Brassicaceae [cruciferae]

Classification :⇒

Division : Phanerogams
sub-division : Angiospermae
class : Dicotyledonae
sub-class : Polypetalae
series : Thalamiflorae
order : Parietales
family : Brassicaceae

✱ Distribution :⇒

This family is also called as "Mustard" family. It has 375 genera & over 3200 species. The members of this family occurs in north temperate region. About 50 genera and over 140 species have been reported from India.

✱ other members (Plants) of this family :⇒

1) Brassica compestris [kali sarson]
2) Brassica hirta [safed rai]
3) Brassica oleracea [Phulkobi]
4) Raphanus sativus [Mula]

✱ vegetative characters :⇒

Habit : Plants are Annual biennial or perennial herbs, having pungent watery sap (juice) rich in sulphur, rarely shrubs.

Root : Branched tap-root. Some genera has swollen roots due to stored food material & becomes fusiform (Radish) or napiform (Turnip).

Stem : Erect, herbaceous, branched cylindrical rarely woody, often reduced (Radish), thickened like corms.

Leaves : Simple, alternate, dissected exstipulate hairy, sessile/petiolate, ovate, lanceolate, margin smooth/serrate, venation is reticulate unicostate.

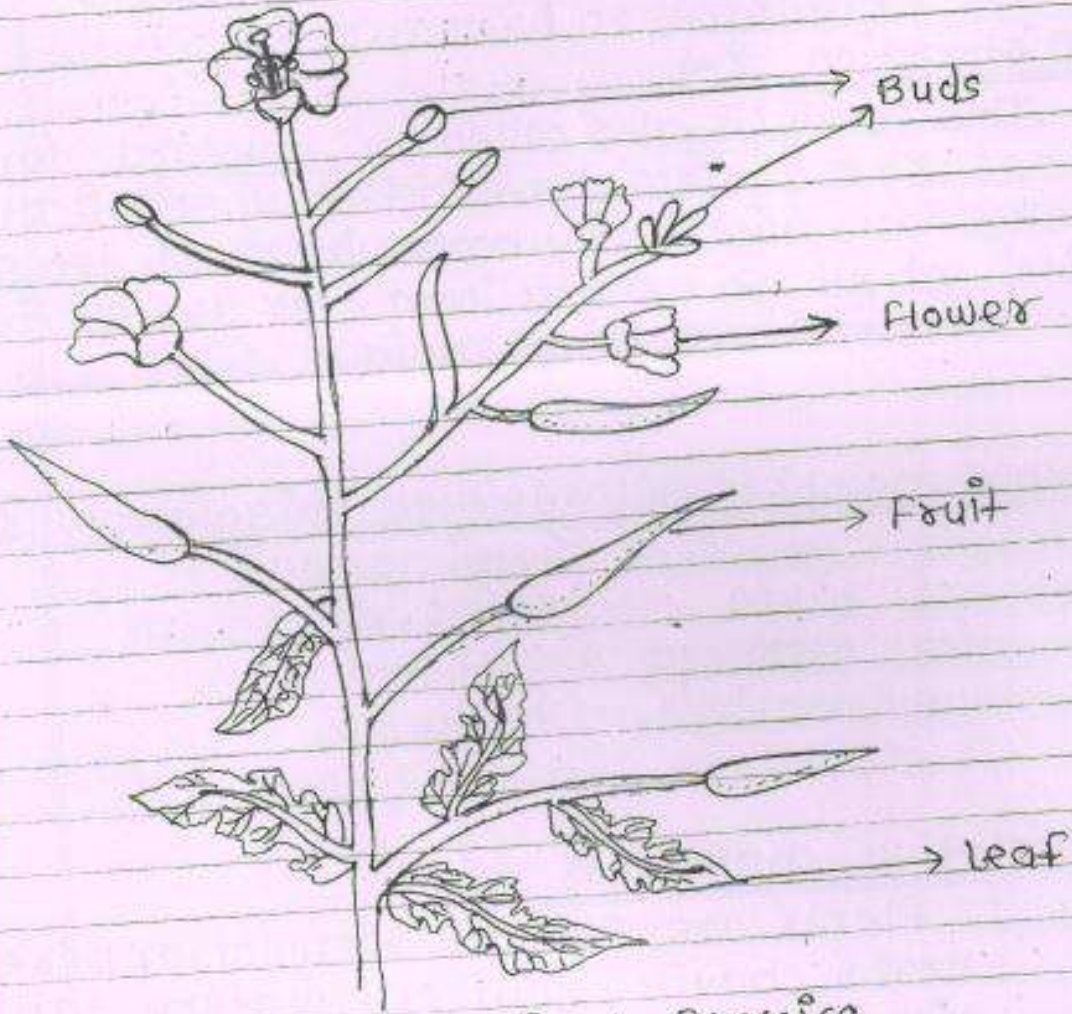

Fig. Flowering twig of Brassica

Floral characters :

Inflorescence : Racemose raceme.

Flower : Ebracteate, pedicillate, bisexual, complete actinomorphic, hypogynous, tetramerous, yellow.

Calyx : Sepals 4, arrenged in two whorls of two each, polysepalous, green, quincuncial aestivation / imbricate.

Corolla : Petals 4, polypetalous cruciform corolla i.e. petals distinguished into two portions claw & limb, valvate aestivation, yellow.

* Cruciform corolla :

→ The corolla may be regular / radially symmetrical, zygomorphic / bilaterally symmetrical or irregular.

→ According to the petals are united or free corolla may be gamopetalous or polypetalous.

→ Cruciform corolla is regular & polypetalous

→ It is a characteristic / distinguishing character of Brassicaceae family.

→ cruciform corolla consists of four free petals.

→ Each petal is differentiated into a claw & limb.

