

CRUCIFERAE

There are about 350 genera and 2500 species in this family. The family is characterised by presence of **Cruciform** (cross-like) corolla.

Distribution

The members of the family are cosmopolitan in distribution but most are common in north temperate region. A large number of vegetable crops, garden crops, garden and wild flowers are included in this family. Locally the family is well represented in plains both by plants under cultivation and as well as wild plants of dry and waste places, and also as weeds of cultivation.

Vegetative Characters

Habit : Mostly annual, biennial or perennial, herbs. Some small shrubs, e.g., *Brassica* spp. are annuals, biennial or perennial herbs.

Root : Usually tap root and branched. May be modified into : **Fusiform root** -- *Raphanus sativus* or **Napiform Root** -- *Brassica rapa*. Sometimes roots are swollen due to stored food present in them.

Stem : Herbaceous in *Brassica oleracea* (Ganth Gobhi); in *Raphanus sativus* (Radish) it is condensed.

Leaf : Simple, Alternate; Exstipulate; Usually radical or cauline, when radical in the form of a rosette as in *Raphanus sativus*; Sometimes **Bulbils** develop in the axils of upper leaves.

Floral Characters

Inflorescence : Generally racemose, may be raceme, corymb or corymbose-raceme; Bracts and bracteoles absent.

Flower : Ebracteate; Pedicellate; Regular; Actinomorphic; Hermaphrodite; Complete; Cruciform; Hypogynous.

Calyx : 4; Polysepalous; Arranged in two whorls.

Corolla : 4; Polypetalous; Cruciform; Petals clawed in Candytuft (*Iberis amara*); Flowers become zygomorphic due to enlargement of other petals.

Androecium : Usually 6 stamens, arranged in two whorls, outer two short and the inner four long (Tetradynamous), characteristics of the family. In *Senebiera*, two stamens are present.

Gynoecium : Bicarpellary; Syncarpous; Ovary: superior; Unilocular but becomes bilocular due to the formation of a false septum; Placentation : parietal; Style: short with two lobed stigmas.

Fruit : Either Siliqua or Silicula; Lomentum in *Raphanus sativus*.

Floral Formula

Brassica campestris :

$\oplus, \text{♀}, K_{2+2}, C_{x4}, A_{x4}, A_{2+4}, \underline{G_{(2)}}$

Senebiera didyma :

$\oplus, \text{♀}, K_{2+2}, C_{xG}, A_{\text{♂}}, \underline{G_{(2)}}$

Important Genera

1. *Brassica campestris* : Sarson.
2. *Brassica campestris* : Var. Toria.
3. *Brassica juncea* : Vern. Rai.

4. *Brassica nigra* -- Black Mustard: (Kali Rai).
5. *Brassica oleraceae* -- (Karam Sag).
6. *Brassica oleracea* Ver. *botrytis* -- Cauliflower (Phool Gohbi).
7. *Brassica oleracea* Ver. *capitata* (Band Gobhi).
8. *Brassica oleraceae* Ver. *gongylodes* -- (Gand Gobhi).
9. *Capsella bursa-pastoris* : Shepherd's purse.
10. *Cherianthus cheiri* -- Wall flower.
11. *Iberis amara* -- Rocket Candytuft.
12. *Nasturtium officinale*.
13. *Ranunculus*

ROSACEAE

The family includes about 115 genera and 3200 species.

Distribution

The members of the family are cosmopolitan but are chiefly found in temperate and colder regions. Locally the family is poorly represented in Punjab in case of wild species. Most of the species are cultivated as ornamentals and fruit trees. The only wild species met around Lahore is *Potentilla supina*. The *Roses*, and *Spiraea* are cultivated as ornamentals. In temperate and cold temperate climates the family is represented by genera like *Agrimonia*, *Spiraea*, *Pyrus*, *Malus*, *Prunus*, *Fragaria*, *Alchemilla*, etc.

Vegetative Characters

Habit: The plants included in this family are trees, shrubs and herbs. Usually they are thorny; Some are climbers.

Root: Tap root and branched.

Stem: Erect or creeping; Herbaceous or hard and woody; Branched; Many shrubs are spiny, e.g., *Rosa*; In *Rosa* and *Rubus*, the spiny outgrowths are cortical and arise both from nodes and internodes; Vegetative propagation by runners, suckers and cuttings.

Leaf: Alternate; Simple or compound--pinnate; Petiolate; Usually stipulate, stipules often adhering to the petiole, i.e., adnate.

Floral Characters

Inflorescence: It may be corymb, corymbose, umbellate, racemose or the flowers may be solitary or in small groups of twos or threes.

Flowers: Usually hermaphrodite, rarely unisexual (*Spiraea anuncus*); Actinomorphic; Regular (irregular in *Parinarium*); Bracteolate; May be hypogynous (*Fragaria*), perigynous (*Prunus*) or epigynous (*Pyrus*).

Calyx: 5 sepals; Gamosepalous; The lobes of calyx free; Valvate or imbricate; Green. ✓

Corolla: 5 or numerous, in multiples of 5; Polypetalous; Various coloured; Absent in *Alchemilla*, *Poterium*. ✓

Androecium: Indefinite; free; Arranged in many whorls of 5 each; Anthers : small, dithecous (2-celled), introse and dorsifixed. ✓

Gynoecium: 1-many; Apocarpous or syncarpous; Generally superior, sometimes inferior (*Pyrus*); Placentation: axile, basal in apocarpous species; Number of stigmatic lobes equivalent to the number of carpels; Style : free or connate; Stigma : simple, lobed or capitate. ✓

