

Morpho-Taxonomic Studies of Some Members of Malvales (Cronquist, 1981) Occurring in Saltlake City, North 24 Parganas, West Bengal

Sanghamitra Sanyal*

Assistant Professor, UG and PG, Department of Botany, Bethune College, affiliated to University of Calcutta,
Bidhan Sarani, Kolkatta, West Bengal, India.

ABSTRACT: The present paper deals with studying ten taxa belonging to the order Malvales (Cronquist, 1981) from taxonomic point of view and screening marker characters which may be helpful in constructing of artificial key. With the help of artificial key the taxa can be easily identified.

KEYWORDS: Artificial key, Malvaceae, Sterculiaceae, Tiliaceae, morphology.

I. INTRODUCTION

The Malvales are an order of flowering plants which includes about 6000 species within 9 families. In traditional classification, this order was variously circumscribed as including four main families i.e. Malvaceae, Bombacaceae, Sterculiaceae and Tiliaceae, also known as “core malvales”, but major disagreement existed between different taxonomic treatments. Contribution from molecular data, new morpho-anatomical data and progress in methodological approaches have recently led to a new broader concept of this order namely “expanded malvales”. Now expanded malvales includes ten families (Neuradaceae, Thymalaceae, Sphaerosepalaceae, Bixaceae, Cistaceae, Sarcolaenaceae, Dipterocarpaceae, Cytinaceae, Muntingiaceae, Malvaceae s.l.) distributed among seven monophyletic lineages. Recent taxonomic treatments group taxa formerly included in “core malvales” in a broader concept of malvales s.l.. Additionally, the intrafamilial taxonomy has been deeply modified and in its present circumscription, Malvaceae includes nine subfamilies (Grewioideae, Byttnerioideae, Tilioideae, Bombacoideae, Malvoideae, Helicteroideae) in 2 main lineages.

Malvales are clearly monophyletic as evidenced by their stratified phloem (with hard and soft layers), wedge shaped rays, mucilage canals and cavities, stellate hairs, connate sepals, mavid leaf with teeth (Judd and Manchester, 1998), cyclopropanoid fatty acid, and rbcL and atpB sequences (Alverson et al. 1998; Fay et al. 1998; Soltis et al. 1998). The complex vascular system that occurs in the petioles may also be synapomorphic. Stamens are frequently numerous and develop centrifugally from only a few trunk vascular bundles. The analysis of rbcL sequences clearly place the order within the rosid complex, as the sister group to Brassicales and Sapindales (Alverson et al. 1998a; Chase et al. 1993). However Bessey (1915), Thorne (1992) and others considered malvales to be related to Urticales based on the common occurrence of bands of fibres in the phloem, alternate leaves with often palmate venation and stipules.

In the phylogeny of expanded malvales based on Bayer et al. (1999) and Alverson et al. (1998), the core malvales clade has been consistently well-supported in molecular phylogenetic analysis as have the clades comprising (Bixaceae + Diegodendraceae + Cochlospermaceae) and (Dipterocarpaceae + Sarcolaenaceae + Cistaceae). However, placement of the remaining families (Muntingiaceae, Sphaerosepalaceae, Thymelaceae and Neuradaceae) is still unclear. Muntingiaceae falls either in the (Dipterocarpaceae + Sarcolaenaceae + Cistaceae) clade (Alverson et al. 1998; Fay et al. 1998) or at the base of the Malvales (Bayer et al. 1999). Family boundaries and circumscription of the

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 5, May 2016

“core malvales” families have long been problematic. A close relationship among these families and particularly Malvaceae and Bombacaceae, has generally been recognized, although until recently most classification systems have mentioned them as separate families. With numerous molecular phylogenies showing Sterculiaceae, Bombacaceae and Tiliaceae as traditionally defined are either paraphyletic or polyphyletic, a consensus has been emerging for a trend to expand malvales to include these 3 families. This expanded circumscription of Malvales has been recognized in most recent version of the Thorne system by the Angiosperm Phylogeny Group and in the most recent comprehensive treatment of vascular plant families and genera, the Kubitzki System().

The dominant family in the APG-II-System() is the extended Malvaceae with over 4000 species followed by Thymelaceae with 750 species. This expanded circumscription of Malvaceae is taken to include the families Bombacaceae, Sterculiaceae and Tiliaceae. Under the older Cronquist system the order contained these four “core malvales” families plus the Eleocarpaceae and was placed among the Dillenidae. Some of the currently included families were placed by Cronquist in the Violales.