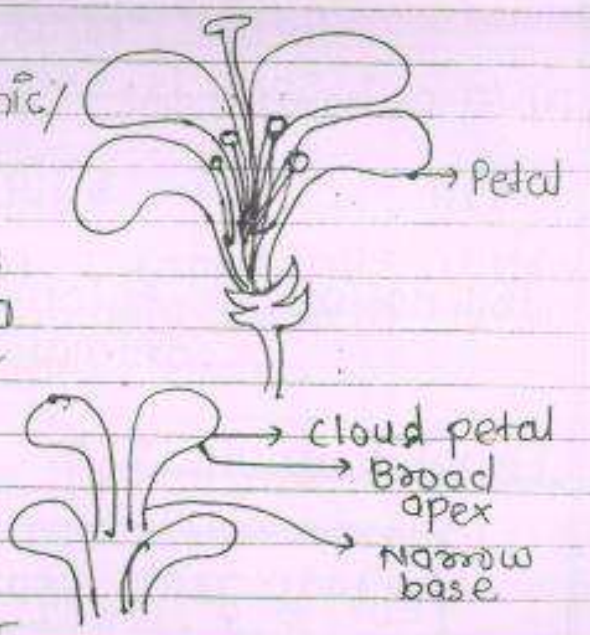

Fig. cruciform corolla.

→ These petals are arrenged in the form of cross hence it is called as cruciform corolla.
→ each petal is known as cloud petal i.e. apex is broad & base is narrow.

Andruecium : stamens 6 in two whorls (2+4), tetrodynamous 4 inner long 2 outer short, anthers are dithecous, introres, glands are present at the base of 4 longer stamens.

Gynoecium : Bicarpellory syncarpous ovary superior, unilocular but becomes bilocular due to development of false septum (replum) ovules many in each locule placentation is parietal, style is short, stigma bilobed.

Fruit : Siliqua / lomentum.

Pollination : Entomophilous / usually by birds, animals / water.

Floral formula :

Ebr, ⊕, ⚥, K_{2+2}, C_4, A_{2+4}, $\underline{G}_{(2)}$

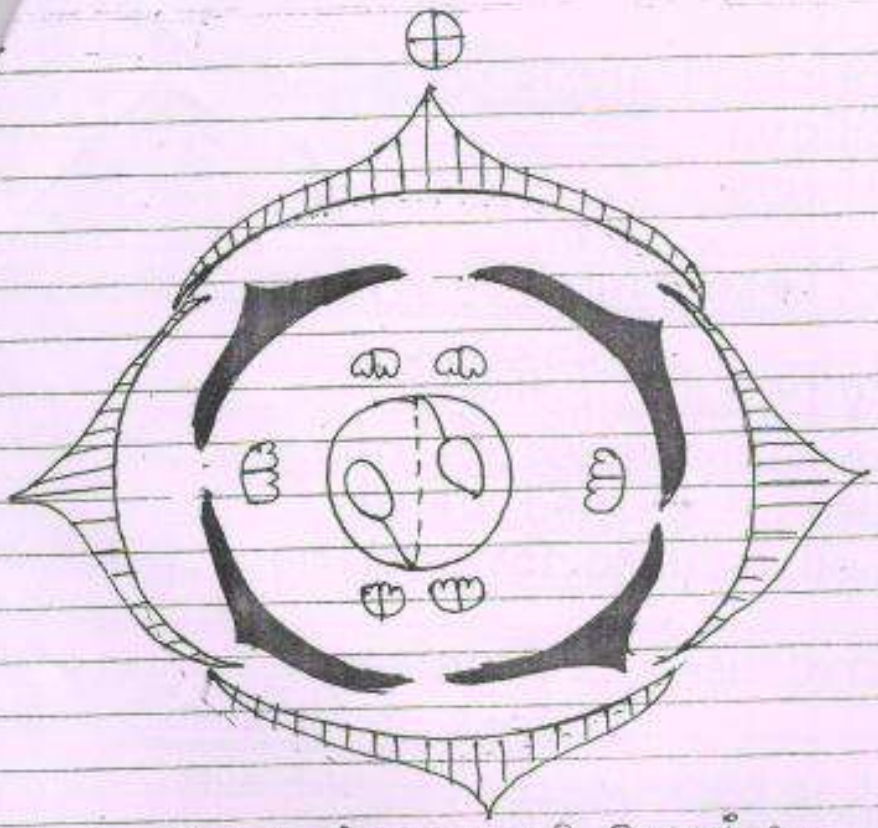

Fig. Floral diagram of Brassica.

★ classification with reasons : ⇒
(Distinguishing characters)

Division : Phanerogams [seed bearing plants]

Class : Dicotyledonae
[Presence of 2 cotyledons, reticulate venation, tap-root system, tetramerous flower.]

Sub-class : Polypetalae [Petals are free]
series : Thalamiflorae [Flower hypogynous, superior ovary, Disc absent]
order : Parietales
[Placentation is parietal].
family : Brassicaceae
[cruciform corolla, tetradynamous stamens, ovary bicarpellary syncarpous, 1st unilocular but becomes bilocular after septum formation,

Fruit is siliqua.

✱ Economic importance of Plants :=

1] Brassica compestris [मोहरी]
→ It is commonly called as mustard or sarson & cultivated as a seed plant.
→ Mustard oil is used for cooking & preparing pickles
→ Leaves are used as vegetables.

2] Brassica oleracea [बंदगोभी]
→ It is commonly called as cabbage & also called as cauliflower.
→ It is used as a vegetable.

3] Raphanus sativus [मूली]
→ It is a tuberous fusiform root which is used as a vegetable.
→ Leaves are used as eaten purpose.
→ Roots are used against the various urinary troubles & gastric disorders.

Botany

Fabaceae [Papilionaceae]

Classification :

Division : Phanerogams
Sub-division : Angiospermae
class : Dicotyledonae
sub-class : Polypetalae
series : Calyciflorae
order : Rosales
family : Fabaceae

☆ Distribution :

Family contains about 500 genera and over 10,000 species. Plants of this family are grows in warm temprate regions of both Northen and southern regions.

over 100 genera and 800 species have been reported from India.

