PERIYAR INSTITUTE OF DISTANCE EDUCATION (PRIDE)

PERIYAR UNIVERSITY

SALEM - 636 011.

B.Sc. BOTANY

THIRD YEAR

PRACTICAL - IV : MAJOR PRACTICAL

Prepared by :
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B.Sc. BOTANY
THIRD YEAR
PRACTICAL - IV : MAJOR PRACTICAL

Time:3 Hours Maximum:100 marks
Practical :90 marks
Record :10 marks

1.Outline the procedure, apparatus and materials required for investigating the physiological problem A assigned. Set up the experiment. Tabulate the data obtained and report the results. Leave the set up for valuation. (20 marks)

2.Based on morphological and anatomical characters assign B and C to their respective probable habitats. Draw suitable diagrams. Submit slides for valuation. (20 marks)

3.Draw and comment on the set up D. (10 marks)

4.Critically comment on E,F,G and H (medicinal botany 4 spotters) (20 marks)

5.Identify and write notes on I,J,K and L. (20 marks)
[I,J-Physiology ; K,L-Ecology]

Experiment:

Determination of Osmotic Pressure of Rhoeo leaf/Onion leaf—Plasmolytic method.

Aim:

To determine the Osmotic Pressure of the cell sap by plasmolytic method.

Materials/Apparatus required:

1 molar sugar solution,distilled water,onion peel/Rhoeo peel,small beakers, glass lids, measuring cylinders, microscope, slides, coverslips, pippette, thermometer.

Procedure:

Prepare the following series of molar sugar solutions from 1 molar sugar solution like 0.12m,0.14m,0.16m,0.18m,0.20m,0.24m .

[Preparation of 1 molar and other molars :

Take 1 molecular weight of sugar 341.12 gram and dissolve in 1000 ml of distilled water.This will be eqal to 1 molar sugar solution.

From 1 molar sugar solution,the following molars are prepared by using the formula

$$V1xS1 = V2xS2$$

V1 =Volume of solution to be taken

S1 =molarity of the solution already known

V2 =Volume of the solution required for the experiment (for example 25cc

S2 = molarity of the solution required for the experiment (0.12m,0.14m,0.16m etc)

For example ,to prepare 0.12 molar sugar solution of 25cc;

V1 = ?

S1 =1 molar

V2 =25cc

S2 =0.12

V1 x1 =25x0.12

$$V1 = \frac{25x0.12}{1} = 3cc.$$

That is, from 1 molar sugar solution 3cc is taken and to this 22 ml of distilled water is to be added. This will give the 0.12 molar sugar solution. Likewise the required molar solutions are prepared.

Table for the preparation of various molar sugar solutions from 1 molar sugar solution:

Sl.no	required molarity	volume to be taken from 1molar solution	distilled water
1.	0.12	3 cc	22 cc
2.	0.14	3.5 cc	21.5 cc
3.	0.16	4 cc	21 cc
4.	0.18	4.5 cc	20.5 cc
5.	0.20	5 cc	20 cc
6.	0.22	5.5 cc	19.5 cc
7.	0.24	6 cc	19 cc

Dried and cleaned small beakers are taken and they are marked with respective molarity. To each of these beakers, the respective molarity solutions are poured and covered with lids.

Take small strips of the lower epidermis of Rhoeo leaf (or)onion peel and put in each beaker. The strips should be immersed in the solution. All strips should be taken from the same leaf. Each strip should have atleast 20 to 25 cells.Check under microscope. The beakers should be covered with glass lids.

After 1 hour take the strip from the beaker and mount in a slide using the same sugar solution from which the strip has been taken. Cover the strip with cover glass and observe under microscope for plasmolysis (the shrinkage of protoplasm towards the centre of the cell represents plasmolysis).Count the total number of cells and of which how many have plasmolysed. Similarly mount and examine, one at a time, the respective strip in the respective molar solution. Tabulate the data. Even incipient plasmolysis is counted as plasmolysed cell.

Somewhere in the series there will be found a strip in which about half of the cells show plasmolysed and about half have do not. The osmotic pressure of the solution in which this condition obtains is consdidered to be equal to that of the cell sap. This can be easily found by using a graph sheet, by plotting the % of plasmolysis in the X axis and molarity in the Y axis.

Example to determine the 50%plasmolysis:

Solution molarity	Total number of cells	No of cells plasmolysed	%plasmolysis
0.12	20	0	0
0.14	20	2	10
0.16	20	8	40
0.18	20	16	80
0.20	20	20	100

In the graph, in this example, 50 % plasmolysis represents 0.17.This will be equivalent to the o.p. of cell sap.This is taken and by using the formula

$$O.P. = \frac{22.4 \times M \times T}{T1}$$

Result:

The O.P. of cell sap of Rhoeo or onion peeling can be calculated.

M =molarity of the solution found from the graph

T= 273+room temperature

T1=273

f room temperature is 30 degree centigrade, the o.p. of cell sap is

$$O.P. = \frac{22.4 \times 0.17 \times 303}{273}$$

= 4.2265 atmospheric pressure.

Experiment:

Effect of temperature on membrane permeability.

Aim:

To show that temperature has an effect on membrane permeability.

Materials/Apparatus required:

Fresh and healthy beet roots,cork borer, distilled water, tap water, test-tubes, thermometer, blotting paper, alcohol.

Procedure:

Small equal sized cylinders of beet-root tissue are cut with the help of a cork borer. These are thoroughly washed with tap water and put in beakers containing distilled water. Each of these cylinders is placed in a separate test-tube containing distilled water at different temperatures like 0 degree centigrade,10 degree,20 degree,30 degree,40 degree,50 degree,60 degree,70 degree, 80 degree. Keep the beet root cylinders immersed in water in the test tubes for at least 1 hour.

Observation:

The intensity of the red colour increases with increase in temperature. This is tabulated.

Sl.No.	Temperature at which cylinders were kept	colour intensity
1.	0 degree centigrade	No colour
2.	10 ”	
	20 ”	
	40 ”	
	50	light red
	51	

3.	60	”	red
4.	70	”	dark red

Water in those test tubes which were kept at lower temperatures, room temperature remain colourless while the water in the test tubes kept at higher temperatures becomes red coloured. The intensity of the colour increases with increase in temperature.O.D.can be taken with Spectrophotometer.

Result:

The red colour is due to the diffusion of anthocyanin pigments from cell-sap into the water because at higher temperatures the semi-permeability of the plasma membrane is gradually lost. In a living system the semipermeable membrane does not allow the pigment to diffuse out. That is why there is no colour at lower temperatures. With the increase in temperature, the cell is killed and the cell membrane is lost.

EXPERIMENT: Effect of chemicals on membrane permeability

Aim:

To show the effect of chemicals on membrane permeability

Materials required:

Fresh and healthy beet roots, cork borer, distilled water, tapwater, test tubes, Formalin, sodium chloride.

Procedure:

Prepare 20% Formalin,20%Alcohol and 20%Sodium chloride solutions. Small equal sized cylinders of beet root are cut with the help of a cork borer. These are cut into small pieces and washed thoroughly with tap water. This is done so as to remove the red colour.

Take 5 ml each of the above Formalin, Alcohol and Sodium chloride in separate test tubes. In each test tube put two pieces of the already washed beet root bits. Mouth of the test tubes are covered. Keep these set ups undisturbed for nearly 40 minutes and observe the change of the colour of the solution in the test tubes.

Observation:

Change of colour is noticed in test tubes. Concentration of colour is much more in the test tube of Alcohol than Formalin and finally in Sodium chloride.

Result:

Chemicals destroy the plasma membrane thereby affects its permeability. Generally alcohol kills the cells more quickly and strongly; that is the reason for more dense colour in the test tube of alcohol. Formal dehyde affects less than alcohol; hence less colour density. Of all the three, Sodium

chloride affects the plasma membrane in least, so very much less colour in the test-tube of Sodium chloride.

It is shown from this experiment that the effect of chemicals on plasma membrane permeability is Alcohol>Formalin>Sodium chloride.

Experiment:

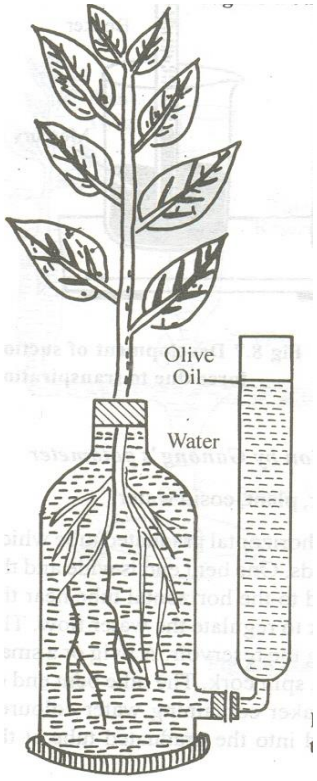
Determination of water absorption and transpiration ratio of twigs.

Aim:

To determine the relationship between water absorption and transpiration.

Apparatus/materials required.

Transpiration-absorption bottle, water, small plant with root system, balance, paper, oil, vasaline.



Absorption-Transpiration Apparatus

Procedure:

The transpiration bottle has a side opening through which one-holed rubber cork is fitted. In the one holed rubber cork, side tube having measurements is inserted. The mouth of the bottle is fitted with a splitted cork.

The transpiration bottle is filled with water. Water is poured so as to reaches the zero level in the side tube. A small plant with root system is inserted through the splitted cork. Small piece of cotton is placed between the

stem of the plant and splitted cork, so that the plant stem cannot be damaged. Vasaline is smeared over the cork to make the water not to evoporate. Oil is poured over the water in the side tube. The whole set up is now weighed with the help of weighing balance and the weight is noted. The water level in the side tube is also noted.

After 2 hours, once again the whole apparatus is weighed and also the level of the side tube noted.

Observation;

The level of water in the side tube is lowered. The weight also is decreased.

Sl.No.	Duration	Weight	Difference	Water level		difference	
		initial	final	intial		final	
1.	30 minutes	150gm	130gm	20gm	0ml	20ml	20ml
2.	next 30 mts	125gm	100gm	25gm	22ml	48ml	26ml
3.	next 30mts	100gm	85gm	15gm	40ml	22ml	18ml

Result:

The decrease in water level represents the amount of water absorbed. The decrease in weight represents the amount of water lost due to transpiration. It is observed that the absorption more or less equals to transpiration

Loss of weight = 20gms

Loss of water = 20ml

$$\text{Ratio} = \frac{20}{20} = 1$$

The eqation may change with time of the experiment, that is during morning, mid-day and evening.