The members of the Malvales order are mostly shrubs and trees. The morphology of Malvales is diverse with few common characteristics like palmate leaves, connate sepals and a specific structure and chemical composition of the seed. A lot of Malvales families live all over in the tropics and subtropics. Many of the species in this order are known for their wood such as Ochroma and Tilia, many of them are used as food such as leaves of Corchorus olitorius, seeds of Theobroma cacao in making chocolates. Many other species are known for their medicinal properties such as Abutilon, Sida, Thespesia and many more. Other well known members of Malvales are Hibiscus, cotton, okra etc. This order is an important source of different types of alkaloids, flavonoids, terpenoids etc.

In the present study the morphological evaluation of the families Malvaceae, Tiliaceae, Sterculiaceae was conducted using the species namely *Abutilon*, *Thespesia*, *Malvastrum*, *Malachra*, *Sida rhombifolia*, *S. acuta*, *Kleinhovia*, *Triumfetta* and *Corchorus*. The aim of this study was to find out the degree of closeness between species and constructing an artificial key for easy identification of taxa.

II. MATERIALS AND METHODS

MATERIALS:

Materials for taxonomical studies were collected from different places in Kolkata. These are given below:

Table:1

SL. NO.	BOTANICAL NAME	FAMILY
1	<i>Thespesia populnea</i>	Malvaceae
2	<i>Malachra capitata</i>	Malvaceae
3	<i>Abutilon indicum</i>	Malvaceae
4	<i>Sida rhombifolia</i>	Malvaceae
5	<i>Sida acuta</i>	Malvaceae
6	<i>Malvastrum coromandelianum</i>	Malvaceae
7	<i>Kleinhovia hospital</i>	Sterculiaceae
8	<i>Corchorus olitorius</i>	Tiliaceae
9	<i>Triumfetta rhomboidea</i>	Tiliaceae
10	<i>Muntingia calabura</i>	Muntingiaceae

METHOD:

All these experimental species were examined morphologically. Each and every part of those plants was studied by dissecting them and observing under simple microscope properly. All the characteristics examined morphologically or under microscope were written down drawn. Field photographs as well as photographs during workout were taken. Herbarium of each plant was also made.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 5, May 2016

III. EXPERIMENTAL RESULTS

The present investigation is focused on the collection of ten plant species of Malvales order and observation of their morphological description. Each of these plants are provided with author citation, habit description and photograph flowering and fruiting time, ecology, distribution and uses.

Thespesia populnea (Linn.) Sol. ex Corr., Ann. Mus. Hist. Nat. Paris. 9:290. 1807. Mast in Hook. f. I.c. 345. pp.; Hu, I.c. 69. pl. 22. f. 9; Bross., I.c. 106. pp.; Fosberg & Sachet, I.c. 8. El. 28; Stewart in Nasir & Ali, Ann. Cat. Vasc. Pl. W. Pak. & Kash. 484. 1972; S. Abedin I.c. 61.

Trees about 15000mm high; stems branched, branchlets densely covered with minute scales, glabrous, dark brownish. Leaves simple, alternate, stipulate; stipules 4-10mm long, linear to lanceolate, caducous; petioles 50-100mm long, swollen tipped, scaly; lamina cordate, (40-100)x(35-90)mm, apex acuminate, base truncate, margin entire, glabrous; 5-7 nerved from the base. Flowers solitary, terminal, bisexual, pentamerous; pedicel 40mm long, jointed near the base; sepals cupular, minutely 5 parted, accrescent and flattened in fruit, persistent; petals 5, 50-75x40-60mm, obliquely obovate, narrowed and fleshy at base, rounded at apex, light yellow with dark purple at base; staminal column 15-25mm long, stamens numerous; carpels 5, syncarpous, ovary superior, globose, 5 celled, 2-3 ovules in each cell; style 2mm long; stigma club shaped, 5 furrowed. Fruit-capsule, globose, indehiscent. Seeds many, ovoid, channeled along the back. (Pl. 1F)

Flowering and Fruiting time:- Throughout the year.

Ecology:- Commonly found in dry location.

Distribution:- Tropical parts of India.

Uses:- The fruits, flowers and young leaves are edible. The timber is used to make small wooden items. Yellow dye is obtained from the flower and fruits. Yellow sticky sap of young fruits is often used to treat skin diseases and leaves are applied to inflamed and swollen joints.

Specimen examined by:- Sanyal, sp. no. 7, near Baghajatin railway station; Sanyal, sp. no. 20, near Hedua Park.

Malachra capitata (Linn.) Linn., Syst. Nat. ed. 12.2:458. 1767. Mast, in Hook. f., I.c. 329; Stewart in Nasir & Ali, Ann. Cat. Vasc. Pl. W. Pak. & Kash. 480. 1972.