☆ Plants of Fabaceae Family :

1) Phaseolus mungo [Mung]
2) Tephrosia hamiltonii [Unhali]
3) Arachis hypogea [Groundnut]
4) Cajanas cajan [Tur]
5) Cicer arietinum [Gram (Harbhara)]
6) Dalbergia sissoo [Shisam]
7) Glycine max [Soyabean]
8) Pisum sativum [Pea]
9) Medicago sativa [Lasunghas]
10) Abrus precatorius [Gunj]
11) Butea monosperma [Palas]
12) Pongamia pinnata [Karanja]

☆ vegetative characters :

Habit : Plants are annual herb / shrubs rarely trees. sometimes they are hydrophytes and xerophytes.

Root : Branched taproot with nodules containing Nitrogen fixing bacteria.

stem : Areal erect / climbing, branched, Woody - herbaceous, solid, cylindrical, hairy, green.

Leaf : stipulate, petiolate, alternate, unipinnate, imparipinnate, reticulate, unicostate.

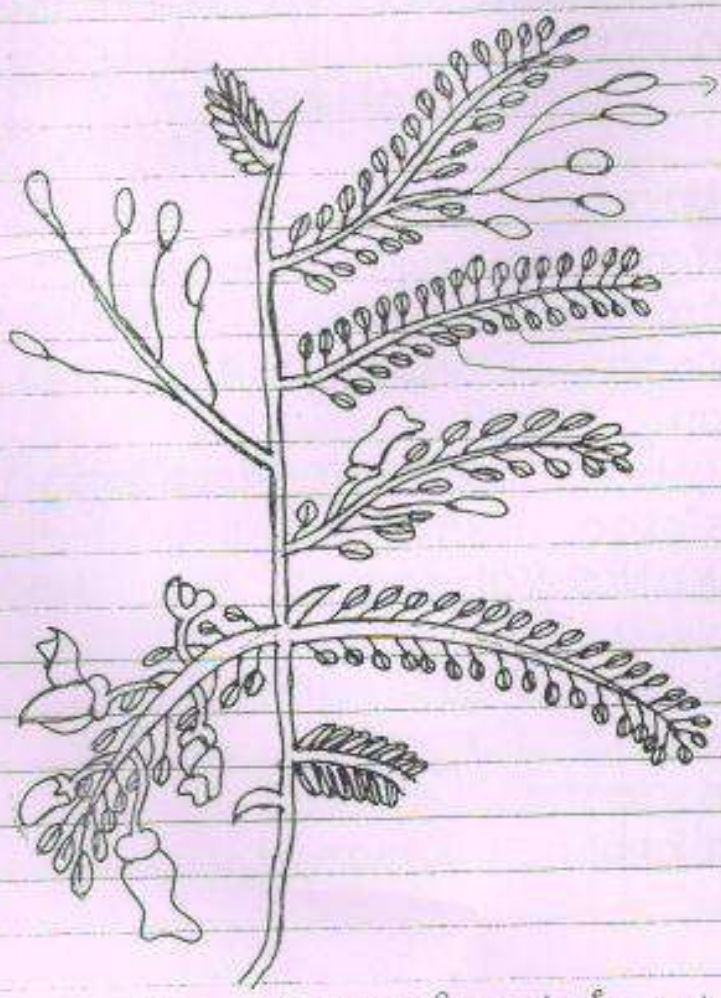

Fig. Flowering twig of Tephrosia

Fig. T.S of ovary.

* Floral characters :

Inflorescence : Racemose raceme.

Flower : Bractiate, pedicillate, complete, bisexual, zygomorphic, pentamerous, epigynous, pink.

Calyx : Sepals 5, gamosepalous, valvate, green, odd sepal is anterior.

Corolla : Petals 5, polypetalous ~~vexillary~~ aestivation. ~~valvate aestivation~~ or Papilionaceous corolla, pink.

* Papilionaceous corolla :

→ Papilionaceous corolla is zygomorphic & polypetalous
→ It is also called as Butterfly-like corolla.
→ It is a characteristic feature of Papilionaceae / Fabaceae family. e.g. Pea, Clitoria.
→ It consists of five petals.
→ Outermost petal is largest known as standard.
→ Lateral two are somewhat wings of butterfly hence known as wings / alae.

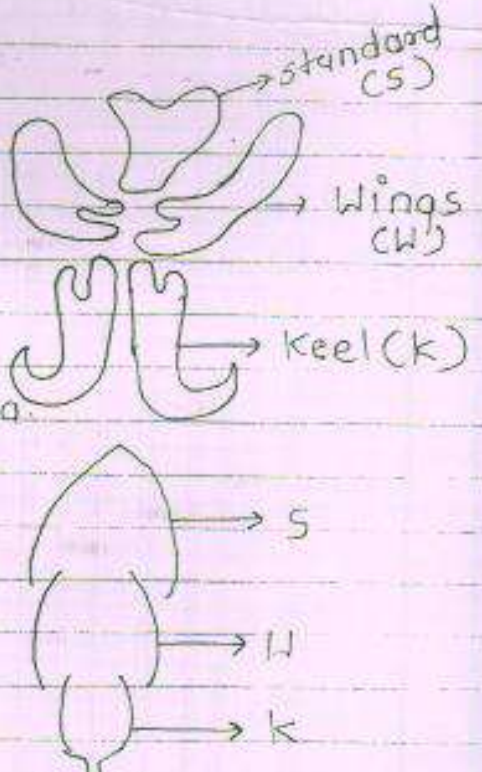

Fig. Papilionaceous corolla

→ Two innermost united to form boat shaped cavity known as keel.
→ It has vexillary aestivation & hence called papilionaceous corolla.

Androecium : stamens 10, diadelphus i.e. (9)+1, 9 are united & 1 is free. free stamen is posterior anthers are dithecous, basifixed, introrse.

Gynoecium : monocarpellary, free carpocarpous unilocular ovary inferior having many ovules in marginal placentation, style short.

Fruit : Legume

Pollination : Entemophilous.