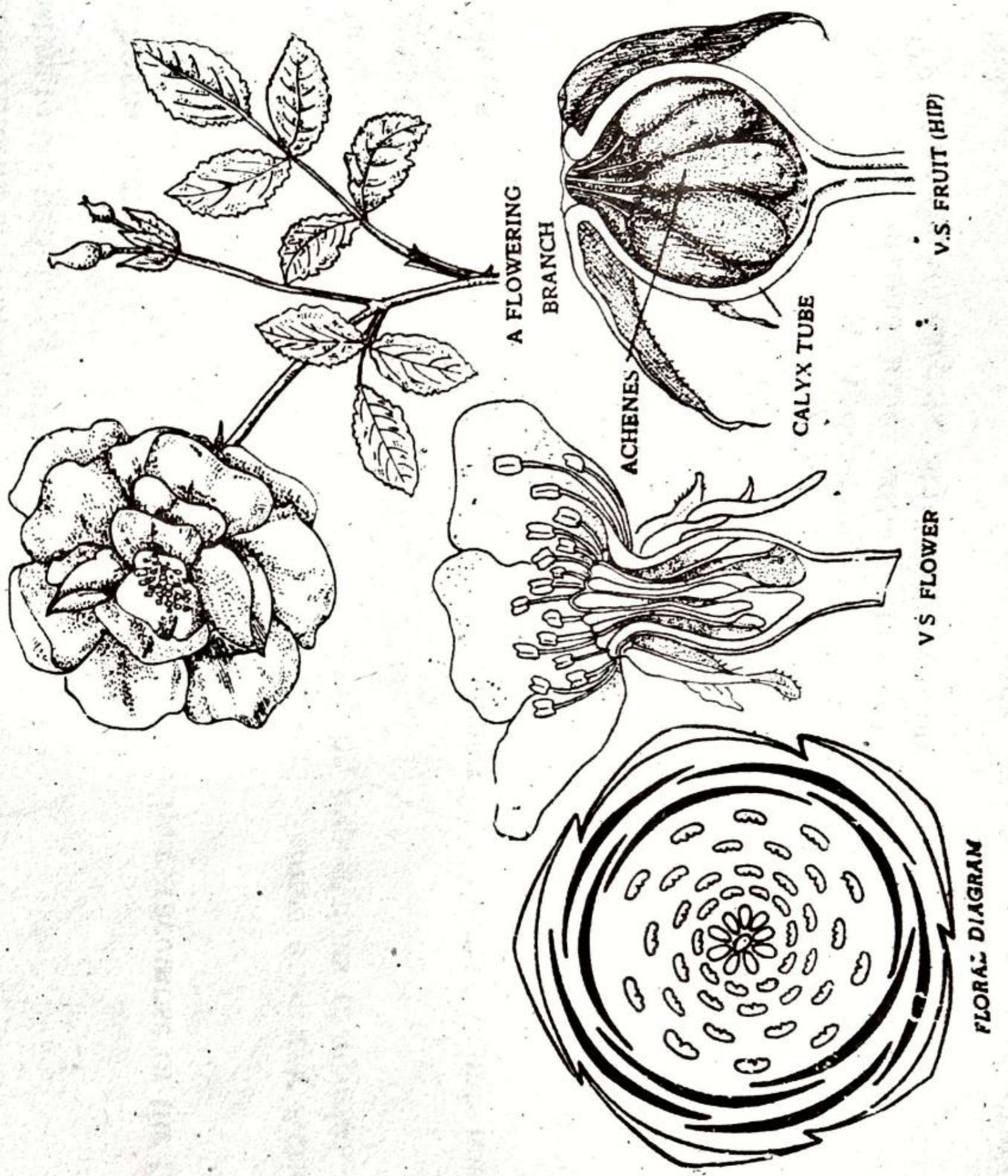
Fruit: Variable : a pome (*Pyrus*), a drupe (*Prunus*), etaerio of drupes (*Rubus*), achenes or follicles.

Seed: Exalbuminous with small embryo. ✓
 Pollination: Entomophilous or anemophilous. ✓

Floral Formula $\oplus \text{ } \text{K}(5), \text{C}_{5-6}, \text{A}_{\infty}, \text{G}_{\infty}$ ✓
Rosa indica:

Important Genera

1. *Prunus persica* ---Aru.
2. *Prunus domestica* -- Plum (Alucha).
3. *Prunus amygdalus*--Almond.
4. *Prunus armeniaca* --Apricot.
5. *Eriobotrya japonica*---Lokat.
6. *Fragaria chiolensis*--Garden strawberry.
7. *Pyrus communis*--Apple.
8. *Spiraea corymbosa*--An ornamental shrub.
9. *Rubus fruticosus*--Blackberry. ✓
10. *Rosa alba*-- Rose.
11. *Rosa chinensis*--Desi gulab.
12. *Potentilla fruticosa* -- A small herb.



Rosa indica (Rose - Gulab)

CUCURBITACEAE

The family includes about 100 genera and 850 species.

Distribution

The members belonging to this family are mainly tropical and sub-tropical in distribution. Only a few genera are found in temperate regions. Locally the family is well represented in the plains by many cultivated genera, including *Cucurbita*, *Citrullus*, *Luffa*, etc. Many plants like *Tricosanthes*, *Coccinia*, *Mukia* grow as wild genera. In some hilly areas *Momordica* is commonly met.

Vegetative Characters

Habit: Mostly annual or perennial trailing or decumbent vines; Usually climbing by means of tendrils and with plenty of juicy sap in the leaves and stems. *Acanthosicyos*—a thorny leafless bush is found in South Africa and *Dendrosicyos*—a small tree with soft stem is found in Arabian coasts.

Root: Tap root; Branched.

Stem: Herbaceous; Climbing; Hollow, often 5-angled with two alternating circles of bicollateral vascular bundles; Glabrous; Hairy or prickly.

Leaf: Alternate; Broad; Usually simple but mostly palmately lobed or divided; Reticulate; Petiole long and hollow; Tendrils may be simple or branched.

Floral Characters

Inflorescence: Usually cymose, solitary axillary, sometimes panicle; Rarely racemose or sub-umbellate.

Flower: Regular; Unisexual, rarely bisexual (*Schizopepon*); Actinomorphic; Epigynous; Pentamerous but with tricarpellary pistil.

