FAMILY FABACEAE (LEGUMINOSAE)

Systematic position
Class : Dicotyledons
Subclass: Polypetalae
Series: Calyciflorae
Order: Rosales

Third largest family among angiosperms.
590-690 genera ; 12,000- 17,000 species
Bentham & Hooker – Order – Leguminosae
suborder – Papiloinoideae
- Caesalpiniodieae
- Mimosoideae
These are considered presently as subfamilies – Papilionaceae
Caesalpiniaceae
Mimoseae
These are further having tribes as next categorization.

Diagnostic features of the family Fabaceae:

•Cosmopolitan in distribution

• habitat varies from xerophytes, mesophytes & hydrophytes

• Include plants with root nodules (Symbiotic association with nitrogen fixing bacteria) , & so these plants are rich in nitrogen content.

• Agriculturally, important – used as nitrogen fertilizers

• Economically useful as many used as pulses, vegetables, oil seeds, dye sources, timber etc.

• Plant characters many common in three subfamilies

• Leaves alternate, pulvinate, stipulate/ exstipulate, simple/ compound (pulvinus – swelling at the leaf base of rachis)

•Racemose inflorescence

• Flowers bisexual, pentamerous & perigynous

• Androecium diplostemonous, or with adelphy various types

• monocarpellary unilocular gynoecium with marginal placentation

•Fruit legume/ lomentum

SUBFAMILY - PAPILIONACEAE

Systematic position:
Class : Dicotyledons
Subclass: Polypetalae
Series: Calyciflorae
Order: Rosales
Family: Fabaceae

<u>Representatives</u> – 375 genera, 9900 species
<u>Distribution:</u> Tropical & Temperate
<u>Habit:</u> Herbs, Shrubs, Trees
Herb – Tephrosia
Shrub – Cajanus
Tree- Dalbergia, Pongamia, Pterocarpus

Twiner – Clitoria
Tendril climber – Lathyrus, Pisum
Near ponds (aquatic)
– Aeschynomene aspera
Xerophyes – Ulex, Cystissus
Climbing shrub – Abrus
Lianas - Rhynchosia


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Roots:- Tap root system with root nodules having rhizobium (symbiotic)

Leaves: simple/ compound imparipinnate, alternate, stipulate, pulvinate, petiolate.

Simple leaf – crotalaria juncea
Compound leaf – C. pallida
Simple trifoliate – Trifolium repense
Bifoliate – Zornia gibbosa
Leaf variously modified as tendrils
Lathyrus entire leaf lamina- Tendril
In Pisum – terminal leaflets -Tendril
Stipules- foilaceous – Lathyrus & Pisum
Leaves kodified to spines – Ulex europeaus (seedling leaf trifoliate)
Desmodium leaf show turgor movements


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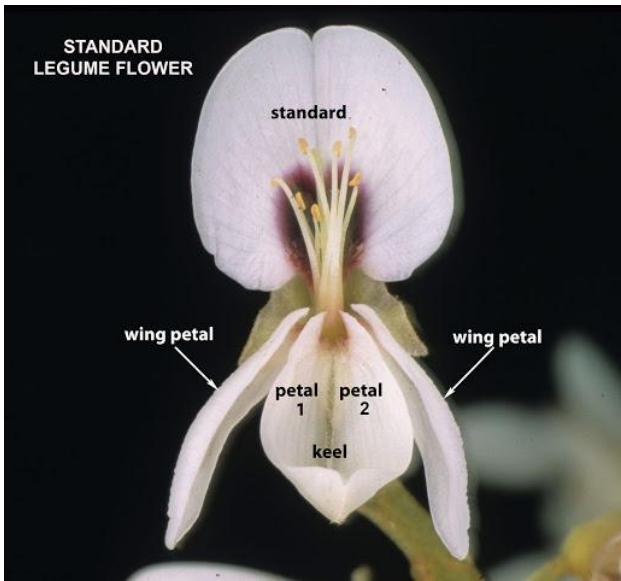
Inflorescence :- Racemose axillary/ terminal
Dalbergia – panicle

Flower:- Bisexual, strongly zygomorphic, perigynous pentamerous, cyclic, bracteate, bracteoloate with papilionaceous corolla.

