

Date: \_\_\_\_\_  
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paper - II

NAME - NISHA SHARMA

COURSE - M. Sc. (Previous) BOTANY

ROLL no. - 1259516

R.K VIGYAN MAHAVIDHYALYA (Kalwar) Jaipur Rj.

 Lotus<sup>®</sup>  
**DRAWING**  
Note Book

Name \_\_\_\_\_  
Class \_\_\_\_\_ Sec. \_\_\_\_\_  
Subject \_\_\_\_\_

Family - Ranunculaceae

[Ranunculus scleratus]

Habit :- Annual herb.

Stem :- Aerial, branched, cylindrical, erect, herbaceous, hairy, solid, fistular.

Leaves :- Stamal & cauline, alternate, Petiolate, simple, exstipulate, leaf base sheathing, deciduous, trilobed, multicostate actinulate venetation.

Inflorescence :- dichasial cymose.

Flower :- Pedicillate, bracteate, bractedate, complete, bisexual, regular, actino-morphic, Pentamerous, hypogynous, yellow, spirally arranged.

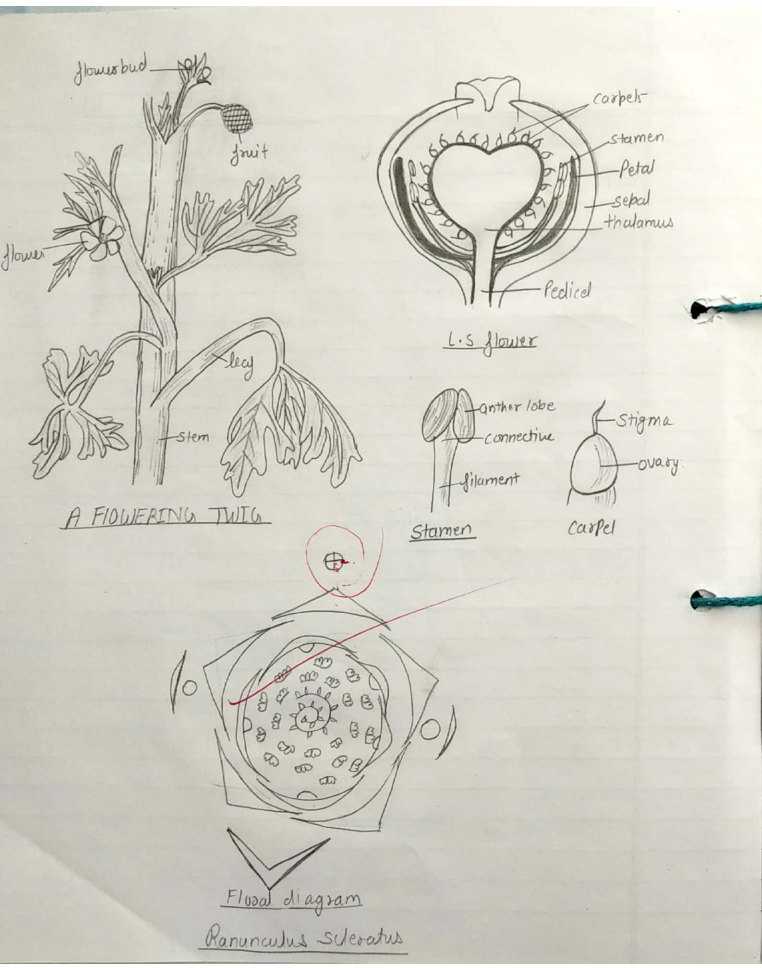
Calyx :- 5 calyx, free, quinuncial.

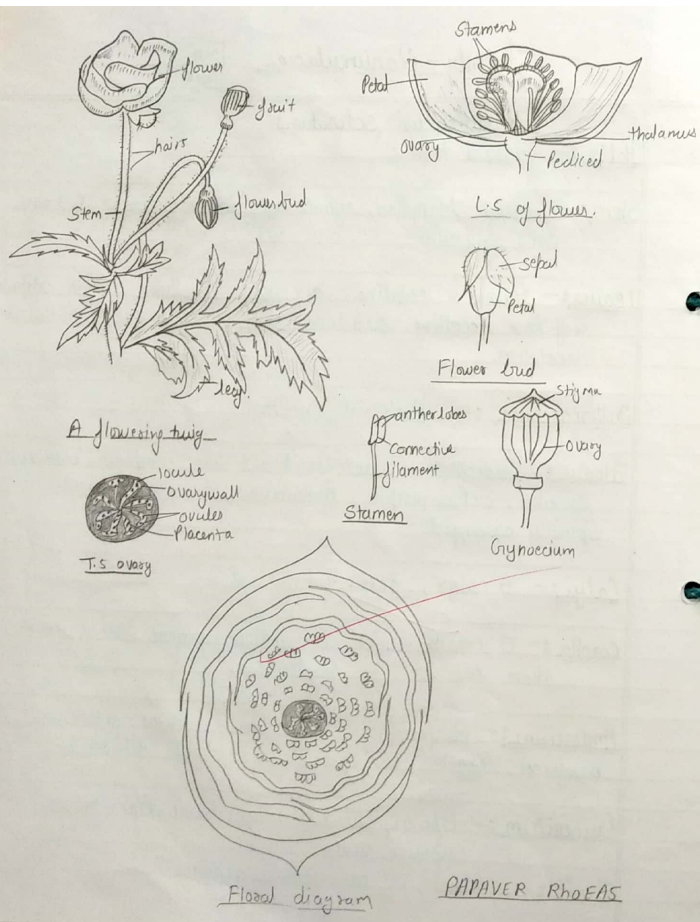
Corolla :- 5 corolla, imbricate, yellow, inner side of corolla there are pr. in nactor sac.

Androecium :- Polyandrous, long yellow, anthers - dithecous, basifixed, exserted, extrorse, longitudinal dehiscence.

Gynoeceium :- Apocarpus, unilocular, basal, Placentation, superior ovary.

Fruit :- Tetraio of one seeded achenes.





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Family - Papaveraceae

[Papaver rhoeas]

Habit :- Shrubby.

Stem :- Aerial, rarely branched, cylindrical, erect, fistular, herbaceous, hairy, milky latex Pr.

Leaves :- ramal & cauline, sessile, alternate simple, lobed, exstipulate, serrate, hairy, unicostate, reticulate venation.

Inflorescence :- Solitary terminal.