Male Flower

Calyx: 5 sepals; Lobed, Petaloid; Campanulate; Gamosepalous.

Corolla: 5 petals; Mostly sympetalous or free; Often deeply lobed; Inserted on the calyx tube; Campanulate to rotate.

Androecium: Usually 5 stamens; Free or combined to form a central column inserted on calyx tube; Anthers : 2-celled; Stamens alternating with petals.

Female Flower

Calyx: Sepals 5; United.

Corolla: 5 petals; Usually free or slightly fused.

Androecium: Generally absent; Sometimes **staminodes** are present.

Staminodes: Rudiments of stamens; O, 3 or 5 are present.

Gynoecium: Tricarpellary; Syncarpous; Ovary: usually inferior, unilocular ; Placentation: looks like axile but it is not so, the ovules are not born in the centre because of

the fusion and curving back of the placentas, so on reaching carpellary walls the placentas fork into two and bear ovules.

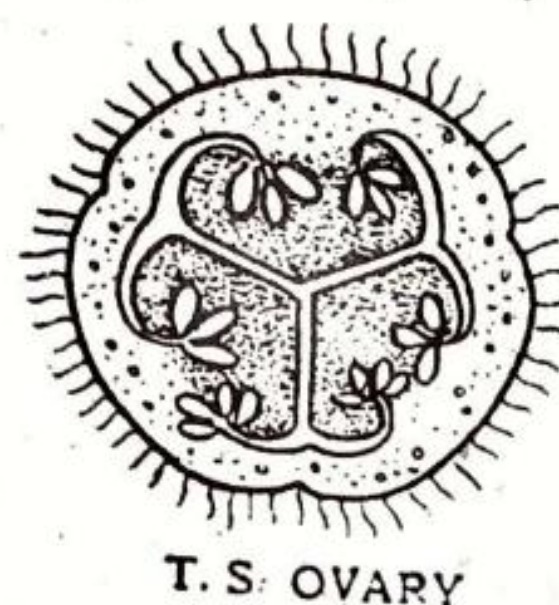
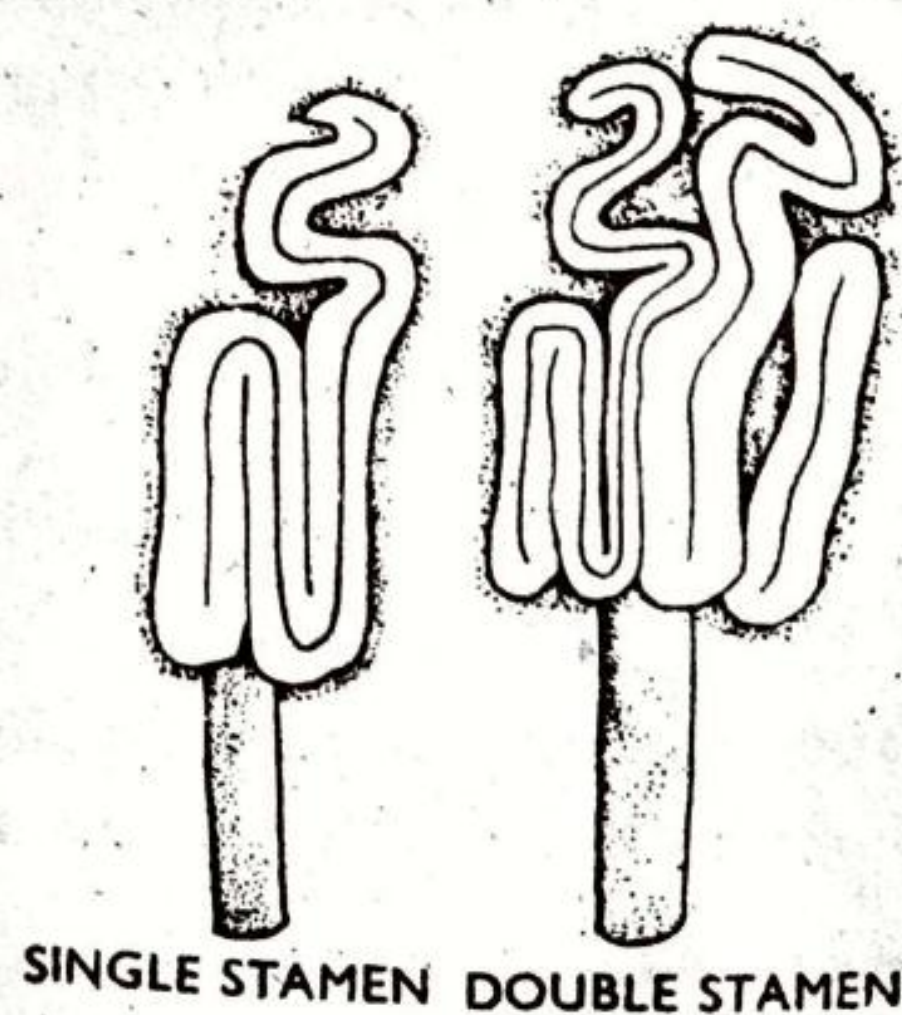
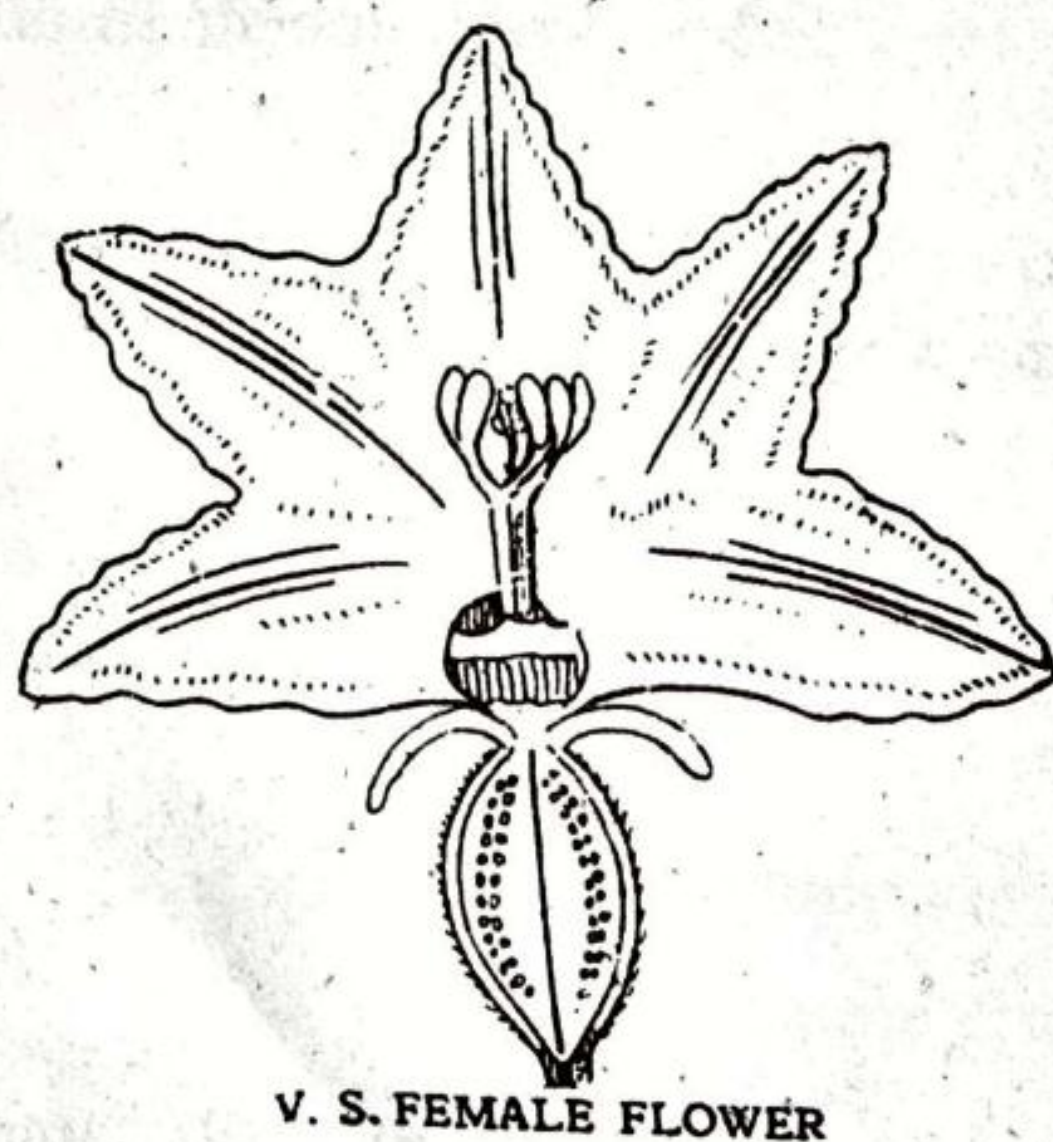
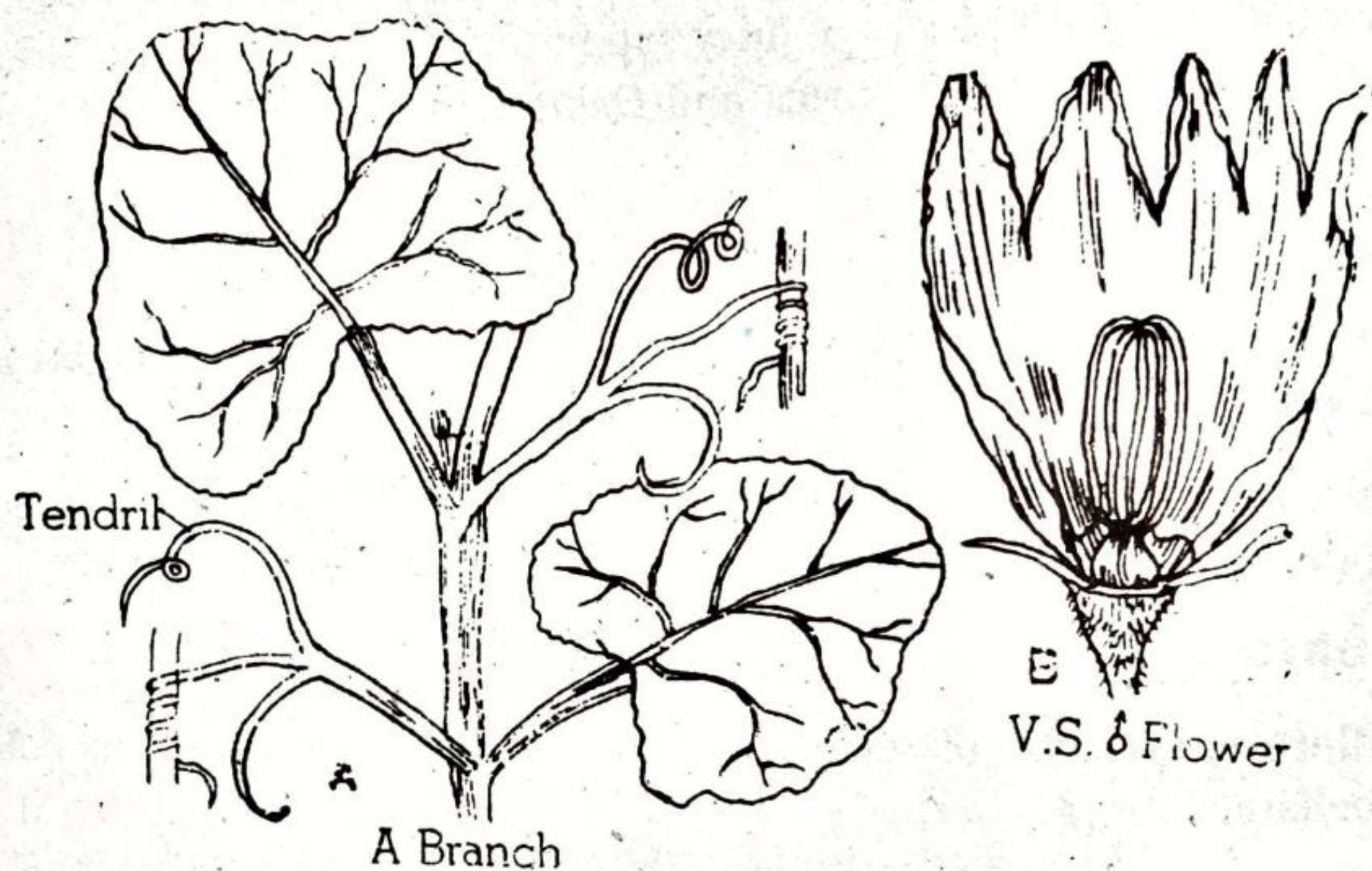
Fruit: A succulent berry with hard rind commonly known as **pepo**. e.g., in *water-melon* and *squash* (kadoo).

