Chapter - 2

EXOMORPHOLOGY
The term, "Systematics" deals with scientific study of interrelationship, taxonomy, identification, nomenclature, classification, diversity and differences between plants. The term, "Taxonomy" was coined by A.P. de Candolle (1813) in his work and was referred to as a part of systematics concerned with the study of principles, procedure, rules and regulations and basis of classification. The terms - "Systematics" and "Taxonomy" are often implied as synonyms. As an oldest science of plants, taxonomy started as the science of morphological description of plants, specially floral parts. People during de Candolle period were in favour of artificial classification since morphological characters were easy to handle and were of more reliable nature. Even today, one cannot deny the significance of characters of exomorphology. The general approach for taxonomic considerations is mainly the static external and internal morphological characters. These are based mainly on 2 types of
EXOMORPHOLOGY

approaches viz., "Descriptive (Classical) taxonomy" and "Experimental taxonomy". The former deals with the formulation of principles and construction of classifications purely on the basis of the characters of exomorphology exhibiting resemblances as well as differences between plants. The most convenient and practical aspect of taxonomy is to analyse the status of a taxon on the basis of its morphological, environmental and phylogenetic characters. There is a strong belief that, since the large herbaria of the world are arranged on the basis of features of exomorphology and all exhaustive floras and classifications are constructed on the similarities and differences in morphology, it is unwise to introduce and recommend broader changes at present, which are likely to create confusion amongst correlated status of many taxa.

Taxonomy started as a descriptive science during the 19th century when the plants were identified and classified mainly on the basis of principles of morphology. This is because, the morphological characters do have their own significance particularly, as an aid in identification and are also more convenient for the primary delimitation of the taxa. Since the beginning, it has been customary to isolate and delimit plants purely on the basis of their appearance as it was the only convenient method to be adapted. Even today, this fact cannot be denied and the characters of morphology have their own importance because, all classification systems suggested are based on the principles of morphology. These characters may be either simple or complex. The plants are studied both from the view point of
their vegetative and floral characters. The nature, appearance, number and organisation of the floral parts constitutes the floral study, while the characters like the kind of the root, nature of the stem, its appearance, the mode of branching, texture, pattern of growth, leaf arrangement, size of the leaf and venation are studied for vegetative parts. It is not necessary that plants should exhibit exact resemblances amongst themselves and may not exhibit exact replication as minor variations do occur owing to the effects of the environment, pattern of growth, the effects of different parameters on growth etc., Though the plants resemble in their floral characters, they may vary widely in their vegetative structure or vice versa, because all parts of the plant may not necessarily evolve at the same time. To overcome all these difficulties and for the sake of convenience, certain principles were laid down by Bessey (1915).

2.1. Family: OLEACEAE:

Unarmed, erect or climbing trees or shrubs. Leaves opposite, simple, 3-foliolate or imparipinnate, entire or toothed. Flowers hermaphrodite, dimorphous, regular in 3-chotomous terminal or axillary cymes or panicles. Calyx small, free, campanulate, truncate or lobed. Corolla gamopetalous, lobes 4 to 9, imbricate or induplicate-valvate, tube long or short. Stamens 2, inserted on the corolla tube, filaments usually short, anthers dehiscing laterally or sub-extrorsely. Ovary free or 2-celled. Ovules 1 to 2 in each cell, attached to
EXOMORPHOLOGY

the inner angle near the apex or base. Style short or long. Stigma simple or 2-lobed. Fruit a loculicidal capsule or indehiscent berry or drupe. Seeds solitary or 2 in each cell, erect or pendulous.

2.2. ARTIFICIAL KEY TO THE GENERA:

1. Erect or climbing shrubs; calyx lobes 4 to 9; corolla lobes 4 to 10; fruit didymous berry ........................... Jasminum

1. Trees; fruit loculicidally 2-valved capsule:

2. Leaves imparipinnate:

3. Flowers in 2 or 3 - chotomous compound cymes; calyx 4 to 7 - toothed; corolla lobes 4 to 7; imbricate in bud .................................................. Schrebera

3. Flowers in capitate heads; anthers oblong; capsule compressed separating into 2, flat, single - seeded carpels, prominently reticulate .............. Nyctanthes

2. Leaves simple:

4. Flowers in axillary or lateral panicles or cymes; anthers elliptic; drupe oblong; nerve axil glandular ........................................ Linociera.