Flower :- Ebracteate, pedicellate, complete bisexual, actinomorphic, regular, dimersous, hypogynous, cyclic.

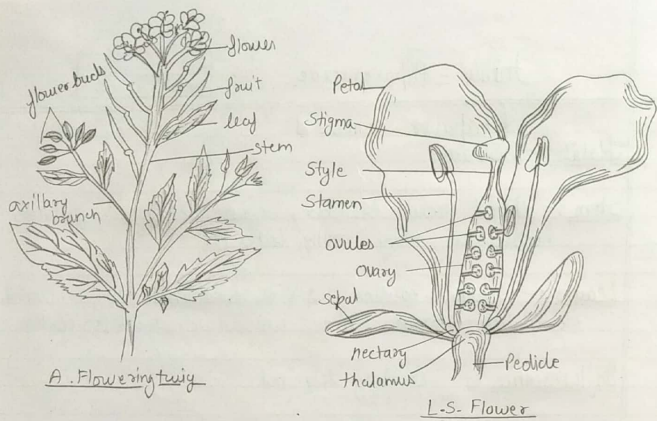
Calyx :- 2, caducous, hairy.

Corolla :- 4, [2+2 arrange in cycle], crumpled imbricate.

Androecium :- Ditheous, basifixed, exserted.

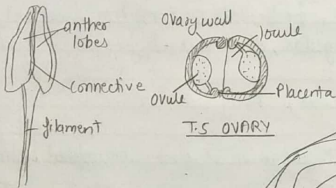
Gynoecium :- Polycarpellary, syncarpous, unilocular, peritaxial placentation.

Fruit :- Capsule.



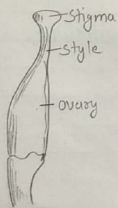
A. Flowering twig

L.S. Flower

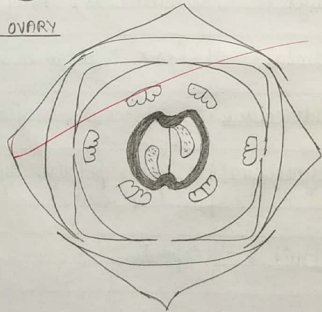


Stamen

T.S. OVARY



Gynoecium



Floral Diagram

BRASSICA CAMPESTRIS

[Brassicaceae / Cruciferae]

Date: \_\_\_\_\_  
Page No.: 4.

[Brassica campestris - Mustard]

Habit :- Annual herb.

Stem :- Aerial, branched, cylindrical, erect, glabrous, solid, herbaceous.

Leaves :- ramal & cauline, simple, exstipulate, sessile, lyrate shaped.

Inflorescence :- racemose raceme, upper side is corymbose raceme.

Flower :- Ebracteate, pedicellate, complete bisexual, regular, actinomorphic, tetramerous, hypogynous, cyclic yellow.

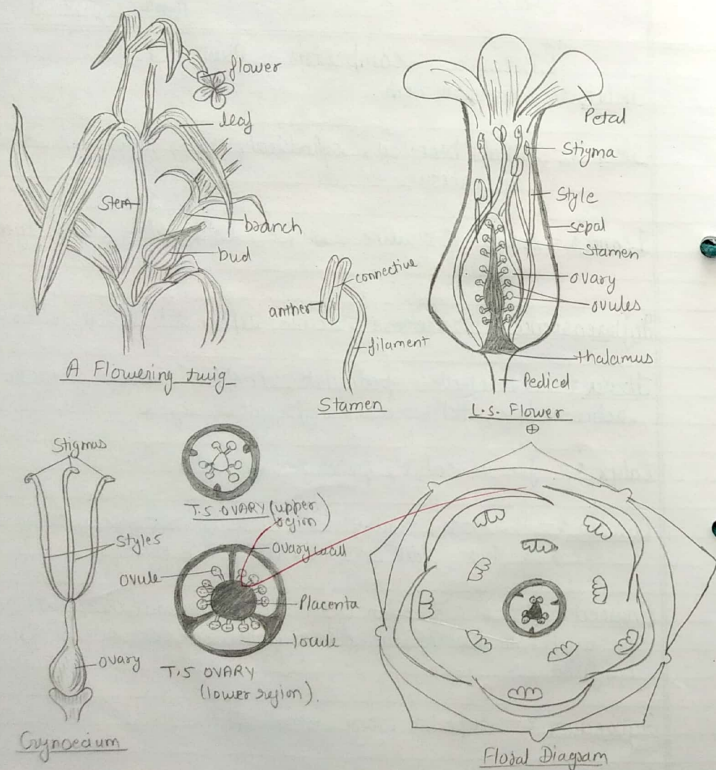
Calyx :- free 4 calyx, petiolate, succate.

Corolla :- 4 corolla (polypetalous), diagonally arranged, every corolla has claw or limb, valvate & yellow.

Androecium :- 6 androecium (2+4) tetradynamous, Polyandrous, nectary pr. in base of antheridium, pollen sac are dithecous, basifixed.

Gynoecium :- Superior ovary, small style.

Fruit :- dry dehiscent siliqua.



SILENE CONOIDEA

[Caryophyllaceae]

Date: \_\_\_\_\_  
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[Silene conoidea]

Stem :- Aerial, branched, cylindrical, erect, herbaceous, hairy, solid.

Leaves :- Ramal & cauline, sessile, amplexical stipulate, opposite decussate, lanceolate, margins entire, acute apex, hairy.

Inflorescence :- Axial.

Flower :- pedicellate, ebracteate, ebracteolate, complete, cyclic, hermaphrodite, actinomorphic, pentamerous, hypogynous.