Floral formula :

$$Br, \oplus, \sigma^{\uparrow}, K_{(5)}, C_{1+2+(2)}, A_{(9)+1}, \underline{G}_{1}$$

✱ Floral diagram :

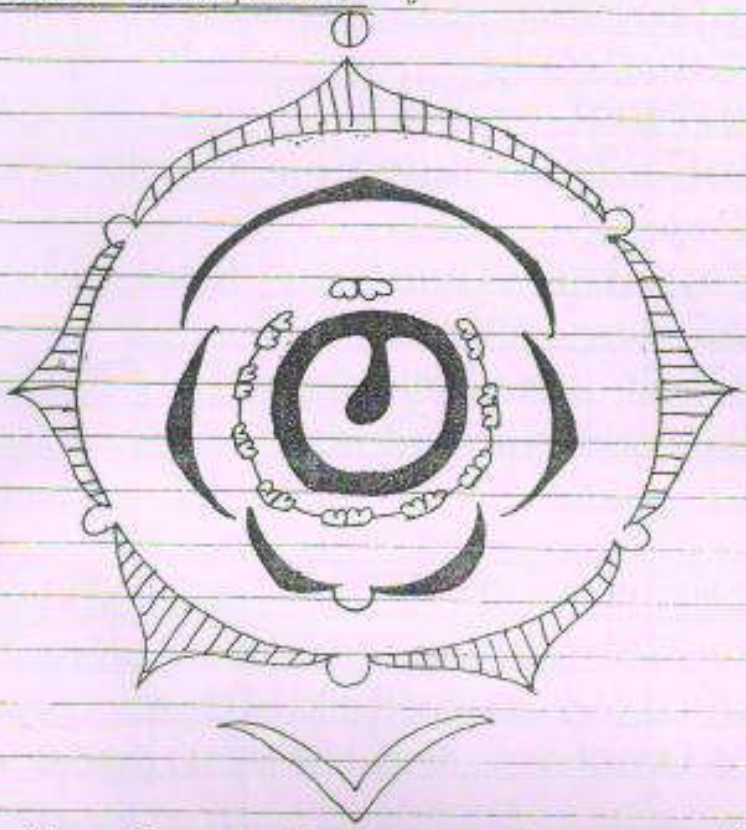

Fig. Floral diagram of Tephrosia hamiltoni

✱ Distinguishing characters of Fabaceae :

→ 5 sepals, gamosepalous
→ 5 Petals, polypetalous
→ Stamens 10, diadalphous i.e (9)+1, Nine are fused one is free.
→ Papilionaceous corolla.
→ ovary inferior monocarpellary apocarpous (free) marginal placentation.

Economic importance of plants :

1) Arachis hypogea [भुईमुंग]
→ This is cultivated for edible seeds and oil yielding purpose.
→ Seeds are used for making food dishes e.g. chatani etc.
→ Refined oil is used for cooking.
→ Oil cake is used for fodder.

2) cicer arietinum [हरभरा]
→ Seeds are edible.
→ Leaves are used as vegetable.
→ Plants are used as fodder purpose also.

3) Dalbergia sissoo [शिसम]
→ Wood is used for making furniture.
→ Pulp is used for making papers to writting & printing.

4) Cajanas cajan [तुर]
→ Seeds are edible, used to prepare dal.
→ Leaves & twigs are used as fodder.

5) Phaseolous mungo [मुग]
→ It is a pulse crop.
→ Seeds are edible, used to prepare dal.

Lamiaceae [Labiatae]
[Mint family]

Classification :

Division : Phanerogams
Sub-division : Angiospermae
class : Dicotyledonae
sub-class : Gamopetalae
series : Bicarpellatae
order : Lamiales
family : Lamiaceae

☆ Distribution :

A family of about 200 genera and 3500 species. About 65 genera and over 400 species have been reported from India.

☆ Plants of Lamiaceae :

1) Ocimum sanctum [Tulsi]
2) Ocimum gratissimum [Ram tulsi]
3) Mentha spicata [Pudina]

☆ vegetative characters :

Habit : Plants are annual or perennial aromatic herbs, sometimes shrubs or rarely trees.

Root : Branched taproot.

Stem : Aerial erect branched solid herbacious, cylindrical, glaberous, quadrangular, hairy.

Leaf : Exstipulate, petiolate, simple, opposite decussate or whorled, hairy aromatic with volatile oil secreting glands, reticulate unicostate.

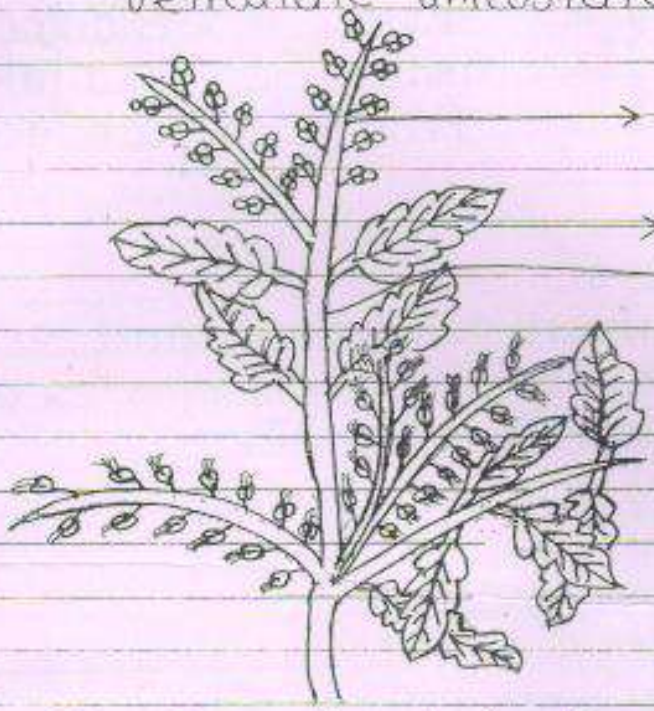

Fig. Flowering twig of Ocimum

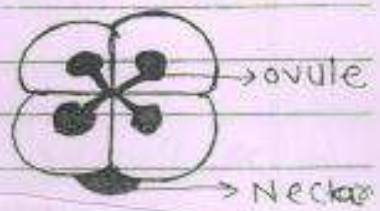

Fig. T.S. of ovary

★ Floral characters :

Inflorescence : often cymose, or verticillaster cymes at nodes condensed into a false whorl, rarely flowers are in simple raceme or solitary and axillary,

Flower : Bracteate, bracteolate, complete, bisexual, zygomorphic, pedicillate, hypogynous, rarely nearly actinomorph [sp. of mentha]

Calyx : sepals 5, gamosepalous, or united into funnel-shaped or campanulate tube usually 2-lipped, 1/4 in ocimum valvate or imbricate.

