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MACRO AND MICRO-MORPHOLOGY OF SOLANUM PSEUDOCAPSICUM L. CULTIVATED IN EGYPT

PART II: The Flower and The Fruit

N. A. El-Emary, A. A. Ali and F. Z. Makar
Department of Pharmacognosy, Faculty of Pharmacy,
Assiut University, Assiut, Egypt.

The macro and micro-morphology of the flower and the fruit of Solanum pseudocapsicum L. cultivated in Egypt are presented with view of finding out characters which might help in its identification in both the entire and powdered forms.

In a previous communication[1] (part 1) the macro and micro-morphology of the root, stem and leaf of Solanum pseudocapsicum L. [2,3] cultivated in Egypt were reported. In this work, the macro and micro-morphology of the flower and the fruit are presented.

EXPERIMENTAL

Material:

The flowers and the fruits of Solanum pseudocapsicum L. were obtained from the Experimental Station of Medicinal Plants of the Faculty of Pharmacy, Assiut University, Assiut. All samples were collected at the fruiting stage.

MACROMORPHOLOGY

The flower: (Fig. 1 D, E, F, G, H)

The flower is tetracyclic, pedicellate, solitary or in lateral clusters, pentamerous, actinomorphic, hypogenous

and white in colour. The flowers measure 1-1.2 cm. in length and 0.7-1 cm. in width, with a curved cylindrical pedicel and showing the typical solanaceous structure:

$$\oplus \;,\; \varnothing \;,\; K_{(5)} \;,\; \overset{\frown}{C_{(5)}\;\;A_5} \;,\; G_{(\underline{2})}$$

The pedicel is green in colour, measuring 0.5-1 cm. in length and 0.6-1 mm. in diameter.

The calyx is green in colour, and is formed of five sepals joined together having a digitiform shape. Each lobe measures about 1 mm. in width and 3-5 mm. in length.

The corolla(Fig. 1 g) is formed of five white petals alternating with the sepals, sympetalous. The petals are ovate lanceolate in shape with acute apex, measuring from 0.4-0.8 cm. in length and 0.2-0.4 cm. in width. The petals are similar in shape and length, having an entire margin.

The androecium: (Fig. 1 D, E)consists of five yellowish orange epipetalous stemens, basifixed, alternating with the petals. The anthers are grouped conically around the style and dehiscing by apical pores. The filament is colourless and measures about 1 mm. in length. The anther is yellowish-orange in colour and measures from 1.5-2.5 mm. in length and about 1 mm. in width.

The gynaecium (Fig. 1 E, F) is syncarpous , superior bicarpellary and bilocular. The ovary is sphoeroconical, 1.5-2.5 mm. in length and about 1 mm. in diameter. The ovary contains numerous ovules in each locule on an axile placentation. The style arises from the apex of the ovary. It is filiform and measuring from 0.3-0.5 cm. in length being usually longer than the stamens. The style terminates in a fleshy rounded papillosed stigma.

The Fruit: (Fig. 1 I, J)

The fruits occur either solitary or in groups of 2-4, each fruit is carried on a short smooth cylindrical stalk, measuring from 1-1.5 cm. in length and 1-2 mm. in diameter, having a smooth shining scarlet-red surface when ripe. It has a persistent calyx consisting of five small triangular sepals. Each sepal measures 0.5-1.2 cm. in length and 0.2-0.4 cm. in width. The fruits are bilocular with axile placentation and numerous seeds. The pericarp is thick and leathery. The fruit has a slight odour and a slightly bitter mucilagenous taste when ripe, but a bitter astringent taste when unripe.

The Seed: (Fig. 1 K, L, M)

The seeds are numerous in the fruit, derived from campylotropous ovules and attached in groups to the placenta. The are 2-3 mm. in length, 1.5-2 mm. in width and about 0.8 mm. in thickness. The seeds are yellowish-white in colour, reniform in shape, laterally compressed with a minutely pitted surface, and narrowing at the hilar-micropylar end. Internally the seed consists of a yellowish-white testa enclosing a copious oily endosperm in which a coiled whitish embryo is embedded with the radicle pointed towards the micropyle and the two cotyledons acutely curved. The seeds are soft when fresh and hard when dry. They are almost odourless with a slightly bitter oily taste.

MICROMORPHOLOGY

D- The Flower

The pedicel:

A transverse section (Fig. 2 A) is nearly circular in outline showing an epidermis followed by a cortex. The vascular tissue consists of phloem and xylem. A parenchymatous pith with groups of perimedullary phloem at its periphery is present in the centre. Idioblasts of microsphenoidal crystals of calcium oxalate are scattered in the cortex and pith.

The epidermis (Fig. 2 C) consists of polygonal axially elongated cells with straight or slightly curved anticlinal walls and covered by a thin smooth cuticle, measuring from 70-90-120 μ in length, 17-20-25μ in width and 14-17-20 μ in height. Stomata are few and of the cruciferous type. They are oval in shape, measuring from 25-30-35 μ in length and from 20-22-25 μ in width. The epidermis bears numerous glandular and nonglandular hairs. Glandular trichomes are with unicellular stalk and unicellular or multicellular globular head, other trichomes with multicellular uniseriate stalk and unicellular head. Nonglandular trichomes are multicellular, branched or nonbranched. The nonbranched type is multicellular uniseriate from 2-7 cells and covered by smooth cuticle. The branched type is multicellular and the apical are cells conical in shape.