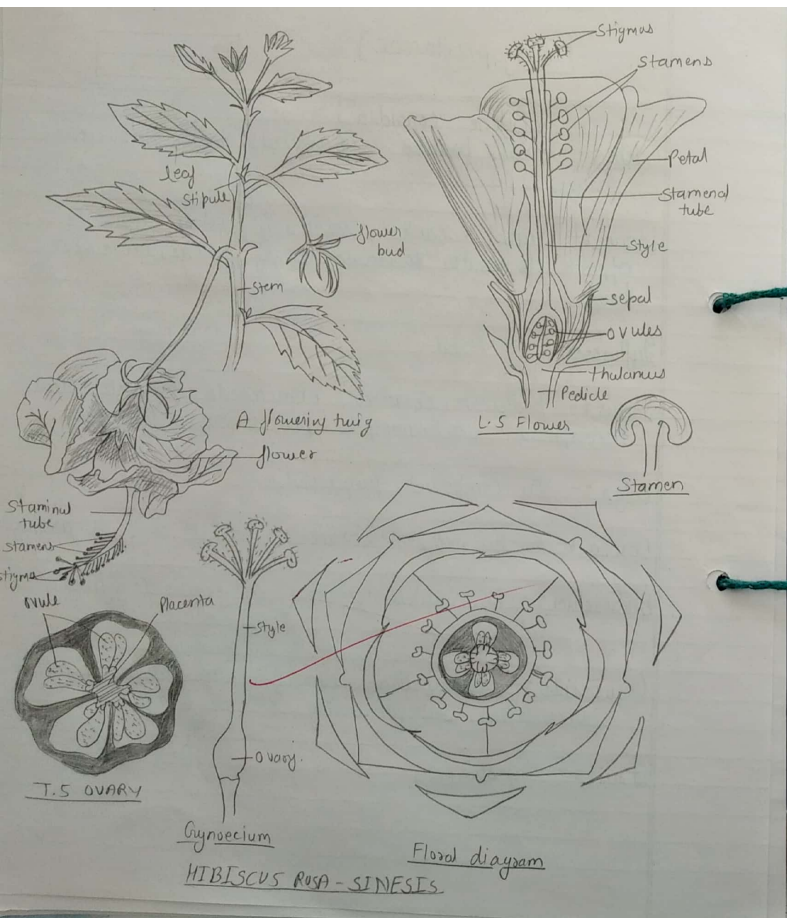
Calyx :- 5, compound, quinquevalvate.

Corolla :- 5, twisted, membranous, shape of corolla is caryophyllous.

Androecium :- 10, Obdiplostemonous, dithecaous dorsifixed, introrse.

Gynoecium :- trilocarpellary, syncarpous, unilocular, free central placentation, superior ovary, 2 style & stigma.

Fruit :- Capsule:



## (MALVACEAE)

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[*Hibiscus-rosa-sinensis*, China rose]

Habit :- Perennial shrub.

Stem :- Aerial, branched, cylindrical, erect glabrous, herbaceous upper stem is herbaceous & lower is woody & solid.

Leaves :- ramal & cauline, alternate, Petiolate, simple, stipulate, free lateral, caducious, oval, serrate margins, apex acute.

Inflorescence :- Solitary axillary.

Epicalyx :- bracteoles, free, valvate, hairy green & linear.

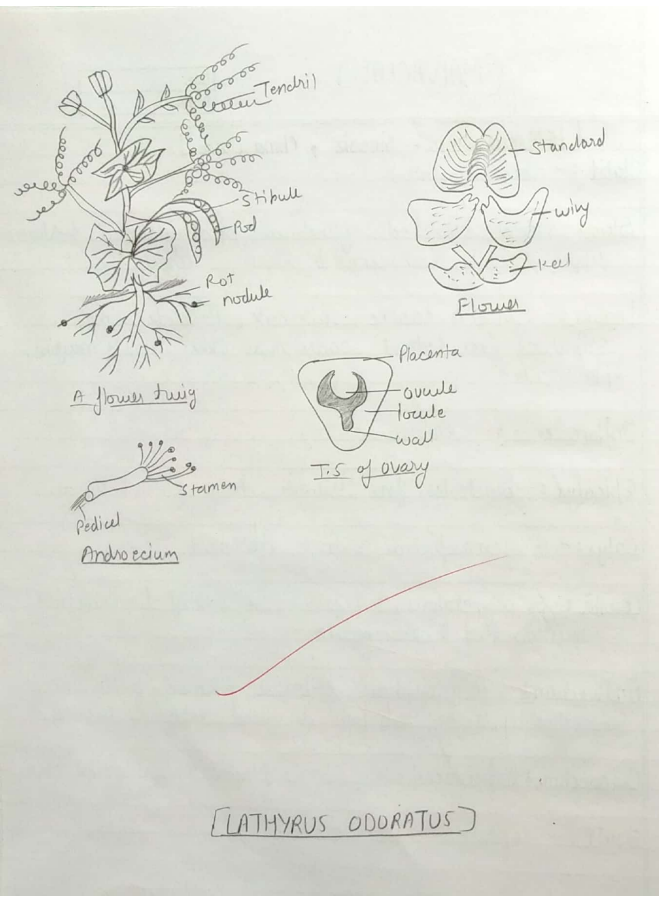
Calyx :- 5, gamosepalous, valvate, Persistent.

Corolla :- 5, polypetalous, but join on the base of filament tube, twisted, Red & ornamental.

Androecium :- ~~Monadelphous, epipetalous, filament, pollen sac is monothecous, kidney shaped, dorsifixed, exserted, crested,~~

Gynoecium :- pentacarpellary, axile placentation, superior ovary.

Fruit :- Capsule.



[Leguminosae / Fabaceae]

Date:   
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[Lathyrus odoratus - Sweet pea]

Habit :- Annual herb.

Root :- branched root with bacterial root nodules.

Stem :- Axial, branched, tendril climber, herbaceous, hollow.

Leaves :- ramal & cauline with petiole, alternate, compound pinnate, transform in tendril, stipulate, foliaceous, sessile, acute.

Inflorescence :- racemose raceme.

Flower :- pedicellate, zygomorphic, slightly perispermous.

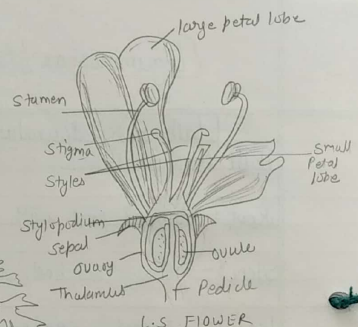
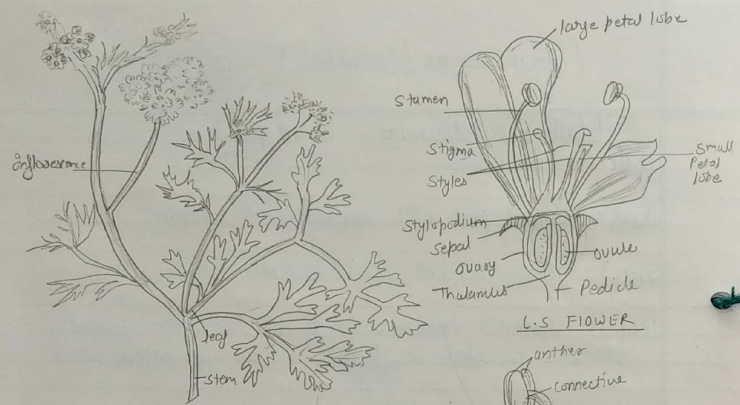
Calyx :- 5, odd sepal anterior.