Experiment:

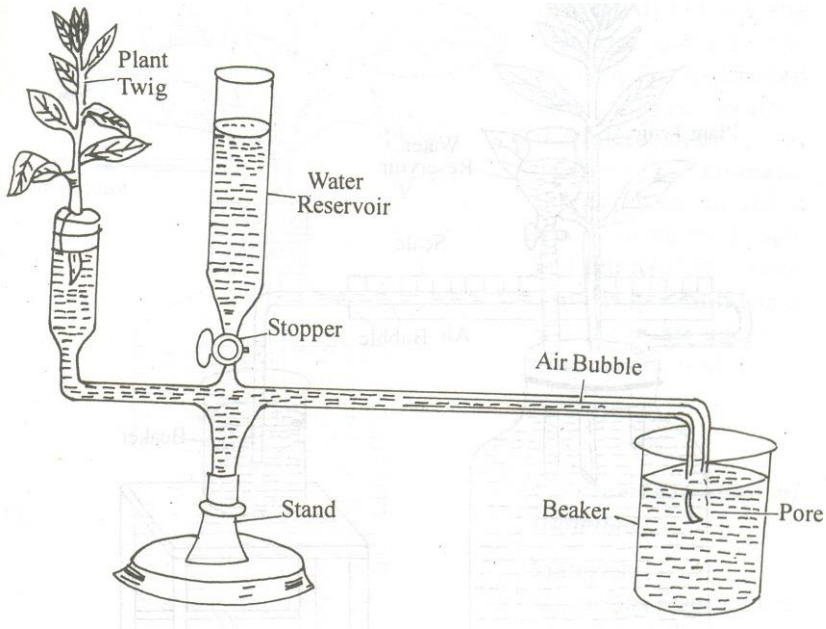
Effect of light intensity on transpiration using Ganong's potometer.

Aim:

To study the effect of light intensity on transpiration using Ganong's potometer.

Requirements:

Ganong's potometer,a fresh twig of plant with leaves, water, beaker, vasaline, stopwatch.



Ganong's potometer

Procedure:

Fill the apparatus with water through the water reservoir. Insert a freshly cut twig with leaves in the water of the vertical arm through the hole of the cork. Make all the joints air-tight by applying grease. Insert an air bubble in the graduated tube and keep the whole apparatus in front of 40 watts bulb at 30 centimeters distance.

Observation:

The air bubble will move towards the reservoir in the horizontal tube. Note down the time and distance travelled by the air bubble. Repeat the same set up by keeping in front of 60 watts,80 watts,100 watts bulbs at the same distance.

Tabulation:

Sl.no	Time taken in minutes	initial	final readings	distance travelled by air-bubble
40 Watts bulb				
1.	5 minutes	0.5	2.0	1.5
	60 Watts bulb			
2.	5 minutes	3.0	6.0	3.0
	80 Watts bulb			
3	5 minutes	6.2	12.0	5.8
	100 Watts bulb			
4.	5 minutes	12.2	20.0	7.8

Result:

As the light intensity increases the rate of transpiration also increases.

Experiment:

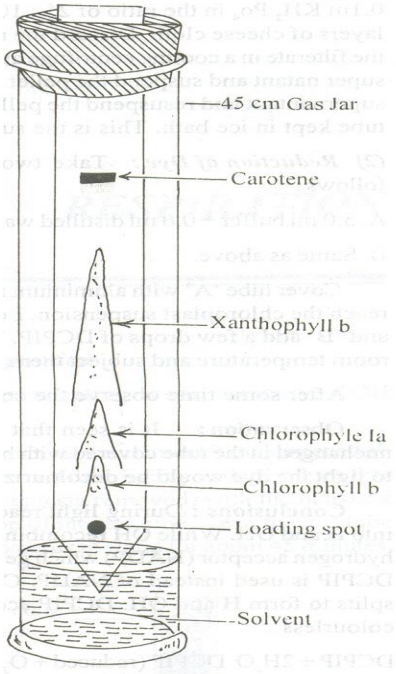
Separation of Plant pigments by Paper Chromatography:

Aim:

To separate plant pigments by paper chromatography method.

Requirements:

Leaves of Tecoma or Bougainvillea, calcium carbonates and petroleum ether, solvent mixture of petroleum ether,100% acetone, methanol in the ratio of 20:4:1,Whatman filter paper No.1,mortar and pestle, beaker, measuring jar, boiling test-tube, split cork, micropippette, muslin cloth.



Procedure:

Preparation of Acetone extract of leaf pigments.

3 grams of fresh healthy green leaves of Tecoma or Bougainvillea are taken in a mortar and pestle. A pinch of calcium carbonate or sand and 40 ml of 80% acetone and 5 or 10 ml of petroleum ether is added and ground well. Filter the solution using fine muslin cloth. Allow the filtrate to evaporate for about 30 minutes to get a concentrated extract of the leaf pigments in acetone. The deep green coloured filtrate obtained is called acetone extract which contains chlorophyll and carotenoids to be separated.

Separation of pigments from the extract:

A boiling test tube containing 5 ml of solvent mixture is taken(solvent mixture=petrolrum ether:100%acetone:methanol in the ratio of 20:4:1).Close the boiling test-tube with split cork. Long strip of Whatman No.1 filter paper of about 2x20cm is taken. One end of this strip is cut in such a manner to make it a pointed end. From this point about 3cm away, with the help of a fine

micropippette, about 3 to 10 drops of the concentrated extract prepared already are put. The drops are applied one after another after the drying up of the previous ones. The drop diameter must not exceed 0.5cm.Spreading of the extract should be avoided. Allow the spot to dry for sometime. Place the strip inside the test tube containing the solvent mixture in such a way that the spotted side of the paper is just immersed for 0.5cm in the solvent. The loaded spot should not be dipped in the solvent.

Close the test tube with split cork. Make the set up airtight and allow the solvent run from the basal end of the paper strip almost to the top. Support the test tube on a stand vertically. This is left for an hour without any disturbance.

Observation:

The solvent move upward and the pigments got separated and distinct colour bands are noticed on the paper. After the separation, take the strip and dry it.

Result:

The level of the moved up solvent in the paper is marked by pencil. This is called solvent front.Various coloured regions are also marked. The distamce between the colouered spot and the spot of the extract represents the distance travelled by the pigment. Likewise the distance travelled by various pigments are found out. From these, Rf value can be calculated by using the formula,

$$Rf = \frac{\text{Distance moved by the pigment}}{\text{Distance moved by the solvent}}$$

Sl,no	pigment	pigment colour	Distance moved by solvent	Distance moved by pigment	Rf
1.	chlorophyll b	light green	10.5	4.2	0.4
2.	chlorophyll a	dark green	10.5	6.1	0.6
3.	xanthophyll	light yellow	10.5	7.55	0.7
4.	carotene	orange yellow	10.5	8.15	0.9

Result:

Rf value of chlorophyll b = 0.4
Rf value of chlorophyll a = 0.6
Rf value of xanthophyll = 0.7
Rf value of carotene = 0.9

Experiment:

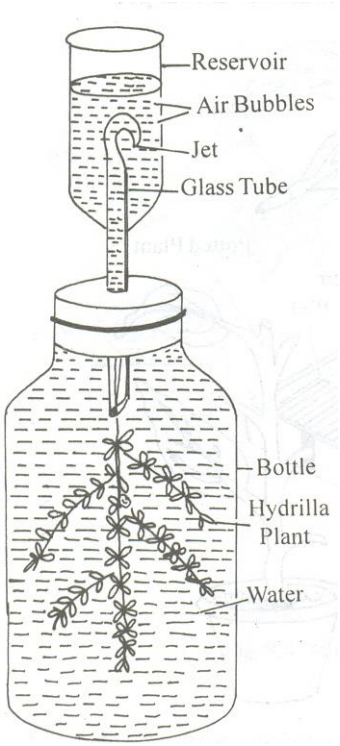
Effect of intensity of light on oxygen evolution during photosynthesis using Wilmott's bubbler.

Aim:

To study the effect of intensity of light on oxygen evolution during photosynthesis using Wilmott's bubbler.

Materials required:

Wilmott's bubbler apparatus, water Hydrilla plant, vasaline, table lamp.



Wilmott's bubbler apparatus

Procedure:

Willmott's bubbler apparatus is filled with pond's water. Cut the bases of the hydrophyte Hydrilla plants, ties them with a thread and insert them in the narrow tube of the bubbler in such a way that their cut ends are towards the upperside in the nozzle.

Keep a table lamp near this apparatus in such a way that the light falls on the plant.

Keep the light at first at a distance of 100cm from the plant. Then, move the light(lamp)towards the plant at 90cm,60cm,30cm,15cm distance. when the plant is at 5cm distance, consider the light intensity as 100 units. Light intensity will be indirectly proportional to the square of distance (Hence light intensity will go on decrease as the lamp moves away from the plant. Construct a graph making number of bubbles against light intensity.

Observation:

As the lamp moves towards the plant, number of air bubbles increases.

Result:

As the light intensity increases ,rate of photosynthesis increases. This is the reason for increase in number of air bubbles, when the lamp is moved towards the plant.

Tble:

Sl.no.	Lamp distance from the plant	No of air bubbles (30 minutes interval)
1.	15cm	50
2.	30cm	45
3.	60cm	30
4.	90cm	20
5.	100cm	10

Experiment:

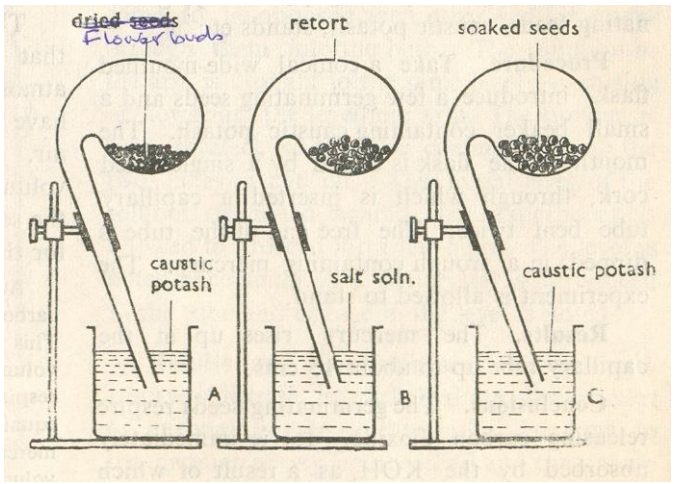
Measurement of rate of respiration in germinating seeds:

Aim:

To measure the rate of respiration in germinating seeds using simple Respiroscope.

Materials required:

Same sized Ganong's Respiroscopes 3 numbers, beakers, stands, germinated seed(Paddy or Phaseolus radiatus seeds –green grams), Potassim-Pyrogallol, K(OH)



Procedure:

Take three equal sized Ganong's respiroscopes and connect them separately with three separate stands. In the bulb of one respiroscope, introduce a known weight of germinated seeds and dip its tube in a beaker containg K(OH).In the bulb of the second respiroscope, introduce known weight of the heated boiled seeds and dip its tube in a beaker containing Potassium-Pyrogallol. In the bulb of the third respiroscope, introduce heated and boiled

seeds and put its tube in a beaker containing K(OH).The level of the solution in three beakers must be of the same one. In all three, the bulbs are covered with black paper to check the effect of light on respiration.

Observation:

In the first respiroscope (germinated seeds),K(OH) level rises in the tube. In the second one(boiled seeds-Pyrogalol),there is no change. In the third one(boiled seeds-KOH) there is no change.