The cortex (Fig. 2 B) is formed of 6 to 10 layers of rounded parenchymatous cells with moderately wide intercellular spaces. The cortex is limited on the inner side by a starch sheath composed of oval to rounded cells containing simple, rounded, oval or polygonal starch granules measuring from 3-6-9 μ in diameter. The starch sheath is followed by

a parenchymatous pericycle.

The vascular system (Fig. 2 B) forms a continuous cylinder surrounding a small pith. The phloem is formed of groups of sieve tissue alternating with phloem parenchyma. The xylem elements are formed of lignified vessels in groups rarely isolated and scattered among thin-walled parenchyma. The vessels are spiral and scalariform, measuring from 18-22-27 μ in diameter.

The pith (Fig. 2 B) is comparatively narrow, showing perimedullary phloem. It is formed of thin-walled cellulosic parenchymatous cells, Idioblasts of microsphenoidal crystals of calcium oxalate are scattered in the cortex and pith.

The Sepal:

The sepal (Fig. 3 A) is formed of an inner and an outer epidermises, a layer of palisade-like cells abutting on each epidermis and a spongy parenchyma traversed by numerous vascular strands.

The inner epidermis (Fig. 3 C) consists of polygonal tabular cells with straight or slightly curved anticlinal walls, covered with smooth cuticle and measure from 40-60-75 μ in length, 35-40-50 μ in width and from 18-22-25μ in height. Glandular trichomes with unicellular stalk and unicellular or multicellular globular head or with unicellular head and mulicellular uniseriate stalk are present. Nonglandular trichomes are multicellular uniseriate of 2 or 3 cells. The outer epidermis (Fig. 3 B) consists of polygonal tabular cells with slightly wavy anticlinal walls, covered by a thin smooth cuticle and measure from 40-60-70 μ in length, 20-40-50 μ in width and 15-20-25 μ in height. Cruciferous stomata are found on both epidermises, but they are more abundant on the outer epidermis. The stomata are oval, measuring from 25-30-40 μ in length and 20-25-30 μ in width on the upper epidermis, 26-32-42 μ in length and 22-25-32 μ in width on the lower epidermis. Few glandular and nonglandular hairs similar to those found on the

inner epidermis are present on the outer epidermis. The palisade-like cells are short, cylindrical, slightly elongated , containing chloroplats and measuring from 25-45-55 μ in length and 20-25-30 μ in diameter. The spongy tissue is formed of thin-walled cellulosic parenchymatous cells.

The vascular strands consist of phloem and groups of lignified spiral vessels. Groups of perimedullary phloem are present. Endodermis and pericycle are undifferentiated. Idioblasts of microsphenoidal crystals of calcium oxalate are scattered in the spongy parenchyma.

The Corolla:

The tissues of the petal (Fig. 4 A) comprises an outer and an inner epidermises enclosing between them a homogenous mesophyll which is traversed by vascular strands.

The inner epidermis of the apical region(Fig. 4 G) consists of thin-walled papillosed cells with straight or slightly curved anticlined walls and measuring from 60-80-100 μ in length, 25-30-40 μ in width and 20-25-30 μ in height. Epidermal cells of the middle region (Fig. 4 J) have distinctly sinuous anticlinal walls, measuring from 50-60-70 μ in length and 22-27-36 μ in width. Epidermal cells at the base of the corolla(Fig. 4 F) are axially elongated, 4-6 sided cells with straight or curved anticlinal walls, measuring from 100-150-200 μ in length and 20-25-30 μ in width. The inner epidermis is covered with a thin smooth cuticle. The outer epidermis of the apical region of the corolla (Fig. 4 I) consists of thin-walled slightly papillosed cells with straight or slightly curved anticlinal walls, measuring from 50-70-90 μ in length, 20-25-35 μ in width and 18-25-30 μ in height. Epidermal cells of the middle region (Fig. 4 K) have distinctly sinuous anticlined walls maeasure from 50-60-80 μ in length and 25-30-40 μ in width. Epidermal

cells at the basal region (Fig. 4 H) are axially elongated 4 to 6 sided cells with straight or slightly curved anticlinal walls and measure from 80-100-150 µ in length and 18-20-25 µ in width. The outer epidermis is covered by a thin smooth cuticle. stomata are present on both epidermises of the corolla, but more frequent on the outer than on the inner epidermis. They are of the cruciferous type. The stomata are oval in shape, measuring from 25-30-40 µ in length, and 20-25-30 µ in width on the inner epidermis, 27-35-45 µ in length and 25-30-35 µ in width on the outer epidermis.