Terrestrial shrub with mucilage, up to 4000mm high; stems reddish in mature parts, densely pubescent with prickly stellate hairs; leaves simple, alternate, stipulate; stipules free lateral, 10mm long; petiole long, pubescent, 30-40mm long; lamina very widely ovate, (30-90)x(35-90)mm, apex obtuse, base cordate, margins serrate-crenate. Inflorescence axillary cyme; flower bisexual, actinomorphic, pentamerous, yellow in colour, bracteates; bract foliaceous with two linear bracteoles; sepals 5, green, hairy, 4mm long, persistent in fruit; petals 5, yellow, obovate, 10mm long; stamens numerous, fused in a column (12mm); anthers 1 celled, reniform; carpels 5, syncarpous, ovary superior, 5-chambered with 1 ovule in each chamber; style 10; stigma capitates. Fruit septicidal capsule with persistent calyx. Seeds obovoid-cuneate, about 2.5 mm long, black, whitish-pubescent. (Pl. 1B)

Flowering and Fruiting time:- April-December

Ecology:- Common in wastelands and swampy areas

Distribution:- Throughout India.

Uses:- The plant possesses emollient and pectoral properties. The roots are used in embrocations for rheumatism and lumbago and as a febrifuge. The leaves are used as an anthelmintic.

Species examined:- Sanyal, sp. no. 5, near Hiland Park; Sanyal, sp. no. 19, Patuli.

Abutilon indicum (Linn.) Sweet, Hort. Brit. ed. 1.54. 1826. Mast. in Hook. f., I.c. 326; Stewart in Nasir & Ali, I.c. 476.

Shrub up to 2000mm high. Stem covered with minute soft hairs, green. Leaves simple, alternate, petiolate, petiole 25-100mm long; leaf blade ovate to cordate, (30-80)x(20-75)mm, apex acuminate, base cordate, margin crenate, minutely hairy tomentose on both surfaces. Flowers solitary, axillary, orange yellow in colour, bisexual; calyx-sepals 5, light green, ovate, 5mm long, tomentose hairy; petals-5, 10x12mm, obovate, rounded at apex; staminal column 6mm long, antheriferous at apex; ovary 4mm across, globose, densely pubescent with silvery white hairs; styles 15-20, to 10mm

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 5, May 2016

long; stigma capitate. Fruit-schizocarp (12x20)mm, globular with a flattened apex; mericarps 15-20, reniform, flattened, densely stellate hairy, blackish when mature. Seeds 3mm long, ovoid or reniform, black.(Pl.1A)

Flowering and Fruiting time:- Mostly April-June but often through winter.

Ecology:- Common in wastelands, foothills to 900m.

Distribution:- Throughout tropical parts of India.

Uses:- The entire plant has medicinal values. The leaves are used as a demulcent, laxative and sedative. The bark is astringent and diuretic; the seeds are used as laxative and the root is diuretic and used to cure leprosy.

Specimen examined by:- Sanyal, sp. no. 1, near Satyajit Ray Film Institute; Sanyal, sp. no. 13, beside Keshtapur canal.

Sida rhombifolia Linn., Sp.Pl.684.1753.Mast in Hook.f., I.c.324; Stewart in Nasir & Ali, I.c.483; S.Abedin,I.c.

Perennial erect herb or shrublet up to 2000-3000mm tall. Leaves alternate, simple; stipules linear, 3-10mm long; petiole up to 25mm long; blade oblanceolate to ovate, (11x130)-(5x60)mm, acuminate to rounded at the apex, cuneate to rounded at the base, margin serrate, upper surface stellate-pubescent, lower surface more densely hairy than the upper surface. Inflorescence-cymose, flower solitary axillary. Flower- bisexual, regular; pedicel upto 30-50mm long; epicalyx absent; calyx 10 ribbed at the base, 5 lobbed to the middle, 5-8mm long; petals 5,6-8mm long, yellow in colour; Staminal column 1-3mm long, hairy, stamens numerous; anther 1-celled, reniform; filament short(2-3mm); carpels-10, syncarpous; ovary superior, 10 locular, with one ovule in each locule; style-10. Fruit-a subglobose schizocarp of 8-12 follicle like mericarps; mericarps 10-25mm long. Seeds flattened, 2mm long, dark brown with two ribs and two erect points. (Pl.1E)

Flowering and Fruiting time:- March-October

Ecology:- Common along roads, river banks, overgrazed grassland etc.

Distribution:- Throughout hotter parts of India.