Corolla :- 5, decending imbricate.

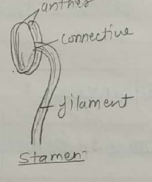
Androecium :- 10, didelphous, pollen sac is bilobed, basal fixed.

Gynoecium :- monocarpellary, marginal placentation, ovary is hairy, semi inferior in position.

Fruit :- legume.

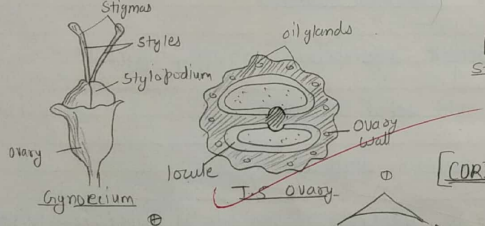


L.S. FLOWER



Stamen

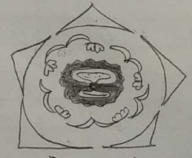
A Flowering twig



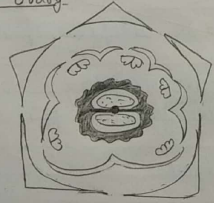
Gynoecium

Ovule

**CORIANDRUM SATIVUM**



Floral diagram (central flower)



Floral diagram (peripheral flower)

{ Apiaceae / Umbelliferae }

Date: \_\_\_\_\_  
Page No.: \_\_\_\_\_

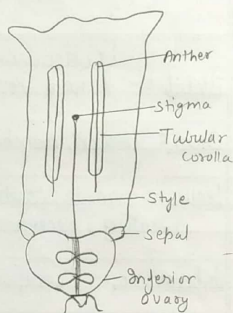
{ Coriandrum sativum - Coriander }

- Habit :- Annual herbaceous.
- Stem :- Aerial, branched, cylindrical, erect, herbaceous, fistular.
- Leaves :- ramal & cauline, sessile, alternate, exstipulate, leaf base sheathing, decomposed, linear, uniseriate, reticulate venation.
- Inflorescence :- Compound umbel.
- Flower :- Actinomorphic, zygomorphic & epigynous, white.
- Calyx :- 5, compound, anterior.
- Corolla :- polypetalous, valvate.
- Androecium :- polyandrous, dorsifixed.
- Gynoecium :- bicarpillary, syncarpous, axile placentation, ovary inferior.
- Fruit :- Cremocarp.

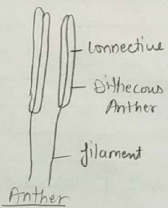




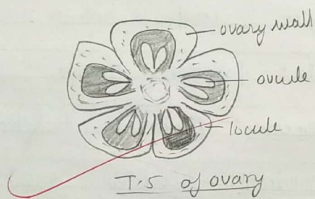
Flowering twig



L.S of flower



Anther



T.S of ovary

[ HAMELIA ]

{ Rubiaceae }

Date: \_\_\_\_\_  
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[ Hamelia - Scarlet Bush ]

Habit :- evergreen, shrub.

Stem :- Aerial, branched, cylindrical, erect, hairy, wood is solid.

Leaves :- ramal & cauline, simple, whorled, Petiolate, stipulate, interpetiole, ovate, entire, acute, uniloculate reticulate venation.

Inflorescence :- cymose.

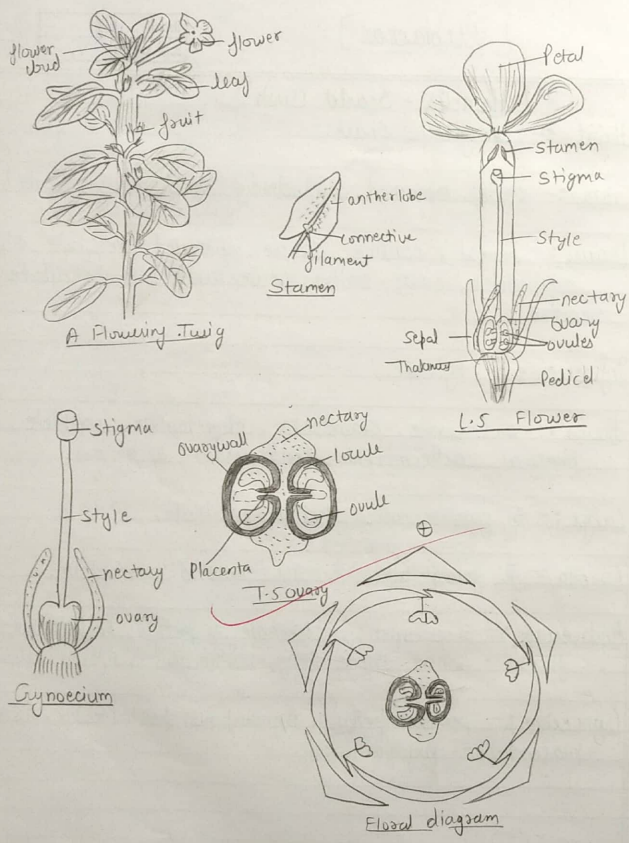
Flower :- sub-sessile, ebracteate, ebracteolate, complete, cyclic, bisexual, actinomorphic, Pentamerous, epigynous.

Calyx :- 5, gamosepalous, petaloid, valvate,

Corolla :- 5, gamopetalous, tubular, twisted aestivation.

Androecium :- 5 stamens, alternate to petals, epipetalous, filament short thesea long, ditheca, basifixed yellow.

Gynoecium :- pentacarpellary, syncarpous, pentalocular, axile placentation, inferior ovary.



