatal frequency (SF), stomatal size (SS), epidermal cell density (ECD) and epidermal cell size (ECS) differ distinctly in different taxa examined. The types of stomata observed in these families are anomocytic, anisocytic, tetracytic, staurocytic, paracytic, hemiparacytic, cyclocytic, polocytic and diacytic. The different types occur on the same surface of the same leaf in a species. The most frequent type is anomocytic in almost all taxa investigated, but hemiparacytic also occurs in all the taxa except in *Callistemon speciosus*, *Eucalyptus citriodora* and *Punica granatum* where they are paracytic.
Some abnormal stomatal forms like variously oriented contiguous stomata, unequal size of guard cells, pore without guard cells, degeneration of one guard cell, arrested development, cytoplasmic connection between two adjacent guard cells and persistent stomatal cell are also noticed. The diversity in stomatal types is recorded in several angiosperm families by Gupta et al. (1965), Paliwal (1965a, 1966a, b, c, 1967); Pant (1965b, 1966); Pant and Banerji (1965a, b, c); Shah (1967, 1968), Shah and Gopal (1969a, b, 1970, 1972); Kothari and Shah (1974, 1975); Inamdar et al. (1974); Naidu and Shah (1981); and Farooqui (1981a, b). Diversity in stomatal types has also been observed during the present investigation.

TRICHOMES

According to Metcalfe and Chalk (1950), the trichomes are divided into two types viz. eglandular or glandular. The present investigation describes the structure, distribution and classification of eglandular trichomes.

The eglandular trichomes are divided into uni, bi and multiseriate on the basis of the number of cells comprising the trichome. The unicellular trichomes may be simple, or conical. The multicellular trichomes are divided into uniseriate and branched. The uniseriate trichomes are either
hooked or shaggy or conical. The structure, distribution and classification of trichomes in some dicotyledonous families are studied by Carlquist (1958, 1959a, 1959b, 1959c); Ramayya (1962, 1963, 1969); Patel and Inamdar (1972); Inamdar and Gangadhara (1975, 1977) and Aleykutty and Inamdar (1978a). Uphof and Hummel (1962), compiled literature on the plant hairs and pointed out their taxonomic significance.

**LEAF ARCHITECTURE**

Several authors have shown that a careful description of venation pattern, together with studies of other details of leaf anatomy, can supplement various taxonomic data (Carlquist, 1959; Verghese, 1969). The distinctive literature of minor as well as major venation pattern can bear comparative analysis (Pray, 1955a, 1955b). Hickey (1973) studied and classified the leaf architecture in dicotyledonous leaves. Hickey and Wolfe (1975) pointed out that the analysis provides the first systematic studies of dicotyledonous leaf architectural features. Melville (1976) gave the terminologies for leaf architecture of angiosperms.

The foliar venation has been studied in different angiospermic families by Foster (1961), Gupta (1961), Hickey (1973), Hickey and Wolfe (1975), Banerji (1978), Singh et al. (1978), Frank (1979), Jain (1978), Banerji

The leaves are simple, symmetrical and asymmetrical, ovate, oblong, obovate, elliptic, linear with acuminate, emarginate, acute and attenuate apex and lobate, obtuse, cordate, acute and cuneate base. The margin is entire or somewhat wavy. The texture is coriaceous, chartaceous and membranous. The leaf area shows great diversity in different taxa. Smallest leaf area is observed in Rotala indica (0.78-1.50 cm$^2$) and largest area recorded in Careya arborea (about 150 cm$^2$).

The venation pattern conforms to pinnate, craspedodromous, camptodromous, actinodromous and eucamptodromous with brochidodromous secondaries in most of the studied species. Primary vein/s is/are straight in all the species and thick or thin. The number of secondary veins on each side of the primary veins is 2-8, arranged in an alternate or opposite fashion, sometimes both types occur in the same leaf. The secondary veins may be unbranched or dichotomously or irregularly branched. Inter secondary veins are found in all the investigated taxa. Marginal ultimate venation is
well developed or incomplete. It may be of looped or fimbriate type.