Uses:- The stems are used as an emollient, diuretic and the roots are bitter, cooling and anthelmintic.

Specimen Examined:- Sanyal, sp. no. 3, near Baghajatin railway station; Sanyal, sp. no. 10, Salt Lake Karunamayee bus stand; Sanyal, sp. no. 15, beside Keshtapur canal.

Sida acuta N.L.Burman ,Fl.Indica.147.1768.

A small, erect, much branched, perennial shrub or herb; 300 to 1000 mm in height; stem and branches flattened at the extremities, fibrous, almost woody at times; leaves alternate, slender, lanceolate, (12-90)x(5-30)mm, apex acute, base acute or rounded, margins toothed, lower surface smooth or with sparse, short, star like (stellate) hairs, with fairly prominent veins; petiole 3 to 6 mm long, hairy, with a pair of stipules, at least one lanceolate-linear, finely hairy, the other stipule narrower; flowers 10 to 20 mm in diameter, solitary or in densely crowded axillary heads; pedicels 3 to 8 mm, slender, jointed near the middle; calyx five-lobed; sepals pale green, triangular, acute, about 6 mm long; petals five, joined at base, 6 to 9 mm or more long, light yellow or pale orange, with a shallow notch at the apex; stamens of many filaments arising from a tube; ovary eight-celled, one-ovulate; style divided into six branches; fruit a capsule, 3 to 4.5 mm in diameter, rough, consisting of five to eight one-seeded segments (mericarp), each of which has two glabrous or nearly glabrous awns or beaks 1 to 1.5 mm long; seeds small, roughly triangular, reddish brown or black. (Pl.1D)

Flowering and Fruiting time:- January-August

Ecology:- Common in dry places, roadsides, wastelands etc.

Distribution:- Throughout India.

Uses:-The plant is used as a reliver of stomachache and is useful remedy in chronic bowel complaints.

Species examined:- Sanyal, sp. no. 9, Salt Lake Karunamayee bus stand; Sanyal, sp. no. 16, beside Keshtapur canal.

Malvastrum coromandalianum Linn.Sp.Pl.2:687.1753;M.tricuspidata R.Brown;Malvastrum ruderae Hance ex Walpers;M.tricuspidatum (R.Brown)A.Gray.

Erect herb, 500mm tall; stem with appressed stellate hairs. Leaves simple, alternate, (20-80)x(10-30)mm, ovate to lanceolate, acute to acuminate at apex, broadly rounded to cuneate at base, margins dentate to nearly serrate; 3-5 nerved at base; petioles 20-30mm long, stellate hairy; stipules 3-5mm long, lanceolate, acuminate, early deciduous. Flowers

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 5, May 2016

axillary, solitary; pedicels slender, 5-8mm long; epicalyx lobes filiform, 5x1mm, pilose; calyx shallowly cup shaped, 5-7mm, accrescent to 8-10mm in fruits, outer surface sparsely pubescent with stellate hairs; petals-5, yellowish, obovate, slightly unequally bilobed at apex, (6x8)-(4x5)mm; stamens numerous, fused in a column, 3-4mm long; filaments arranging only near apex of column; anthers reniform; carpels-10, syncarpous, ovary superior, 10 locular with one ovule in each locule; style branched, filiform with capitate stigma. Fruit-discoid, schizocarp. Seed-minute, compressed, reniform. (Pl.1C)

Flowering and Fruiting time:- October-April

Ecology:- A weed of disturbed places, roadside, old cultivation and rubbish dumps.

Distribution:- Throughout India.

Uses:- Leaves are used for carbuncles and decoction of leaves are used to clean wounds and also for dysentery. Plant is used in making brooms.

Specimen Examined:- Sanyal, sp. no. 4, near Baghajatin railway station; Sanyal, sp. no. 14, beside Keshtopur canal.

Kleinhovia hospita Linn. Sp.Pl., ed.2.2:1365.1763.

Trees, up to 12000mm tall; bark gray. Branchlets gray-green, sparsely pilose. Leaves simple, alternate; stipules linear, about 8 mm long; petiole 30-55 mm; leaf blade broadly ovate to heart shaped, (40-110) × (50-130) mm, glabrous on both sides, apex acuminate or acute, base cordate or subcordate, margin entire, palmately nerved. Inflorescence a terminal, loose panicle protruding from the crown. Flowers about 5 mm wide, pale pink; pedicel 2-10 mm long; bracteoles lanceolate, 2-4 mm long, pubescent; sepals 5, linear, 6-8mm long, pink, tomentose; petals 5, pink, shorter than sepals, 1-cucullate, yellow at apex, shorter than others; stamens 15, monadelphous, 8-15 mm long, staminal tube adnate to gynandrophore, 5-lobed, each lobe with 3 anthers and alternating with staminodes; anthers sessile; ovary globose, hairy, usually only 1 ovule developed in each locule; style glabrous; stigma capitate, slightly 5-lobed. Fruit- a rounded, 5-lobed, membranous capsule, 20-25 mm in diameter, loculicidally dehiscent, each locule 1-2-seeded. Seeds globose, whitish. (Pl.1L)

Flowering and Fruiting time:- March-July

Ecology:- Common in grassland, roadside, riverbanks etc.

