

Chapter 6

Chemotaxonomical studies on some members of the Melastomataceae

The Melastomataceae are a large family consisting of about 200 genera and 4000 species widespread in tropical and subtropical regions. The plants are shrubs or herbs or sometimes lianas or small trees, often with quadrangular stems and commonly with various sorts of complex hairs. Leaves opposite (but often the members of a pair unequal, or one member even suppressed) or seldom whorled, simple and usually entire, commonly with 3-9 prominent sub parallel veins, seldom pinnately veined. Stipules mostly wanting or vestigial. Flowers in various sorts of cymose inflorescences, commonly rather large and showy, sometimes subtended by showy bracts, typically without nectar and visited by pollen-gathering insects, perfect or seldom unisexual, partly or wholly epigynous or less often strongly perigynous with the persistent hypanthium enveloping but free from the ovary or sometimes the hypanthium attached to the ovary only by longitudinal septum like ribs, regular except for the stamens, 4-5-merous. Calyx lobes valvate, or the calyx sometimes calyptrate or reduced to a mere rim on the hypanthium. Petals distinct or rarely connate at the base and convolute in bud. Stamens generally in 2 cycles and twice as many as the petals, often dimorphic or seldom only one cycle alternate with or opposite to the petals. Filaments generally inflexed in bud (each anther sometimes occupying a cavity between the hypanthium and the ovary); commonly twisted at the anthesis so as to bring all the anthers to one side of the flower. Anthers tetrasporangiate and dithecal opening by pores or slits. Connective often thickened at the base and commonly with appendages of diverse form. Gynoecium of 3-5 carpels united to form a compound ovary with as many locules or seldom unilocular through failure of the partitions. Style terminal, stigma capitate. Ovules numerous in each locule, an axile or less often basal or rarely even free-central

or parietal placentas, bitegmic with a zig-zag micropyle. Fruit a loculicidal capsule or berry, seeds commonly numerous, mostly small without endosperm and embryo with two unequal cotyledons.

Anatomical Characters

Clustered or solitary crystals of calcium oxalate present in some of the parenchyma cells. Secretory cells also are reported. Vessel-segments are with simple perforations and vestured pits. Imperforate tracheary elements with clearly bordered pits, or with simple pits and then generally septate. Wood-rays uniseriate or some of them 2-5 seriate, heterocellular or less often homocellular, many of the cells containing amorphous gummy deposits. Wood-parenchyma commonly paratracheal and rather scanty, but sometimes also in apotracheal ribbons and including some vertical crystalliferous strands. Internal phloem characteristically present and intraxylary phloem sometimes present as well. Cortical and/or pith bundles usually present.

Previous Chemical Reports

No member of this family has been studied for their chemical components so far.

Useful plants

Astromia is a source of timber. *Bellucia*, *Conostegia* and *Heterotrichum* provide edible fruits. Dyes are obtained from *Dionychia* and *Memecylon*. A large number of plants such as *Dissotis*, *Medinilla*, *Melastoma* and *Memecylon* are cultivated ornamentals. Leaves of *Melastoma malabathricum* are astringent and used in diarrhoea, dysentery and leucorrhoea while the bark and roots are used for healing wounds and other skin diseases. They are also used in preparation of gargles.

Taxonomy

Hooker divided the family into three suborders Melastomeae, Astronieae and Memecyleae. The first suborder Melastomeae is further divided into four tribes Osbeckieae, Oxysporae, Sonerileae and Medinilleae. Presently the family is classified into three subfamilies.

1. **Crypteronioideae** : Fruit of a loculicidal capsule, the valves often held together apically by persistent style and seeds small, winged. This subfamily is often separated as a family Crypteroniaceae.
2. **Memecyloideae** (fruit a 1-5 seeded berry, embryo large)
3. **Melastomatoideae** (fruit many seeded embryo small)

In the present work 9 members of the family were screened for their secondary metabolites and the distribution of them are used in finding out the inter-relationship within the family.

Materials and Methods

Most of the plants have been collected from parts of Kerala and Tropical Botanical Garden and Research Institute (TBGRI) Palode, Trivandrum. *Tibouchina* and *Memecylon edule* were collected from Ooty Botanical Garden and Victoria Gardens, Bombay respectively. The voucher specimens of all the plants have been deposited in the Herbarium, Department of Botany, The Maharaja Sayajirao University of Baroda (BARO). Standard procedures described in chapter 2 were followed for the extraction, isolation and identification of the phytochemicals.

Results

The distribution of various flavonoids, phenolic acids and quinones are presented in Table 4. All the plants except *Memecylon malabaricum* are found to have flavonoids in leaves and stem. Both flavonols and flavones are located in this family. Flavones were seen only in two plants of tribe Medinilleae, *Dissotis* and *Tibouchina*. Apigenin and 4'-OMe luteolin were the flavones of the latter plant and acacetin, of the former. Both these plants contained flavonols also. The flavonols encountered were kaempferol, quercetin and its methoxylated derivatives, quercetagenin and myricetin. The last two flavonols are seen in *Osbeckia grandiflora* and *M. edule* only. Gossypetin was located in one plant *Osbeckia aspera* only. Quinones were more frequent, located

Among the phenolic acids, gallic acid was identified in six plants, *p*-hydroxy benzoic acid was found in *Dissotis* as well as *Tibouchina* and melilotic acid was seen in the former plant only. Alkaloids were absent from all the plants screened. .

Discussion

The chemical data delineate the subfamily Memecyloideae clearly from the other subfamily Melastomatoideae. The former subfamily is with very less flavonoids (flavones are absent here) in leaves or stems while these compounds are abundant in the latter taxon. Phenolic acids such as *p*-hydroxy benzoic and gallic acids also are present in the latter subfamily only. The fact that only two members of the Memecyloideae are screened in the present work necessitates that more members of this subfamily are to be screened for arriving at any valid taxonomic conclusions. The absence of higher incidence of flavonols and absence of these compounds keep the Memecyloideae advanced over the Melastomoideae which contains the primitive flavonoids in abundance. The lower prevalence of gossypetin, a distinct flavonol abundant in the Myrtaceae and Combretaceae indicate that the Melastomataceae are not very close to these families.

Between the tribes Osbeckieae and Medinilleae, the former tribe contains only flavonols and the latter possesses both flavones and flavonols. The Medinilleae is peculiar in discarding the primitive characters such as highly hydroxylated flavonols such as quercetagenin, myricetin and gossypetin. The presence of flavones and absence of highly hydroxylated flavonols keep this tribe very advanced over the Osbeckieae.