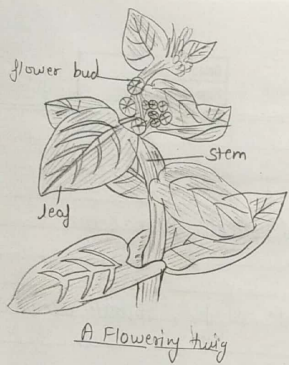
[CATHARANTHUS ROSEUS]

[Apocynaceae]

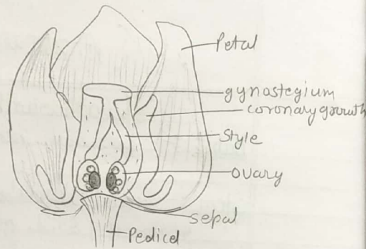
Date: \_\_\_\_\_  
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[Catharanthus roseus]

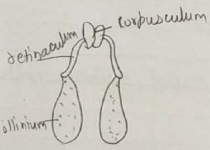
- Habit :- perennial herb.
- Stem :- aerial, branched, cylindrical, erect, herbaceous, glabrous, solid, milky latex pr.
- Leaves :- ramal & cauline, petiolate, simple, opposite decussate, exstipulate, mucronate.
- Inflorescence :- cymose, pr. in axillary pairs.
- Flower :- pedicellate, bracteate, complete, bisexual, actinomorphic, pentamerous, hypogynous, cyclic pink.
- Calyx :- 5, quincuncial, gland dotted green.
- Corolla :- 5, clockwise, twisted, rotate, corolline-cusona pr.
- Androecium :- ~~sygiate~~, basifixed, introrse inserted.
- Gynoecium :- superior ovary, ligulate, nector pr.
- Fruit :- follicle.



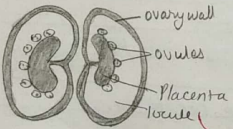
A Flowering twig



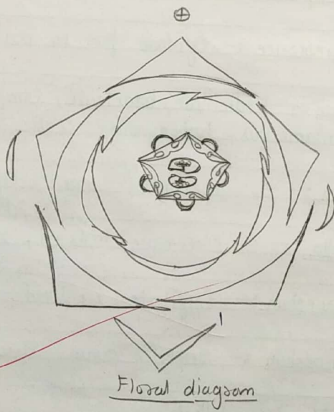
L.S Flower



Transistor



T.S Ovary



[CALOTROPIS PROCERA]

## [Asclepiadeaceae]

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### [Calotropis procera]

Habit :- Annual shrub or like short tree.

Stem :- Aerial, branched, cylindrical, erect, hairy.

Leaves :- ramal & cauline, simple, sessile, semicomplexitudinal. leaf base, exstipulate, opposite decussate, leathery, ovate, entire.

Inflorescence :- polycephal cyme.

Flower :- bracteolate, pedicellate, bisexual, regular, actinomorphic. Pentamerous, hypogynous, cyclic, white, purple.

Calyx :- 5, quinquevalvular.

Corolla :- twisted, campanulate.

Androecium :- Gynostegium, every stamen made by pollinia, trans later fr.

Gynoecium :- bicarpellary, capocarpous, uni-locular, marginal placentation, Pentangular.

Fruit :- follicle.

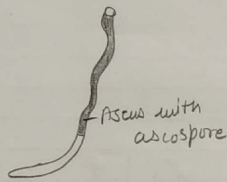
Formula :-  $B_2, b_2, \oplus, \text{♀}, K_5, C_5, A_5, \overline{C_2}$

# Plant Diseases

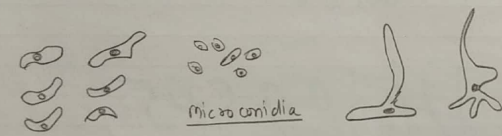
Ergot of Bajra *C. fusiformis*



mature / o. sclerotium

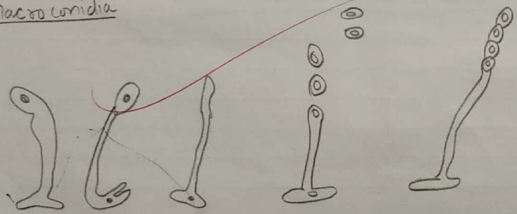


Ascus with ascospore



macroconidia

microconidia



Production of macro & microconidia on the tips of germ tube.

Life cycle of *Claviceps fusiformis*

Plant disease

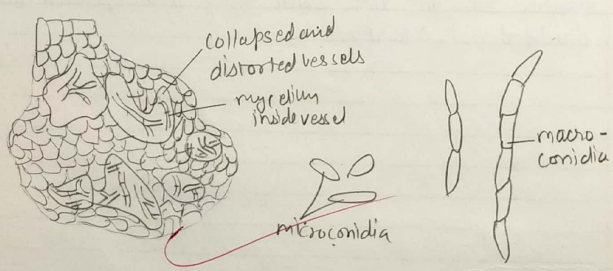
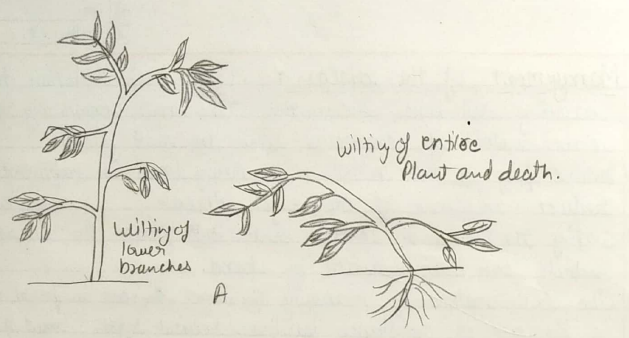
Ergot of Bajra / Pearl millet.

1. Pathogen :- *Claviceps microcephalum*.
2. Host :- *Penicillium typhoidis*.
3. Distribution :- This disease was first reported in south India. It is occurred in delhi, uttarakhand, Rajasthan, Haryana, Punjab.
4. Symptoms :- The disease becomes evident as small droplets of pinkish or light honey coloured fluid which keep on exuding from the spikelets, later these droplets become darker, coalesce, and cover larger area of the cob. In advanced stages small dark brown sclerotia can be seen projecting b/w the glumes. These sclerotia contains alkaloids responsible for ergot poisoning the animals.
5. Disease cycle :- This disease is soil born. The conidia can survive for 13 months in the soil.
  - The sclerotia produce ascospore which are responsible for new infection.
  - The imp role of this type of inoculum in primary infection now is well established.
  - During conversion of the honey dew stage of the sclerotial stage, sclerotia are two types. some are aggregation of hyphae and conidia which later show only myceliogenic germination. The ascospore are carried by wind current to fresh flowers.

6. Management of the disease :- Long-crop rotation help in avoiding soil-borne inoculation. The most commonly recommended method of control is seed clean.
- Intercropping of pearl millet with mung bean is reported to reduce incidence of the ergot disease.
  - Soaking the seed in 20-32% salt sol<sup>n</sup> floats the sclerotia which can be removed by hand.
  - The best method of managing the ergot disease in pearl millet is the use of resistance varieties. Several ergot, smut & downy mildew resistant lines with highly yield potential were developed at ICRESAT.