Minor venation pattern is observed up to quinternary (5°) in most of the taxa. Areolation is complete in all the species except in Ammannia baccifera, Rotala indica, R. serpyllifolia and Lobelia alsinoides and L. heymena. Areoles may be pentagonal, rectangular, squarish and trapezoidal (in shape), their size being variable in different taxa investigated.

Loops are formed by the veinlets and tracheids. Tracheids and bundle sheath parenchyma and veinlets are observed in all the taxa. Bundle sheath cells may be oval, ellipsoidal, rectangular, triangular and trapezoidal.

Vein endings are simple or branched once, twice, thrice or many times. They may be uni or biseriate. The taxonomic significance of vein endings are emphasized by Levin (1929), Strain (1933) and Inamdar and Murthy (1981). Isolated vein endings, isolated tracheids and bundle sheath cells are also observed in various taxa.

From the above information the leaf architectural characters may be helpful in delineating the different taxa within the family or in different families, thus, can provide reliable data in identification, and hence, their importance in forensic sciences at all level cannot be underestimated.
VESSEL ELEMENTS AND XYLEM FIBRES

The measurements of the total length of an element, rather than any part of it, gives the most reliable data in phylogenetic considerations (Chalk and Chattaway, 1934). Abbe and Abbe (1971) pointed out that the differences in habitat have minor influence on dimensional characteristics of vessel members. A general account of tracheary elements is given by Carlquist (1961), Fahn (1974), Radford et al. (1974) and Esau (1977). However, it is interesting to note that the studies of vessel elements in different families have drawn considerable attention of the botanists viz. Bignoniaceae (Chalk, 1933), Gramineae, Cyperaceae, Juncaceae, and Restoniacae (Cheadle, 1953, 1955), Capparidaceae (Aleykutty and Inamdar, 1978), Cyperaceae (Cheadle and Kosakai, 1972, 1974), Juncales (Cheadle and Kosakai, 1973, 1975), Convolvulacaeae (Shenoy and Inamdar, 1979), Myrtaceae (Khan et al., 1980), Malvaceae (Rao and Inamdar, 1980), Umbelliferae (Koshy, 1981), and Papilionaceae (Gopala Rao, 1981). Metcalfe and Chalk (1950) reported the vessel elements to be extremely short to moderately long, solitary or in small groups, with simple, occasionally scalariform perforation plates in all the families investigated.

From a critical analysis of the vessel elements of different organs (node, internode, petiole, mid ribs etc.)
in different taxa it is evident that they show a great diversity in their structure, shape, size and distribution, even in different organs of the same taxon. In all the investigated species the vessel elements fall under extremely short (below 175 μm), very short (175-250 μm long), moderately short (250-350 μm long), medium sized (350-800 μm long) (following the classification of Radford et al., 1974). Occasionally moderately long (800 μm onwards) are also found. Moderately long vessels with an equal frequency occur in the internodes of Terminalia chebula. The broadest and narrowest vessel elements are found in internode and petiole of Eucalyptus citriodora and Couroupita guianensis respectively.

The extremely short vessel elements occur together with other types in different organs of various species studied with a few exceptions. Therefore, it is rather not possible to draw any phylogenetic significance on the basis of vessel studies.

Vessel elements with two perforation plates are common in all the taxa investigated. Vessel elements with scalariform perforations are considered to be the primitive than those with simple perforation plates (Bailey, 1953). The simple perforation plates have evolved from the scalariform type.

The tails are found in almost all species and their sizes are nearly equal in all taxa. The adjacent wall
thickenings of vessel elements may be simple or bordered.

The occurrence of fibres in all families is reported by Metcalfe and Chalk (1950). The fibres are moderately short to moderately long, classified with the reference of their length by Radford et al. (1974). Usually fibres are unisepate, occasionally bi or multisepate, thick or thin walled, lignified, even or smooth, ends pointed, sometimes one end truncate or oblique or much prolonged at both ends into tails, occasionally one or both ends very shallowly to deeply forked. Pits are often distinct, obliquely alternate or irregularly arranged, but lateral wall pitting is simple and slit like. They may be spindle shaped, ellipsoidal, straight or cuneate.