Explanation:

In the first respiroscope, when the living germinating seeds respire ,the liberated CO2 is absorbed by KOH, hense rise in the level of KOH. In the third one as boiled and killed seeds are present, there is no respiration and hence there is no change. In the secondone also there is no respiration(as the seeds are killed) but as the Pyro-galol absorbs O2 present in the respiroscope, the level increases. The level is noted with the help of a scale from the level in the beaker and the level in the tube.

Result:

In the seeds storing starch, during respiration, the amount of oxygen taken is equivalent to the amount of CO2 liberated.

The level of Pyrogalol = (O2) = 7.8 cm

The level of K(OH) = CO2 = 8.0cm

$$R.Q. = \frac{CO2}{O2}$$

$$= \frac{8.0}{7.8} = 1.02$$

Experiment:

Measurement of rate of respiration of flowerbuds

Refer the experiment of respiration using seeds ------ instead of seeds use flower buds.

Demonstration Experiments:

Spotters:

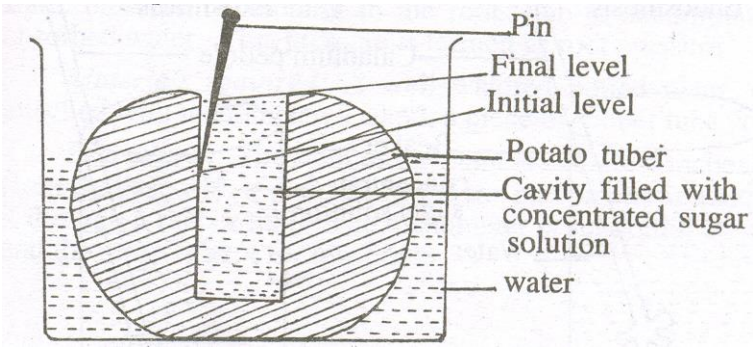
POTATO OSMOSCOPE:

AIM:

To demonstrate the phenomenon of Osmosis by using Potato Osmoscope

Requirements:

Pototo tuber, sugar solution, water, pin, beaker, scalpel, knife.



Potato Osmoscope

Procedure:

A large sized potato tuber is taken. The outer skin is peeled off and the base is cut to make it flat. A hollow cavity is made in the centre with the help of scalpel. The cavity is filled with strong sugar solution. The initial level of sugar solution in the tuber cavity is marked with a pin inserted in the wall of the tuber. The potato tuber is now placed in a beaker of coloured water. The flat side of the tuber must be on the lower side.

Observation:

After few hours the level of sugar solution in the cavity of potato tuber rises.

Result:

The experiment indicates that the water in the beaker has diffused into potato cavity through potato cells which act as semipermeable membrane and shows the phenomenon of osmosis.

water in the beaker	---	high concentrated solvent
potato cells	---	semipermeable membrane
sugar solution	---	less concentrated solvent

(movement from outer to inner=endosmosis)

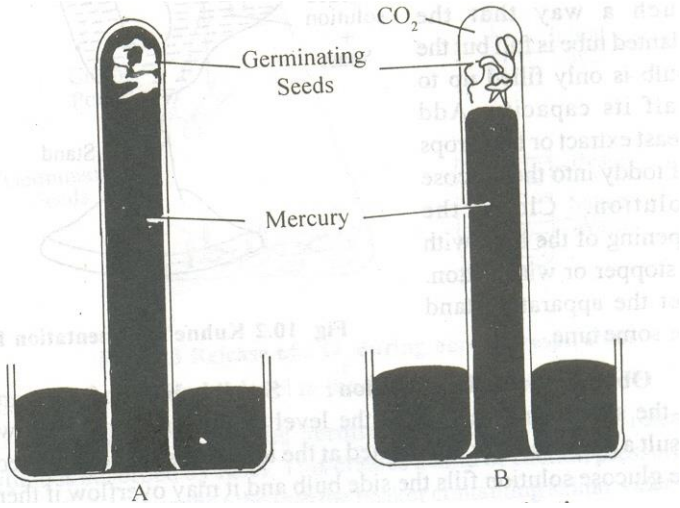
ANAEROBIC RESPIRATION:

Aim:

To demonstrate anaerobic respiration.

Requirements:

A test tube, mercury,a dish,K(OH)pellet, soaked seeds(Pisum or Ciser), dropper.



Procedure:

A few Kerminating seeds are taken in a test-tube. The test tube is filled with mercury and is carefully inverted over the mercury in a dish. Keep the set up as such for few minutes.

Observation:

After sometime the level of mercury falls down in the test-tube. When a pellet of KOH is inserted, the mercury level once again increases in the test-tube.

esult

Result:

The germinating seeds at the apex of the inverted test-tube respires anaerobically and gives out carbon-di-oxide. The liberated CO2 lowers the level of mercury. On addition of KOH, the CO2 gets absorbed and mercury level once again rises in the test-tube. This shows that respiration can take place for a while even in the absense of O2.

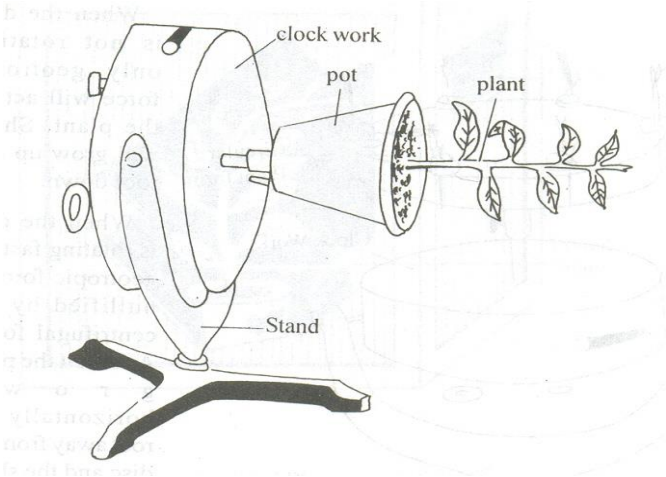
GEOTRPOISM:

Aim:

To demonstrate the phenomenon of geotropism with the help of Klinostat.

Requirements:

Potted plant, Clinostat.



Clinostat.

Procedure:

Fix the clinostat, which consists of a rod with a disc attached on it on a plate. Klinostat can rotate due to the clock work mechanism. At the end of the rotating rod fix a potted plant in the horizontal position and rotate it either by hand or by electric mechanism and observe for sometime.

Now fix the plant in the same horizontal position but do not use the clok work mechanism and donot rotate it. Observe after two or three days.

Observation:

In the plant, where the Klinostat is rotating there is no curvature in the root or shoot. When the Klinostat is not working, there is curvature in the stem towards the upperside, and curvature in the root towards lowerside.

Result/Inference:

In the first one(clock is working),there is no curvature in root or shoot because all the sides of the plant are successively coming to receive the geotropic stimulus equally. When the clock is not working(no rotation),due to the phenomenon of positive geotropism, roots turn towards lower side, and due to negative geotropism, the shoot turns towards upperside.

The bending growth is caused by auxin. When the clock works, the axis of the plant rotates uniformly, the auxin distribution is uniform and hence no bending either in stem or root.

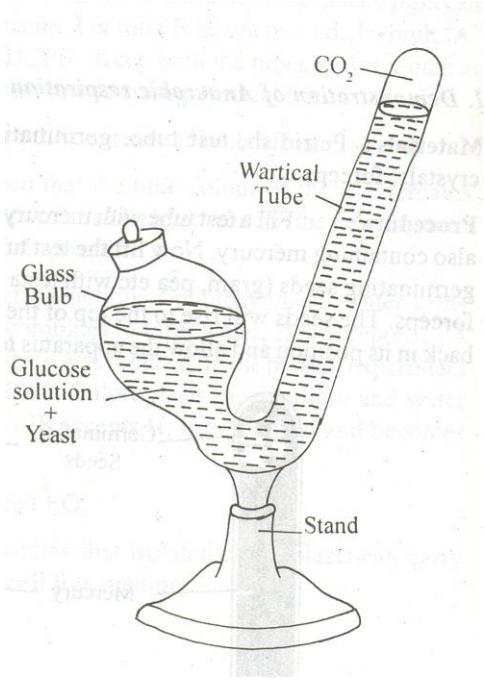
FERMENTATION—KHUNE'S FLASK:

Aim:

To demonstrate the phenomenon of fermentation.

Requirements:

Kuhne's fermentation flask, baker's Yeast, glucose, water, beakers, cotton plug, KOH.



Kuhne's fermentation flask

Procedure:

Prepare 10%glucose solution in water in a beaker. Take some baker's yeast and prepare a creamy mixture in water shaking it thoroughly. Thoroughly stir the yeast solution into sugar solution and pour it now into the fermentation tube of kuhne's flask filling completely the upright arm and half of the bulb. Close the mouth of the bulb with cotton plug.

Keep this kuhne's fermentation flask in warm place for sometime.

Observation:

After sometime, a gas begins to collect in the upright arm and the level of the solution in the upright arm falls.By introducing a caustic potash it can be concluded that the gas collected in this part is carbon-di-oxide. The solution also gives a smell of alcohol after sometime.

Result:

Formation of CO2in the tube and the smell of alcohol is due to the process of fermentation of sugar by enzyme zymase which is present in the yeast cells.

ECOLOGY

Study of the morphological and structural adaptations of hydrophytes, mesophytes, xerophytes, halophytes, parasites and epiphytes to correlate to their habitat:

HYDROPHYTE:

HYDRILLA

Morphological features—Adaptations

1.Slender stem, poorly developed root system.
(as the plant is submerged in water, no need for root system to absorb water)

2.poorly developed root system(only for anchorage)

3.Transparnt,flexible,soft stem(for direct absorption of water).

4.Small,thin,transparent leaves.(direct absorption of water through epidermal cells).

5.Mucilage covers all parts of the plant body(to prevent excessive absorption and decay)

Habit

Structural adaptations:

Stem-T.S.