Calyx:- Sepals 5, gamosepalous, irregular with valvate aestivation. Odd sepal anterior in position. Bilabiate in Aeschynomene aspera

Corolla:- Petals 5, polypetalous, irregular with Descendingly imbricate aestivation, and Papilionacoeus corolla. Odd petal posterior ,large Single (standard/ vexillum), 2 median petals (wing/ alae), 2 anterior pair petals (keel/ carina). Keel petals united (boat shaped)and enclose the essential organs



Androecium:- stamens 10, monadelphous/ diadelphous. The filaments are free at apex and bear anthers.In diadelphous, the free stamen is posterior in position.

In abrus, posterior stamen is absent.

In aeschynomene, 2 bundles of 5 stamens each.

Anthers bithecous, dorsifixed

Sophora – all 10 stamens are free

Gynoecium:- short stalked, Monocarpellary, half inferior half superior, unilocular with margina placentation. Style terminal & capitate stigma.

ovules reduced to (2-4 Arachis)

Fruit:- legume

Lomentum – Desmodium12

Geocarpic pod- arachis

Seed:- few – many, single seeded in Dalbergia & Pterocarpus. Seeds known as pulses, cotyledons fleshy, edible Rich in proteins, nonendospermous

Economic importance:

- Vigna radiata/ Phaseolus aureus (Green gram) – seeds edible
- Vigna mungo/ P. mungo (Black gram) – seeds edible
- P. biflorus/ Macrotyloma uniflorum (Horse gram) – edible seed
- Cicer arietinum (Bengal gram/ chick pea) – edible seeds
- Pisum sativum (Garden pea) – edible seeds
- Arachis hypogea (groundnut) – seeds edible, oil extracted from seeds






•Canavalia ensiformis (Sword beans/ Jack beans) –edible

• Cyamposis tetragonoloba (Cluster beans) – edible fruit

• Sesbania grandiflora (Humming bird tree) – ornamental, flowers edible

• Dolichos lablab (Hyacinth bean)- fruits edible

• Cajanus cajan (pigeon pea/ red gram)– edible seeds

•Vigna unguiculata (cow pea) – fruits & leaf edible

• Lathyrus odoratus (Sweet pea)- Ornamental

• Trigonella foenum-graceum (fenugreek) – seeds as spice & used for diabetics treatment, leaves edible

• Indigofera tinctoria (Indigo) – dye “indigo” obtained from leaves

• Myroxylon balsamum (Tolu balsam) sap exudate medicine. , cough, bronchitis, swollen airways, and cancer. applied directly to the skin to treat bedsores, cracked nipples, cracked lips, and minor skin cuts.

• Glycirrhiza glabra (Liquorice)- medicinal an extract of the root as a sweetening & flavoring agent,herbal remedy for gastritis and upper respiratory tract infections , cough syrups with **licorice** extract.

Glycyrrhiza glabra fruits

•Dalbergia latifolia (Rose wood) – Timber, furniture making
•Mucuna pruriens (Cowhage)– medicinal (herbal drug used for the management of male infertility, nervous disorders, and also as an aphrodisiac.)
• Pterocarpus marsupium (Indian Kino)– Timber, leaves for fracture, gastric disorders

• P. santalinus (red sandal wood)– Medicinal, used in cosmetic industry
•Desmodium gyrans (indian telegraph plant)
• Clitoria ternatea – dye from flowers
• Crotalaria juncea (sun hemp) – cortical fibres fro rope, floor mats
• Butea monosperma (Flame of the forest) – timber, yellow dye from flowers, host for lac insect, leaves fodder for elephants.
• Aeschynomene aspera – light wood, usd for making toys
• Erythrina variegata (indian coral plant) – ornamental

