

Chapter 5

Chemotaxonomical studies on some members of the Lythraceae

Introduction

The family Lythraceae consists of about 24 genera and nearly 500 species widespread in tropical countries with relatively few species in temperate regions. The plants are herbs or seldom shrubs or even trees. Leaves opposite or less often whorled only seldom alternate, simple, entire with vestigial stipules. Flowers solitary or fascicled in the axils or often in terminal racemes or spikes, less often in dichasia or panicles, perfect, often heterostylic regular or sometimes irregular strongly perigynous with a prominent sometimes spurred hypanthium. Sepals appear as lobes of hypanthium, valvate often alternating with external appendages at the sinuses. Petals alternate with the sepals, distinct attached at the summit of the hypanthium or within its tube, commonly pinnately veined, crumpled in bud or sometimes wanting. Stamens most commonly twice as many as the petals and bicyclic, attached below the summit of the hypanthium, the outer set initiated before the inner or the inner (lower, antipetalous) cycle sometimes wanting. (In *Lagerstroemia* numerous and centrifugal, in *Rotala* the stamen solitary). Filaments more or less elongate, anthers versatile or seldom basifixed, tetrasporangiate and dithecal, opening by longitudinal slits. Gynoecium of 2-4 carpels united to form a compound pistil that is often surrounded at the base by an annular nectary disc or nectary unilateral. Style filiform and stigma capitate. Ovary superior, plurilocular with as many locules as carpels. Placentation axile or rarely free central. Ovules two or more locule, crassinucellar, bitegmic with a zig-zag micropyle. Fruit dry, capsular. Seeds more or less numerous without endosperms; embryo oily.

Anatomical characters

Stem is with internal phloem next to the pith. Crystals of calcium oxalate commonly present in some of the parenchymatous tissue including the wood parenchyma. Vessel segments with simple perforations and vestured pits. Imperforate tracheary elements with simple or minutely bordered pits, commonly septate, wood-rays uniseriate or less often some of them 2-3 seriate, homocellular or heterocellular, many of the cells containing amorphous gummy deposits. Wood-parenchyma mostly paratracheal.

Useful plants

Lawsonia inermis yields the famous dye **Henna** used to color hair and clothes and its leaves are used as a prophylactic against skin diseases. It has astringent properties. It is used externally in the form of paste against boils, burns, bruises and skin inflammations. This plant is used for coloring palms of hands, soles of feet and finger nails, dyeing hair, beard and eye brows. *Woodfordia floribunda*, **Dhataki**, is a well-known medicinal plant. Dried flowers are added in arishtas to cause alcoholic fermentation. In Madhya Pradesh, a paste of the flowers is used for treatment of cough. Fresh leaves are also an excellent remedy in case of snake-bite. Among the Santals, it is used as a remedy in excessive bleeding during pregnancy, cholera, fever, muscular pain, sores and spleen complaints. Leaves of *Lagerstroemia flos-reginae* are purgative, deobstruent and diuretic. Decoction of leaves and dried fruit, prepared like tea is used for diabetes mellitus in Philippines. Bark is a stimulant and febrifuge. Its decoction is given in abdominal pain and diarrhoea. Roots are considered as astringent, stimulant and febrifuge. *Lagerstroemia indica* bark is considered stimulant and febrifuge. Along with bark leaves and flowers are used as purgative and hydrogogue in Indo-China. Leaves of *Ammania baccifera* are used in treatment of rheumatic pains and fever, has laxative and stomachic properties. Leaves or ashes of the plant are mixed with oil and applied to cure herpetic eruptions.

Taxonomy

Hooker (1862-1883) divided the family into two tribes Ammanieae and Lythreae.

- 1) **Ammanieae:** Low or aquatic herbs with small or minute flowers and calyx is membranous: containing *Ammania* and *Hydrolythrum*.
- 2) **Lythraeae:** Trees or shrubs, calyx herbaceous or coriaceous, petals often large wrinkled: containing *Woodfordia*, *Lawsonia*, *Lagerstroemia*, *Pemphis*, etc.

Previous chemical reports

Lawsonone, (2 – hydroxy 1, 4 – naphthaquinone), a dyeing principle, is present in all parts of *Lawsonia alba* and leaves of *Woodfordia floribunda*. ‘Woodforticosin’ isolated from the dried leaves of the latter plant is useful as an inhibitor of topoisomerase and as neoplasm inhibitor. It also serves as an antitumour agent also.