Distribution:- Throughout India.

Uses:- The plant is used as a traditional medicine to treat scabies. Young leaves are eaten as a vegetable. Bast fibres are used to make ropes. Extracts of the leaves have shown anti-tumor activity against sarcoma in mice.

Specimen examined:- Sanyal, sp. no. 12, near Salt Lake PNB; Sanyal, sp. no. 18, beside Keshtopur canal; Sanyal, sp. no. 21, near Hiland Park.

Corchorus olitorius Linn., Sp.Pl.529.1753.DC., Prodr.1:504.1824; Boiss., Fl.Orient.1:845.1867; Masters in Hook.f., Fl.Brit.Ind.1:397.1874; Bamber, Punj.Pl.234.1916; Kashyap, Lahore Dist.Fl.54.1936; Hutch & Dalz., Fl.W.Trop.Afr.ed.2.1(2):308.1958; Cooke, Fl.Bomb.Pres.(reprint.ed.)1:157.1958; Maheshwari, I.c.88; Jafri, Fl.Kar, 24 7.1966.

Erect annual herb up to 1500mm tall; usually branched; stems glabrous, reddish. Leaves simple, alternate, elliptic-lanceolate, (60-100) × (35-50)mm, apex acute or acuminate, base subobtusate, margin serrate with basal most serrations extending into filiform appendages up to 6mm, almost glabrous, 3-5 nerved; petioles 20-25mm long, slightly pubescent, stipules subulate, 8mm long, glabrous. Inflorescence-a 1-4 flowered axillary fascicle, bracteate. Flowers bisexual, regular, subsessile, 4-5mm long, pentamerous; sepals free, narrowly obovate, 5-7mm long; petals-5, freeobovate, 5-7mm long, yellow, caducous; stamens numerous, somewhat connate at the base; ovary superior, cylindrical, 5 locular; style short; stigma 5 lobed, minutely papillate. Fruit-a cylindrical capsule, 20-7mm long, 10 ribbed, usually dehiscent by 5 valves. Seeds-many, angular, dark grey. (Pl.1G)

Flowering and Fruiting time:- August-October

Ecology:- Commonly in grasslands, abandoned fields, often close to marshes, lakes.

Distribution:- Pantropical regions of India.

Uses:- Leaves are used mainly in the cuisine of Southern Asia the Middle East and North Africa. The plant has an antioxidant activity. Herbal tea is made from the dried leaves.

Specimen examined :- Sanyal, sp. no. 6, near Hiland Park; Sanyal, sp. no. 23, near Ajaynagar crossing.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 5, May 2016

Triumfetta rhomboidea Jacquin ,Enum . Syst.Pl.22.1760.

Subshrubs or herbs, 500-2000mm tall. Branchlets gray-brown tomentose. Leaves 3-7costate, (30-90) x(25-75) mm, generally rhomboid-ovate, stellate or simple hairy to glabrescent, acute at the apex, cuneate at base, margin irregularly bluntly serrate; petiole up to 35 mm long; stipules subulate, 3-4 mm long. Cymes 3-5 per axil. Flowers golden yellow, 5-6 mm across, subsessile; sepals-5, narrowly oblong, 4.5-5.5 mm, villous, appendaged at tip; petals yellow, slightly shorter than sepals, hairy along margins; stamens 10, filaments as long as sepals, papillose; carpels 2-3, syncarpous; ovary superior, subglobose, 2-3-loculed with uncinat hairs; style subulate; stigma 2-3-lobed. Capsule globose, ca. 3 mm in diameter, spiny, indehiscent; spines gray-yellow puberulent, tip hooked. Seeds 2-6. (Pl.1H)

Flowering and Fruiting time:- August-November

Ecology:- Common in roadsides, agricultural lands etc.

Distribution:- Throughout hotter parts of India.

Uses:- The bast fibres are used for making rope, string and theads. The boiled roots are eaten as a vegetable. A decoction of the leaves is used against dysentery. The roots are used as pain-killer especially against headache and toothache.

