

CHEMOTAXONOMY OF THE ACANTHACEAE II.¹

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ABSTRACT

Divergent views have been expressed regarding the circumscription of the tribe Thunbergiaceae. The present study on the chemotaxonomy of seven species of *Thunbergia* has been undertaken to see how far chemical data along with data from other disciplines would help in assessing the systematic position of the tribe Thunbergiaceae. In all, 24 tests have been carried out using fresh material as well as ethanolic extracts of shade dried materials. The investigated species of *Thunbergia* share several chemical characters between them. However, *T. alata* differs from other thunbergias in the weak reaction for Cigarette Test, negative reaction for Hot Water Test and doubtful presence of saponins. From the available information on the chemotaxonomy of Thunbergiaceae including *Mendoncia*, it is tentatively suggested that Thunbergiaceae be retained in Acanthaceae. The work of Grant (1955) and Ahmad (1974) lends support to this view.

INTRODUCTION

The family Acanthaceae comprises 250 genera and 2500 species (Willis, 1966). There is considerable difference of opinion regarding the division of the family. Bentham and Hooker (1862-1883) divided Acanthaceae into five tribes viz. Thunbergiaceae, Nelsonieae, Ruellieae, Acantheae and Justiceae.

The tribe Thunbergiaceae includes two genera—*Thunbergia* represented by 200 paleotropical species and *Mendoncia* comprising 60 species distributed throughout the Central and tropical South America and tropical Africa (Ahmad, 1974). Lindau (1895) recognised four subfamilies namely Thunbergioideae, Mendoncioideae, Nelsonioideae and Acanthoideae. The Thunbergioideae of Lindau (1895) include three genera *Thunbergia*, *Meynia* and *Pseudocalyx*.

Nees Von Esembeck (1847) divided the family into two groups Anechmata-

cantheae (with retinacula) and Echematocantheae (with retinacula). He included *Thunbergia* and *Mendoncia* in the tribe Thunbergiaceae under Anechmatocantheae.

According to Van Tiegham (1908) Acanthoideae of Lindau (1895) represent the true Acanthaceae and hence created a separate family Thunbergiaceae, to include also the other subfamilies viz. Nelsonioideae, Thunbergioideae and Mendoncioideae. Wettstein (1935) also did not favour the creation of an independent family, Thunbergiaceae. He recognised only two subfamilies, namely, Thunbergioideae and Acanthoideae, the former including the first three subfamilies of Lindau (1895).

Basing on the embryological studies Mauritzon (1934) suggested the elevation of the subfamily Thunbergioideae to the rank of an independent family Thunbergiaceae.

Bremekamp (1953, 1965) after a

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thorough study, elevated the two sub-families, Thunbergioideae and Mendoncioideae, to the rank of independent families.

Subsequent workers on the basis of their studies on embryology, palynology and morphology expressed different views some supporting and some refuting Bremekamp (1953, 1965). In the present study the chemotaxonomy of 7 species of *Thunbergia* has been undertaken to see how far the chemotaxonomical data along with data from other disciplines would help in resolving the dispute regarding the systematic position of Thunbergiaceae.

MATERIALS AND METHODS

The following taxa have been included in the present study :

Test 'A' 9. Maule Test 10. Saponin Test 'A' 11. Ehrlich Test.

Test for hydroxyquinones were done using the method by Thomson (1957). Ethanolic extract of shade dried plant parts were used for testing for substances like saponins, flavonoids, tannins, alkaloids, indoles, leucoanthocyanins, lignans phenols and Liebermann-Burchard Test, Molisch Test, Labat Test and Noller Test. Where fresh materials were not available the shade dried materials were soaked in distilled water for several hours for carrying the above tests.

RESULTS AND DISCUSSION

The chemotaxonomic characters of the investigated species of *Thunbergia* are presented in Table I. From the table it could be seen that the different

Sl. No.	Species	Place of collection	Collector
1.	<i>Thunbergia affinis</i> T. Moore	Khammam	Sarma
2.	<i>T. alata</i> Bojer ex Sims	Khammam	Sarma
3.	<i>T. erecta</i> T. Anders.	Kobenhavn, Denmark.	
4.	<i>T. fragrans</i> Roxb.	Khammam	Sarma
5.	<i>T. grandiflora</i> Roxb.	Khammam	Sarma
6.	<i>T. kirkii</i> Hook. f.	Lucknow	N.J. Ahmad
7.	<i>T. mysorensis</i> (Wt.) T. Anders.	Bangalore	Vishnu Murthy

The materials were collected at the flowering and fruiting time.