The mesophyll of the petal (Fig. 4 A) is homogenous. It consists of rounded parenchymatous cells with moderately large intercellular spaces. Few idioblasts containing microsphenoidal crystals of calcium oxalate are scattered among the mesophyll cells. The vascular strands consist of phloem tissue, groups of lignified spiral vessels and perimedullary phloem. Glandular and nonglandular trichomes are present on both surfaces specially on the apical region of the petal. The glandular trichomes are with unicellular stalk and unicellular or multicellular globular or ovoid head. Some glandular trichomes have multicellular uniseriate stalk and unicellular or multicellular globular head. Nonglandular trichomes are either branched or nonbranched. The nonbranched trichomes are unicellular or multicellular uniseriate from 2 to 5 cells, the apical cells show rounded apices. The branched type is multicellular.

The Androecium:

The androecium (Fig. 5 A) consists of two nearly equal anther-lobes which are attached together by the connective through which runs a small vascular strand. Each anther-lobe is formed of two unequal pollen sacs, which are full of numerous comparatively small pollen grains. The anther

wall consists of an epidermis, a fibrous layer and the remains of tapetum.

The epidermis of the anther (Fig. 5 C) is polygonal in surface view, having straight or slightly curved anticlinal walls and covered by a striated cuticle. The cells measure from 30-40-50 μ in length. 25-30-35 μ in width and 20-23-28 μ in height. Stomata are very few and of the cruciferous type. They are oval in shape, measuring from 20-25-35 μ in length and 18-24-28 μ in width. Trichomes are not observed.

The epidermis of the filament (Fig. 5 H)ispolygonal, axially elongated with straight or slightly curved anticlinal walls and covered by a smooth cuticle, measuring from 55-70-90 μ in length and 15-18-25 μ in width.Stomata are not observed.

The fibrous layer (Fig. 5 B, D) is formed of a single layer near the line of dehiscence but becomes gradually wider until it is two to three layers near the connective.

The pollen grains(Fig. 5 E) are spherical or subspherical with three germ pores and three germinal furrows extending from one pole to the other. The grains have finely pitted exine and measuring from 12-22-28 in diameter.

The Gynaecium:

A transverse section in the ovary(Fig. 5 I) is nearly circular in outline. It shows an outer and an inner epidermis enclosing in between a wide mesophyll formed of several rows of parenchyma and traversed by several vascular strands.

The outer epidermis of the ovary wall (Fig. 5 K) is composed of polygonal cells with straight anticlinal walls and covered by thin smooth cuticle. The cells measure from 30-40-50 μ in length, 18-25-30 μ in width and 15-20-25 μ in height Stomata are rare, oval in shape and measuring from 24-28-35 μin length and 20-24-28 μ in width. Glandular trichomes are few, but the nonglandular hairs are abundant. Glandular hairs with unicellular stalk and multicellular

globular or ovoid head. Covering trichomes are either branched or nonbranched. The nonbranched type is multicellular uniseriate, 2-6 cells, the branched type is multicellular, the apical cells are conical in shape.

The mesophyll of the ovary (Fig. 5 J) consists of several rows of parenchymatous cells with relatively small intercellular spaces and shows idioblasts of microsphenoidal crystals of calcium oxalate.

The vascular system consists of numerous vascular strands traversing the mesophyll. Each vascular strand is composed of phloem and few lignified spiral vessels.

The epidermal cells of the style(Fig. 5 L) appear in surface view as polygonal, axially elongated cells with straight or slightly curved anticlined walls and covered with thin smooth cuticle. The cells measure from 50-75-90 μ in length and 15-20-25 μ in width.

The epidermal cells of the stigma (Fig. 5 M) are polygonal with straight anticlinal walls. The cells at the top are distinctly papillosed. The papillae are oval in shape, measuring from 40-50-80 μ in length and 15-20-25 μ in width.

Powdered Flower :

The powdered flower is greenish-white in colour with a faint odour and a slightly bitter taste. It is characterised by the following diagnostic structures:

1- Fragments of covering trichomes, branched and nonbranched. Nonbranched hairs are mullicellular uniseriate from 2-7 cells. Branched hairs are mullicellular, the apical cells are conical in shape.
2- Fragments of glandular head, beside multicellular uniseriate stalk and unicellular or multicellular globular head.
3- Pollen grains, spherical or subspherical with

three germ pores and three germinal furrows and pitted exine.

4- Fragments of fibrous layer of the anther walls, showing bar-like thickening and characteristic beaded appearance.

5- Numerous idioblasts of microsphenoidal crystals of calcium oxalate.

6- Fragments of thin-walled epidermal cells covered. by smooth cuticle showing cruciferous stomata.

7- Fragments of pepillosed cells of the stigma.

8- Fragments of lignified vascular strands showing slender spiral vessels.

9- Fragments of parenchymatous cells containing simple starch granules.

10- Fragments of epidermal cells of the corolla with wavy anticlined walls.

E- The Fruit

The pericarp:

The pericarp (Fig. 6 A) consists of an epicarp followed by a fleshy mesocarp, the endocarp being undifferentiated.