•Pongamia pinnata / Milletia pinnata (indian beech tree) – seeds for skin diseases

• Tephrosia purpurea (wild indigo) - weed

• Glyricidia sepium (Mexican lilac)– hedges

•Arachis pintoi (Pinto Peanut) -ornamental

Diagnostic features:

- Plants with simple/ pinnately compound leaves
- leaf pulvinate, stipulate with entire margins
- Inflorescence racemose type
- Flower bisexual, strongly zygomorphic, perigynous, pentamerous, cyclic, dichlamydeous and complete.
- Calyx 5, gamosepalous with valavte aestivation, odd sepal anterior in position
- Corolla 5, polypetalous, papilionaceous with descendingly imbricate aestivation
- Androecium with 10 stamens, monadelphous/ diadelpous with bithecous anthers
- Gynoecium monocarpellary, unilocular half inferior half superior with ovules on marginal placentation.
- Gynophore present.
- Style terminal & stigma capitate
- fruit legume

SUBFAMILY – CAESALPINIACEAE

Systematic Position:
Class: Dicotyledons
Subclass: Polypetalae
Series: Calyciflorae
Order: Rosales
Family: Fabaceae
Representatives: 160 genera & 2000 species
Distribution: Tropical & subtropical
Habit: herb, shrubs, trees
herb – Cassia tora
Shrub – Caesalpinia, Bauhinia
Tree- Tamarindus
Climber – Caesalpinia sepiaria
Lianas – Bauhinia vahlii
Xerophyte - Parkinsonia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Leaves: large, pinnately/ bipinnnately compund, pulvinate, stipulate, alternate

Bilobed leaf – Bauhinia

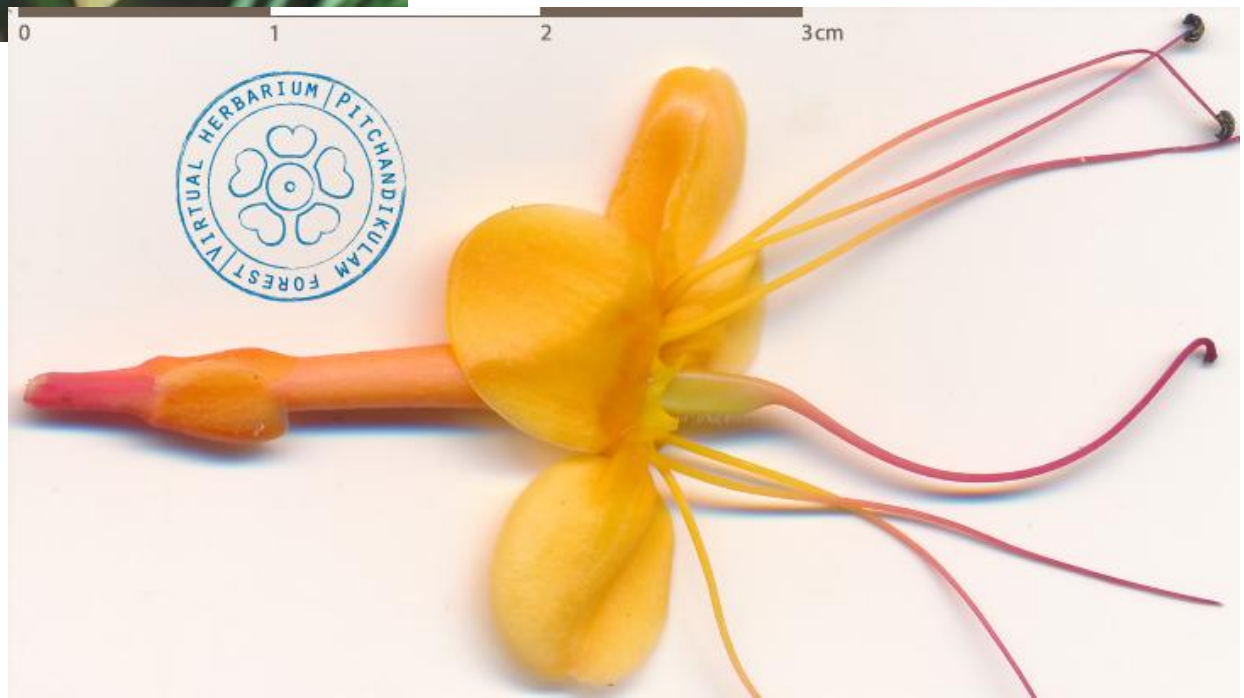
Stipules – spiny (parkinsonia), Leafy (Delonix), auriculate(Cassia auriculata)