Seed: Many, flattened, exalbuminous with oily contents.

Floral Formula

Male flower: $\oplus, \sigma, K_{(5)}, C_{(5)}, A_{1+(2)+(2)}, G_0$

Female flower: $\oplus, \phi, K_{(5)}, C_{(5)}, A_{(0)}, G_{(3)}$



Cucurbita maxima (Gourd-Walaiti kadoo)

Important Genera

Dicot Families 28

1. *Bennincasa cerifera*—Wax gourd (Petha).
2. *Citrullus vulgaris*—Water melon.
3. *Citrullus vulgaris* Var. *fistulosus*—Round gourd (Tinda).
4. *Citrullus colocynth*—Bitter gourd (Tuma).
5. *Cucumis melo*—Musk melon (Kharbooza).
6. *Cucumis melo* Var. *utilissima*—Tar.
7. *Cucumis sativus*—Cucumber (Kheera).
8. *Cucurbita pepo*—Vegetable marrow (Ghia - kadoo).
9. *Luffa acutangula*—Kali tori.
10. *Luffa cylindrica*—Vegetable sponge (Ghia - tori).
11. *Momordica charanjia*—Bitter gourd (Karela).
12. *Ecballium elaterium*—Squirting cucumber.

Economic Importance

Source of Food: The fruits of a large number of plants of this family are eaten as vegetables. Some of these are *Luffa acutangula* (Kali tori); *Luffa cylindrica* (Ghia tori); *Lagenaria siceraria* (Lauki), *Citrullus lanuas* Var. *fisulosus* (Tinda), *Cucurbita moschata* (Halwa kadoo).

Delicious fruits are obtained from *Cucumis melo* (small ground), *Citrullus vulgaris* (Tarbooz) and *Cucumis melo* (Kharbooza).

Source of Medicines: Some of the plants have medicinal value. Majority of them are laxatives present mainly in seeds and fruits; some are poisonous and the dried pulp of *Colocynthis* (Tuma) yields a drug.

Manufacture of Musical Instruments : The hard pericarps of *Benincasa hispida* and *Lagenaria siceraria* are used in the manufacture of musical instrument.

Ornamental Plant : *Cocicnia indicia*, *Coccinia cordifoila* and *Schium elude* are grown as ornamental plants.

Distinguishing Characters

Habit: Large, weak, juicy herbs, climbing by means of tendrils.

Leaf: Cordate or Palmately lobed with coarse hairs.

Flower: Monoecious.

Calyx & Corolla: 5.

Stamens: 5, but usually less, most commonly 3, two large and one smaller; Anthers:

free or connate.

Carpels: Ovary usually inferior, usually trilocular, Placentation: parietal.

Fruit: Fleshy berry.

Seeds: Exalbuminous.

COMPOSITAE (Asteraceae)

The family contains about 950 genera and probably 20,000 species. It is the largest family of angiosperms.

Distribution

The members of the family are cosmopolitan, i.e., found everywhere on the surface of earth in a variety of ecological conditions from the sea coasts to the altitudes.

Vegetative Characters

Habit: Herbs, shrubs, very rarely trees and climbers. Many plants possess milky juice while in the others the juice is watery, resinous and bitter.

Root: Tap-root; Branched. In some cases tuberously thickened as in *Helianthus tuberosus*.

Stem: Soft, sometimes woody; Usually hairy; Erect.

Leaves: Alternate, sometimes opposite and rarely whorled; Simple or compound; Exstipulate; Petiolate; Sometimes acicular (needle-like or reduced to scales) as in some xerophytic species.

Floral Characters

Inflorescence: Racemose; Head or Capitulum; Rarely spike.

Flower: Flowers of a capitulum, i.e., **Florets** may be Hermaphrodite, unisexual (monoecious or dioecious) or neuter; Pentamerous; Actinomorphic or zygomorphic; Epigynous.

Two kinds of florets are found: **Disc Florets**--tubular flowers, and **Ray Florets**—ligulate flowers.

The florets are arranged in following ways:

- 1- All the ray and disc florets in a single head may be tubular and actinomorphic, e.g., in *Ageratum*, *Veronica*.
- 2- All the ray and disc florets in the head may be ligulate and zygomorphic, e.g., in *Launea*, *Sonchus*.
- 3- Disc florets may be actinomorphic and tubular while the ray florets may be zygomorphic and ligulate or bilabiate---**Heterogamous Flower**.

Disc Florets: Sessile; Regular; Actinomorphic; Complete; Hermaphrodite; Bracteate; Epigynous.

Calyx: Rudimentary or entirely absent, sometimes modified into a large number of bristles or hair-like structures called **Pappus**. The pappus is persistent and act like a parachute and helps in the dispersal of fruits.

Corolla: 5; Gamopetalous; Tubular, 5-lobed; Actinomorphic.