1.Eidermis ts made up of thin walled parenchyma cells(as root system absent direct absorption of water)

2.complete absence of cuticle(to promote aborption of water)

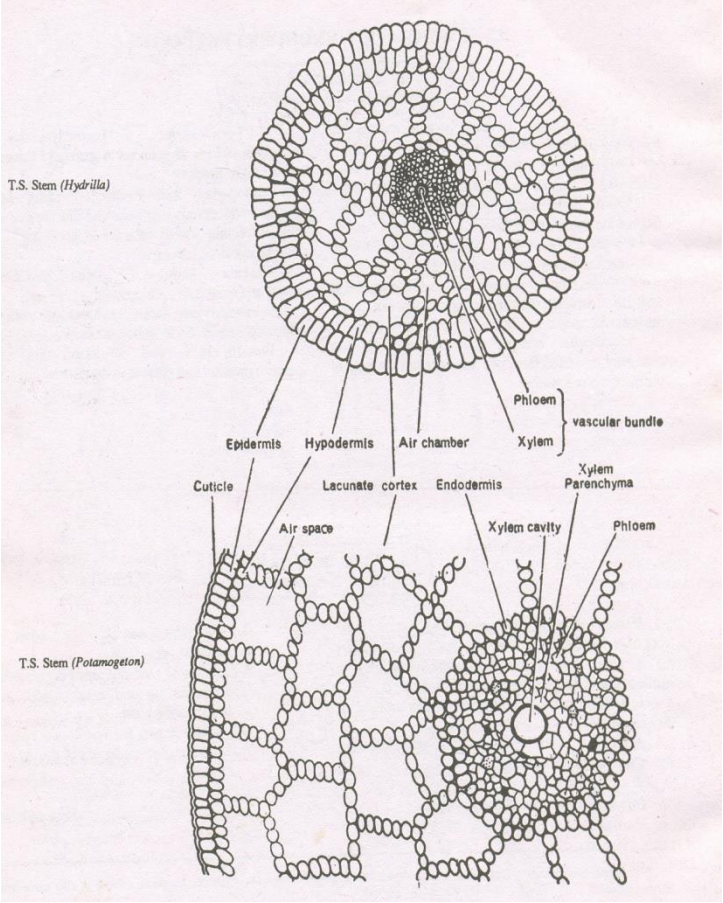
3.cortex is composed of large number of air cavities which are separated by uniseriate, parenchymatous diaphragms(to store gas)

4.mechanical tissue absent(no need for conduction of water)

5.vascular tissues are reduced

6.xylem elements are represented by a single element(cavity) in the centre
(as the whole plant is under water no need for conduction)

7.phloem is presnt in large amount.



Hydrophytic features of stem:

i.presence of large intercelluar spaces

ii.presence of only thin walled parenchyma cells

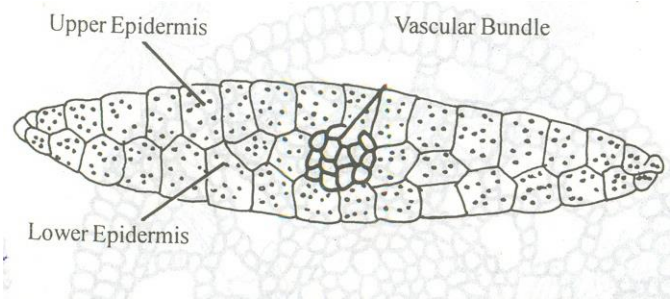
iii.absence of supporting or mechanical tissue.

iv.presence of very much reduced vascular tissue.

Leaf-T.S.

1.The upper and lower epidermal layers are made up of a single layer of cells.

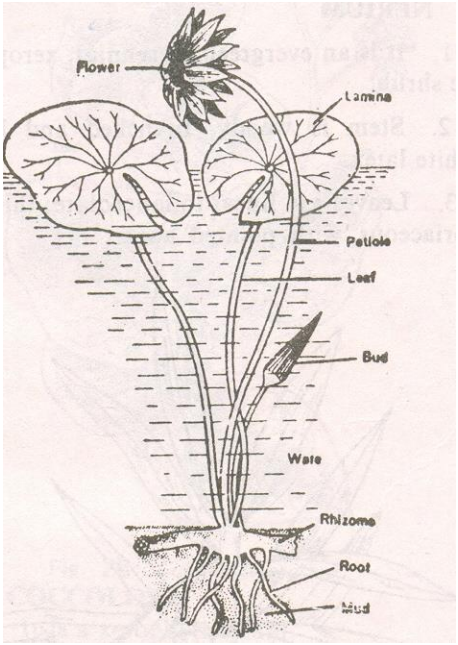
There is no cuticle. Deposition of mucilage.
2.stomata absent.
3.single midrib alone is present ; lateral veins are absent. Bundle sheath absent. Few xylem tracheids are present.
4.mesophyll tissue highly reduced ; more or less absent.
5.all cells including epidermis are chlorophyllous.



NYMPHAEA-Hydrophyte:

Morphological features—Adaptations:

1.Rooted aqatic plant with floating leaves.
2.Leaves have very long petioles.(long petiole helpful for bending in water current)
3.Wax coating on the upper side of the leaf(as the leaves are floating on water wax coating is helpful for making water not to adhere to the leaves)
4.Stem rhizomatous growing horizontally underneath the soil.

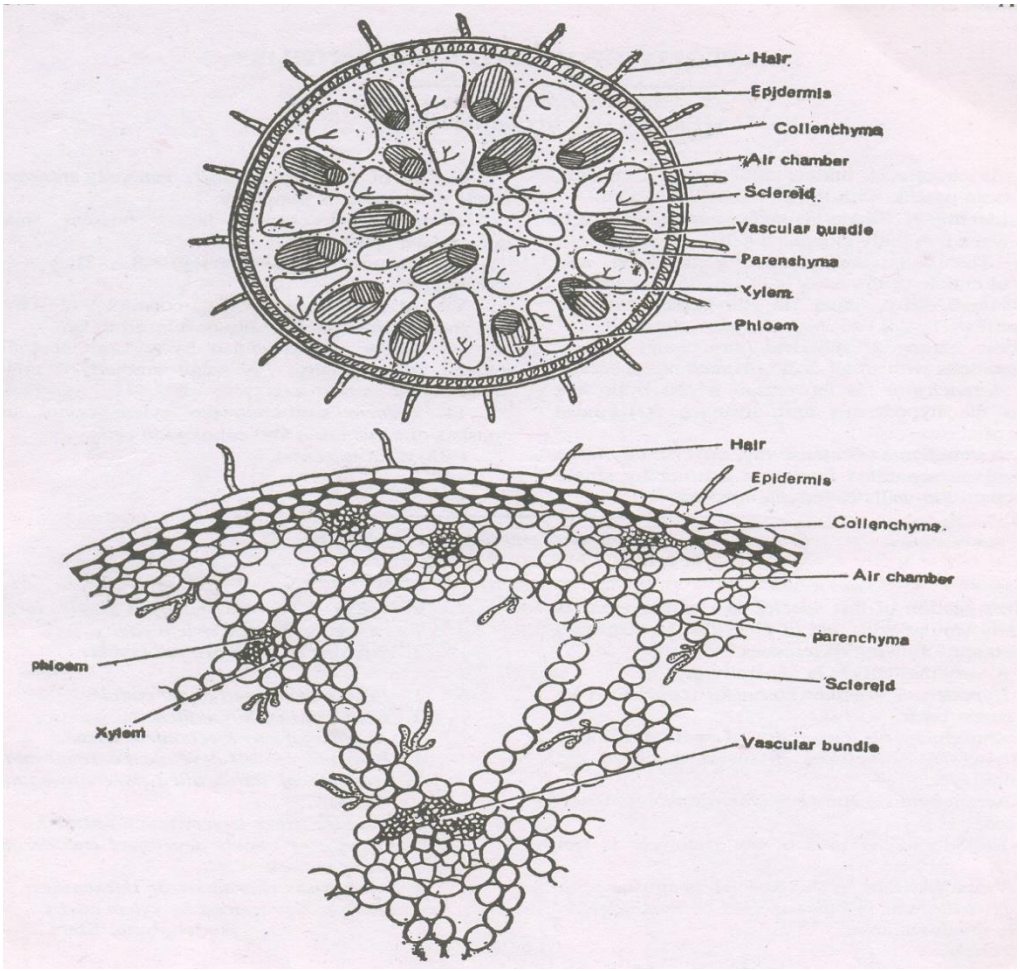


Structural(Anatomical) features:

Petiole—T.S.

1.Thin walled epidermal cells

2.Thick coating of mucilage(ro check decay of the leaf as they are in water always)
3.Absence of or a very thin cuticle
4.Presence of chloroplasts in the epidermal cells
5.Collenchymatous hypodermis(mechanical tissue helpful for bending)
6.Below the epidermis,parenchymatous region with intercellular spaces and large air chambers are present(helpful for buyoncy)
7.Branched or stellate sclereids are found protruding into the cavities(gives mechanical strength)
8.In the vascular bundle xylem is represented by a lacuna. Phloem elements are present in their normal conditions.



Hydrophytic features of petiole
i.presence of air cavities
ii.reduction of vascular tissue
iii.absence of stomata on epidermis
iv.absence of mechanical tissue

Lamina (leaf blade)—T.S.

1.The lamina is dorsiventrally flattened

2.Upper epidermis is single layered. Waxy cuticle is deposited above the epidermis(to check water adhering)

3.Large air spaces in the mesophyll region(helpful for floating)

4.Presence of stellate sclerids and trichosclereids projecting into the cavities(helpful for mechanical strength)

5.Stomata are present only on the upper epidermis

6.Cuticle and stomata are absent on the lower epidermis(for direct movement of water)

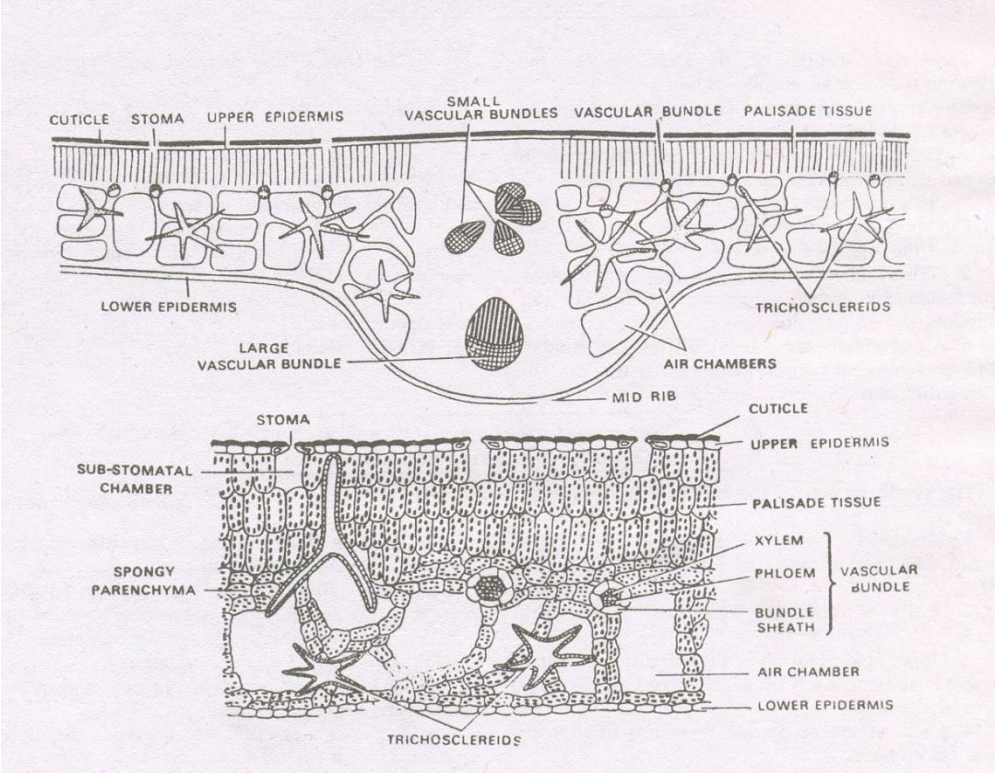
7.Absence of mechanical tissue

8.Reduced and small vascular bundles.