## WILT OF COTTON

1. Pathogen :- *Fusarium Oxysporium* (Deuteromycotena).
2. Host :- *Gossypium* sp.
3. Distribution :- This disease are found all over the world where cotton crop is grown. In India this disease has been reported in Maharashtra, Gujrat, M.P & Rajasthan.
4. Symptoms :- The fungus attacks the host when the plants are 1-3 weeks old. In very early stage of plant growth, vein clearing on cotyledonary and first leaves is also visible. often the diseased plants are short with smaller leaves and bolls.
5. Disease cycle :- This is a soil & seed born disease. The fungus is a parasite & can viable in the soil for a long time. The fungus enters the host root after multiplication they move to xylem vessels it plugged the xylem vessels by the mycelium.
  - Two types of conidia produced by mycelium by *Fusarium*.  
1. Microconidia . 2. Macroconidia.
6. Disease control :- Sanitation, crop rotation, seed treatment (organomercurial), Resistant varieties (Vimas, Daulat), Sujaya, G-11-22, G-22, G-46, Solar treatment of soil.



Wilt of cotton.

## The Rust of Crucifers

1. Pathogen - *Albugo candida*.
2. Host - Crucifer crops (Mustard, cress, Rape, Radish, Cabbage etc).
3. Symptoms - isolated spots or pustules appear on leaves or stems or inflorescence. The pustules of variable size are raised as shiny white areas. on leaves these are confined to lower surface only. Due to Hypertrophy and Hyperplasia of floral parts, these show swelling and distortion.
  - The peduncle and pedicel become enormously thick. Floral parts become fleshy, swollen, green or violet in colour, the stamens falling off early.
  - The petals may turn green like sepals. pollen grains sterile.
  - The stem and the axis of inflorescence may get twisted.
4. Disease cycle :- The primary infection occurs due to oospores perennating in the soil. oospore germinate in presence of water to form a vesicle in which a large no. of zoospore are formed. These zoospores swim in a film of water and land on the suitable host, germinate by germ tube, enter the host and establish infection.
  - Soon after absorbing nutrients and food materials from host, accumulates below the lower epidermis. due to pressure the lower epidermis breaks and white rust symptoms become apparent on the leaves.



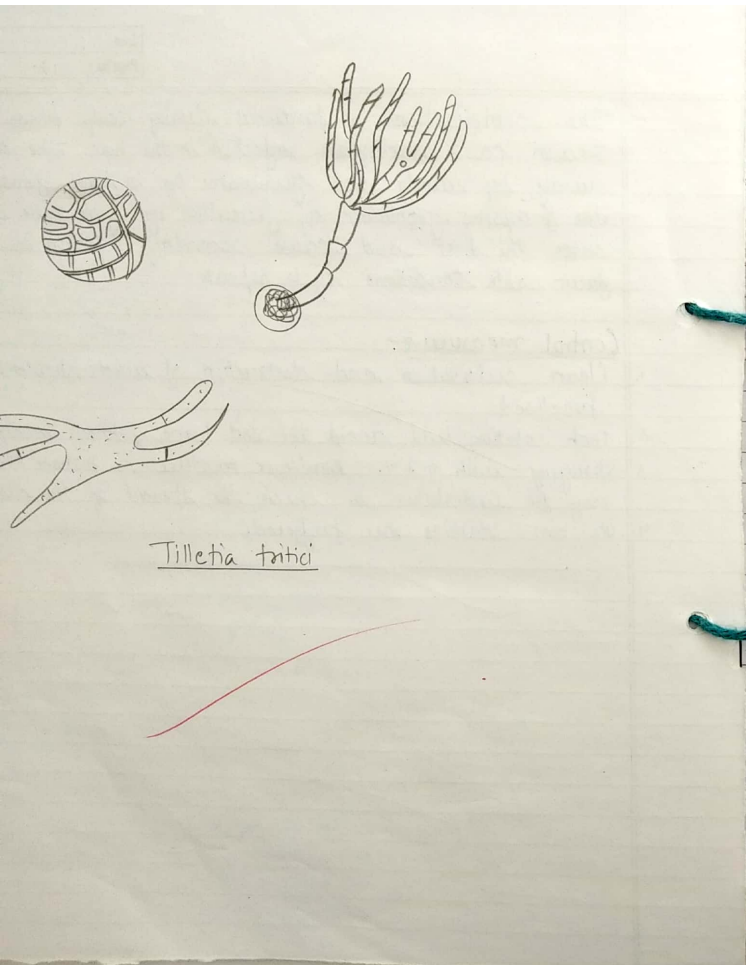
Date :

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- The conidiosporangia produced during early phase of growing season cause secondary infection in the host. They are blown away by winds and germinate to form zoospores.
- The zoospores germinate by formation of germ tube which enters the host and cause secondary infection. In favourable conditions cycle repeats.

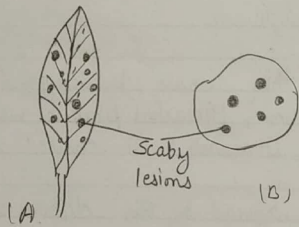
### Control measures :-

1. Clean cultivation and destruction of weed should be practised.
2. Crop rotation will avoid the soil borne primary inoculum.
3. Spraying with 0.8% Bordeaux mixture or Dithane M-45 (0.2%) may be undertaken to check the spread of the disease.
4. Resistant varieties are preferred.



Common bunt or Stinking smut of wheat.

1. Pathogen :- Tilletia tritici [Tilletia foetida].
2. Host :- Triticum aestivum.
3. Distribution :- In India this disease is confined to cooler region such as Kashmir, Himachal Pradesh and parts of Punjab and western Uttaranchal. It caused loss in yield.
4. Symptoms :- The plant affected by this disease the ear become thick dark green in colour and more open. The affected ears become narrow & longer than the healthy plant. After maturity all the grains of ears are being converted into spore balls. The spore ball known as bunt balls. The spore are released from the bunt balls with difficulty. The spores release during threshing & attack on the healthy grains.
5. Disease cycle :- This disease is seed born the infection takes place by seed born spore after fertilization. Infection the fungus grow along the tip of the shoot as the same time fungal mycelium enter in the inflorescence and affected the ovary.
6. Disease control :- use of fungicides, Resistant varieties (Kalyan sona) T-129, IWL-137, & Seed treatment by fungicides or solar.