Androecium: 5; Epipetalous; Alternate with corolla lobes.

Gynoecium: Bicarpellary; Syncarpous; Ovary: inferior; Placentation: basal.

Ray Floret: Sessile; Zygomorphic; Irregular; Ligulate.

Calyx: Represented by pappus or absent.

Corolla: 5; Gamopetalous; Bilabiate or ligulate.

Androecium: Absent.

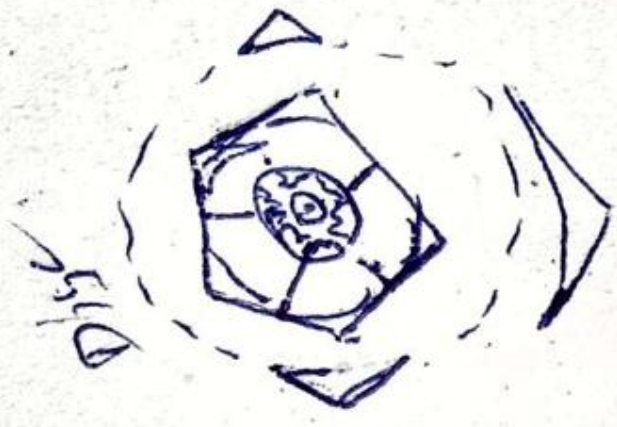
Gynoecium: As in disc floret.

Fruit: Cypsella (acheneal single seeded fruit)

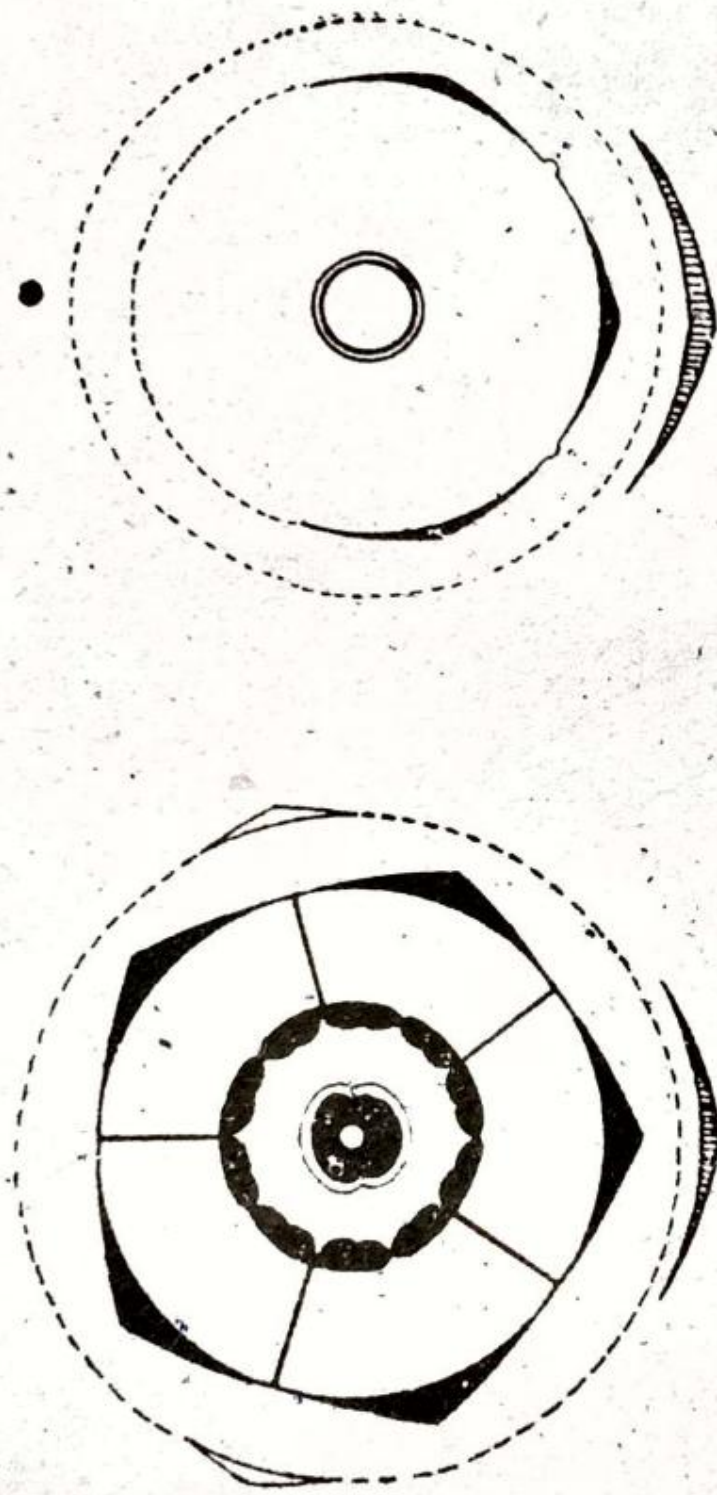
Seed: Non-endospermic.

Floral formula

Ray Floret: $\text{Disc } \oplus, \text{♀}, \text{K}_{\text{pappus}}, \text{C}_{(5)}, \text{A}_{(5)}, \text{G}_{(2)}$
 Disc Floret: $\text{Ray } \ominus, \text{Neuter}, \text{K}_{\text{pappus}}, \text{C}_{(5)}, \text{A}_0, \text{G}_0$



Disc $\oplus, \text{♀}, \text{K}_{\text{pappus}}, \text{C}_{(5)}, \text{A}_{(5)}$



Ray Floret

Disc Floret

Important Genera

1. *Helianthus annuus*: (Sunflower) A cultivated garden plant. The fruits yield oil.
2. *Bellis perennis*: Cultivated as an ornamental plant.
3. *Centuarea moschata*: (Sweet Welliam) An ornamental plant.
4. *Ageratum conyzoides*: (Wild herb) A common weed.
5. *Lactuca sativa*: (Lettuce-Salad) Cultivated, leaves used as salad.
6. *Sonchus asper*: (Dodak) Wild.
7. *Chrysanthemum indicus*: (Gul-e-Daudi) Cultivated as an ornamental plant.
8. *Zinnia elegans*: Cultivated as ornamental plants. Flowers with different colours.
9. *Taraxacum officinale*: (Dandelion) Cultivated. Roots used in European medicines, and as coffee substitute.
10. *Artemisia indica*: Medicinal herb. Found in hilly areas.
11. *Aster tripolium*: Cultivated as an ornamental plant.
12. *Calendula officinalis*: (Garden Marigold) Cultivated as ornamental plant.
13. *Cosmos*: Cultivated as garden plant.