The epicarp (Fig. 6 B) consists of a row of polygonal cellulosic cells with more or less straight anticlinal walls. The cells are more thickened on the outer tangential and radial walls, less thickened on the inner tangential walls and having a marrow lumen. The cells measure from 12-18-25 in diameter and 35-40-50 in height. Trichomes and stomata are not observed. The mesocarp (Fig. 6 A) is formed of several rows of thin-walled cellulosic perenchymatous cells, oval to rounded in shape. They contain mucilage which stains red with ruthenium red. Few idioblasts of microsphenoidal crystals of calcium oxalate are scattered in the parenchymatous mesocarp which is traversed by numerous vascular strands,

with narrow annular or spiral vessels. Mesocarpal cells contain orange-red chromatophores.

The Sepal:

The sepal (Fig. 6 C, D, E, F, G, H,D) has the same structure as that of the flower but is more developed and the inner epidermis of the sepal of the fruit has sinuous anticlinal walls.

The Seed:

A transverse section in the seed (Fig. 7 A) shows a testa followed by an oily endosperm then by an embryo.

The testa (Fig. 7 B, C, D) consists of an epidermis formed of polygonal radially elongated cells in T.S. showing stratified lignified thickening on the inner tangential and most of the radial walls, while the outer tangential walls are thin and covered by a thin smooth cuticle. The cells measure from 100-150-200 μ in length, 70-100-120 μ in width and 80-120-180 μ in height. The rest of the testa is formed of four layers of tangentially elongated thin-walled cellulosic parenchymatous cells followed by a hyaline layer of thin-walled collapsed cells.

The endosperm is formed of polyhedral moderately thick-walled cellulosic cells containing fixed oil and aleurone grains which contain one crystalloid and one or more globoid. The embryo is formed of polygonal thin-walled cellulosic cells containing fixed oil and aleurene grains.

Fruit Stalk:

The fruit stalk has the same structure as the pedicel of the flower, with the following differences:

1- The epidermis(Fig. 8 B) is covered by striated cuticle.

2- The pericycle(Fig. 9) is formed of thin-walled parenchymatous cells interrupted at intervals with isolated fibres, rarely in groups of two

or three. They are oval to rounded with strongly thickened stratified walls having a narrow rounded lumen and a tapering apex, measuring from 500-1000-1550 μ in length and from 20-30-35 μ in diameter.

3- The phloem contains numerous idioblasts of microsphenoidal crystals of calcium oxalate.

4- The xylem (Fig. 9), the secondary xylem is lignified, formed of vessels few tracheids, abundant wood fibres and wood parenchyma. The vessels are pitted and reticulate, measuring from 20-40-40 μ in diameter. The tracheids are fusiform, pitted with blunt apices, measuring from 60-80-120 μ in length and from 10-17-20 μ in diameter. The wood fibres have moderately thick walls, wide lumen and pointed tips measuring from 300-400-500 μ in length and from 16-20-25 μ in diameter. The wood parenchyma are rectangular axially elongated with slightly thickened and pitted lignified walls. The primary xylem is formed of spiral and scalariform vessels accompanied with unlignified wood parenchyma.

Both the xylem and phloem are traversed by numerous mostly uniseriate, very rarely biseriate medullary rays containing starch granules similar to those of the cortex. In the phloem region the cells are parenchymatous while in the xylem region the cells are polygonal and radially elongated having moderately thickened, pitted lignified walls.

5- The pith shows some fibres at its periphery.

Powdered Fruit:

The powdered fruit is orange-red in colour with a slight odour and a slightly bitter taste. It is characterised by the presence of the following diagnostic structures:

1- Fragments of the epidermis of the testa showing polygonal cells having thick, stratified lignified anticlinal walls.
2- Abundant fragments of the epidermis showing cruciferous stomata covered by a smooth or striated caticle. Glandular trichomes with unicellular globular head or multicellular globular head and unicellular stalk. Few nonglandular multicellular branched or nonbranched trichomes.
3- Fragments of thin-walled cellulosic parenchyma of the mesocarp containing orange-red chromatophores.
4- Few simple rounded, oval or polygonal starch granules.
5- Fragments of parenchymatous cells containing starch granules.
6- Numerous idioblasts of microsphenoidal crystals of calcium oxalate.
7- Fragments of thick-walled cellulosic polygonal cells of the epicarp.
8- Fragments of thin-walled cellulosic parenchyma of the mesocarp containing mucilage which stains red with ruthenium red.
9- Fragments of the endosperm and embryo containing aleurone grains and fixed oil.
10- Fragments of wood tissue showing pitted, reticulate, spiral and scalariform vessels.
11- Patches of moderately thickened lignified wood fibres with wide lumen and pointed tips which may be crossed at right angle by pitted, lignified medullary rays.
12- Few large pericyclic fibres, usually isolated, with thick lignified walls, narrow lumen and tapering apex.