Symptoms of citrus canker on leaves (A) & fruits (B).

## Citrus canker

1. Pathogen :- *Xanthomonas* sp.

2. Host :- Citrus sp.

3. Distribution :- Citrus canker is a bacterial disease of worldwide distribution occurring wherever citrus is grown. It is a serious menace to our most valued citrus orchards causing objectionable blemishes on the fruit. The disease causes serious damage in India, China, Japan and Java.

4. Symptoms :- Crater like disease lesions or scabby spots and small cankers appear on all over the ground parts of the plant such as leaves, young branches and fruit. Later, the spots turn whitish or greyish to finally rupture. The older lesions are corky and brown, sometimes purplish.

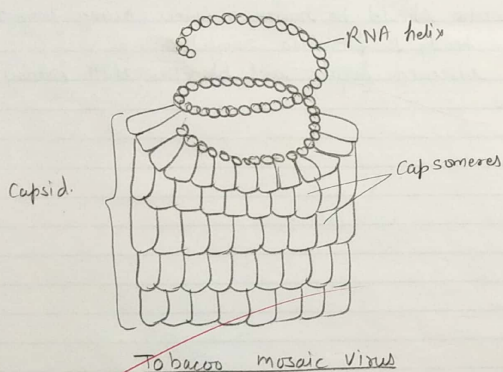
5. Disease cycle :- Infection takes place through the stomata and wounds. The disease is not soil borne. The pathogen perennates in the old lesions on the twigs still attached to the host plant. From there it is carried by driving rains and by insects to new localities. Man functions as the chief agent of dissemination by planting infected nursery stock in new localities.

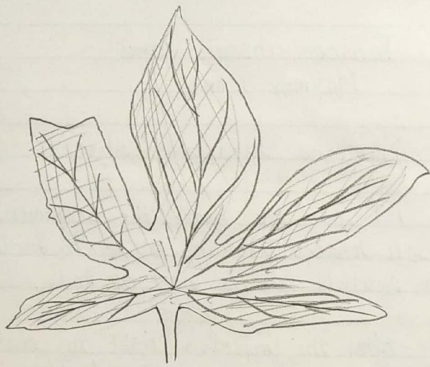
6. Control measures :-

1. Eradication of diseased plants.
2. use of disease free nursery stock.
3. Spraying with Bordeaux mixture and lime sulphur is a useful measure to protect the fruit.
4. Citrus nurseries should be raised in places away from the regions of heavy & protected rainfall.
5. Pruning of diseased foliage and branches with pruning scissors.

## TOBACCO MOSAIC DISEASE

1. Pathogen:- Tobacco mosaic virus  
Marmor tabaci
2. Host :- Nicotiana tabacum (Tobacco).
3. Distribution:- All over the world the commonest disease found in all tobacco growing areas. In India this disease is found in south & middle part of India.
4. Symptoms:- After the infection light to dark green mottlings on the leaves. After the complete infection the plants are stunted in growth & leaves are appear mosaic type. This disease is caused by TMV. It is rod shaped virus measuring  $300\text{nm} \times 18\text{nm}$ . Each rod have a central hollow tube, this tube have RNA is core & protein coat of outer side. The virus survive 50 years on dry tobacco leaves.
5. Disease cycle:- The virus is sap transmissible. It enter by the wound and injured surface. The virus can die on  $90^\circ\text{C}$  temperature for 10 min exposure. The TMV may be transfer in the field by smoking & chewing tobacco.





Yellow vein mosaic of Bhindi.

## Bhindi yellow mosaic

1. Pathogen :- Bhindi yellow vein mosaic virus. (Begmovirus).
2. Host :- *Abelmoschus esculentus* Moench. (bhendi okra).
3. Distribution :- The causal agent is the single-stranded DNA Bhendi yellow vein mosaic virus, which is associated with a beta-satellite. Both of which are required for infection. It was first reported in okra plants in 1924 in India and Sri Lanka. In India it is a serious problem wherever the crop is grown.
4. Symptoms :- The symptoms include alternate green and yellow patches, vein clearing, and vein chlorosis of leaves. The yellow network of veins is very conspicuous, and vein and veinlets are thickened. In severe cases, the chlorosis may extend to interveinal area and may result in complete yellowing of leaves, fruits are dwarfed, malformed, and yellow green. The white fly *Bemisia tabaci* sibling species group is the insect vector. The whitefly vector reproduces to significant numbers during the summer season when it transmits the virus to okra plants.
5. Disease cycle :- The disease is transmitted by whitefly *Bemisia tabaci*. The population is high during hot summer months, the crop is seriously affected then. The virus also survives on various weeds growing along roadside.

## 6. Control :-

- Sanitation.
- Resistant varieties.
- TMV - RR-2
- TMV - RR-3
- Spray of tannic acid is also a control of disease.

for eg. *Crotton sparsifolia*, *Ageratum* etc.

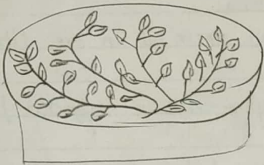
### 6. Control Measures:-

1. The vector that are responsible for the spread of virus need to be controlled by spraying dimethoate 0.03% or monocrotophos 0.05 at 10 days intervals.
2. Foliar spray of 5 to ml neem oil in one litre water at weekly intervals.
3. ~~Removal and destroying disease affected plants.~~
4. Crop rotation
5. use of resistant varieties. (Akra Abhay, Punjab padmini etc).
6. use of seed collected from disease free plants.