Specimen examined:- Sanyal, sp. no. 8, Near Hiland Park; Sanyal, sp. no. 11, Salt Lake Karunamayee bus stand; Sanyal, sp. no. 17, beside Keshtopur canal.

Muntingia calabura L.;Sp.Pl.1:509(1753)

Tree up to 5000mm tall; branches spread horizontally. Leaves simple, alternate, lanceolate or oblong, (50-90)x(20-35)mm long, long pointed at the apex, oblique at the base, margin serrate, dark green and minutely hairy on the upper surface, gray or brown-hairy on the lower surface. Flowers borne singly in the leaf axils, tiny, 12.5-20mm wide, bisexual, pentamerous; calyx-light green, sepals 5, 5mm long, lanceolate, apex pointed; petals-5, white, 7-9mm long, ovate; petals falling in the afternoon; stamens numerous, prominent, yellow; carpels-5, syncarpous, ovary superior, 5-locular, one ovule in each locule; style-1, thick; stigma 5 parted. Fruit-small, round, red to sometimes yellow, smooth, thin skin, soft, juicy berry. Seeds-minute, yellowish.

Flowering and Fruiting time:- February-April

Ecology:- Common in roadsides and dry places

Distribution:- Throughout hotter parts of India.

Uses:- The fruits are eaten and can be processed into jams and the leaves can used for making tea. Flowers can be used as an antiseptic and to treat abdominal cramps. Timber can be used for carpentry and to produce ropes and fibres.

Specimen examined by:- Sanyal, sp. no. 2, near Satyajit Ray Film Institute; Sanyal, sp. no. 22, near Ajaynagar crossing.

IV. RESULT AND OBSERVATION

From the above observation an artificial key is prepared on the basis of the morphological characteristics of different plant species of the core malvales families:

- 1a. Corolla in twisted aestivation, polypetalous or gamopetalous.....2
 - 2a. Habit-large tree; leaves with entire margin, glabrous; calyx cupular without partition..*Thespesia populnea*(Malvaceae)
 - 2b. Habit shrubs or herbs; leaves with serrated margin, hairy; calyx 5-parted.....3
 - 3a. Mainly shrubs; leaf very widely ovate to cordate; petals obovate without notch at apex.....4
 - 4a. Annual shrubs; stems and leaves covered with prickly stillate hairs; flowers in axillary cyme with broad leafy bracts, bracteoles 2; fruit septicidal capsule with persistent calyx.....*Malachra capitata* (Malvaceae)
 - 4b. Perennial shrubs; stems and leaves covered with tomentose hairs; flowers solitary axillary with very minute bract, bracteole absent; fruit schizocarp with 15-20 mericarps....*Abutilon indicum*(Malvaceae)
 - 3b. Mainly herbs; leaf lanceolate to ovate; petals obovate with a shallow notch at the apex.....5

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 5, May 2016

- 5a. Epicalyx present below the calyx; stipule deciduous; leaves densely hairy. *Malvastrum coromandelianum*
(Malvaceae)
- 5b. Epicalyx absent; stipule persistent; leaves less densely hairy.....6
- 6a. Leaf blade oblanceolate to ovate; flowers solitary axillary, pedicel longer; 1 awn on each mericarp
.....*Sida rhombifolia* (Malvaceae)
- 6b. Leaf blade lanceolate; flowers generally in densely crowded axillary head, pedicel shorter; 2
awns on each mericarp.....*Sida acuta* (Malvaceae)
- 1b. Corolla in valvate aestivation, always polypetalous.....3
- 3a. Leaves oblanceolate, margin serrated; stamens are free without staminodes.....7
- 7a. Habit tree; flowers pedicillate, petals obovate, white in
colour; fruit juicy berry.....*Muntingia calabura*
(Muntingiaceae)
- 7b. Habit- herbs; flowers subsessile, petals lanceolate,
yellow in colour; fruit dry capsule.....8
- 8a. Stems and leaves glabrous; leaves with filiform
appendages, sepals without appendages, shorter
than petals; fruits dehiscent 5-locular cylindrical
capsule without spines.....
Corchorus olitorius (Tiliaceae)
- 8b. Stems and leaves densely hairy; leaves without any appendages; sepals with appendages at tip, longer
than
petals; fruits indehiscent globose capsule with spines.....
Triumfetta rhomboidea (Tiliaceae)
- 3b. Leaves broadly ovate, margin entire; stamens monadelphous with alternating anthers and
staminodes.....*Kleinhovia hospita* (Sterculiaceae)

V.CONCLUSION

The morphological features revealed in the present study were helpful for the correct identification of the above mentioned plants. A family is usually characterized by their various character states representing a number of genera and species included under the different families of the order. To have comprehensive and complete idea about a family, it is essential to consider some aspects of the family. In the present study this includes characterization, distribution and classification of the taxa of the order core Malvales. In such case, scientific name with author citation, description, flowering and fruiting time, ecology, distribution and specimen examined of each plant have been documented. All these aspect mentioned above will represent a comprehensive account of the order core Malvales based on exomorphic characters.