4. Flowers hermaphrodite; dioecious or polygamous; anthers oblong; drupe ellipsoid; nerve axil glandular ........................................ Olea.
EXOMORPHOLOGY

2.3. ENUMERATION:

**Jasminum Linnaeus**

Erect or climbing shrubs. Leaves opposite, simple, trifoliolate or imparipinnate. Flowers sweet-scented, in terminal or axillary cymes. Bracts linear and small. Bracteoles linear. Calyx tube funnel-shaped, lobes 4 to 9, linear. Corolla hypocrateriform, white, pink or yellow, tube narrow, lobes 4 to 10, spreading, imbricate in bud. Stamens 2, included in the corolla tube, anthers oblong, filaments very short, connective usually shortly produced and triangular. Ovary 2-celled, ovules 2 in each cell, attached near the base. Style filiform. Stigma bifid. Berry didymous or simple by the suppression of 1 carpel, carpels globose, ellipsoid or elongate. Seeds in each carpel 1, erect.

2.3. A. ARTIFICIAL KEY TO SPECIES:

1. Leaves simple:

2. Calyx pubescent:

   3. Calyx lobes linear-subulate.................... J. sambac

   3. Calyx lobes very short, triangular.... J. roxburghianum

2. Calyx glabrous:

   4. Calyx lobes minute to 3mm. long.....J. angustifolium

   4. Calyx lobes more than 7 mm. long....... J. cuspidatum
1. Leaves compound:

5. Leaves trifoliolate:

6. Leaves with the 2 lower leaflets very small and frequently wanting.............J. auriculatum

6. Leaves with all 3 leaflets similar and present, lateral lobes little smaller than the terminal

.............................J. azoricum

5. Leaves imparipinnate, more than 5 - foliolate...

.............................J. grandiflorum.


Wiry climbing shrub. Leaves elliptic ovate, 1.0 to 2.5 x 0.5 to 1.8 cm, chartaceous, glabrous, base obtuse to truncate, apex obtuse, lower parts smaller. Petiole to 3mm. long. Flowers white in few - flowered terminal cymes. Pedicel to 5.0 mm. long. Calyx lobes 5, minute, unequal, linear, glabrous. Corolla tube 1.0 cm, lobes 9, ob lanceolate, 1.5cm, twisted towards right. Stamens 2, included, anthers oblong, apiculate. Stigma 2-fid. Berry globose, 0.8 cm. across.

In dry deciduous forests of Srikakulam, Visakhapatnam, Nellore and Chittoor districts. Fl. and Fr.: April - August. Vern: Adavimalli, Srimalle, Lingamalle, Garuda Malle. Kottur
EXOMORPHOLOGY


Scandent shrub. Leaves 3-foliolate, the 2 lateral leaflets very small, deciduous, central leaflet large, broadly ovate, 3.5 to 4.5 x 2.0 to 2.5 cm, chartaceous, densely pubescent on the nerves beneath when young, base rounded, apex mucronate. Petiole to 2mm. Flowers white in compound, many-flowered, pubescent, lax, pedunculate cymes. Bract linear-lanceolate. Pedicel to 4 mm. long. Calyx pubescent, lobes 5, triangular, thick puberulous. Corolla tube 1.2 cm, lobes 7, obovate, 6mm. long. Stamens 2, included, anthers 3mm. Ovary oblong, truncate. Style 4mm, shortly 2-fid. Berry globose, 7mm. across, black.

Occasional in forests of all districts. Fl. and Fr.: July-December. Vern: Adaviteegamalle, Malle, Sannajaji. Talakona (CTR), KH 5542; Jaipur (ADB), KH 5558; Ghani RF (KNL), RVR 1782; Kothakota (ATP), JSG 21160 (MH and DD); Valgalalapalle (KNL), AWL 1240 (DD); Chodavaram (EG), MSR 1469 (CAL), Sriharikota (NLR), JSG 12383 (CAL), Kondapalli (KNL), CAB 8130 (CAL and MH), Kodimial (KMN), GVS 20080 (MH), S. Kota (VSKP), NPBK 11029 (CAL and MH). (Transp -1d).