## LITTLE LEAF OF BRINJAL

1. Pathogen :- Phytoplasma
2. Host :- Solenium malongina (egg plant).
3. Distribution :- In India it was first reported from combatore. The disease is a serious threat to profitable cultivation of the veg. crop in most of the state. When young plants are attacked they do not produce flowers and fruits.
4. Symptoms :- The main symptom of the disease is production of very short leaves by the affected plant. The petioles are so much reduced in size that the leaves appear sticking to the stem. Such leaves are narrow, soft, smooth and yellowish in colour. Newly formed leaves are further reduce in size. The internodes of the stem are shortened and at the same time a large number of axillary buds are stimulated to grow into short branches with small leaves. This gives the whole plant a bushy appearance. Usually such plants fail to form flowers fruiting is rare.
5. Disease cycle :- The disease is caused by a mycoplasma like organism. Now it is recognised as a phytoplasma of the clover proliferation. These structures are present in the phloem sieve tube cells of some stem, Petioles, Phyllodes, and roots and also in Haemolymph and fat

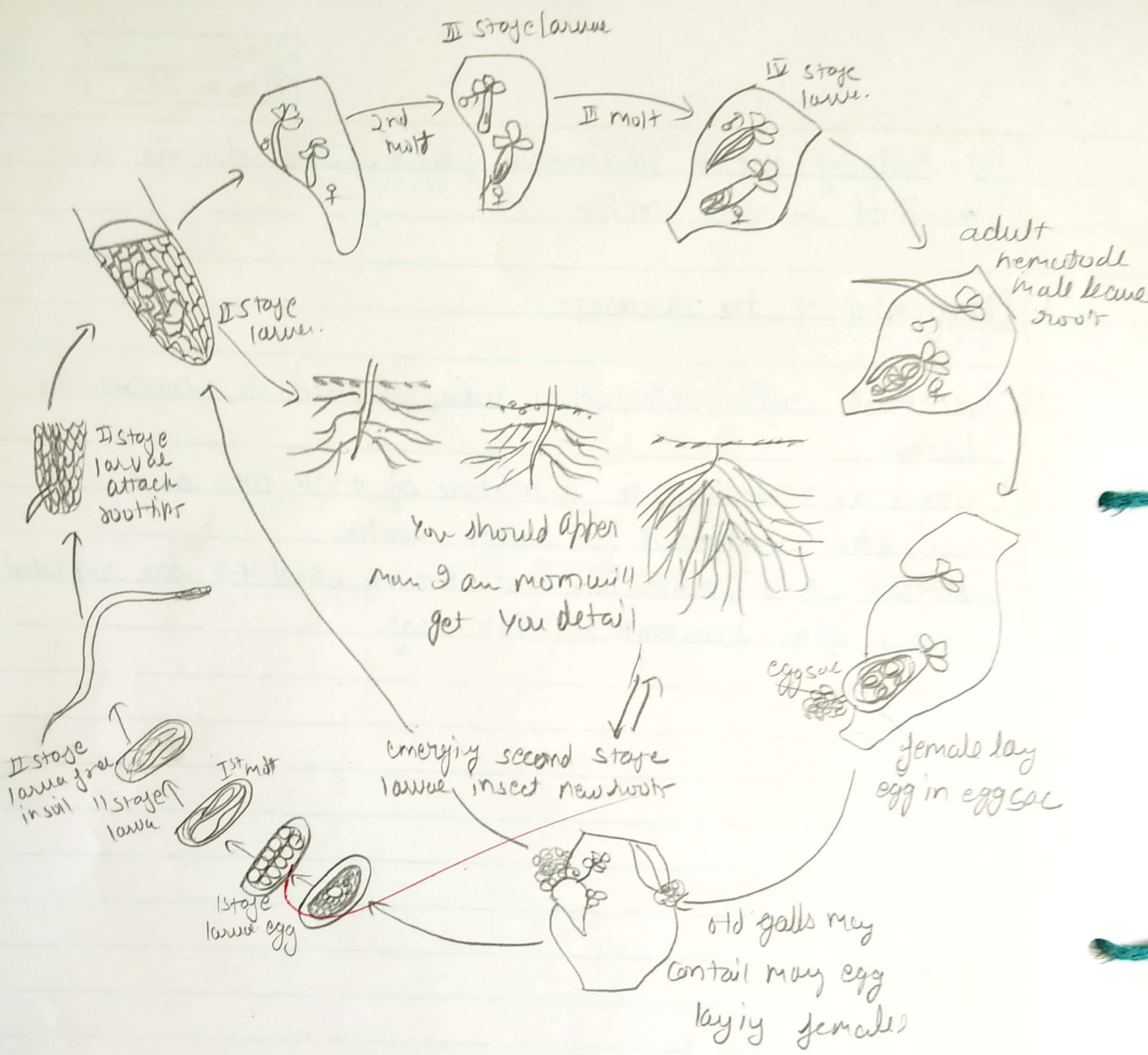


Little leaf of Brinjal (egg plant)

fat body of vector *Hishimonus phycit*. This disease is transmitted by insect vector.

#### 6. Management of the disease:-

- Treatment with tetracyclins were claimed to control the disease.
- Matasystox, malathion or a mixture of 0.1% BHC and 0.1 DOT have been recommended for vector control.
- Cultivars BB-7, BWR-12, Pant Rituraj and H-8 are reported to have some resistant to little leaf.



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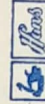
Disease cycle



## Root-knot disease of vegetables

1. Pathogen :- *Meloidogyne* sp.

2. Causal organism and disease cycle :- The life cycle starts from the egg deposited by the females within the host tissues or outside the gelatin matrix completely or partially embedded in the root tissues. The eggs are held in a large sized sac. After embryonic development a fully formed larva is formed in the egg. This 1st Stage larva is highly resistant to dry conditions and can move within the egg after 1st molt, which occur within the egg.
- II stage larva with well developed stylet is formed. Under suitable conditions, the egg hatch and the second stage larvae emerge out of egg cell.
  - These larvae move very slowly, without any particular direction and without feeding in the soil. They enter the root caps by piercing through the cell wall with the help of their stylet throats and ~~injecting glandular secretions~~. This is the start of disease cycle.
  - When they found host to be suitable after moving through the undifferentiated root cells, they come to rest, orienting their 'heads' towards the developing stele region at the zone of cell elongation, with their bodies mostly lying in the root cortex.
  - The nematode start feeding on root cells and injecting gland secretions and biochemical and cytological changes occur in the undifferentiated cells of vascular system around its head.



Date :

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- These cells abnormally develop from or enlarge to form giant cells which serve as the food tank for nematode.
- The cells divide repeatedly to give rise to sucklings and eventual gall formation the roots.
- As the giant cells are being formed, the young nematodes also increase considerably in width and gradually become flask shaped. Sex differentiation occurs at this stage.
- The third stage juveniles are swollen, with a short blunt tail.
- These III stage larvae undergo third molt to give rise to the IV stage male and female larvae.
- The IV stage undergoes IV<sup>th</sup> molt to give rise to adult females & males. Adult females persist inside the host cells while adult males leave them. Egg laying is completed in about a week. The larvae hatched in soil move in search of new roots or fresh locations.

### Control - Crop Rotation.

- Use of resistant varieties.
- Early planting.
- Heat treatment of propagation material.
- Heat treatment of soil.
- Chemical control.

15/7/18