Using fresh materials the following standard tests described by Gibbs (1974) were carried out :

1. Cigarette Test
2. Hot Water Test
3. HCl/Methanol Test
4. HCN Test 'A'
5. Juglone Test 'A'
6. Leucoanthocyanin Test 'A'
7. Syringin Test 'A'
8. Aurone

species of *Thunbergia* exhibit similarities as well as differences between them. They resemble in the negative reaction for Aurone Test 'A' Ehrlich Test, HCl/Methanol Test, MCN Test 'A', Juglone Test 'A'. Leucoanthocyanin Test 'A', Syringin Test 'A', alkaloids, hydroxyquinones, indoles, Labat Test, tannins and positive reaction for Cigarette Test,

TABLE I

Name of the taxon	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
<i>Thunbergia</i>																									
<i>affinis</i>	-	+	-	0	-	+	-	-	+	-	-	-	+	-	-	-	-	-	-	+	+	+	-	-	-
<i>T. alata</i>	-	+	-	0	-	-	-	-	+	?	-	-	+	-	-	-	-	-	-	+	+	+	-	-	-
* <i>T. alata</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
* <i>T. coccinea</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
* <i>T. elegans</i>	-	-	-	0	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>T. erecta</i>	-	-	-	0	-	-	-	-	+	-	-	-	+	-	-	-	-	-	-	+	+	+	-	-	-
* <i>T. erecta</i>	-	-	-	0	-	-	-	-	+	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
<i>T. fragrans</i>	-	+	-	0	-	+	-	-	+	-	-	-	+	-	-	-	-	-	-	+	+	+	+	+	+
<i>T. grandiflora</i>	-	+	-	0	-	+	-	-	+	-	-	-	+	-	-	-	-	-	-	+	+	+	+	+	+
<i>T. kirkii</i>	-	-	-	0	-	-	-	-	+	-	-	-	+	-	-	-	-	-	-	+	+	+	+	+	+
<i>T. mysorensis</i>	-	-	-	0	-	-	-	-	+	-	-	-	+	-	-	-	-	-	-	+	+	+	+	+	+
<i>T. mysorensis</i>	-	-	-	0	-	-	-	-	+	-	-	-	+	-	-	-	-	-	-	+	+	+	+	+	+

*Data from Gibbs (1974 : personal communication)

flavonoids, Maule Test and Molisch Test. *T. alata* showed doubtful reaction for saponins, while all other thunbergias are negative. *T. grandiflora* was positive to Liebermann-Burchard Test and the test for lignans while *T. kirkii* is positive to lignans only. The rest of the species investigated gave negative reaction to both the tests. Noller Test was negative in *T. fragrans* and *T. kirkii*, doubtful in *T. myserensis* and positive in the rest.

The colour reactions for flavonoids indicate probable presence of flavones or flavonols in *T. fragrans*, *T. grandiflora*, *T. kirkii*, *T. myserensis* and *T. erecta*, dihydrochalcones in *T. Alata* and flavanones in *T. affinis*. However, flavones were reported to present in *T. grandiflora*, *T. erecta* and *T. fragrans* (Nair, Nagarajan and Subramanian, 1965; Subramanian and Nair, 1971; Nair and Subramanian, 1974).

The information on the chemistry of species of *Mendoncia* is scanty. The available information (Gibbs, personal communication) shows that *Mendoncia pilosa* resembles other thunbergias in the absence of alkaloids and saponins. However, *Mendoncia pilosa* differs significantly in possessing tannins, a primitive character. Flavonols were reported to be absent in *M. pilosa* (Gibbs, personal communication).

Bremekamp (1955) divided *Thunbergia* into 8 subgenera. They are Subgenus :

1. Coniostephanus : *T. affinis*, *T. erecta*.
2. Thammidium : *T. kirkii*
3. Parahexacentris : *T. alata*
4. Hexacentris : *T. grandiflora*, *T. myserensis*
5. Adelphia : *T. fragrans*
6. Hypenophora : Nil
7. Euthunbergia : Nil
8. Macrosiphon : Nil

Chemotaxonomy of seven species of

Thunbergia shows that Parahexacentris differ from the other in weak reaction for Cigarette Test, negative reaction for Hot Water Test and doubtful presence of saponins.

Based on the characters of hair-base Rizzine (1948) divided the genus *Mendoncia* into four subgenera viz. *Dialyactinocithus*, *Bremekampia*, *Gameactinocithus* and *Anactinocithus*.

The subfamilies Mendoncioideae and Thumbergioideae share between them certain characters such as the winding habit, possessing prominent bracteoles, axillary flowers and small-sized calyx. The Mendoncioidae differ significantly from the members of Acanthaceae in having drupaceous fruits with one or rarely two ovoid seeds. However, the Thumbergioideae stand distinct in their climbing habit, beaked capsular fruit, four rounded ovules and absence of jaculators.

Grant (1955) on cytological grounds does not support the elevation of Mendoncioidae and Thumbergioideae into independent families. Mohan Ram and Wadhi (1965) and Sahi and Dixit (1969) on morphological grounds suggested the elevation of Thunbergiaceae into a distinct family. On the basis of palynological studies, Chaubal (1966) preferred the separation of *Thunbergia* complex from Acanthaceae. Khaleel and Boraiah (1973) basing on embryological studies support the separation of *Thunbergia* into Thumbergiaceae, thus agreeing with Mauritzon (1934). Ahmad (1974) noticed certain important differences in the epidermal characters between the species of *Mendoncia* and *Thunbergia*. Basing on his studies of epidermal characters, he assigns Thumbergioideae the status of a subfamily in Acanthaceae. Wermham (1912) regards that the tribe Thumbergiaceae is closely related to Convolvula-

ceae. But "the amisostemonous androecium (four stamens) and the primitive retinacula of *Thunbergia* justify its inclusion in the higher family" (Wernham, 1912).

The species of *Thunbergia* under the present study show that the chemical characters of Thunbergiaceae (*Thunbergia*) do not support the creation of an independent family but support the status of a tribe within Acanthaceae.

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