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CHEMOTAXONOMY OF EUPHORBIACEAE IN ANDHRA PRADESH, INDIA

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ABSTRACT
Thirty species of *Euphorbiaceae* pertaining to nine generas, viz. Breynia(3), Bridelia(2), Cleistanthus(1), Drypetes(1), Glochidion(1), Phyllanthus(17), Sauropus(1), Securinega (2), Out Group(Givotia and Mallotus), are screened for aminoacids, and eight other secondary metabolites(alkaloids, ellagicacid, lignans, iridoids, methylinedioxy compounds, steroids, tannins and triterpenoids).There was positive reaction for alkaloids and negative to lignans, with all the species. The numerical relationships of taxa studied are discussed base on phenetic chemical evidence at specific generic levels.

KEY WORDS: Chemotaxonomy, *Euphorbiaceae,* Andhra Pradesh, India.

INTRODUCTION
In India, the Euphorbiaceae with a major distribution in Peninsular India. Of these, 35 genus are endemic while 24 are threatened **(1)**.There are 121 species of Euphorbiaceae occurring in Andhra Pradesh **(2)**. One of the largest families with about 300 genera and 8,000 species **(3)** with cosmopolitan distribution. They are essentially tropical dominating Brazil, Indo-Malayasia, Africa and S. America. in India, the family is represented by genera and 450 species **(4).** The genus Euphorbia alone encompasses 2,000 species **(5),** out of which 200 species are reported from India. Obviously, there is difference of opinion as regards the sectional classification of Indian Euphorbiaceae.

The Euphorbiaceae in general received good attention by phytochemists **(6)** and chemo-taxonomists **(7)(8).** These include the study of alkaloids, free amino acids, carbohydrates and flavonoids. However, the disposition of Euphorbiaceae of India into various sections is not to the satisfaction of taxonomists by above chemo-taxonomic methods. Therefore, an attempt was made to look a fresh at the infra-familial classification of Euphorbiaceae employing the distribution of micro-molecules. However, in the present study, 30 species of Euphorbiaceae are studied from Andhra Pradesh to assess the bearing of amino acids and eight other secondary metabolites (alkaloids, ellagic acid, lignans, iridoids, methylinedioxy compounds, steroids, tannins and triterpenoids), for their classification.

MATERIAL AND METHODS
Thirty species of Euphorbiaceae (Table-1) were collected from various localities in Andhra Pradesh. These were analyzed for amino acids by one- dimensional ascending paper chromatography **(9)(10).** The other secondary metabolites were also screened employing standard phytochemical tests **(10)(11)(12)(13).** Plant material collected from different places of Andhra Pradesh. The vouchers numbers are 1001, 1002, 1003, 1004, 1005, 1006, 1007, 1008 and 1009 deposited at Kakatiya University, Warangal.

The shade-dried plant material was extracted with 80% methanol. The procedure followed for phytochemical extraction was that of (**10**)**.** The extract was loaded on Whatman No.1 chromatographic paper in one direction with solvent butanol-aceticacid-water (4:1:1). The chromatographic paper, after development, was dried and sprayed with 0.2% ninhydrin in acetone **(10**), which was used as the detecting spray. The spots were identified by running the standards under identical conditions and comparing their R_f values.

OBSERVATIONS:
The study of the distribution of amino acids, and eight other secondary metabolites studies (Table-1) from the shade-dried plant material of Euphorbiaceae are described below:

Table1 Distribution of various chemical constituents

S.no	Chemical constituents	TAXA								
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
	a) Amino Acids:									
1	DL-Alanine	0	0	0	0	0	1	0	0	1
2	DL-2-amino-n-butyric acid	0	0	0	0	0	1	0	0	1
3	L-Arginine Hcl	0	0	0	0	1	1	0	0	0
4	DL-Aspartic acid	1	0	0	0	0	0	0	0	0
5	L-Cysteine Hcl	1	0	0	0	1	1	0	0	0
6	DL-Dopa	0	0	0	0	0	1	1	0	0
7	L-Glutamic acid	0	1	0	0	0	1	0	0	1
8	Glycine	0	1	0	0	0	1	0	0	1
9	L-Histidine Hcl	0	1	0	0	0	1	0	0	0
10	L-Hydroxy proline	0	0	0	0	0	1	0	0	0
11	Dl-Iso-Leucine	0	0	0	0	0	1	0	0	0
12	DL-nor- Leucine	0	0	0	0	0	1	0	0	0
13	L-Lycine Hcl	0	0	0	0	0	1	0	1	0
14	DL-Methionone	0	0	0	0	0	1	0	0	1
15	L-Ornithine Hcl	0	0	0	0	0	1	0	0	0
16	DL-β-phenyl alanine	0	1	0	0	0	1	0	0	1
17	L-Proline	1	0	0	0	0	1	0	0	0
18	DL-Serine	0	0	1	0	0	0	0	0	0
19	DL-Threonine	1	0	0	0	0	1	0	0	1
20	DL-Trjptophane	1	0	0	0	1	1	0	0	0
21	L-Tyrosine	0	0	0	1	0	1	0	1	0
22	DL-Valine	1	0	0	0	0	1	0	1	0
	b) Unknown Amino acids:									
23	A (hR_f 2.4)	1	0	0	0	0	0	0	0	0
24	B (hR_f 3.1)	0	0	0	0	0	1	0	0	0
25	C (hRf 4.2)	0	0	0	0	0	1	0	0	0
26	D (hRf 5.1)	0	0	0	0	0	1	0	0	0
27	E (hRf 6.5)	0	1	0	0	0	1	0	0	0
28	F (hRf 8.3)	0	0	0	0	0	1	0	1	1
29	G (hRf 9.7)	1	0	0	0	0	1	1	0	0
30	H (hRf 12.5)	0	1	1	0	0	1	0	0	0
31	I (hRf 14.6)	1	0	0	0	0	1	0	1	1
32	J (hRf 18.3)	0	0	0	0	0	1	0	0	0
33	K (hRf 20.7)	1	0	0	0	0	1	0	0	1
34	L (hRf 26.4)	1	1	0	0	0	1	0	1	0
35	M (hRf 27.4)	1	0	0	1	0	1	0	0	0
36	N (hRf 28.2)	0	0	0	0	0	1	0	0	1
37	O (hRf 30.0)	1	0	0	0	1	1	0	0	0
38	P (hRf 32.5)	0	1	1	0	0	1	0	0	0
39	Q (hRf 34.3)	1	0	0	0	0	1	1	0	0
40	R (hRf 35.9)	0	1	1	0	1	1	0	1	1
41	S (hRf 37.9)	1	0	0	0	0	1	0	0	1
42	T (hRf 40.3)	0	0	0	0	0	1	0	0	1
43	U (hRf 44.4)	0	0	0	0	0	1	0	0	0
44	V (hRf 48.0)	1	0	0	1	0	1	0	0	0
45	W (hRf 49.4)	0	0	0	0	0	1	0	0	0
46	X (hRf 58.6)	0	0	0	0	0	1	0	0	0
47	Y (hRf 63.4)	1	0	0	0	0	1	0	0	0
	c) Secondary Matabolites:									
48	Alkaloids	1	1	1	1	1	1	1	1	1
49	Ellagic acid	1	0	1	0	0	1	0	0	1
50	Iridoids	1	1	0	1	0	1	1	1	0
51	Lignans	0	0	0	0	1	1	0	0	0
52	Methylene dioxy compounds	1	1	0	0	0	1	1	1	1
53	Tannins	1	0	1	1	1	1	0	1	0
54	Steroids	0	1	0	0	1	1	0	1	1
55	Triterpinoids	1	1	0	1	0	1	1	1	0

1. *Breynia ;* 2. *Bridelia ;* 3. *Cleistanthus;* 4. *Drypetes ;* 5. *Glochidion ;* 6. *Phyllanthus*7. *Sauropus* ; 8. *Securinega*; 9. Out Group *(Givotia & Mallotus)*

1= Present; 0 = Absent

Table 2 Paired, Group Affinity and Isolation values of Euphorbiaceae at generic level.