Parkinsonia – main rachis modified to spine, sec. rachis form phyllodes

Inflorescence:- Axillary/ terminal, corymb.
Corymbose panicle- Saraca

Flower: - coloured, bisexual, medianly zygomorphic, dichlamydeous, cyclic, pentamerous, peigynous,bracteate, bracteolate.
Zygomorphy due to size reduction of posterior odd petal.

Calyx:- Sepals 5, polysepalous mostly, sometimes gamosepalous, with imbricate aestivation.
Sepals 4 – Tamarindus (2 posterior sepals fused, so only 4 sepals)
Sepals – tube like, coloured as corolla absent (Saraca)
Sepals petalloid & spathulate (Caesalpinia)
Valvate aestivation – Delonix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VIRTUAL HERBARIUM | PITCHANDIKULAM FOREST

Corolla:- Petals 4 -5, Polypetalous, with ascendingly imbricate aestivation., clawed petals

Saraca, Hardwickia - petals absent (apetalous)

Tamarindus – anterior laterals absent (3 petals seen)

Androecium:- 10 stamens, free, 2 whorls 5 +5 (diplostemonous), long coloured filaments, anthers basifixed & bithecous

Fused & diadelphous (Amherstia)

Fused & monadelphous (Tamarindus)

Number of stamens show suppression- Cassia tora out of 10 stamens, 4 posterior ones staminodes, remaining 6 – here 2 long, 2 median, 2 small stamens

Tamarindus- stamens 7-8, only 3 fertile.

Gynoecium:- Monocarpellary, unilocular, half inferior half superior ovary with one or more ovules on marginal placentation, ovary with stalk at base (gynophore), style terminal and stigma capitate.

Fruit:- Legume. Tamarindus- Pod
Samara - Pterlobium

Seed:- exalbuminous

Diagnostic Features:
Shrubs or trees
Leaves pinnately or bipinnately compound , Pulvinate, stipulate
Inflorescence Corymb
Flower Bisexual, medianly zygomorphis, Perigynous, cyclic, pentamerous, bracreate, bracteolate & complete
Calyx 5, polysepalous with imbricate aestivation
Corolla 5, polypetalous, clawed with asendingly imbricate aestivation
Androecium 10, free with long coloured filaments, bithecous & basifixed anthers
Gynoecium monocarpellary, superior, unilocular with ovules on marginal placentation
Style terminal & stigma capitate
Fruit is a legume
Seed nonendospermous.

Economic importance:-

* Caesalpinina pulcherrima (Peacock flower)– ornamental, Antimicrobial, Antiviral, Antitumorous, Abortifacient, Antiulcer and Anti-inflammatory activity.

*Tamarindus indica (Tamarind)– fruit edible, wound healing, abdominal pain, diarrhea, dysentery, parasitic infestation, fever, malaria and respiratory problems.

*Cassia tora/ Senna tora - natural pesticide, pet food industry, seeds and leaves treat skin disease, seeds as laxative.