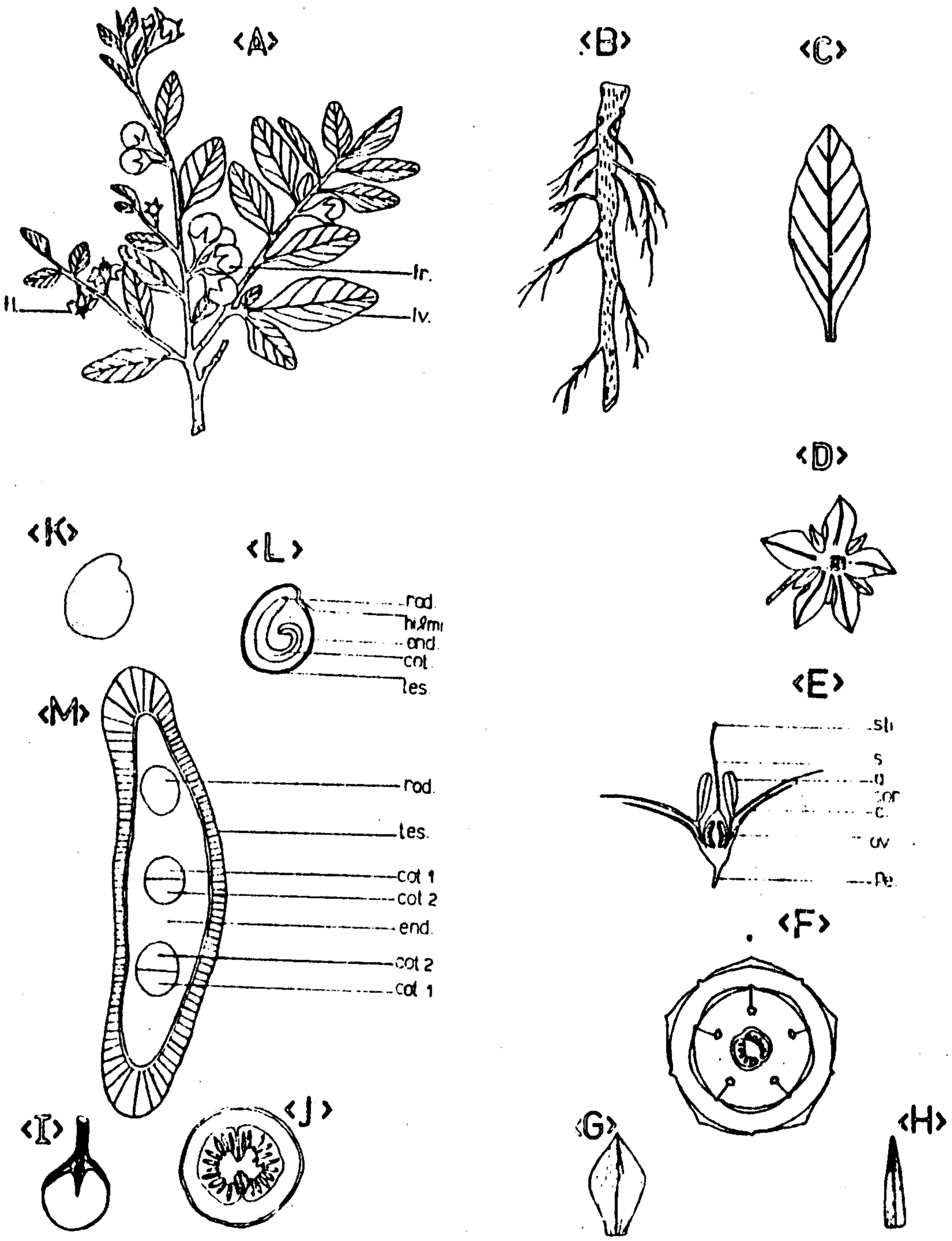


Fig. 1: Solanum Pseudocapsicum L.

A- Fruiting shoot	X ½
B- Root	X ½
C- Leaf	X ½
D- Flower	X 4
E- Vertical section of the flower	X 4
F- Floral diagram	
G- Petal	X 3
H- Sepal	X 4½
I- Fruit	X ½
J- T. cut in the fruit	X 2
K- Seed	X 10
L- L. cut parallel to the flat surface of seed	X 10
M- L. cut perpendicular to the flat surface of the seed	X 48

Fl., flower; fr., fruit; lv., leaf; sti., stigma; s., style; a., anther; cor., corolla; c., calyx; ov., ovule; pe., pedicel; rad., radicle; hi., hilum; mi., micropyle; end., endosperm; cot., cotyledon; tes., testa.