9.Xylem represented by only a few elements(as always in water no need for water conduction)

10.vessels absent.

14.well developed phloem.



Hydrophytic features of leaf:

i.presence of air spaces

ii.presence of trichosclerids

iii.presence of stomata on upper epidermis only

iv.absence of mechanical tissue

v.very much reduced vascular system.

XEROPHYTES:

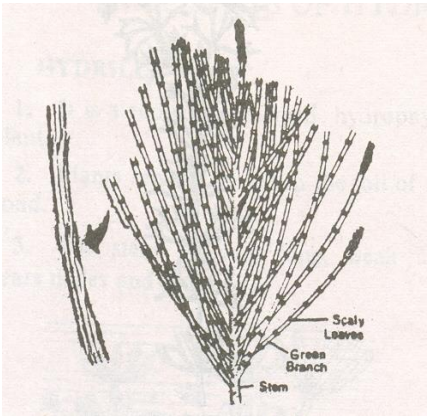
CASUARINA sp[Phylloclad]

Morphological features—adaptations:

1.Branches are green, jointed, look like leaves. Leaves are scalelike, highly reduced and present in a whorl at nodal region.(as leaves are reduced, stem is greenish and performs leaf function that is photosynthesis=phylloclad)

2.leaves are transformed into scales(to check transpiration)

3.Stem with ridges and furrows(to check transpiration)



Structural features:

Stem-T.S.

1.Single layer of epidermis. coated with cuticle(to check transpiration)

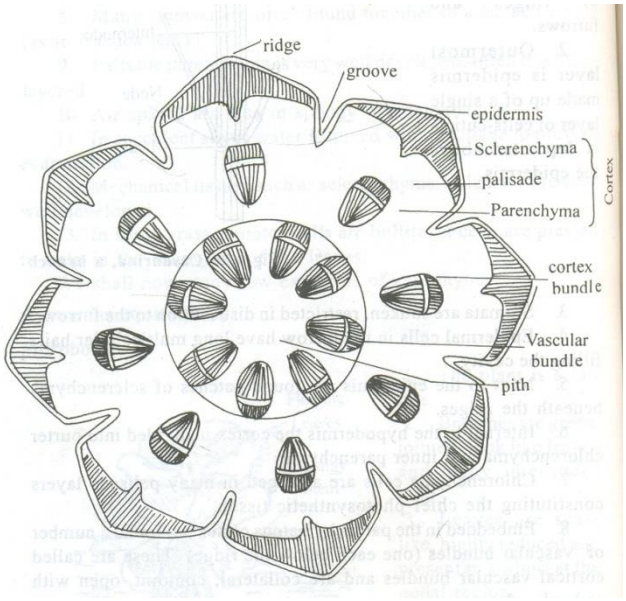
2.Stem shows ridges and furrows. Stomata are sunken and present in the furrows, covered with multicelluar hairs.(to check transpiration)

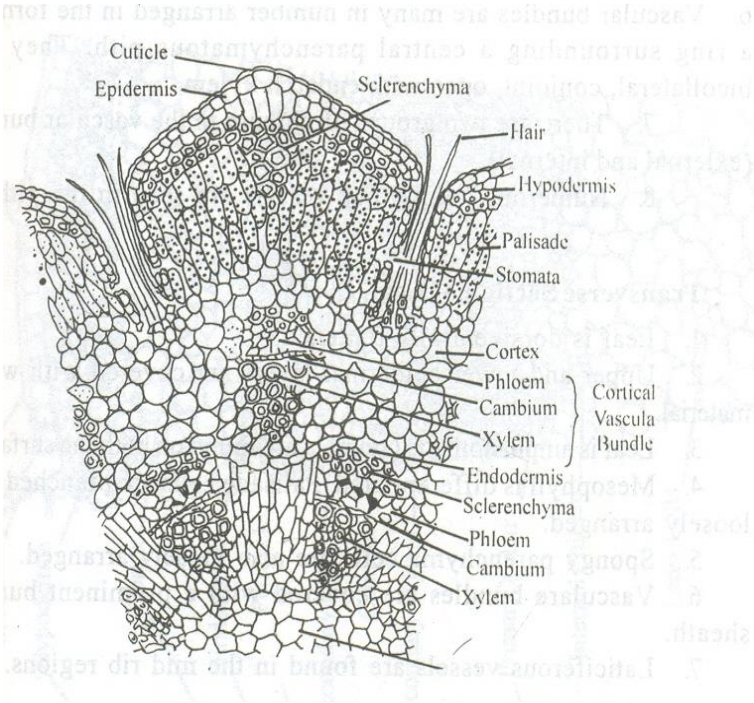
3.Sclerenchyma patches below the epidermal region.

4.chlorenchymatous cortex (as leaves are modified into scales stem performs photosynthesis)

5.Vascular bundles well developed-cortical and stelar vasvular bundles.

6.large amount of xylem tissue.





Xerophytic characters of stem:

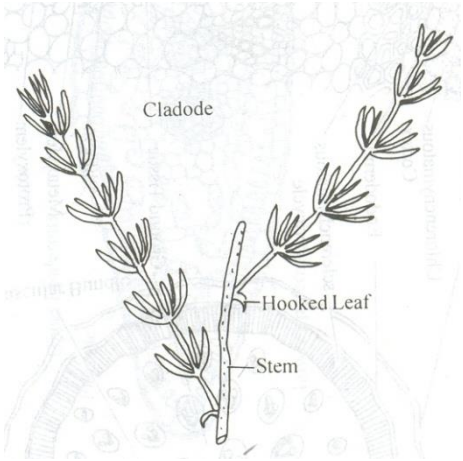
i.presence of thick cuticle above the epidermis
ii.presence of ridges and furrows
iii.presence of stomata in the grooves,protected by hairs.
iv.presence of pallisade in the cortical region of stem
v.sclerenchymatous hypodermis.
vi.presence of highly developed mechanical tissue
vii.presence of well developed vascular system.

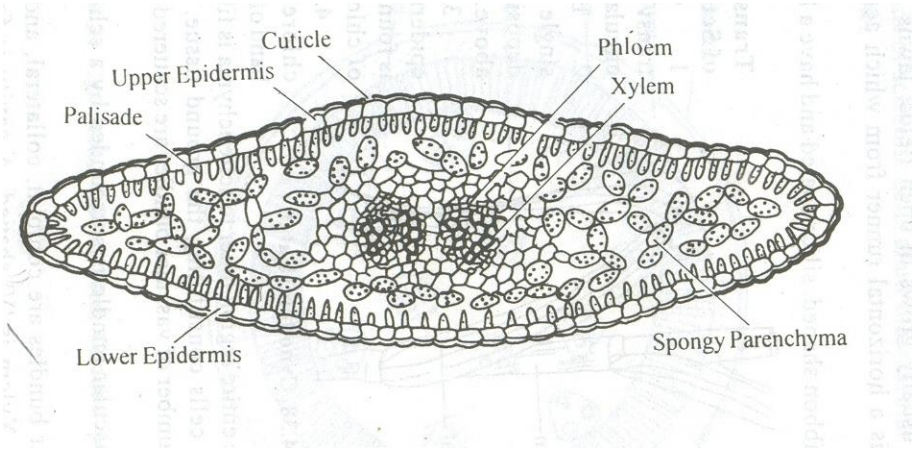
ASPARAGUS –Cladode:

Morphological features:

1.Leaves reduced to scales(partly spinous and partly scaly)

2.Branches are greenish and leaf like; performing photosynthesis(=cladode)





Structural features-cladode-T.S.

1.cladodes dorsiventrally flattend

2.Upper and lower epidermis single layered

3.stomata few in number(to reduce transpiration)

4.Palisade found all around the cladode internal to both upper and lower epidermis(to increase photosynthetic region;as the leaves reduced to scales)

5.Two vascular bundles in the centre.

NERIUM:

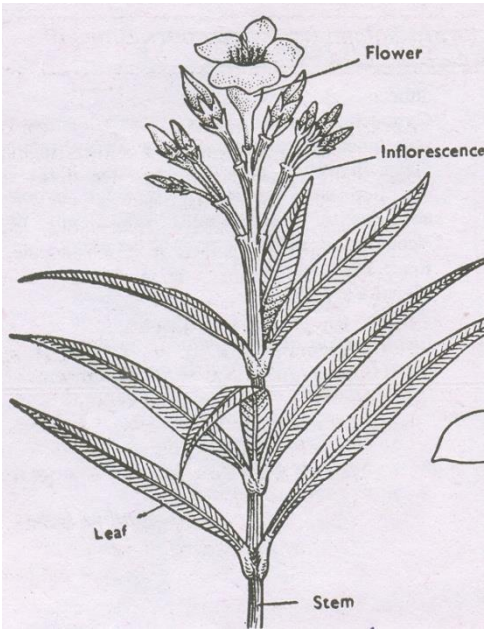
Morphological features:

1.Stem bears latex-xerophytic character.

2.Thick coriaceous leaves—to check transpiration

3.Waxy coating in the leaves—to check transpiration

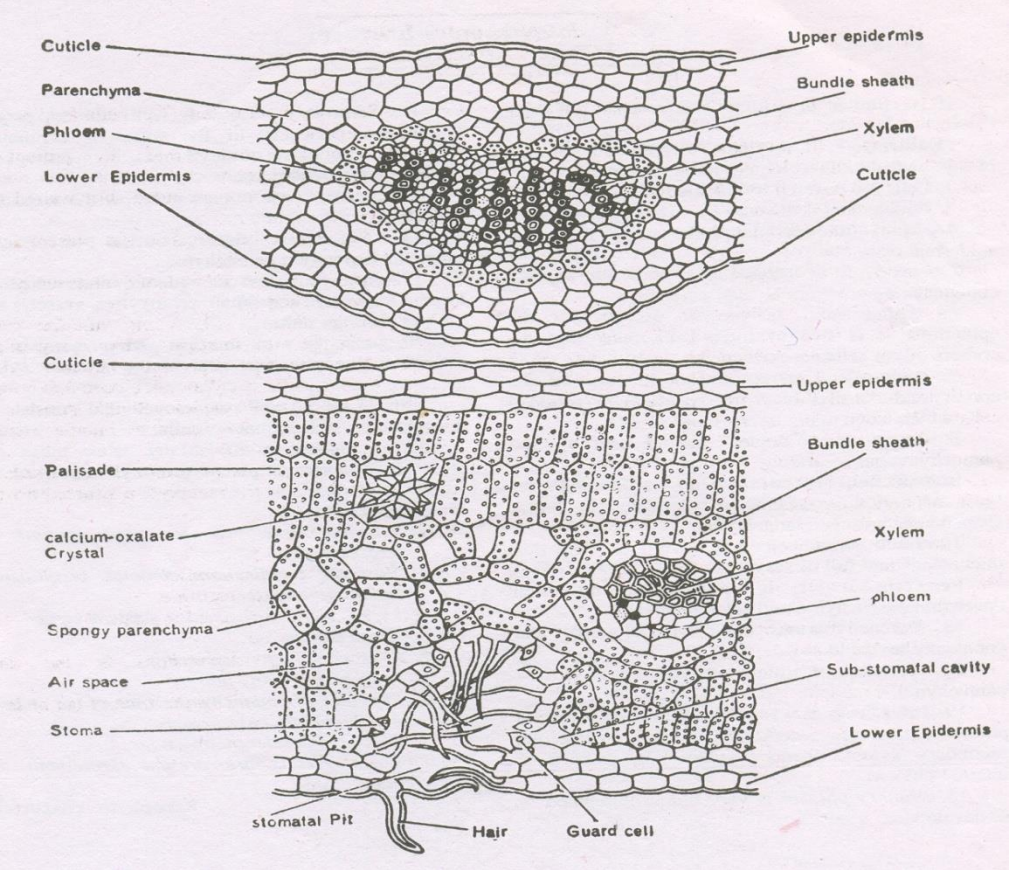
4.Ternate phyllotaxy (to reduce direct sunlight)



Anatomical features:

Leaf-T.S.