GRAMINAE (*Poaceae*)

There are about 500 genera and 4,500 species in this family.

Distribution

The members of this family (grasses, cereals and millets) are cosmopolitan in distribution. The plants are commonly distributed in temperate regions. Locally the family is represented by more than 40 genera and about 100 species. The common winter grasses are: *Poa annua*, *Polypogon monspeliensis*, *Avena sativa*, *Triticum aestivum*, *Hordeum vulgare*, *Phalaris minor*. The common spring and summer grasses are: *Cynodon dactylon*, *Digitaria* spp., *Oryza sativa*, *Zea mays*, *Saccharum* spp. Many genera are found on the mountains.

Vegetative Characters

Habit: Mostly the plants are annual, biennial or perennial herbs or shrubs. The largest woody species are *bamboos* which may attain a height of 100 ft.

Root: Generally adventitious, fibrous, fascicled or stilt as in *Zea mays*.

Stem: Erect, prostrate or creeping; Usually fistular (hollow), rarely solid (*Zea mays*). Conspicuous nodes and long internodes; In many *grasses* suckers and runners also develop. Rhizomes and root stocks are found among the perennial grasses; Small tubers and corms are also found in many species; The aerial stem is usually known as **Culm** which is usually cylindrical but in few *grasses* flattened.

Leaf: Simple; Alternate; Sessile; Leaf base forming a sheath which covers the internode wholly or partially; At the junction of leaf sheath and the lamina a thin membranous outgrowth is present called **Ligule**; Lanceolate; Surface: smooth or glabrous.

Floral Characters

Inflorescence: The inflorescence is complex in this family. The inflorescence is composed of several to many spikelets, which are combined in various manners on a main axis called the **Rachis**. The inflorescence may be:

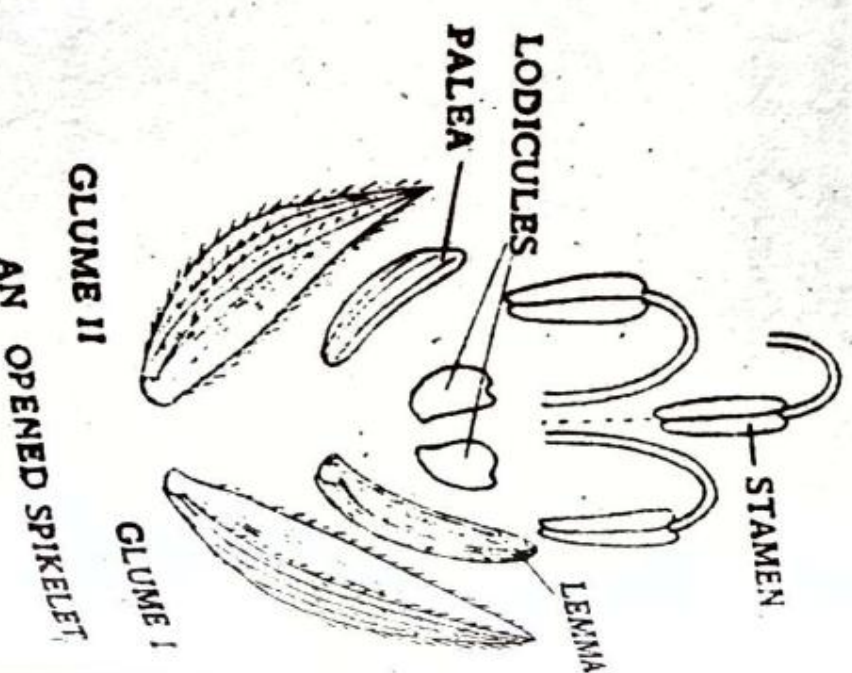
Compound spike---*Wheat*.

Raceme---*Restiaca*.

Panicles---*Avena*.

Each spikelet may bear one to several florets attached to a central stalk, the **Rachilla**. There is a pair of sterile **Glumes** at the base of the spikelet. Just above the glumes, there is a series of flowers, partly enclosed by the glumes. Each floret has at its base a **Lemna** and above **Palea**. The lemma is the outer bract of the floret and bears a long **Awn** as an extension of the midrib at the apex or back.

Flower: Sessile; Bracteate (Lemna and Palea); Hermaphrodite (*Wheat*) or unisexual (*Maize*); Zygomorphic; Hypogynous; Irregular.