Corolla : Petals 5, gamopetalous, 2-lipped, 4/1 in ocimum i.e. 4 in posterior lip & 1 in anterior lip; bilabiate, valvate or imbricate.

Androecium : usually 4 stamens (ocimum), didynamous, epipetalous, sometimes only two stamens (salvia), filaments of anthers are free, anthers dithecous, introrse.

Gynoecium : Bicarpellary syncarpous ovary superior, bilocular in young condition but becomes tetralocular with single ovule in each locule with axile placentation style is gynobasic [i.e. style is attached at the base of ovary or arising from the base of ovary], stigma bifid [two lobed], Nectar-secreting disc is present

Fruit : schizocarpic [at maturity it splits into 4 mericarps]

Pollination : Entomophilous

Floral formula :

Br, Brl, ⊕, ⚥, $K_{(5)}$ or $(1/4)$, $\overset{\frown}{C}_{(5)}$ or $(4/1)$, A_{2+2}, $\underline{G}_{(2)}$

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* Floral diagram :-

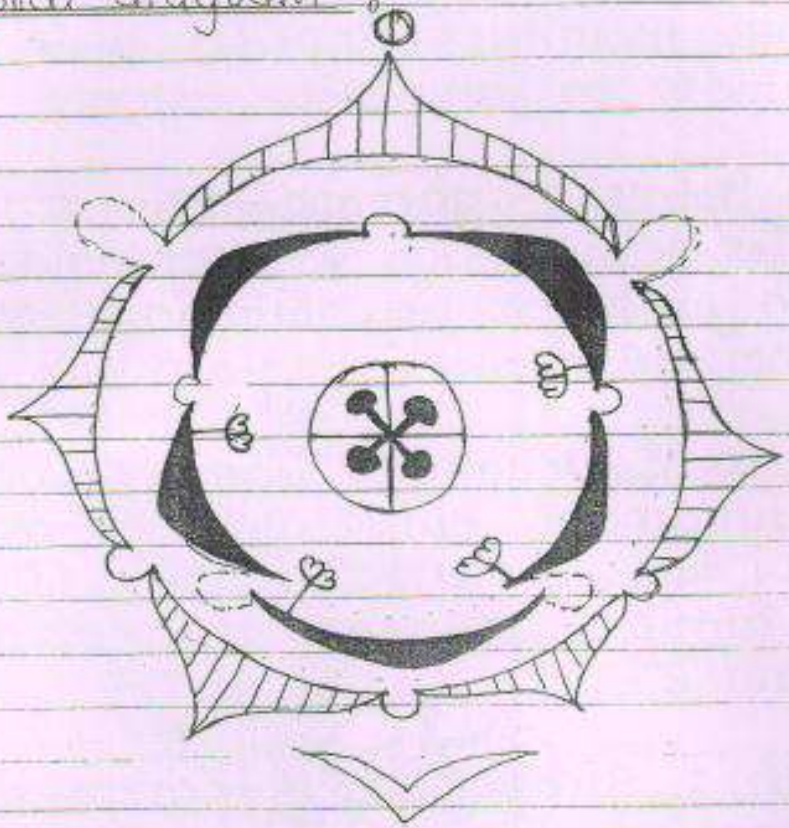

Fig. Floral diagram of Ocimum

* Distinguishing Characters :-

1) leaves opposite decussate.
2) Stem is hairy & quadrangular.
3) Inflorescence is verticillaster
4) Bilabiate corolla.
5) stamens epipetalous

☆ Economic importance of plants :

1] Ocimum sanctum : [तुलस]
→ Root decoction is used in fever & malerial fever.
→ Leaves are used for cough, cold & fever.
→ Basil oil is obtained & used in medicine & perfumery.

2] Ocimum gratissimum [श्यामतुलस]
→ Basil oil, obtained & used in variety of medicine & perfumery.
→ Seeds are given in headache.

3] Mentha spicata [पुदिना]
→ Mint oil is used in nausia & vomiting.
→ Leaves of mentha are used for preparing 'chutney' which helps in indigestion and rheumatism.

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→*← Poaceae or Gramineae →*←
[Grass family]

Classification :
Division : Phanerogams
Sub-division : Angiospermae
class : Monocotyledonae
series : Glumaceae
Family : Poaceae (Gramineae)

☆ Distribution :
Poaceae is the largest and most important family of angiosperms from the economic point of view. It is represented by about 620 genera and over 10,000 species distributed in all regions. About 240 genera and over 1200 species have been reported from India.

☆ Plants of Poaceae / Gramineae
1] Triticum aestivum [Wheat]
2] Sorghum vulgare [Jawar]
3] Saccharum officinarum [sugercane]
4] Oryza sativa [Rice]
5] Zea mays [Maize]

☆ Vegetative Charecters :
Habit : Annual or perennial herbs, or shrubs or trees (e.g. Bambusa).

Root : Adventitious and fibrous.

~~Leaf : Simple, alternate, ...~~

Stem : erect, prostrate or creeping, simple or commonly branched at the base, hollow internodes, solid & swollen nodes, in Poaceae aerial stem is called as "culm". In most of the grasses, main axis only develops lateral branches from the basal buds, such branches are called as "tillers".