1.Thick cuticle -to reduce transpiration
2.Multilayered epidermis-to check transpiration
3.Suncken stomata –to check transpiration
5.well developed vascular tissue
6.Presence of depressions in the lower epidermis
7.Presence of hairs in the incurvings of lower epidermis.



CALATROPIS:

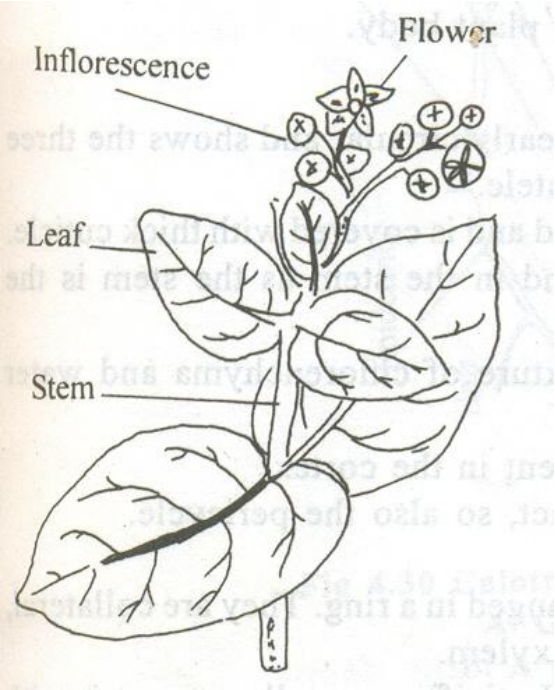
Morphological features:

1.All aerial parts are covered with white waxy material which acts as insulation against heat.

2.Presence of milky latex—to reduce transpiration

3.Opposite decussate phyllotaxy—to check direct sunlight effect.

5.Plant is covered by white, soft, wooly hairs-to reduce transpiration



Structural features:

Stem-T.S.

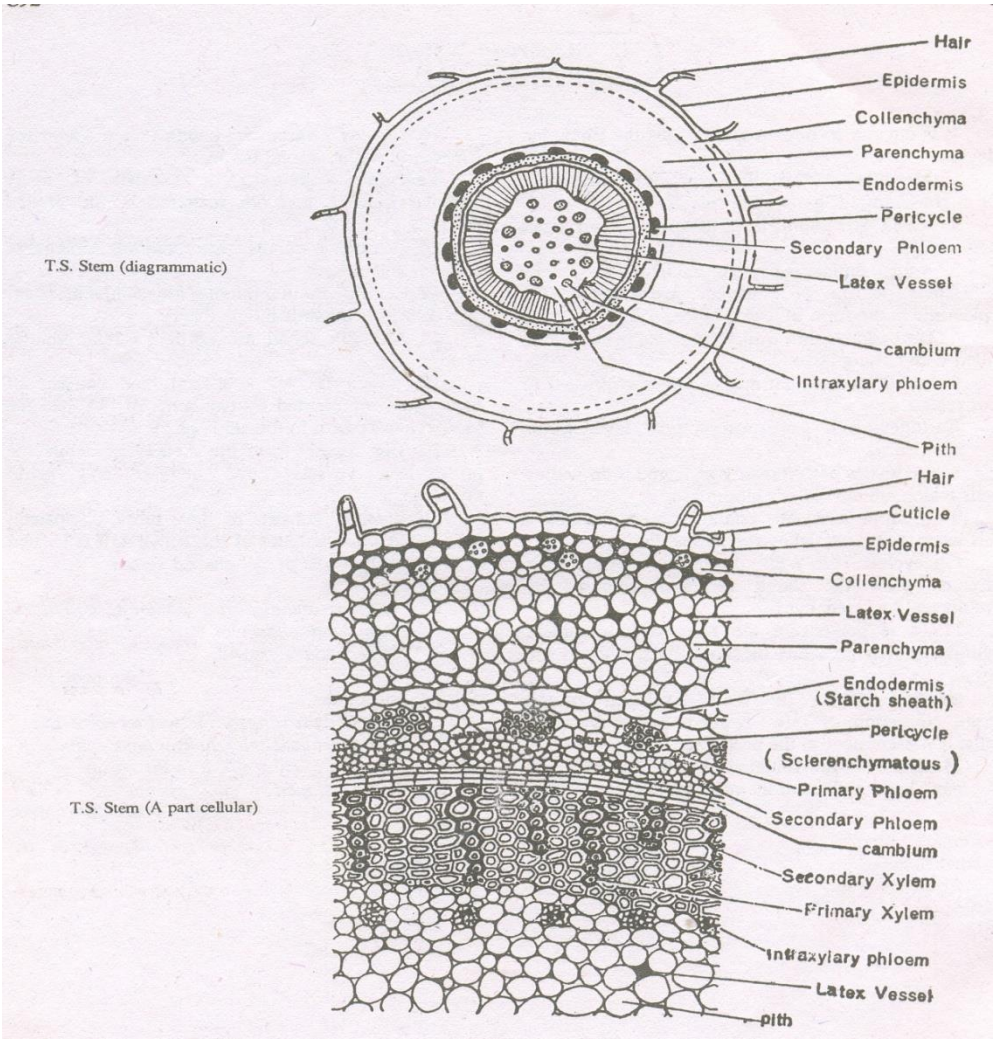
1.thick cuticle

2.presence of waxy coating

3.presence of many hairs

4.presence of latex cells throughout the parenchyma

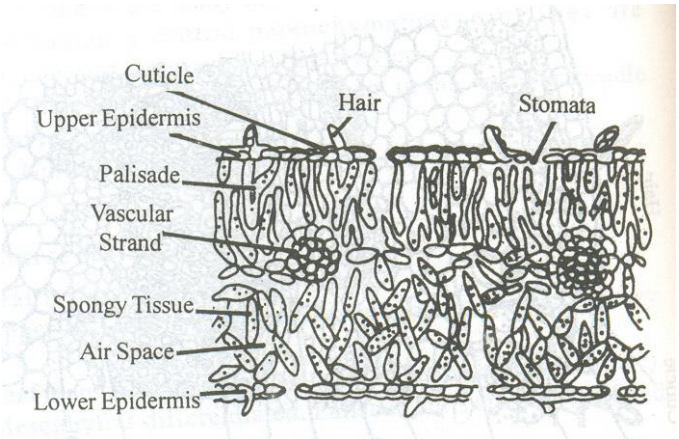
5.sclerenchymatous pericycle.



Leaf-T.S.

1.both the epidermis covered by waxy material

2.presence of laticiferous tissue



EPIPHYTE:

VANDA sp

Morphological features:

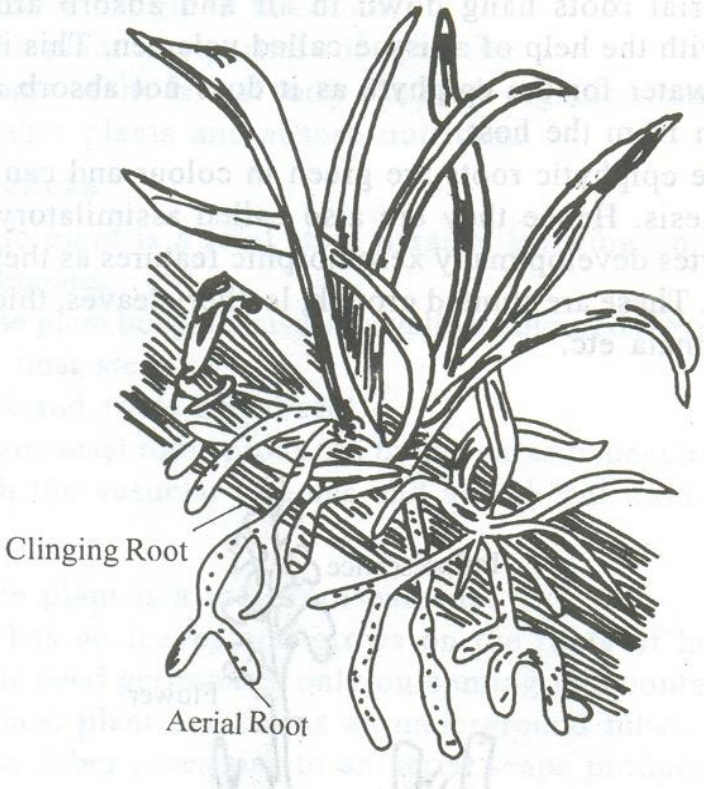
-.grows on the branches of trees

-two types of roots noticed (clinging roots and aerial roots)