Taxa*	Taxa*									GA	IV values	
	1	2	3	4	5	6	7	8	9		IVi	IVn
1	100.0	29.1	20.5	35.8	34.1	57.7	35.0	38.2	37.0	387.4	8.6	3.6
2		100.0	37.0	29.6	27.5	37.6	35.7	45.7	42.8	385.0	0.0	0.0
3			100.0	44.4	40.0	21.0	31.5	30.7	30.3	355.4	14.2	1.8
4				100.0	30.0	23.6	52.6	46.0	18.1	380.1	0.0	0.0
5					100.0	28.2	19.0	35.7	22.8	337.3	0.0	0.0
6						100.0	25.9	38.0	52.7	384.7	21.1	14.5
7							100.0	44.4	29.4	373.5	0.0	0.0
8								100.0	43.9	422.6	0.0	0.0
9									100.0	377.0	0.0	0.0

*1. *Breynia*; 2. *Bridelia*; 3. *Cleistanthus*; 4. *Drypetes*; 5. *Glochidion*; 6. *Phyllanthus*; 7. *Sauropus*; 8. *Securinega*; 9. OutGroup *(Givotia* and *Mallotus).*

GA = Group Affinity; IV = Isolation Value; IVi = Individual Isolation value;

IVn = The percentage of unique characters within a taxon with respect to the grand total of all different characters in all taxa.

Phenogram of different section of Euphorbiaceae Drypetes, Sauropus, Securinega are the closely related forming the P1 cluster at 0.35 from the first cluster excluding the Phyllanthus, which is so isolated with its alkaloids constituents. Chemical studies summarized by polhill (1982) another important observation is that Phyllanthus can be placed at the end of all clusters.

RESULTS

Amino acids

Twenty-two amino acids were detected in the nine genera of *Euphorbiaceae* besides; there are 25 non-protein amino acids present with different hR_f values. There exhibit a highly scattered distribution.

(i) Known amino acids: The amino acid L-cysteine-HCl, DL-tryptophan both are present in three genus of Euphorbiaceae (*Breynia, Glochidion* and *Phyllanthus*), L-glutamic acid glycine, and DL-β-phenylalanine are found in three genus of Euphorbiaceae (*Breynia*, *Phyllanthus*, OutGroup (*Givotia* and *Mallotus*), L-threonine was detected in three genus of Euphorbiaceae (*Breynia*, *Phyllanthus* (OutGroup), L-tyrosine is present in three genera of Euphorbiaceae (*Drypetes*, *Phyllanthus* and *Securinega*). DL-valine is present in three genus of Euphorbiaceae (*Breynia*, *Phyllanthus* and *Securinega*). DL-alanine, DL-2-amino-n-butyric acid, and DL-methionine are observed in two genus of Euphorbiaceae (*Bridelia*,

OutGroup). L-arginine-HCl was detected in two genus of Euphorbiaceae (*Glochidion*, *Phyllanthus*), DL-dopa occurs in *Phyllanthus* and *Sauropus*, L-histidine-HCl was observed in *Bridelia* and *Phyllanthus*. L-lysine-HCl is presenting *Phyllanthus* and *Securinega* whereas L-proline was observed in *Breynia* and *Phyllanthus* of Euphorbiaceae. While L-hydroxy proline, DL-iso- leucine, DL-nor-luecine and L-ornithine-HCl occur only in *Phyllanthus*. DL-aspartic acid is found in *Breynia* whereas DL-serine is present in *Cleistanthus*. All amino acids except DL-aspartic acid and DL-serine are present in *Phyllanthus*.