Leaf : Simple, alternate, sessile, arrenged in two rows on opposite sides of the stem (2-ranked), developed at nodes, crowded at base, and consisting of sheath, blade and ligule [membranous outgrowth which is thin called ligule]. In some cases ligule is hairy, leaf blade or lamina usually long, narrow, flat with parallel venation.

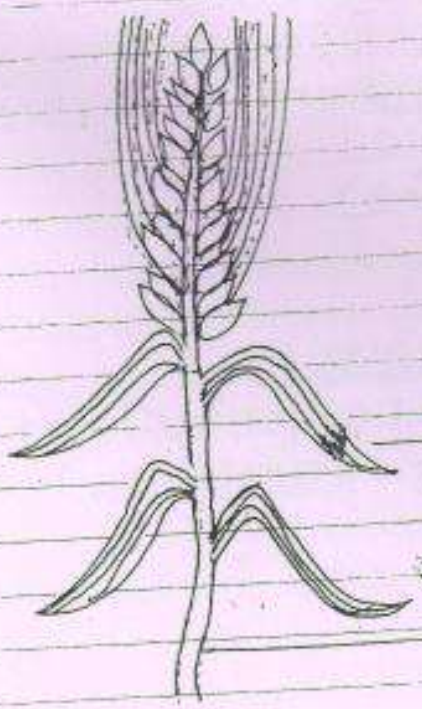

Fig. A Wheat plant.

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Floral characters :-

Inflorescence : spikelet.

* Spikelet of Poaceae / Graminae :

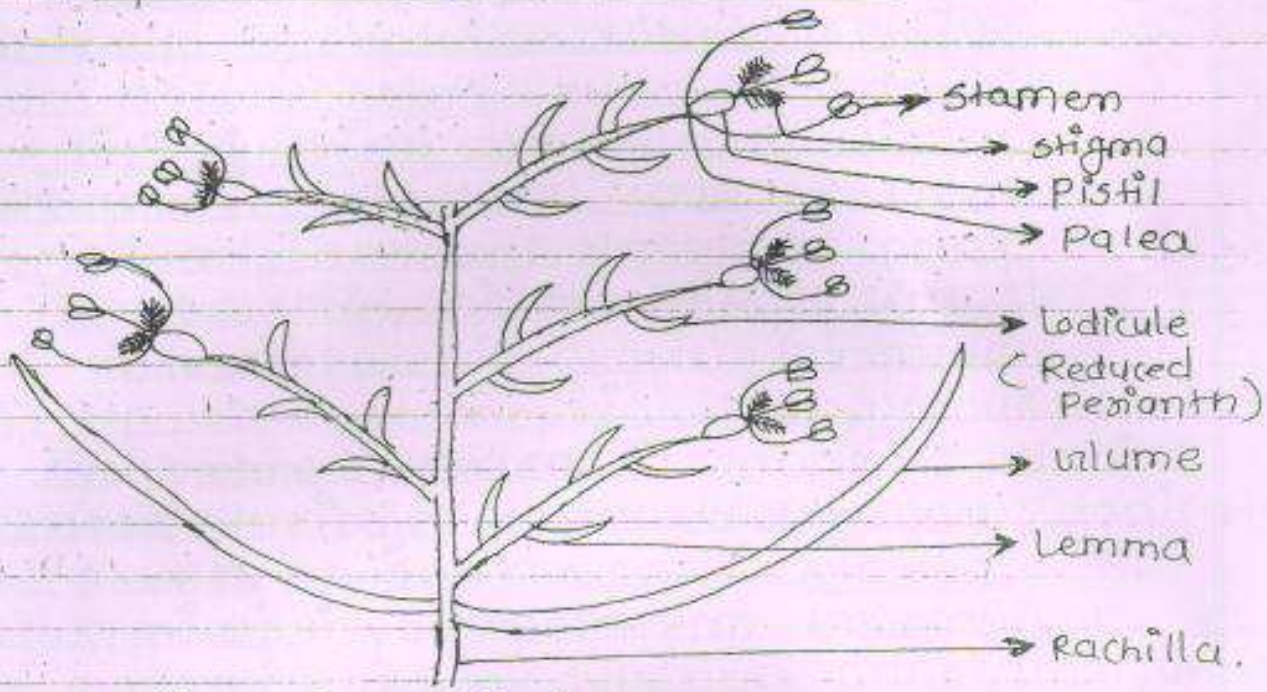

fig. Sikelet of Poaceae

→ Each spikelet consists of 1 to many flowers arrenged alternately on the central axis called rachilla.
→ At the base of spikelet there is a pair of sterile glume.
→ Ulume arises one above the ~~rachilla~~ other opposite site of rachilla.
→ Ulumes encloses all the flowers till they open.
→ single flower is called floret.
→ each floret consist of a bract at the base which is represented by Lemma which bears bristle like awn at its tip.
→ Awn is the extension of midrib.
→ The bracteole is represented by palea.
→ The essential organs i.e. stamens & carpels are protected in between Lemma & palea.

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Flower : Flowers are also called as florets. Bracteate [Floret is subtended by two bra called lemma and palea. Lemma is als called as fertile or flowering glume whic is green in colour. Palea present inbetwee rachilla and lemma, which is thin memberanous.] Bracteolate ['morphologica palea represents bracteole], zygomorphi or actinomorphic, bisexual or unisexual, hypogynous, trimerous flower

Perianth : Perianth is absent or reduced to usually 2 or rarely 3 minute scales calle lodicules [fleshy or hyline structure] present anterolaterally if 2 in number.

Androecium : stamens 1 to 6 or rarely more but usually 3 in each floret, odd stamen is always anterior, filaments are free, anthers dithecous, introrse.

Gynoecium : bicarpellary or tricarpellary syncarpous, ovary superior unilocular containing one ovule with basal placentation, style 1-3, common 2, stigma 2 & feathery.