Extensive climbing shrub, with rough bark. Leaves 3-foliolate, drying yellow, elliptic-oblong, 1.5-4.5 x 0.5-3.0 cm, sub-coriaceous, glabrous, base truncate, undulate, apex shortly acuminate. Petiole to 3 cm. Flowers large, white in copious lax paniculate axillary cymes. Peduncles glabrous, 2.5 cm. long. Pedicel to 1 cm. long. Bracts 4mm. calyx lobes 5, triangular, 2mm. long. Corolla tube 2 cm, lobes 5, oblong, 1.2 cm. long. Stamens included, anthers apiculate, 3 mm. Style 2 cm. Stigma linearly fusiform. Berry oblong, 1.2 x 0.7 cm.


Rigid shrub, to 12 m. tall, branches sarmentose. Leaves obovate, 1.8 to 5.8 x 0.6 to 1.5 cm, coriaceous, shining, acute at both ends. Petiole to 4 mm. long, nerves prominent. Flowers white, fragrant in 1 to 5-flowered, corymboid terminal
and axillary cymes. Pedicel 3 mm. long. Calyx glabrous, lobes 5, linear-subulate, 6 mm. long, acuminate. Corolla white, tube 1.5 cm. long, lobes 9, obovate, 8 mm. Stamens 2, included, anthers 5 mm. long, acute. Ovary globose, 1.7 mm. Style 7 mm. Stigma forked. Berry oblong, globose, bilobed, shining.

Occasional in dry deciduous forests of Kurnool, Cuddapah, Chittoor and Vishakapatnam districts. Fl. and Fr. : January-July. Vern : Adavimalle. Talakona (CTR), KH and DAM 5540; Talakona (CTR), GVS 46961 (CAL); Balepalle (CDP), JSS 11004 (CAL and DD); Rollapenta (KNL), JSS 18706 (MH); Araku valley (VSKP), DDSR 21351 (MH). (Transp -2).
EXOMORPHOLOGY

Jaji, Chamber, Chameli. S.K. University (ATP), NY 546 (MH); East of Bhupatipur (KMN), GVS 20193 (MH). (Transp -26).


Villous climbing shrub, branchlets softly pubescent. Leaves elliptic-ovate or ovate, 4.0 to 9.0 x 3.0 to 7.0 cm, softly tomentose on both sides, base rounded, apex acute, main nerves 7 pairs; petiole 1.2 cm. long, densely pubescent. Flowers white in lax trichotomous, densely villous, many-flowered cymes. Pedicels 5 mm, villous. Calyx lobes 5, densely villous, teeth small or minute, triangular. Corolla tube 6 mm. long, lobes 5. Carpels solitary, ellipsoid, black, 7 mm. long.

Nallamalais in Kurnool and forests of Medak, Anantapur and Visakhapatnam districts. Fl. and Fr.: July-January. Vern: Errimali. Tanjavnam (VSKP), GVS 47303 (CAL); Narsapur (MDK), KMS 8019 (CAL and MH); Penukonda (ATP), SKW 6008 (BLAT).


Erect or sometimes small, climbing shrub with sarmentose branches. Leaves broadly ovate or elliptic, 3.0 to 8.0 x 2-5 cm, chartaceous, shining, pubescent along nerves, base
EXOMORPHOLOGY

rounded or truncate, apex acute to acuminate, nerves 6 pairs. Petioles 0.5 cm. long, hairy. Flowers white, fragrant in 3-flowered terminal cymes. Bracts linear, subulate. Peduncle 1.2 cm. long. Pedicel 0.5 cm. long. Calyx lobes 7, curled, 7 mm, hispid, acuminate. Corolla tube 1.0 cm. long, lobes oblong. Stamens 2, included, anthers 4 mm, apiculate. Style 3 mm. Stigma forked. Berry globose, green turning violet.

Cultivated in most districts, rarely as an escape plant, Fl. and Fr.: March—August. Vern: Malli, Vira Jaji. Macha Reddy (NZB), KH 5545; Kalava (KNL), RVR 8142; S.K. University Campus (ATP), NY and TP 144; Horseley Hills (CTR), JSG 15193 (CAL and MH); Duggeru (SKLM), GVS 62512 (CAL and MH); Maredumalli (EG), GVS 24248 (MH). (Transp -38).