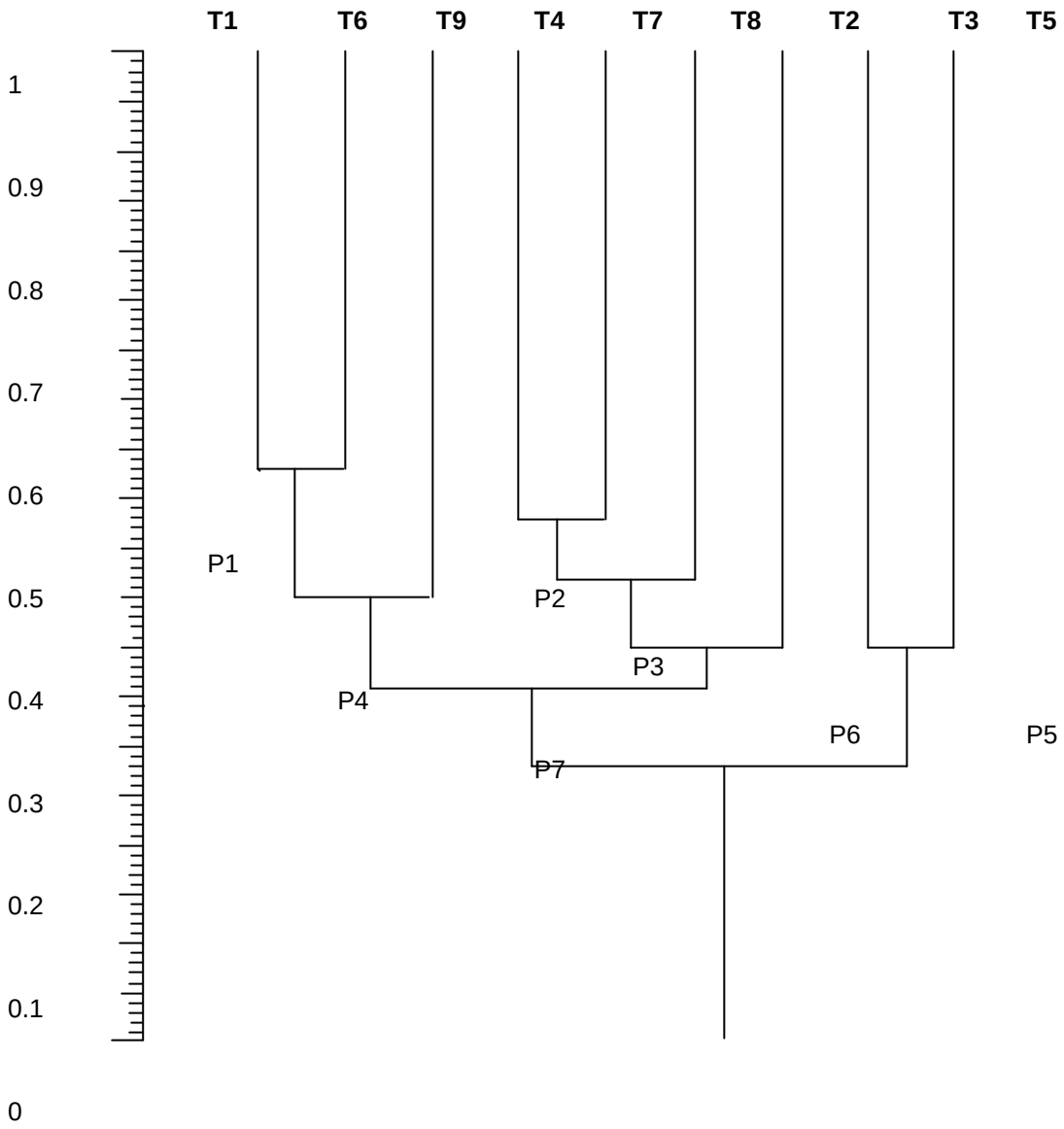

Figure 1 Phenogram of Euphorbiaceae at generic level
T1. *Breynia*; T2. *Bridelia*; T3. *Cleistanthus*; T4. *Drypetes*; T5. *Glochidion*;
T6. *Phyllanthus*; T7. *Sauropus*; T8. *Securinega*; T9. OutGroup (*Givotia* and *Mallotus*)