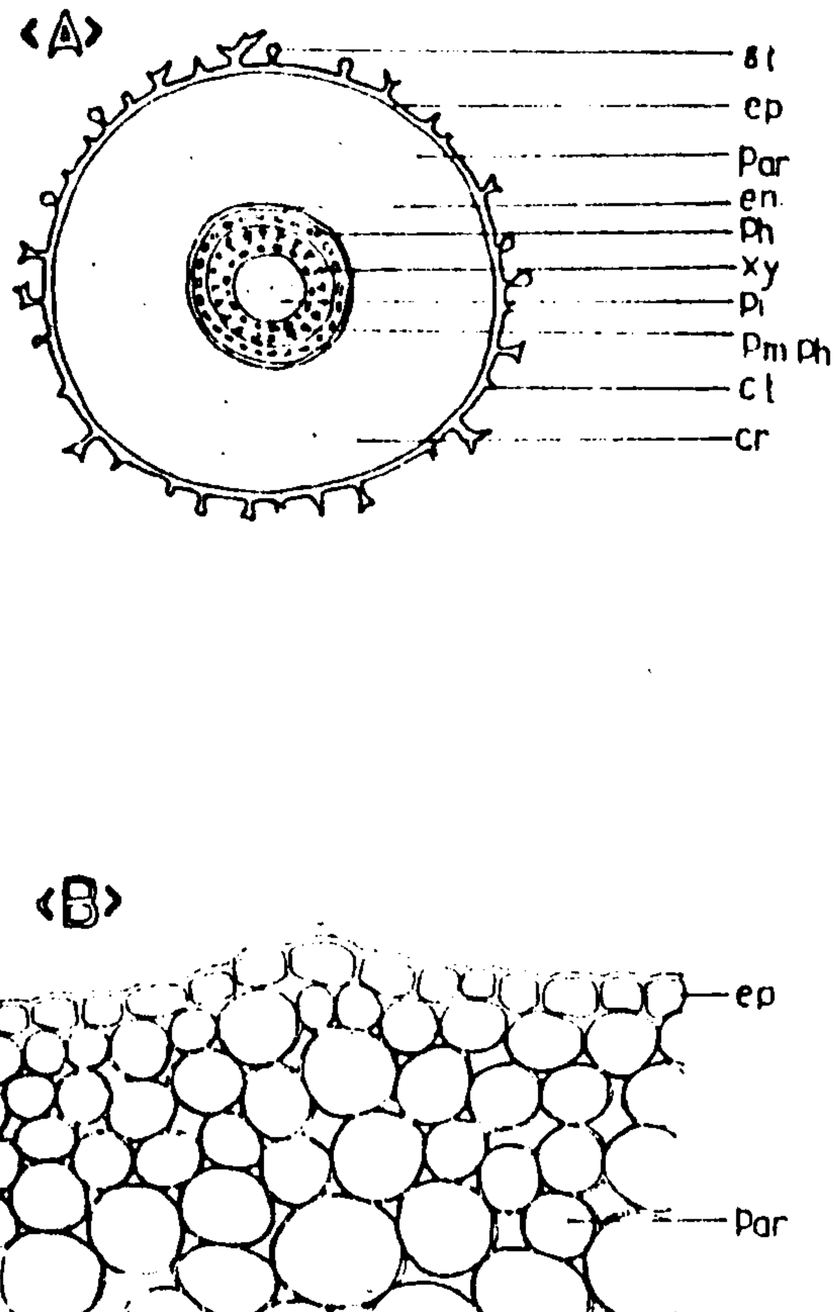
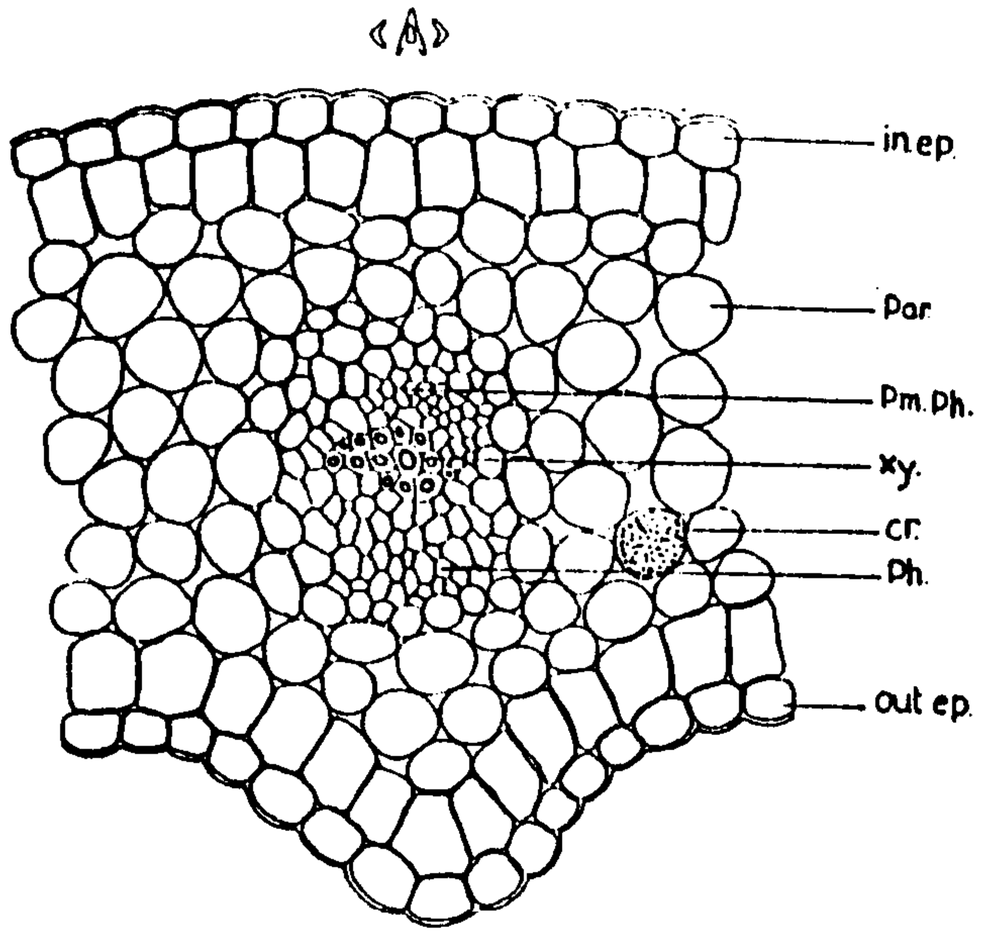