Fruit : Usually caryopsis, ~~variety millet~~

Pollination : Anemophillous [through wind]

Floral formula :

$Br, Brl, \oplus_{or}\, \oplus, \varphi_{or}\, \sigma_{or}\, \varphi, P_{2 \text{ or } 3 \text{ or absent}}, A_{3 \text{ or } 1-6}, \underline{G}_{(2-3)}$

✱ Distinguishing charecters :

1] Roots are adventitious.
2] Stem is hallow.
3] Leaves simple, sheathing & ligulate.
4] Inflorescence is panicle of spikelet.
5] Flower zygomorphic, hypogynous, protected in lemma & palea.
6] Perianth absent or represented by 2 lodicules.
7] Stamen 3 and free.
8] Gynoecium bicarpellary or tricarpellary syncarpous, ovary superior, unilocular, contains single ovule with basal placentation.

Floral diagram :

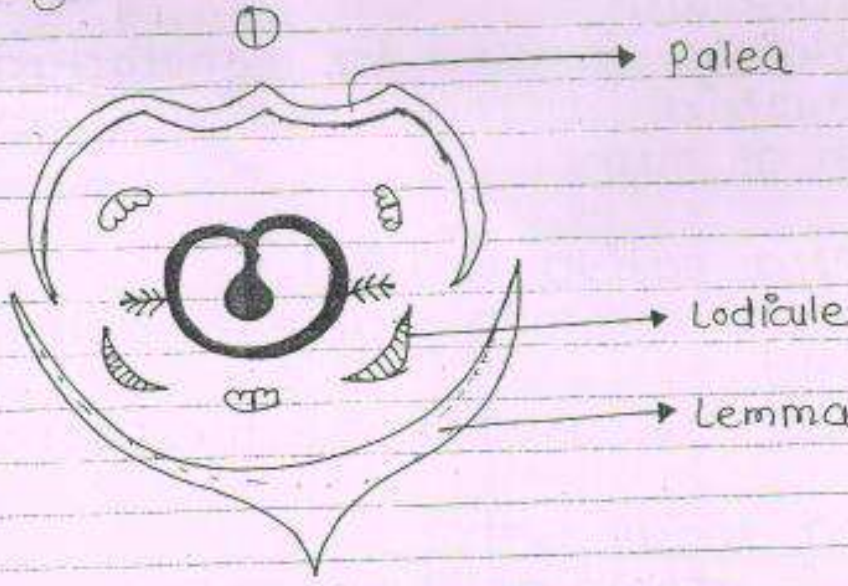

Fig Floral diagram of Triticum aestivum.

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✱ Economic importance of plants :-

1] Triticum aestivum [गेहूं]
→ It is commonly called as "wheat".
→ Wheat is universally used as ~~staple~~ staple food for human being.
→ Its straw are used for cattles, for packing goods, for manufacturing paper.
→ Grains are used for making "chapatti" after grinding.

2] Sorghum vulgare [ज्वारी]
→ It is important cereal crop.
→ Grains are used for making "Bhakari".
→ Stem & leaves are used for cattle.

3] Saccharum officinarum [ऊस]
→ It is comercial crop plant.
→ Sugar is obtained from the stem juice of saccharum.
→ Molasses is used for manufacturing industrial alcohol & alcoholic beverages such as rum.

4] Oryza sativa [तांदूळ]
→ Used as common staple food throughout the world.
→ Straw are used for cattle purpose.

5] Zea mays [मका]
→ It is grown as food crop.
→ Leaf stalks are used manufacturing paper
→ Corn oil is used for preparing paints, varnishes etc.

Solanaceae
[Potato family]

Classification :

Division : Phanerogams
sub-division : Angiospermae
Class : Dicotyledonae
sub-class : Gamopetalae
series : Bicarpellatae
order : Polemoniales
family : Solanaceae

✱ Distribution :=

A family of about 90 genera and 2800 species distributed in tropical and temprate region. About 15 genera and over 90 species have been reported from India.

✱ Plants of Solanaceae family :=

1) Datura inoxia [Datura]
2) Capsicum annum [Chilli]
3) Solanum tuberosum [Potato]
4) Solanum melongena [Brinjal]
5) Nicotiana tabacum [Tobacco]
6) Lycopersicon esculentum [Tomato]
7) Withania somnifera [Ashwagandha]

✱ Vegetative charecters :

Habit : mostly annual, biennial or perennial herbs, sometimes shrubs or small trees.

Root : Branched tap root.

Stem : Aerial erect, herbaceous or woody, branched, sometimes modified into tubers (e.g. Solanum tuberosum).

Leaves : Simple, alternate, exstipulate, entire, pinnately compound in potato & tomato, unicostate reticulate.