REFERENCES

1. Bayer, C. and K. Kubitzki, "Malvales, Capparales and non-betain Caryophyllales", *The Families and Genera of Vascular Plants*, 5:225-311, 2003.
2. Smith, Stacey D. and David A. Baum, "Core Malvales. *The Tree of Life Project*." http://tolweb.org/core_Malvales/21172/2003.03.25. 2003.
3. Bayer, C., M.F. Fay, A.Y. De Bruijn, V. Savolainen, C.M. Morton, K. Kubitzki, W.S. Alverson and M.W. Chase, "Support for an expanded family concept of Malvaceae with circumscribed order Malvales: a combined analysis of plastidial *atpB* and *rbcL* DNA sequences" *Botanical Journal of The Linnean Society*, 129:267-303, 1999.
4. Judd, W. S., C. S. Campbell, E. A. Kellogg, P. F. Stevens, M. J. Donoghue. "Malvales." *Plant Systematics : A Phylogenetic Approach*, 2nd edition:405-410, 2002.
5. Le Péchon T, Giquard LD, "On the relevance of molecular tools for taxonomic revision in Malvales, Malvaceae s.l., and Dombeyoideae". *Methods Mol Biol*. 1115:337-63. doi. 10.1007/978-1-62703-767-9-17. 2014.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

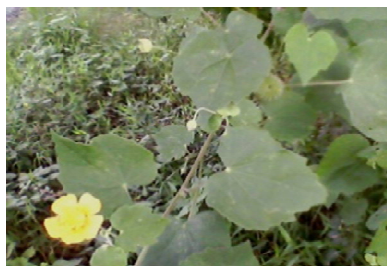
Vol. 5, Issue 5, May 2016

6. Alverson, W.S., K.G. Karol, D.A. Baum, M.W. Chase, S. M. Swensen, M. McCourt, and K.J. Sytsma.. "Circumscription of the Malvales and relationship to the other Rosidae: Evidence from *rbcL* sequence data", *American Journal of Botany*. 85:876-887, 1998.
7. Angiosperms Phylogeny Group: "An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG III", *Botanical journal of the Linnean Society* 161 (2) : 105-121. doi: 10.1111/j. 1095-8339. 2009.00996, 2009.
8. Heywood, V. H., Brummitt, R. K. , Culham, A. and Seberg, O., "Flowering Plant Families of the World", Richmond Hill, Ontario, Canada: *Firefly Books*. ISBN 1-55407-206-9, 2007.
9. Cheek, Martin, "The validation of two new family names in Malvales: Durionaceae & Brownlowiaceae." *Kew Bulletin* 61 (3):443, 2006.
10. Dowel, A. & Reveal, J. L. "Proposal to conserve the name Dombeyaceae." *Taxon*. 56(1): 265-266. 2007.
11. Pragati V. G. Parameshwar, Sreenath K. P., "Phylogenetic Relationship of Some *Ipomoea* seed protein by SDS-PAGE", *International Research Journal of Biological Science*. 2(10): 64-67. 2013.
12. Earl E. King and Harry R. Leffler. "Nature and Pattern of Proteins during Cotton Seed Development" *Plant Physiology*. 63:260-263, 1979.
13. Susmita Maity, Animesh K. Datta and Asokeprasun Chattopadhyay, "Seed Protein Polymorphism in Nine Species of Jute (*Corchorus*, family: Tiliaceae)," *Indian Journal of Science and Technology*. 2(1), 2009.
14. Fatma Ozturk, Selcen Babaoglu, M.Erkan Uzunhisarcikli, Leyla Acik, Mecit Vural, I. Sefa Gurcan. "Genetic Differentiation of Turkish *Althaea* L. and *Alcea* L. species." *Advances in Molecular Biology*. (1-2):47-56, 2009.
15. A.Z. Hegazi and N.Hamideldin, "The Effect of Gamma Irradiation on Enhancement of Growth and Seed Yield of Okra (*Abelmoschus esculentus*(L.) Monech) and Associated Molecular Changes", *Journal of Horticulture and Forestry*. 2(3):38-51. 2010.
16. Mrinmoy Ghosh, S.J.Sahani, K.K.Pulicherla "Evaluating the Antioxidant Activities in the Leaf Extract of a Medicinal Plant, *Abutilon indicum* (Linn) Sweet." *International Journal of Science and Nature*. 2(3):602-606,2011.
17. Guanqing Hu, Norme L. Houston, Dharminder Pathak, Linnea Schmidt, Jay J. Theleu, and Jonathan F. Wendel. "Genomically Biased Accumulation of Seed Storage Protein in Allopolyploid Cotton". *Genetics*. 189:1103-1115, 2011.
18. Oshchepkova, Yu. ; Rogozhin , E. ; Oripova, M. ; Veshkurova, O.; Egorov, Ts, ;Salikhov, Sh. "Cationic Peptides and Proteins from Seeds of Plants of the Family Malvaceae", *Chemistry of Natural Compounds*. 48:288-290, 2012.
19. Osawaru, M. E. Ogwu, M.C., Chime, A.O. and Amorighoye, A.R. "Morphological Evaluation and Protein Profiling of Three Accessions of Nigerian *Corchorus* Linn. Species." *Bayero Journal of Pure and Applied Science*. 5(1):26-32, 2012.
20. deSousa Ferreira Soares G, Assrey A.M. , de Almeida Gadelha CA, de Moraes Gomes V, Delatorre P, da Conceicao, Simoes R, Cavada BS, Leite JF. Nagano CS, Pinto NV, de Luna Freire Pessoa H, Santi-Gadelha T. "Purification and Biological Activities of *Abelmoschus esculentus* Seed Lectin", *Protein J*. 31(8):674-80.doi:10.1007/s10930-012-9447-0, 2012.
21. Bindu R. Nair, Rakesh G. Vadhyar, Meenu R.M. , Rahul P Chandran, Resmi S.R. , Sreeja J. and G. Valsaladevi. "Identification of Molecular Markers in Species of *Abelmoschus* Medik. (Malvaceae) for Inter- and Intraspecific Discrimination", *Indian Journal of Fundamental and Applied Life Science*. 3(1):52-61. 2013.