Cassia occidentalis - plant extracts antibacterial, antifungal, antimalarial, anti-inflammatory, antioxidant, hepatoprotective and Immunosuppression activity

*C. fistula (golden shower) – ornamental, bark as tonic, antidysentric, for skin complaints, the powder or decoction of the bark in leprosy, jaundice, syphilis and heart diseases. The aqueous extract of the root bark exhibits anti-inflammatory activity.

*Saraca indica (asoka tree) - gynecological problems , menstrual disorders , as tonic, controlling spasms and abdominal pain.
*Bauhinia acuminata – leaf treat bladder stone , leprosy , asthma and digestive diseases. plant used in traditional medicine.
*B. tomentosa –bark used for Skin Problems,cure Wounds and Ulcers. A decoction prepared from its bark is used for gargling to treat Oral Problems like Sore Throat.
*B. purpurea (butterfly tree) -antibacterial, antidiabetic, analgesic, anti-inflammatory, anticancerous, nephroprotective and thyroid hormone regulating activity.




*B. monandra – (Napoleon's plume) folk medicine for diabetes treatment leaf extracts of sources of natural antioxidants

Haematoxylon campechianum (bloodwood tree) -astringent, anti-inflammatory agent and to treat gastric disorders. Ornamental, haematin from heartwood is used for producing dye haematoxylin.

Delonix regia (flamboyant / royal poinciana) -seed is carminative, ornamental

Parkinsonia aculeata (Jerusalem thorn) - antipyretic, antimalarial, diaphoretic and abortifacient.

Amherstia nobilis (pride of burma) – ornamental (loveliest tree in world)

SUBFAMILY-MIMOSACEAE

Systematic position
Class: Dicotyledons
Subclass: Polypetalae
Series: Calyciflorae
Order: Rosales
Family: Fabaceae
Representatives: 82 genera & 3200 species
Distribution: mostly tropical, rarely temperate
Habitat: Mesophytic, xerophytic, hydrophytic
Habit: Shrubs or trees
Shrub – Acacia acinacea
Trees – Enteroloboium
Herb – Mimosa
Xerophyte – Acacia, Prosopis
Hydrophyte – neptunia
lianas - Entada

Leaves: Alternate, stipulate/ exstipulate, pinnate/ bipinnately compund, with entire margins.
Phyllodes (petiole) – Acacia melanoxylon, A. auriculiformis
Stipules to spines – Acacia
A.sphaerocephala – stipular spines show myrmecophily
Sleep movements – Mimosa , Neptunia

Inflorescence: Spike; Axillary. Head like in Mimosa, condensed cyme - Enterolobium

Flower: Bisexual, actinomorphic, cyclic, dichlamydeous, hypogynous, pentamerous/ tetramerous , bracteate, ebracteolate, sessile.
Polygamous- Entada, Mimosa

Calyx: Sepals 4/5, gamosepalous , valvate aestivation.
5 sepals, odd sepal at anterior position.

Corolla: equal to sepals, free/ fused, valvate aestivation.

Androecium: Equal to petals – Mimosa, Double the number of petals – Adenanthera, indefinite – Acacia, Pitecolobium. Filaments long, coloured.

Based on stamen number, family divided to two – Mimosa group with definite number, Acacia group with indefinite number.

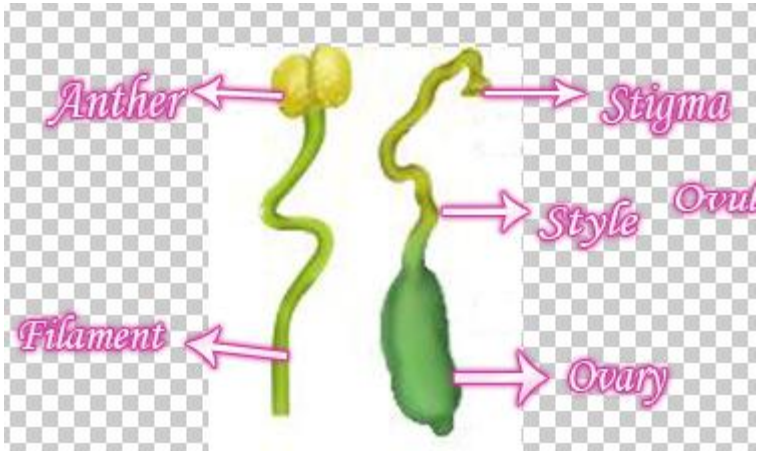
Anthers bithecous , basifixed, with longitudinal dehiscence.