Fig. 2: The Pedicel

A- Diagrammatic T.S. in the pedicel	X 24
B- Detailed T.S. in the pedicel	X 135
C- Epidermis	X 135
D- Vessel	X 135
E- Idioblasts of microsphenoidal crystal of calcium oxalate	X 135
F- Covering trichomes	X 135
G- Glandular trichomes	X 135

g.t., glandular trichome; ep., epidermis; par., parenchym; ph., phloem; xy., xylem; pi., pith; pm.ph., perimedullary phloem; c.t., covering trichome; en., endodermis; p., pericycle, cr., idioblast of microsphenoidal crystals of calcium oxalate.



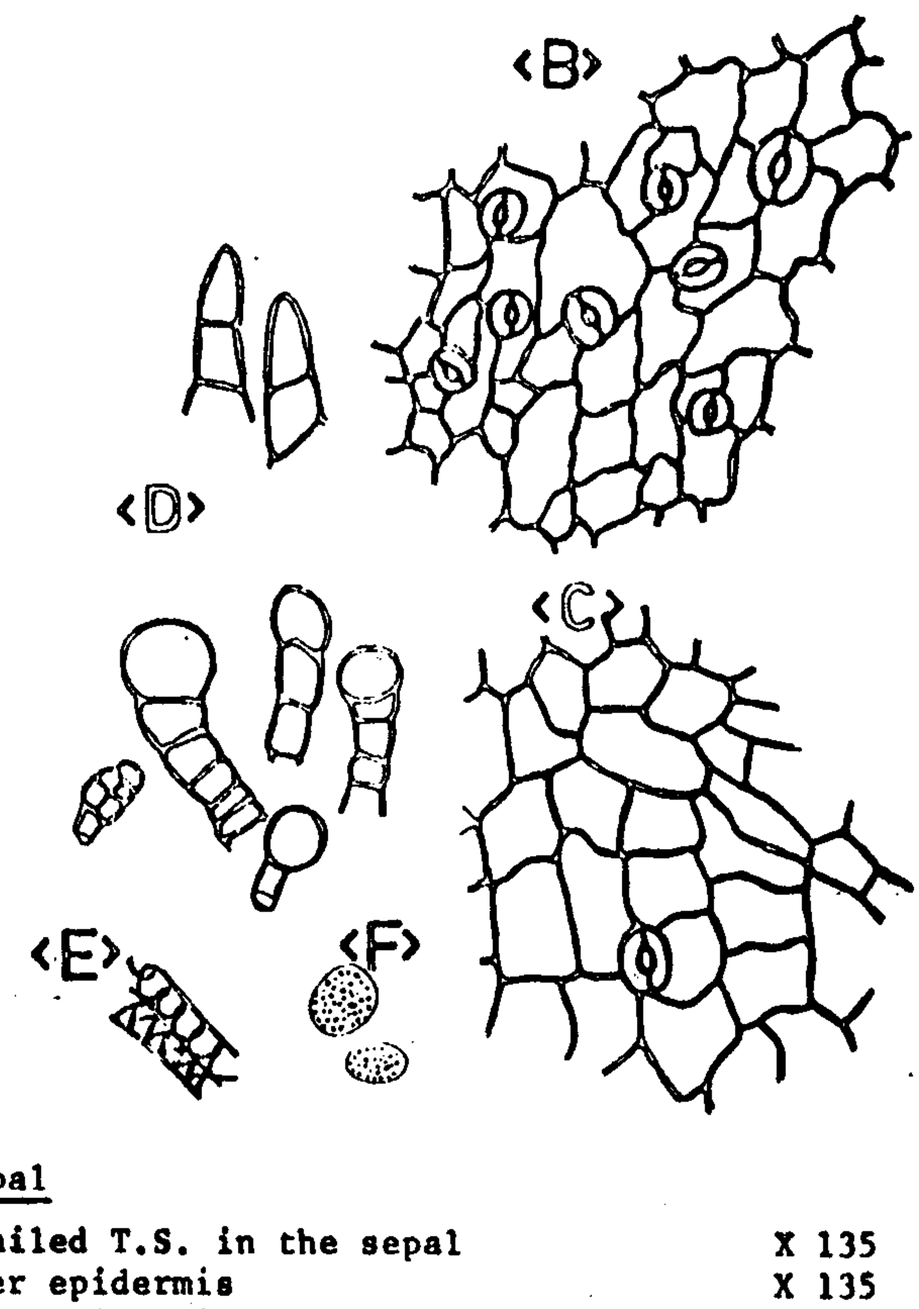


Fig. 3: The Sepal

A- Detailed T.S. in the sepal	X 135
B- Outer epidermis	X 135
C- Inner epidermis	X 135
D- Trichomes	X 135
E- Vessels	X 135
F- Idioblasts of microsphenoidal crystals of calcium oxalate	X 135

in., ep., inner epidermis; par., parenchyma; xy., xylem; ph., phloem; pm. ph., perimedullary phloem; out. ep., outer epidermis, cr., idioblast of microsphenoidal crystals of calcium oxalate.