Linociera Swartz

Shrubs or trees. Leaves opposite, entire. Flowers in axillary or lateral panicles or cymes. Bracts at the divisions, small. Calyx small, 4-lobed. Corolla of 4 long or short petals, nearly free or cohering in pairs, induplicate-valvate in bud. Stamens 2, filaments short or 0, attached at the base of the petals, anthers dehiscing on the margin, connective broad. Ovary 2-celled, ovules 2 in each cell, pendulous from its apex. Style short. Stigma bifid or entire. Drupe ellipsoid. Seed solitary, pendulous.
2.3.B. ARTIFICIAL KEY TO THE SPECIES:

1. Panicles short, to 2.5 cm. long, leaf margins recurved, very glabrous. ............................................. *L. zeylanica*

1. Panicles more than 2.5 cm. in length............. *L. intermedia*


Small tree, to 10m. Leaves elliptic-oblong, 6.0 to 15.0 x 3.5 to 6.0 cm, chartaceous, glabrous, base very acute, running down into the petiole, entire, apex acuminate, shining, main nerves prominent beneath, about 10 to 12 pairs. Petioles to 3cm. Flowers white in axillary, many-flowered panicles, panicle to 8.0cm, branches compressed. Pedicels 2mm. long. Calyx glabrous, ovate. Corolla lobes 4, linear oblong. Ovary glabrous. Stigma deeply 2-fid with divericate lobes. Drupes ellipsoid, purple when ripe.


EXOMORPHOLOGY

Small tree, to 10m. tall, branchlets minutely pubescent. Leaves ovate to obovate, 2.5 to 12.0 x 1.2 to 4.4cm, coriaceous, base cuneate, recurved, apex obtuse to subacute. Petiole 2 cm. long. Flowers cream-coloured in panicles. Panicles 2.2 cm. long. Calyx 4-toothed, 2mm. long, tawny-pubescent without cilia. Corolla cream coloured, lobes 4, lanceolate, 4mm. long. Stamens 2, partly exserted, anthers lanceolate. Ovary glabrous. Drupe obovoid, 6.0 x 3.0 mm, apex mucronate.

Balepalle forests of Cuddapah and forests of Chittoor, Nellore and Visakhapatnam districts. Fl. and Fr.: December - April. Vern: Punisi, Punagamu, Nellidabba. Anantagiri (VSKP), DAM 6505; on way to Jabalitheertham, Tirumalai (CTR), KS 7853 (MH); Balepalle (CDP) JLE 15709 (MH). (Transp -44).

Nyctanthes Linnaeus

Shrubs or small trees. Leaves opposite, ovate, entire or toothed. Flowers in small, sessile, bracteate heads disposed in terminal trichotomous cymes. Calyx ovoid-cylindrical, sub-truncate, finally splitting or deciduous. Corolla salver-shaped, corolla-tube cylindrical, orange in colour, lobes 4 to 8, contorted in bud, spreading, white in colour. Stamens 2, sub-sessile near the top of the corolla-tube. Ovary 2-celled, ovule 1 in each cell, erect, basal. Style cylindrical. Stigma shortly 2-fid. Fruit an orbicular capsule, compressed parallel to the septum, separating when ripe into 2 single-seeded cells. Seed
EXOMORPHOLOGY


Bushy shrub or small tree, to 3.0 m. tall, rough all over with stiff white hairs, young branches sharply quadrangular, hairy. Leaves ovate to obovate, 3.0 to 7.5 x 1.8 to 4.0 cm, coriaceous, rough and scabrous above with short bulbous hairs, base rounded, apex acute, 7-nerved, conspicuous beneath. Petiole 1.0 cm. long. Flowers yellow or white, in 3-chotomous. Pedunculate, capitate heads. Peduncles 4-angled, hairy. Bracts broadly ovate. Calyx narrowly campanulate, hairy outside, lobes 5, persistent. Corolla tube orange-coloured, equalling the lobes, salverform, lobes white, 5 to 7, twisted. Stamens 2, included, anthers oblong, sessile. Ovary globose. Capsule 1.0 to 2.0 x 0.8 to 1.8 cm, compressed, separating into 2, flat, 1-seeded carpels, prominently reticulate.