-clinging roots are helpful for anchoring epiphytes on the barks

-aeril root with velamen tissue are helpful in absorbing atmospheric moisture

-aerial roots green in colour and carry out photosynthesis



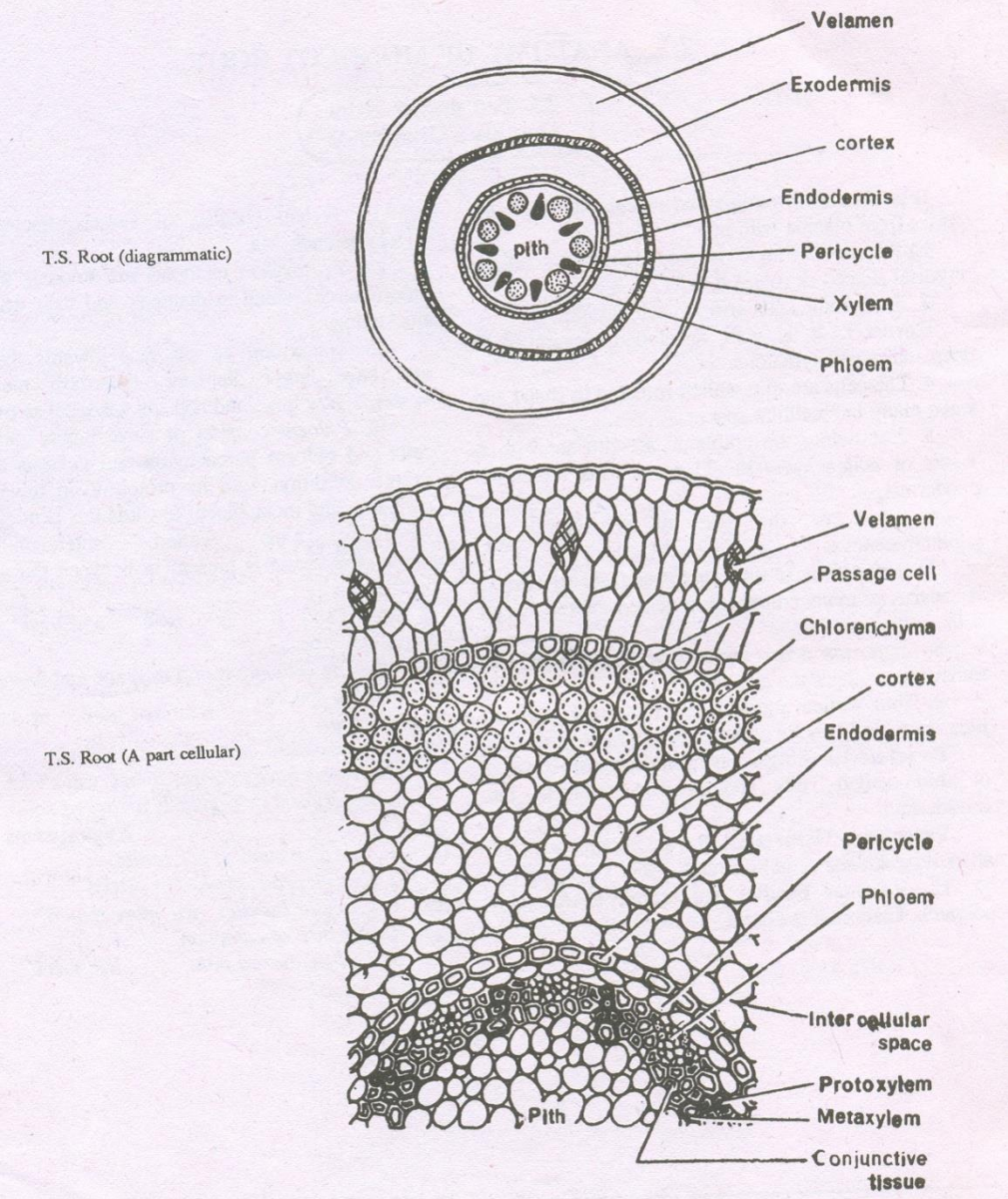
Xerophytic adaptations:

i.stunted growth

ii.leathery leaves

iii.thick cuticle

iv.sunken stomata



Anatomical features:

Aerial root-T.S.

1.outermost layer of dead cells having fibrous thickenings. absorbing organ(absorbs atmospheric moisture)

2.protective layer for reducing the loss of water from the cortex

3.chlorenchymatous cortex performing photosynthesis.

PARASITE:

Cuscutta sp

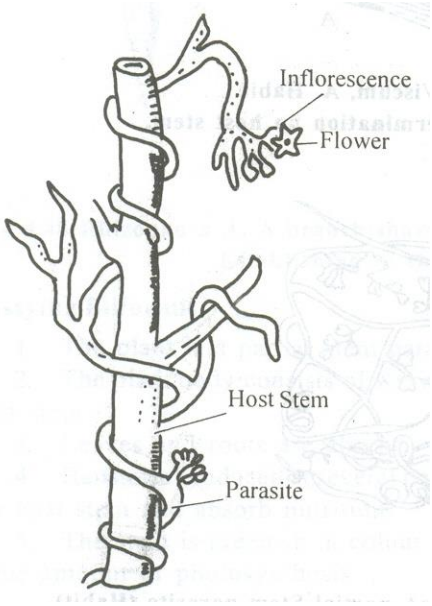
Morphological features:

1.The plant is a total stem parasite growing on host(on Tecoma)

2.The plantbody consists of a yellow coloured stem that twines round the host stem

3.Leaves and roots absent

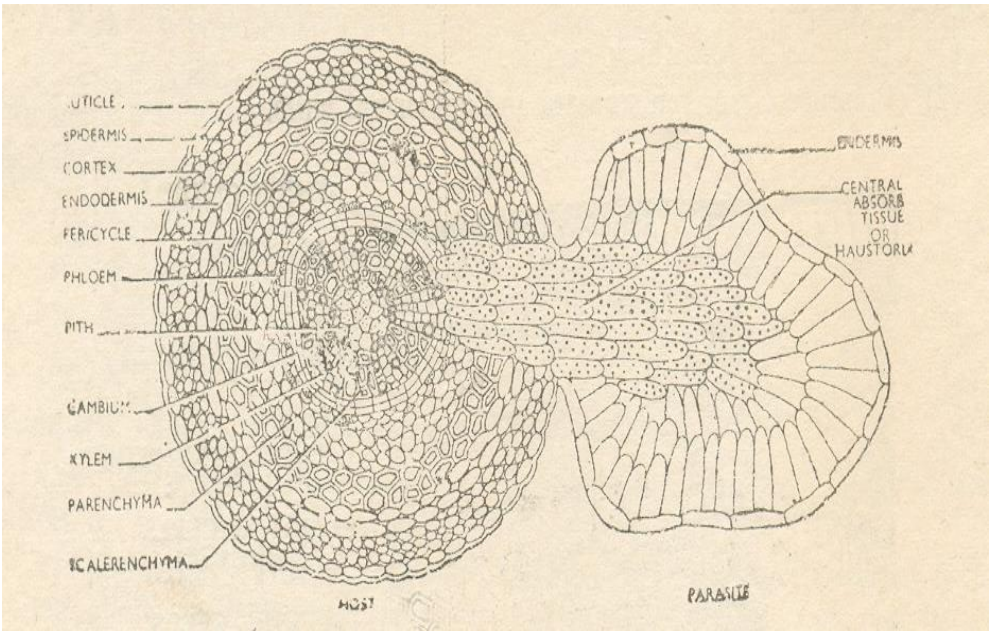
4.Haustorial roots produced by the parasite penetrate the host stem reach the vascular bundles and absorb nutrition.



T.S.of host and parasite

1.Sucking roots or haustorial roots arise from the parasite and enter into the host stem.

2.Haustorial roots have direct contact with the phloem of the vascular bundles of the host.

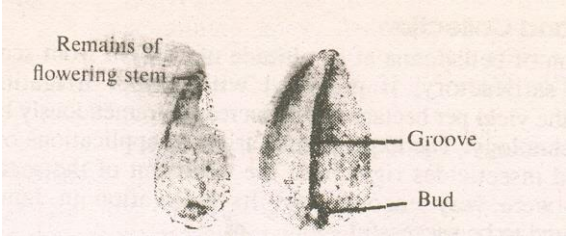


MEDICINAL BOTANY

SPOTTERS:

COLCHICUM:

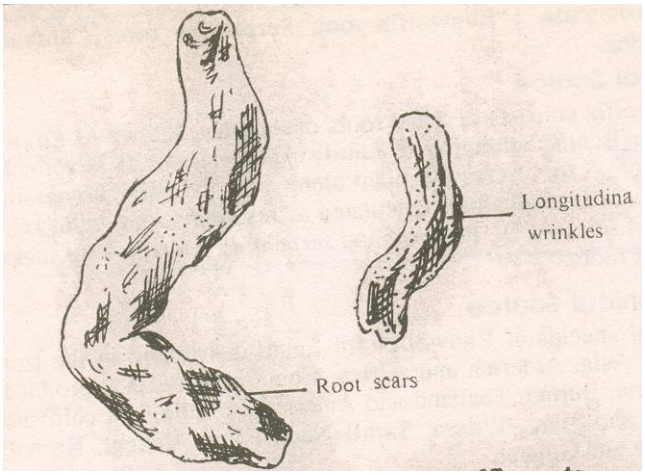
Botanical name ------- Clochicum autumnale
C.luteum



Family ---------- Liliaceae
Useful medicinal part ---- corm,seed
Drug and its properties --- corms contains the alkaloid colchicine.
Used for pains and infammation of gout.
Colchicine largely used in plant breeding research to induce polyploidy.

RAUWOLFIA

Botanical name ---------Rauvolfia serpentina



Common name --------sarpagandha
Family ---------- Apocynaceae

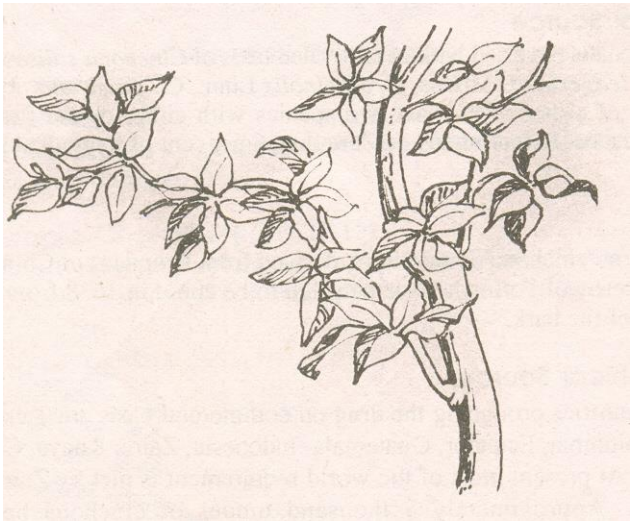
Useful medicinal part ----root

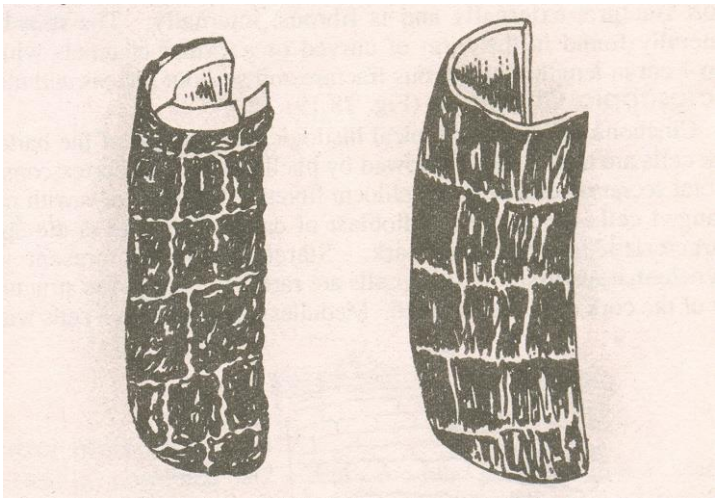
Drug aits uses ----------Drug consists of the dried roots with bark intact. The roots contain several alkaloids

Drug is used as a sedative and hypnotic and for reducing blood pressure. Roots useful in diseases of bowels and in fever.

CINCHONA:

Botanical name ----------Cinchona officinalis, C.calisaya, C.ledgeriana, C.succirubra.