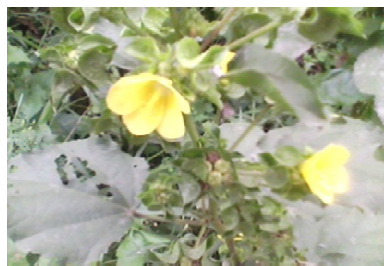
International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

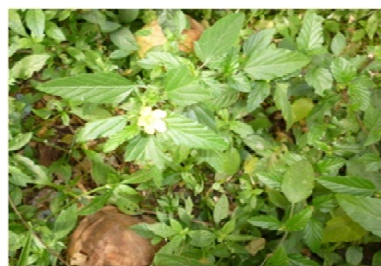
Vol. 5, Issue 5, May 2016



A



B



C



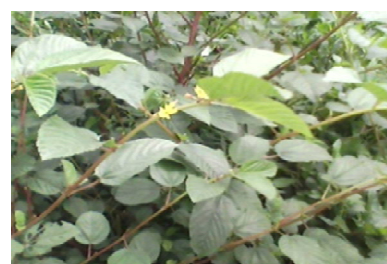
D



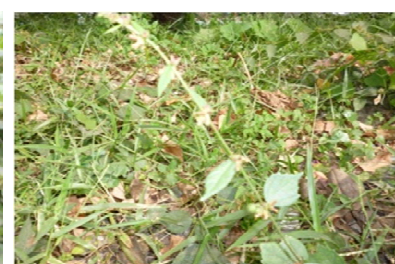
E



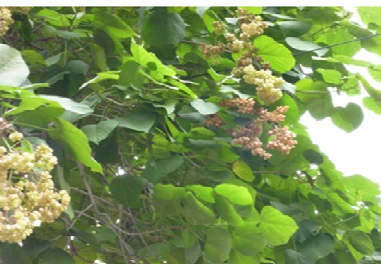
F



G



H



I

A. *Abutilon indicum* L.

B. *Malachra capitata* (L.) L.

C. *Malvastrum coromandelianum*(L.) Garcke

D. *Sida acuta* Burm.f.

E. *Sida rhombifolia* L.

F. *Thespesia populnea* (L)Sol. ex Correa

G. *Corchorus olitorius* L.

H. *Triumfetta rhomboidea* Jacquin.

I. *Kleinhovia hospita* L.

PLATE-1:PLANTS SPECIES OF MALVALES