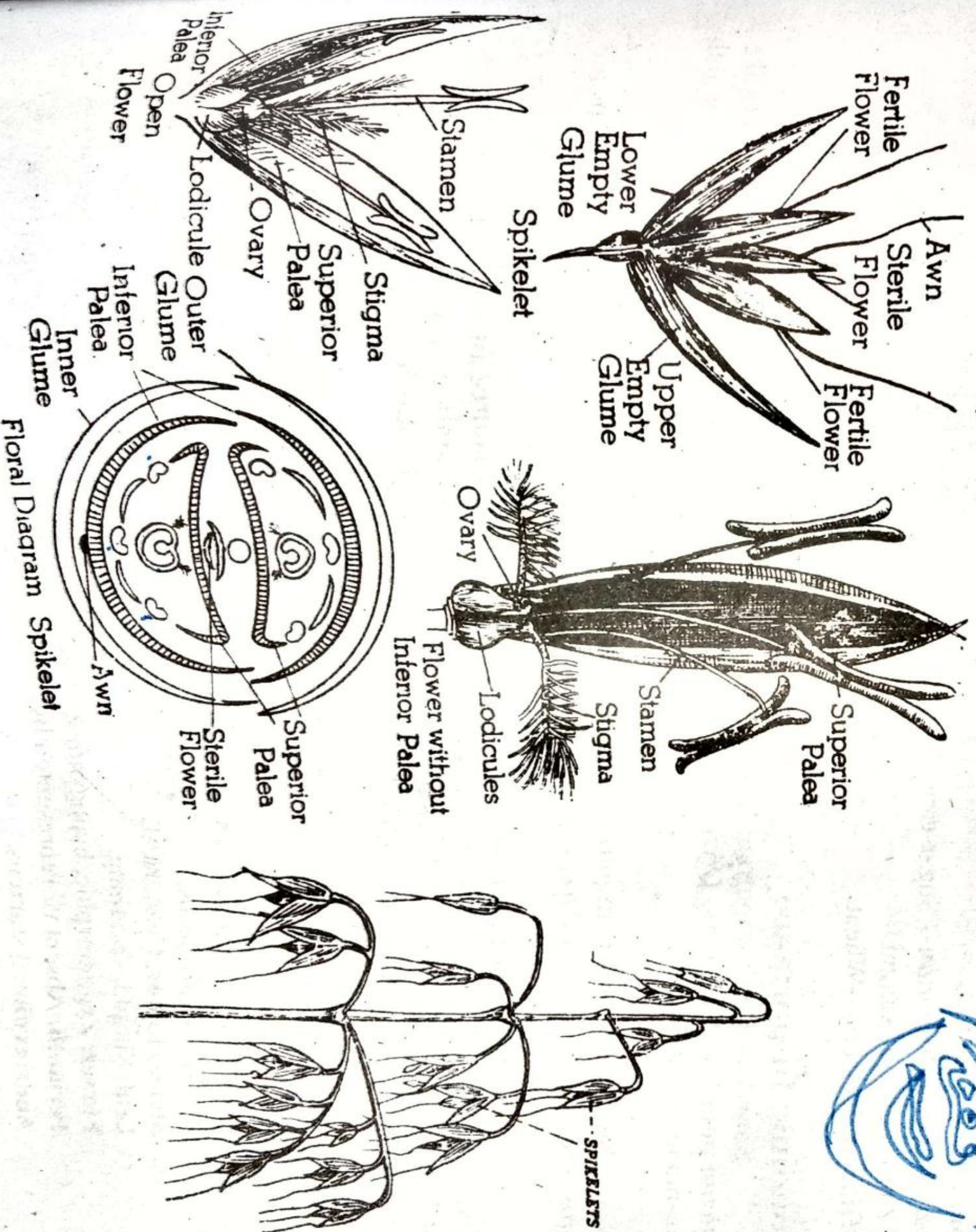


Perianth: Absent; Sometimes 2-3 membranous scales called the **Lodicules** lying on the anterior side below the stamens are regarded as rudimentary perianth. These lodicules are hygroscopic and force apart the paleae and glumes on absorption of water exposing the essential organs of the flower.

Androecium: Usually 3 stamens, sometimes 6 (*Oryza*), in some species the number of stamens reduced to 2 or 1. Stamens: are with long filaments and versatile anthers; Anthers: dithecous.

Gynoecium: Monocarpellary; Syncarpous (Actually the pistil is tricarpellary but only one carpel is functional); Ovary: unicellular, single ovuled, superior; Style: short; Stigmas: feathery.

Fruit: Usually caryopsis, rarely a nut or berry (*Bambusa*).



Avena sativa (Oat-Javl)

Avena sativa (Panicle of spikelets)

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Seed: Endospermic.

Pollination: Usually anemophilous (wind pollinated).

Floral Formula: $\sigma^{\frac{1}{2}} P_0$ or 2 lodicules, A_3 or 3+3, \underline{G}_1

Important genera

1. *Andropogon sorghum*---Jawar.
2. *Andropogon squarrosus*---Khas.
3. *Arundo donax*---Nari.
4. *Bambusa arundinacea*---Bamboo.
5. *Cymbopogon citratus*---Lemon grass.
6. *Cynodon dactylon*---Dub-grass.
7. *Hordeum vulgare*---Barley.
8. *Oryza sativa*---Rice.
9. *Panicum miliaceum*---Cheena.
10. *Pennisetum typhoides*---Bajra.
11. *Saccharum arundinaceum*---Sarkanda or Kana.
12. *Secale cereale*---Rye.
13. *Saccharum officinarum*---Sugar-cane.
14. *Setaria italica*---Kangni.
15. *Triticum indicum*---Wheat.

Economic Importance

Source of Food: Important food plants belong to this family. For example, cereals like *Triticum aestivum*, *Zea mays*, *Oryza sativa*, *Hordeum vulgare*, *Avena sativa*, *Secale cereale* and man-made cereal *Triticale*.

Source of Fodder: Important fodder crops belong to this family. The fodder crops are *Agrostis*, *Cynodon*, *Poa*, *Festuca*, *Lolium*, *Phalaris* and *Stipa* spp.

Source of Sugar: *Saccharum officinarum* is important source of sugar. Other species of *Saccharum* yield fibre that is utilised for making ropes. The bamboos are used variously, i.e., for paper pulp, as water-channels, as food, and for making of the musical pipes. *Arundo donax* is also used for making musical pipes.

Source of Oils: The species of *Cymbopogon* and *Veliveria zizanioides* are a source of Khus oil.

Distinguishing Characters

Habit: Usually herbs.

Stem: Hollow, Cylindrical.

Leaf: Simple, sheathing.

Flower: Zygomorphic, hypogynous, protected by palea.

Perianth: Absent or represented by two lodicules.

Androecium: 3 stamens.

Gynoecium: Single carpel with a single basal ovule.

Fruit: A caryopsis.