Common name --------Kumain

Family ---- ----Rubiaceae

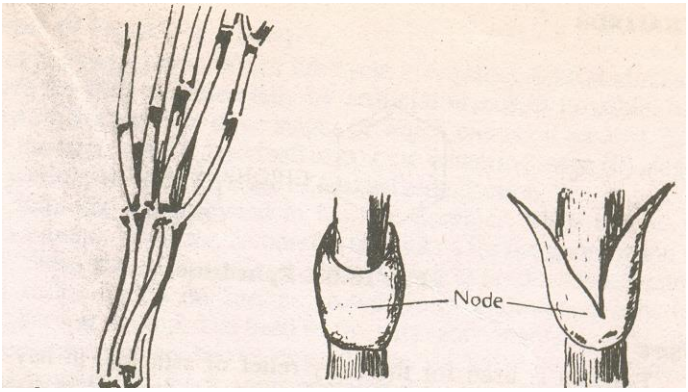
Useful pare --------- bark, dried bark.

Drug and uses -----Bark yields several alkaloids, important being Quinine. Used for malarial fevers.

Destroys certain bacterial infrctions and useful in pneumonia, amoebic dysenetry and for eye lotions. As local applications on rheumatic pains. Cinchona bark also used as insecticides.

EPHEDRA:

Botanical name ----------Ephedra gerardiana



Family ----------Gnetaceae (Gymnosperm)

Useful part ----------Wood

Drug and uses:

Dried stem constitutes the drug. Ephedrine is the main alkaloid used for the treatment of asthma.

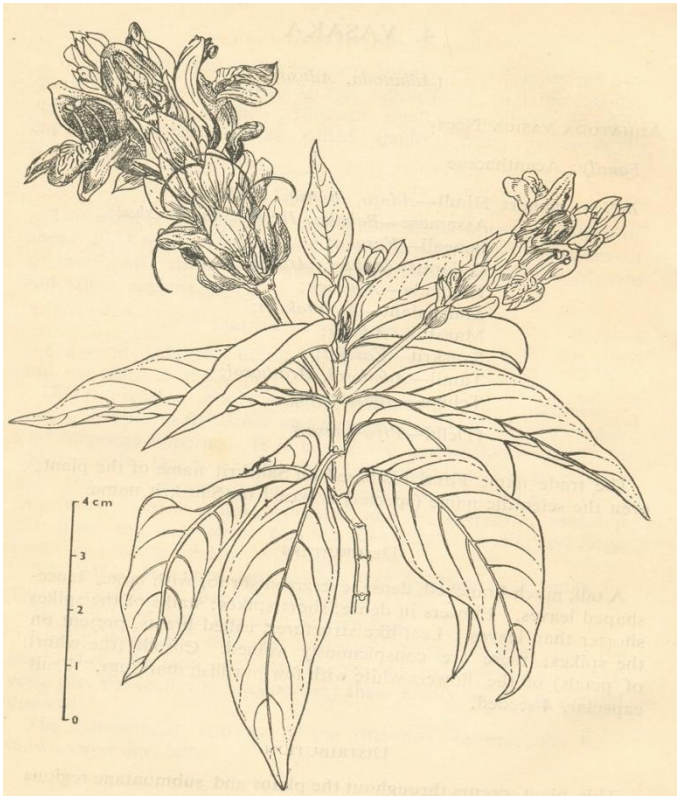
Drug is useful as a stimulant for heart.

Used in hay-fever, rashes etc of allergic origin

Nasal sprays are used in sinusitis, asthmatic attacks, inflammation of mucos membranes Used to control night wetting.

ADATHODA:

Botanical name ----------Adathoda vasica

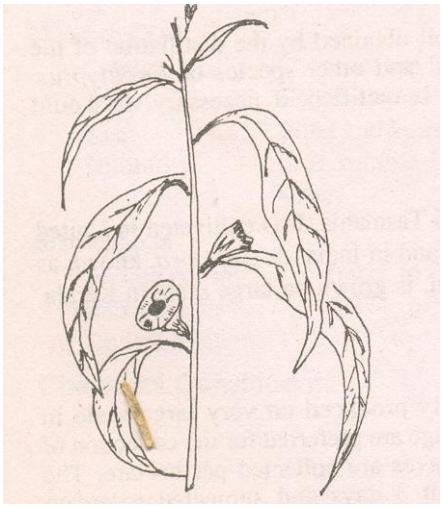


Common name ----------Vasak, Adathodai(Tamil)
Family ----------Acantaceae
Useful part ----------leaves
Drug and uses;

The drug vasaka comprises the fresh or dried leaves of the plant.
Leaves contain an alkaloid vascicine and an essential oil.
Used as an expectorant
Quick relief in bronchitis.

EUCALYPTUS:

Botanical name ----------Eucalyptus globulus



Family --------Myrtaceae

Useful part ----------leaf

Drug and properties :

Volatile oil Eucalyptus oil is obtained by distillation of fresh leaves.

oil contains cineole.

oil is used as a counter-irritant, an antiseptic and expectorant.

Usrd to relieve cough and in chronic bronchitis in the form of inhalations'

Used as an ingredient of several liniments and ointments.

Solution of eucalyptus oil used as nasal drops.

OCIMUM:

Botanical name ----------Ocimum sanctum

Common name ----------Sacred basil, Tulasi(Tamil)

Family ----------Lamiaceae

Useful part ----------leaves

Drug and uses;

Tulsi leaves contain bright, yellow coloured and pleasant volatile oil. Chemically it contains eugenol, eugenol-methyl-ether

oil is antibacterial and insecticidal

The juice or infusion of the leaves is useful in bronchitis, catarah, digestive complaints

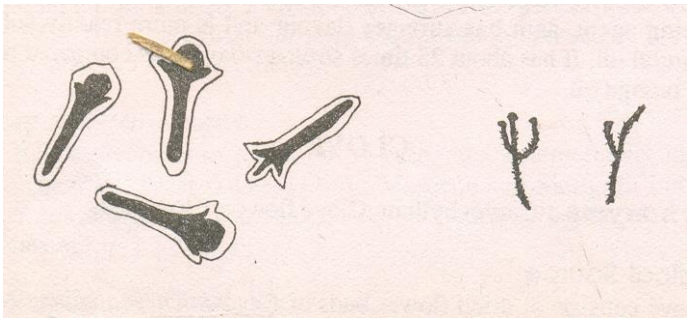
Applied locally in ringworm and other skin diseases

It is dropped in ears to relieve earache.

Adecoction of leaves used to cure commom colds.

EUGENIA:

Botanical name ---------Eugenia caryophyllata



Common name ------cloves

Family ------Myrtaceae

Useful part ----Dried flower buds

Drug and uses :

Volatile oil eugenol is present in the dried flower buds

Clove oil is used as a dental analgesic, carminative, stimulant, flavouring agent.

Used in flatulense and indigestion.

Stops nausea and vomiting.

Used as antiseptic and preservative

Taken internally ,it is carminative and antispasmodic.

WOOD APPLE:

Botanical name ------Aegle marmelos

Common name ----- Wood apple.Bel ,Vilvam(Tamil)

Family --------Rutaceae

Useful part ---Fruit pulp.Fruit 8-20cm diameter, globose, green, finallygreyish, rind woody;pulp orange coloured., sweet aromatic.

Drug and properties:

The drug called Bel comprises fresh, ripe or half ripe fruits.

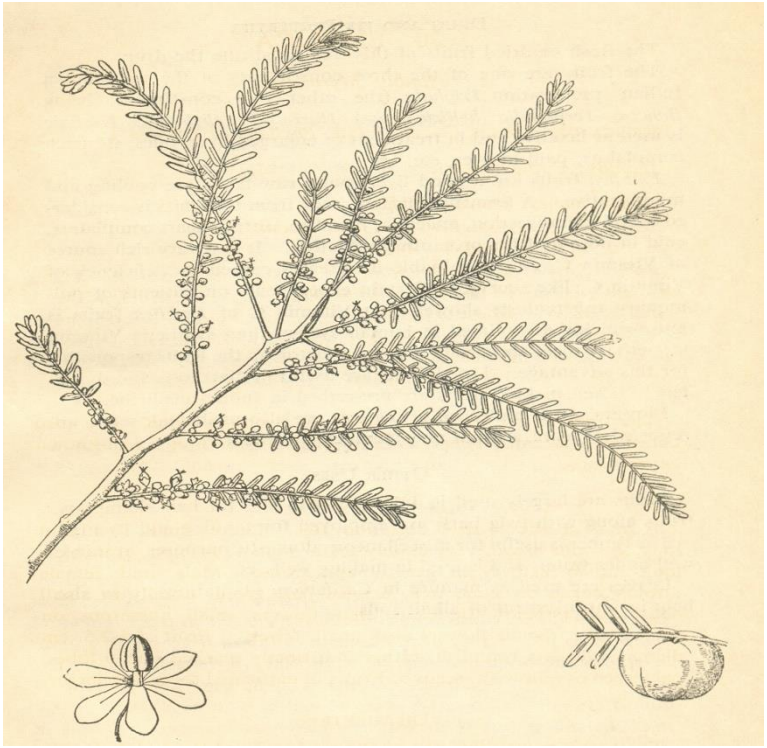
Useful in chronic diarrhoea and dysentery

Sharbat from the pulp used as soothing agents for intestines of patients for bacillary dysentry.

The unripe or halfripe fruits improve appetite and digestion.

GOOSEBERRY:

Botanical name -------Emblica officinalis (Phyllanthus emblica)



Family ----------Euphorbiaceae

Common name ---Goose berry, Nelli kai (Tamil)

Useful part ---Fruit.1.5-2.5cm diameter, fleshy, roundish, marked into 6 lobes, pale-green or yellowish

Drug and uses;

Fruits are a good liver tonic.

Raw fruits are cooling and mild laxative.

Very rich source of vitamin C and is valuable in diseases caused by deficiancy of vitamin, like scurvey.

Dried fruits are useful in diarrhoea and dysentry.

POPPY:

Botanical name -----Papaver somniferum

Common name -----Poppy

Useful part --------Seeds

Drug and properties:

Important alkaloids are narceine, codamine, lanthopine.

used as expectront. usedin the treatment of diarrhoea.

GINGER:

Botanical name ------- Zingiber office nale
Common name ----- Ginger
Family ------ Zingiberaceae
Useful part Undrground rhizome.

Drug and properties:

Rhizome contains 1-2% of volatile oil, an acrid resinous matter and starch. Zingeberine is the principal constituent of oil of ginger. Gingerol and shogaol are the other oils. Ginger is used as a stomachic, an aromatic, a carminative, stimulant and flavouring agent.

Ginger oil is used in mouth washes, ginger bevarages and liquors.

TURMERIC

Botanical name ------ Curcuma longa.
C.amada.
Family ------ Zingiberaceae
Useful part ---- Rhizome

Drug and uses :

Turmeric contains about 5% of volatile oil, resin, abundant Zingiberaceous starch grains and yellow colouring substances known as curcuminoids. The chief component of curcuminoids is curcumin. Curcumin possess antimicrobial and anti-inflammatory
actions. Used as a condiment or spice and colouring agent.

NOTES