

**ELAEOCARPACEAE**

## Chapter 7

## ELAEOCARPACEAE

The Elaeocarpaceae are a small family of about 10 genera and 400 species (Cronquist, 1981), widely distributed in tropical and subtropical regions. The two genera **Elaeocarpus** (250 Spp.) and **Sloanea** (100) are the largest genera. In India the family is represented by 3 genera and about 45 species.

The members of this family are trees or shrubs with simple, entire, alternate/ opposite leaves. Flowers are usually bisexual, actinomorphic, regular, hypogynous and borne in racemes, panicles or dichasial cymes. Epicalyx is absent. Sepals (3) 4-5 or more, distinct or connate at the base, valvate or sometimes imbricate. Petals (3) 4-5, distinct or seldom connate at the base, often fringed at the tip, valvate, or seldom imbricate or sometimes wanting.

Stamens numerous, distinct, originating centrifugally, often weakly organised to five antisealous groups, borne on a more or less definite disc or enlarged receptacle that is sometimes elongated to form an androgynophore. Anthers tetrasporangiate and diethecal opening by a transverse apical slit or by apical pores. Connective is often prolonged. Gynoecium of two to many carpels (rarely one), syncarpous, 2-many locules with two or more ovules on axile placentation. Style one, simple or lobed. Ovules anatropous, bitegmic, crassinucellar with a zig-zag micropyle and an integumentary tapetum. Fruit a shiny capsule or drupe.. Seeds sometimes arillate with copious, oily or proteinaceous endosperm. Embryo straight or curved.

#### Anatomical features

Hairs are simple, unicellular and glandular but never stellate or peltate. Mucilage cells are seen in leaf epidermis. Leaf and stem are devoid of mucilage cavities or canals. Crystals of calcium oxalate solitary or in clusters. Phloem continuous (triangular, stratified phloem not seen). Vessels with simple perforations in pronounced radial multiples. Intervascular pitting large, usually opposite, fibres with small bordered pits, septate. Wood rays pluriseriate (2-3 cells wide or 4-10 cells wide), or uniseriate, heterogeneous. Wood parenchyma scanty, paratracheal.

In *Dicraspidia* and *Muntingia* vessels are mostly solitary (as against radial multiple of 4 or more in other genera), wood semi-ring porous, inter-vascular pitting small and alternate, parenchyma apotracheal and storied and rays homogeneous, fibres not septate, storied.

### Palynological, Embryological and Cytological features

Pollen grains are binucleate, small, globose and commonly tricolporate. Ovules bitegmic, crassinucellar with zigzag micropyle and an integumentary tapetum. Endosperm development is nuclear. Endosperm is oily, proteinaceous and copious. The basic chromosome numbers are 12, 14 or 15.

### Chemistry

The Elaeocarpaceae are poorly investigated for their chemistry. Gibbs (1974) reports unique indolizidine and near-indolizidine alkaloids from *Elaeocarpus*. Ellagic acid is isolated from *E. ganitrus* (Bhattacharya et al., 1975), proanthocyanidins from *Muntingia* and tannins from *Muntingia*, *Aristotelia* (Gibbs, 1974) and *Elaeocarpus* (Tanaka et al., 1986).

### Economic importance

From an economic point of view the Elaeocarpaceae are not of much importance. Some species of *Elaeocarpus* and *Sloanea* are used for veneers and cabinet work. Holy rosaries made out of *Elaeocarpus* fruits (Rudrakash) are highly priced. A few species of *Aristotelia*, *Tricuspidaria* (*Cnidodendron*) and *Muntingia* are cultivated as ornamentals. *Elaeocarpus tuberculatus* is considered useful in cholera and prolonged fevers and *E. serratus* anti-dysenteric (Chopra et al., 1933).

### Taxonomy

The Elaeocarpaceae were treated as a tribe of Tiliaceae by Bentham and Hooker. Schumann (1895) divided the family into two tribes Elaeocarpeae and Aristotelieae and this classification is followed by many. The inclusion of

**Muntingia** in this family is debatable. It has a valvate calyx and plurilocular ovary like the *Elaeocarpaceae* but is different from them in possessing short, broad, longitudinally dehiscent anthers. This genus, once placed in the *Tiliaceae* along with *Elaeocarpus*, exhibits many anatomical features in common with the *Tiliaceae* (Metcalfe and Chalk, 1950). Thorne (1981) retains **Muntingia** in *Tiliaceae* but Cronquist, taking into consideration the similarities between this genus and *Flacourtiaceae* genera **Prockia** and **Hasseltia**, transferred it to the *Flacourtiaceae*. Gibbs (1974) included **Muntingia** in *Elaeocarpaceae* itself.

In the present work two species of *Elaeocarpus*, and one each of *Tricuspidaria* and **Muntingia** are screened for their flavonoids, other phenols, alkaloids, saponins and tannins and with the aid of chemical data the taxonomic affinities of the plants in question are assessed.