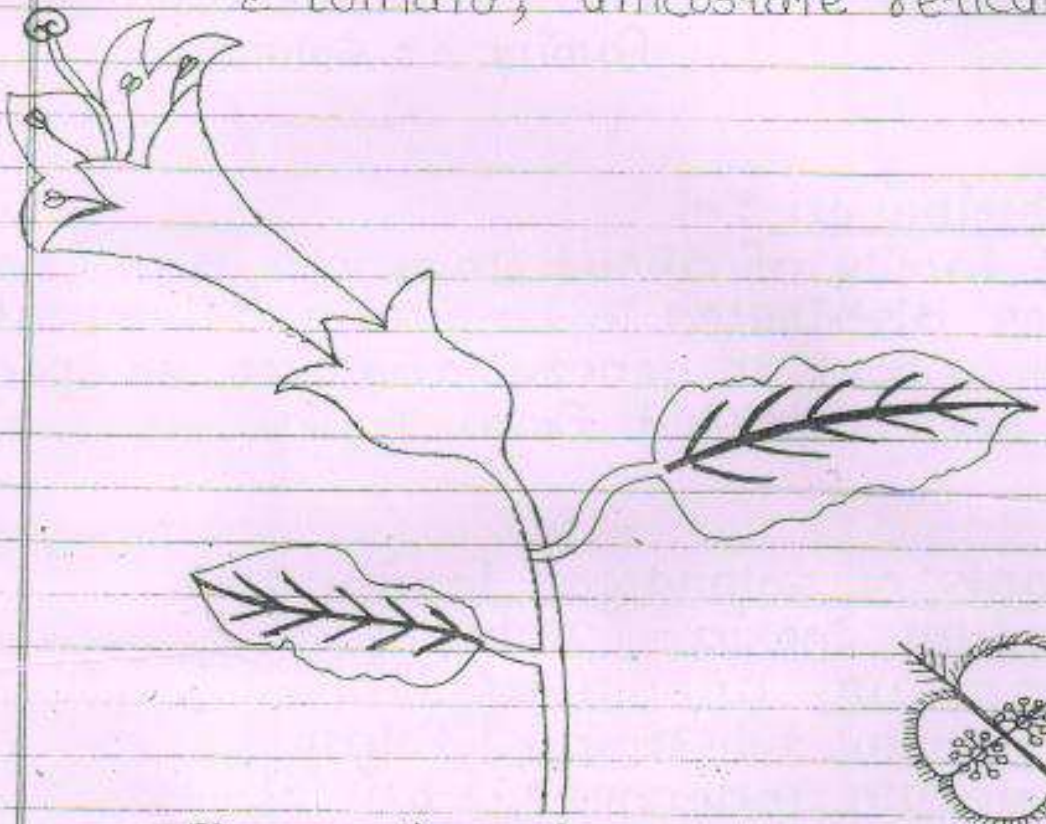

Fig. Flowering twig of Datura

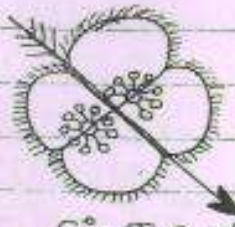

Fig. T.S. of ovary.

☆ Floral charecters :

Inflorescence : Axillary solitary, (generally Cymose.

Flower : Bracteate or ebracteate, pedicillate, bisexual, actinomorphic, complete, pentamerous, white, hypogynous.

Calyx : Sepals 5, gamosepalous, valvate, persistant, green.

Corolla : Petals 5, gamopetalous tubular or infundibuliform (funnel shaped), valvate or twisted.

Androecium : Stamens 5, epipetalous, alternate with petals (corolla lobes), free, anthers dithecous, introrse.

Gynoecium : Bicarpellary syncarpous, ovary superior bilocular but becomes tetralocular because formation of false septum (e.g. Datura), ovules many in each locule with axile placentation, ovary hairy obliquly placed, stigma bilobed, style long.

Fruit : Capsule [Datura] or berry [Tomato]

Pollination : Entomophilous.

Floral formula :

$$Br/Ebr, \oplus, \varphi, K_{(5)}, \overset{\curvearrowleft}{C_{(5)}}, A_5, \underline{G}_{(2)}$$

☆ Distinguishing characters :

1) Flower pentamerous, hypogynous.
2) Stamens epipetalous.
3) Gynoecium bicarpellary syncarpous ovary superior & obliquly placed with axile placentation.
4) Fruit is capsule or berry.

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★ Polemoniales (order) :
Herbs or climbers with simple, alternate leaves, flowers actinomorphic, pentamerous hypogynous, stamens epipetalous, ovary bicarpellary syncarpous.

Floral Diagram :

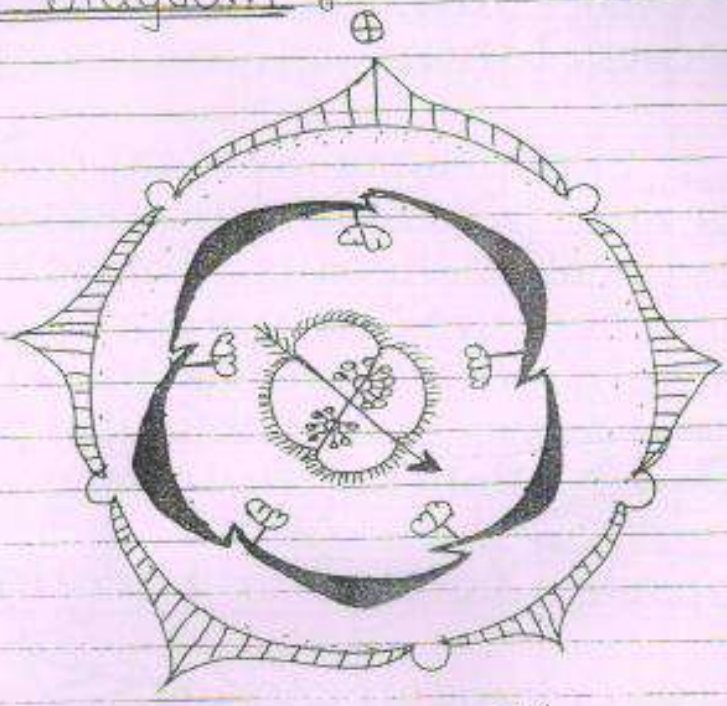

Fig. Floral diagram of Datura inoxia

★ Economic Importance of plants :
1) Datura inoxia : [धोतरा]
→ Dried leaves are used in the treatment of asthama.

2] Capsicum annum : [लाल मिर्ची]
→ Fruits are edible.
→ Fruits are also pickled & eaten as raw.

3] Lycopersicon esculentum [टोमॅटो]
→ Fruits are edible.
→ Fruits are used in vegetables & salad.

4] Solanum tuberosum [बटाटा]
→ It is cultivated for its edible tubers.
→ Tubers are rich in starch & used as a source of starch.
→ Tubers are used in preperation of food.

5] Solanum melangena [वांगे]
→ Fruits are edible.
→ Fruits are used to prepare food & special dish e.g. "Bharit"

6] Nicotiana tabacum [तंबाखू]
→ It is cultivated for its leaves.
→ The leaves contain an alkaloid called "nicotine"

7] Withania somnifera [अश्वगंधा / अस्कुंद / ढोरगुंज]
→ Leaves are used in fevers.
→ Roots are used in curing coughs.