(ii) Unkown amino acids: The non-protein amino acids are rather restricted and non-overlapping in their distribution. There are 25 unidentified amino acids present. The non-protein amino acid R (hR_f 35.9) is present in six genera of Euphorbiaceae. (*Bridelia*, *Cleistanthus*, *Glochidion*, *Phyllanthus*, *Securinega* and OutGroup (*Givotia* and *Mallotus*), unkown amino acid A (hR_f 2.4) is present only in *Breynia* whereas B (hR_f 3.1), C (hR_f 4.2),D(hR_f5.1), J (hR_f 18.3), U (hR_f 44.4), W (hR_f 49.4) and X (hR_f 58.6) are found in *Phyllanthus*. Amino acid E (hR_f 6.5) is present in *Bridelia* and *Phyllanthus*, F (hR_f 8.3) is observed in *Phyllanthus*, *Securinega* and OutGroup of Euphorbiaceae. G (hR_f 9.7) and Q (hR_f 34.3) occur in *Breynia*, *Phyllanthus* and *Sauropus* of Euphorbiaceae. H (hR_f 12.5), P (hR_f 32.5), is present in *Bridelia*, *Cleistanthus* and *Phyllanthus* of Euphorbiaceae. I (hR_f 14.6) is present in *Breynia*, *Phyllanthus*, *Securinega* and OutGroup, K (hR_f 20.7) and S (hR_f 37.9) are present in *Breynia*, *Phyllanthus* and the

OutGroup, L (hR_f 26.4) is present in *Breynia*, *Bridelia*, *Phyllanthus* and *Securinega*. M (hR_f 27.4) and V (hR_f 48.0) are found in *Breynia*, *Drypetes* and *Phyllanthus* N (hR_f 28.2) and T (hR_f 40.3) are observed in *Phyllanthus* and the OutGroup O (hR_f 30.0) is seen in *Breynia*, *Glochidion* and *Phyllanthus*. Y (hR_f 63.4) is present in *Breynia* and *Phyllanthus*.

SECONDARY METABOLITES

Nine genera of Euphorbiaceae were tested for eight secondary metabolites. Alkaloids are present in all genera of Euphorbiaceae tested ellagic acid is observed in *Breynia*, *Cleistanthus*, *Phyllanthus* and Out Group, iridoids and triterpenoids are commonly to *Breynia*, *Bridelia*, *Drypetes* and *Sauropus*. Lignans are found in *Glochidion* and *Phyllanthus*. Methylenedioxy compounds are present in six genera (*Breynia*, *Bridelia*, *Phyllanthus*, *Sauropus*, *Securinega* and the OutGroup. Tannins are present in *Breynia*, *Cleistanthus*, *Drypetes*, *Glochidion*, *Phyllanthus* and *Securinega*. Steroids are found in *Bridelia*, *Glochidion*, *Phyllanthus*, *Securinega* and OutGroup.

DISCUSSION

The results of the present study of survey of micromolecules or secondary metabolites of members of the Euphorbiaceae are discussed under phytochemical diversity, in Table-2 the numerical assessment of the same as paired and group affinity values, isolation values – group and individual - followed by the phenetic relations through cluster analysis and phenogram construction. The current evidence is examined *vis-à-vis* the traditional and current classification of the family at different levels of the taxonomic hierarchy.

Phenetic Relationships

The numerical assessment of the micromolecules in Euphorbiaceae are examined through the construction of dendrograms for the species of the genera, sectional and generic level. The pointers are justified based on the traditional and modern evidences.

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