### Materials and Methods

*Elaeocarpus ganitrus*, *Tricuspidaria* and **muntingia** were obtained from Sims park, Conoor (Tamil Nadu) and *E. serratus* from FRI gardens, Dehradun. The leaves of these plants are analysed using standard procedures described in chapter 2.

### Results

The results of screening leaves of four members of the *Elaeocarpaceae* are presented in Table 7.

All the four plants i.e., two species of *Elaeocarpus* and one each of *Tricuspidaria*, and **Muntingia** contain flavonoids in their leaves. Unlike other families, flavones are found to be absent in this family. Flavonoids are the dominant flavonoids distributed in all the four plants. Kaempferol is rare, obtained from *Elaeocarpus ganitrus* only.

Table 7: The distribution of various chemical characters in four members of the

Elaeocarpaceae

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
<u>Tribe - Elaeocarpeae</u>																					
1		+	.	+	+	.	+	.	+	.	+	.	+	+	.	+	.	+	.	+	.
	<i>Elaeocarpus ganitrus</i> Roxb.																				
2.		.	.	+	.	.	+	.	.	.	+	.	.	+	.	.	.	.	.	+	.
	<i>Elaeocarpus serratus</i> Roxb.																				
3.		.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.
	<i>Tricuspidaria dependens</i> Ruiz.&Pav.																				
4.		.	+	.	.	.	.	.	.	.	+	.	+	+	+	+	+	+	.	.	+
	<i>Muntingia calabura</i> Roxb																				

1) Kaempferol 2) 7-OMe Kaempferol 3) Quercetin 4) 3'-4'-DiOMe Quercetin, 5) 3'-OMe Quercetin, 6) 4'-OMe Quercetin, 7) Gallic acid, 8) Myricetin 9) Glycoflavones, 10) Proanthocyanidins, 11) p-OH benzoic acid, 12) Protocatechuic acid, 13) Vanillic acid, 14) Syringic acid, 15) Gentisic acid, 16) Melilotic acid, 17) p-Coumaric acid, 18) Ferulic acid, 19) Alkaloids, 20) Saponins 21) Tannins.

7-OMe Kaempferol also is seen in *Muntingia* only. Quercetin is more common, present in both *Elaeocarpus* and *Tricuspidaria*. 3'-OMe Quercetin is present in *E.ganitus* and 4'-OMe quercetin in *Tricuspidaria*. 3',4'DiOMe quercetin is located in both the species of *Elaeocarpus*. Myricetin is found to occur in *E. serratus*, while glycoflavones are seen in *E. ganitus* only. *Muntingia* gave a positive test for proanthocyanidins. Among the phenolic acids, gallic acid is found to be present in the genus *Elaeocarpus*. Vanillic and syringic acids are ubiquitous. *p*-Hydroxy benzoic acid and ferulic acid are present in *Muntingia* and *Tricuspidaria* respectively. *p*-Coumaric acid is located in *Elaeocarpus* as well as in *Muntingia*. Gentisic acid is identified from *Muntingia* and *Tricuspidaria*. Alkaloids are seen in *Elaeocarpus* only. All the three genera are devoid of saponins. *Elaeocarpus serratus* and *Muntingia* contained tannins.

#### Discussion

All the three genera screened in the present study *i.e.*, *Elaeocarpus*, *Tricuspidaria* and *Muntingia*, appear to form a homogeneous group producing flavonols as the dominant phenolics. The flavones, present in all the four other families screened (*Malvaceae*, *Bombacaceae*, *Sterculiaceae*, and *Tiliaceae*), are conspicuously absent here. The production of glycoflavones (*Elaeocarpus*) and proanthocyanidins (*Muntingia*) are the two characters bringing this family together with the other members of the Malvales.

The systematic position of *Muntingia* is debated in detail. This genus differs from the other members of the *Elaeocarpaceae* in many anatomical features such as solitary

vessels, small alternate intervascular pitting and similar pits to the ray cells, parenchyma apotracheal and storied and few uniseriate rays. Cronquist (1981) transferred **Muntingia** to the Flacourtiaceae based on the nature of dehiscence of anthers. Though **Muntingia** is different from the rest of the Elaeocarpaceae in producing proanthocyanidins, it is quite unlike the Flacourtiaceae members in not producing flavones, the characteristic flavonoid pigments of latter family. Moreover there is no report on a cyclopentenoid lipid component (which is highly typical of the Flacourtiaceae) anywhere in **Muntingia**. Anatomically also the Flacourtiaceae are characterised by the rarity or absence of wood parenchyma (when present, paratracheal and non-storied) and 3-5 cells wide medullary rays composed of square and upright cells as against the apotracheal storied parenchyma and uniseriate rays of **Muntingia**. All these evidences indicate that the inclusion of **Muntingia** into the Flacourtiaceae increases the heterogeneity (which is already evidenced by the highly diversified nature of this family) of this group. **Muntingia** is not at home in the Tiliaceae also because it does not produce the flavones which form one of the dominant phenolic pigments of that family. Therefore, the proper place of **Muntingia** seems to be in the Elaeocarpaceae itself where it may be given a separate status of a tribe Muntingieae.