Flowers conspicuous due to the exerted coloured filaments.

Gynoecium: Superior, Monocarpellary, unilocular , with many ovules on marginal placentation. Style terminal & filiform, stigma capitate/ inconspicuous.

Fruit: Legume /Lomentum

Seed: Exalbuminous with straight embryo.



Diagnostic Features:
Shrubs or trees
leaves pinnately/ bipinnately compund pulvinate, stipulate with entire margins
Inflorescence spike
Flower bisexual, actinomorphic, pentamerous/ tetramerous, dichlamydeous, cyclic, hypogynous, bracteate, ebracteolate
Calyx 4 or 5, gamosepalous with valvate aestivation
Corolla 4/5, gamopetalous with valvate aestivation
Androecium equal / double/ infinite number, filaments long & coloured with bithecous, basifixed & introrse anthers
gynoecium superior, monocarpellary, unilocular with ovules on marginal placentation. Style filiform, terminal & stigma inconspicuous.
Fruit legume/ lomentum
Seeds exalbuminous.

Economic importance:

Mimosa pudica (Touch me-not) - antibacterial, antivenom, antifertility, aphrodisiac, treatment of urinogenital disorders, piles, **dysentery**, sinus, and also applied on **wounds**.

Acaia auriculiformis (Ear-Pod Wattle) - A decoction of the root sore eyes; an infusion of the bark treated **rheumatism;** recover wastelands.

A. Catechu (**catechu)-** treatment of cough, sore throat; bark - dysentery, diarrhoea, healing wounds; seeds antibacterial action.

A.mangium (black wattle) –**wood** for paper, timber, furniture, firewood, charcoal. leaves can serve as forage for livestock.

A. arabica (Indian Gum arabic) – foliage for cattle, bark in tanning

A.Senegal (Sudan gum arabic) - Tree yields commercial gum arabic, used extensively in pharmaceutical preparations. Pharmaceutical drugs and cosmetics use gum as a binder, emulsifying agent, and a suspending or viscosity-increasing agent.

A.decurrens (Green Wattle) - fuelwood and charcoal , bark astringent, for diarrhea, ornamental, prevents soil erosion.

A.Dealbata (silver wattle) – yellow dye form flowers, ornamental,
prevents soil erosion

Pithecolobium dulce (Manila tamarind, Madras thorn) - bark and pulp being astringent, haemostatic , gum ailments, toothache and bleeding.

Samanea saman/ Enterolobium saman/ Albizzia lebbeck (Rain tree) – shade tree, plant is used in the treatment of diarrhea, stomach pain, and sore throat. It is also used as a laxative.

Adenathera pavonina (Barbados pride)-A red powder from the wood used as antiseptic paste. ground seeds treat boils and inflammations. decoction leaves treat gout and rheumatism. The bark to wash hair.
Prosopis spicigera (screw-bean) -in traditional medicine leprosy, dysentery, asthma, leucoderma, dyspepsia , earache. Bark wood, tanning, fuel, firewood and charcoal.
Neptunia oleracea (water mimosa)-Pheophorl its related compounds plant makes this plant a promising antitumor plant.
The plant can also be used in sewage water treatment plants.

Entada rheedii (African dream herb or snuff box sea bean) – pulp of seed edible, dried, powderd, mixed with tobacco and chewed by aborigins of africa. Plant as a topical ointment against jaundice, toothache, ulcers and to treat muscular-skeletal problems.

Assignment:
Make a comparison of three subfamilies of family on vegetative & reproductive characters.