In deciduous forests of Telangana and Coastal Andhra Pradesh. Fl. and Fr.: Through the year. Vern.: Paarijatham, Kisteli, Pagada Malle, Karshas. Sunnipenta (KNL), RVR and PVP 2331; Reddipalli farm (ATP), NY 276; Vempalli (ADB), GO 4433; Near Addatigala (EG), GVS 68580 (MH); Kondagutta (KMN), GVS 25688 (MH); Pegarikutta east (MDK), KMS 6081 (MH); Near Sileru (VSKP), GVS 42708 (MH). (Transp -4°).
EXOMORPHOLOGY

Olea Linnaeus

Shrubs or trees. Leaves opposite, entire or toothed. Flowers small, hermaphrodite, dioecious or polygamous, in axillary or lateral panicles. Bracts small. Calyx small, 4-lobed. Corolla campanulate, tube short, lobes 4, valvate, often induplicate. Stamens 2, on the corolla tube, filament short, anthers oblong, connective broad, anthers dehiscing marginally. Ovary 2 celled, ovules 2 in each cell. Style short. Stigma capitate or bifid. Drupe ellipsoid or subglobose exocarp fleshy. Seed solitary, pendulous.


A moderate - sized densely foliaceous tree, to 8.0 m. tall. Leaves ovate-elliptic, 7.0 to 11.0 x 3-4.5 cm. margin entire, tip acute or acuminate, base attenuate. Flowers small, 0.2 cm. across, white, in panicles, axillary or terminal. Fruit slightly ovoid drupe, 2 cm. across, deep purple when ripe. Bark brown, rough. Wood pale - brown, hard.

Hills of Chittoor district and almost all districts along the Western Ghats, both in deciduous and evergreen forests of Indian peninsula, but rare in valleys. F1. and Fr. : March - December. Vern : Edale, Koil payar, Idalai koil. (Transp – 7A).
**Schrebera Roxburgh nom. cons**


Moderate-sized deciduous tree, to 18 m. tall. Bark greenish, rough with protuberances. Leaves imparipinnate, leaflets opposite, 7 to 9, elliptic-ovate, 6.0 to 9.5 x 4.0 to 5.0 cm, coriaceous, base obliquely attenuate, apex acute, petiole of terminal leaflet 4.0 cm. long. Flowers yellowish-white, in terminal and axillary, 3-chootomously paniculate cymes, covered with brown scales. Pedicels to 5 mm. long, pubescent. Calyx pubescent, lobes unequal, 4 to 7-toothed, 3.0 mm. long. Corolla white with brown centre, salverform, tube 1.0 to 5.0 cm. long, pubescent at base within, lobes 5 to 8, fimbriate, 5.0 mm. long,
EXOMORPHOLOGY

pilose within, undulate. Stamens 2, inserted near the top of the corolla tube; filaments 1.2 cm. long, hairy, anthers oblong. Ovary 2-lobed. Style 6.0 mm. long, slightly longer than the corolla tube. Stigma shortly bifid. Capsule pear-shaped, pendulous, very hard and woody, dotted with scabrous specks, loculicidal, 2-valved. Seeds winged.

Occasional in moist deciduous forests of Srikakulam, Kurnool, Karimnagar, East Godavari and Visakhapatnam districts. Fl. and Fr.: January - May. Vern: Mukkem, Makkam, Ishugarashi, Magalingam. Pachheruvu (KNL), RVR 2152; Rachepalli (KMN), GVS 22247 (MH); Ramapachodavaram (EG), GVS 24470 (MH); Cherukonda (VSKP), GVS 28164 (MH). (Transp - Sb).
TRANSP. 1a - JASMINUM AURICULATUM

TRANSP. 1b - JASMINUM AZORICUM
TRANSP. 2a - *Jasminum cuspidatum*

TRANSP. 2b - *Jasminum grandiflorum*
TRANSP. 5a - OLEA DIOICA

TRANSP. 5b - SCHREBERA SWIETENIOIDES