A naphthaquinone from stem bark has been isolated and 24 β -Ethylcholest-4-en-3 β -ol from the roots of *Lawsonia inermis* (Gupta, 1992). Roots, stem and leaves of *Lagerstroemia flos-reginae* are found to contain hydrocyanic acid. Ellagitannins isolated from these plant parts are activators of glucose transport in fat cells (Anon., 1998).

In the present work, 7 plants belonging to the tribes Ammanieae (2) and Lythraeae (5) have been screened for their phytochemicals both in stem and leaves and the distribution of the same have been used for taxonomic considerations..

Materials and Methods

All the plants were collected from Baroda and environments. The voucher specimens of these plants have been deposited in the Herbarium, Department of Botany, The Maharaja Sayajirao University of Baroda (BARO), Vadodara. Standard methods, presented in chapter 2 were followed for the extraction, isolation and identification of the phytochemicals.

Results

The results on the screening of leaves and stem of 7 plants belonging to the Lythraceae are presented in Table 3.

Table 3. The distribution of various chemical markers in some members of the Lythraceae

Sr.No.	Name	Acacetin	7 - OMe Acacetin	Luteolin	3 - OMe Luteolin	3',4' - diOMe Luteolin	Kaempferol	Quercetin	3 - OMe Quercetin	Quinone	p - Hydroxy benzoic acid	Vanillic acid	Syringic acid	Galllic acid	Mellicotic acid	p - Coumaric acid	Ferulic acid	Tannins	Alkaloids
	Tribe : Ammanieae																		
1	<i>Ammania tenuis</i> C.B. Clarke (whole plant)									+		+	+		+		+	+	
2	<i>Ammania baccifera</i> Linn. (leaves)							+	+	+		+	+	+	+		+	+	+
 (stem)							+	+	+		+	+	+	+		+	+	+
	Tribe : Lythraee																		
3	<i>Lagerstroemia flos-reginae</i> Retz. (leaves)							+	+	+	+	+	+	+		+		+	+
 (stem)							+	+	+	+	+	+	+		+		+	+
4	<i>Lagerstroemia indica</i> Linn. (leaves)	+	+				+	+	+	+		+	+	+		+		+	+
 (stem)							+	+	+		+	+	+		+		+	+
5	<i>Lagerstroemia parviflora</i> Roxb. (leaves)			+	+					+		+	+	+	+	+		+	+
 (stem)			+	+					+		+	+	+	+	+		+	+
6	<i>Lawsonia inermis</i> Linn. (leaves)			+	+					+		+	+	+		+		+	+
 (stem)					+				+		+	+	+		+		+	+
7	<i>Woodfordia floribunda</i> Salisb. (leaves)							+	+	+	+	+	+	+		+		+	+
 (stem)									+		+	+	+		+		+	+

The family is found to possess flavonoids, alkaloids and tannins. Flavones and flavonols were the main flavonoids located here. Flavones such as acacetin, 7'- OMe acacetin, luteolin and its 3'4'- diOMe derivative were the flavones observed. These compounds were seen restricted to the tribe Lythreae. The flavonols were seen in both the tribes Ammanieae and Lythreae. Kaempferol, quercetin and 3'- OMe quercetin were the flavonols identified. *Lagerstroemia indica* contained both flavones and flavonols. The phenolic acids present were gallic, *p*-hydroxy benzoic, melilotic, *p*-coumaric and ferulic acids. Both *p*-hydroxy benzoic and *p*-coumaric acids were seen in tribe Lythreae only. Alkaloids were located in *Ammania baccifera* and stem of *Lagerstroemia flos-reginae*. Quinones were seen in all the plants screened.

Discussion

The presence of flavonols and quinones in all the screened members of this family indicate the homogeneity of this taxon. It also indicates that the Lythraceae are similar to the families Myrtaceae and Combretaceae. But the absence of gossypetin common in both the above said families from the members of Lythraceae screened is interesting. Therefore the separation of this family in a suborder Lythrineae is supported.

Within the family, the two tribes appear distinct from each other. The tribe Ammanieae possesses only flavonols and is devoid of *p*-hydroxy benzoic and *p*-coumaric acids. The other tribe contains flavones in addition and also *p*-hydroxy benzoic and *p*-coumaric acids. Though Ammanieae are herbs and thus advanced, chemically Lythreae is advanced because of flavones in them.