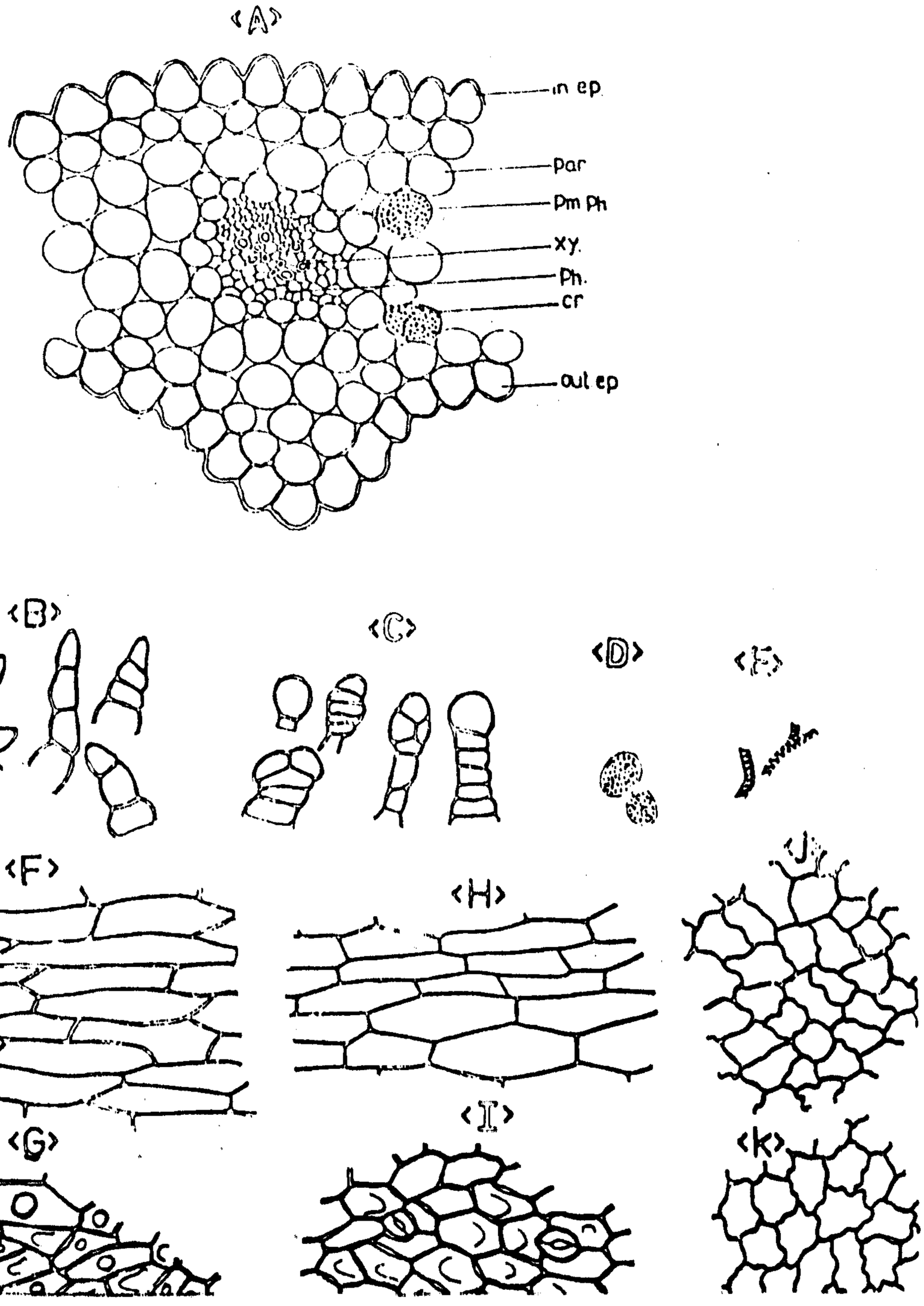


Fig. 4: The Petal

A- Detailed T.S. in the petal X 135
B- Covering trichomes X 135
C- Glandular trichomes X 135
D- Idioblasts of microsphenoidal crystals of calcium oxalate X 135
E- Vessels X 135
F- Inner epidermis in the basal region X 135
G- Inner epidermis in the apical region X 135
H- Outer epidermis in the basal region X 135
I- Outer epidermis in the apical region X 135
J- Inner epidermis in the middle region X 135
K- Outer epidermis in the middle region X 135

in.ep., inner epidermis; par., parenchyma; pm.ph., perimedullary phloem; xy., xylem; ph., phloem; out. ep., outer epidermis cr., idioblast of microsphenoidal crystals of calcium oxalate.

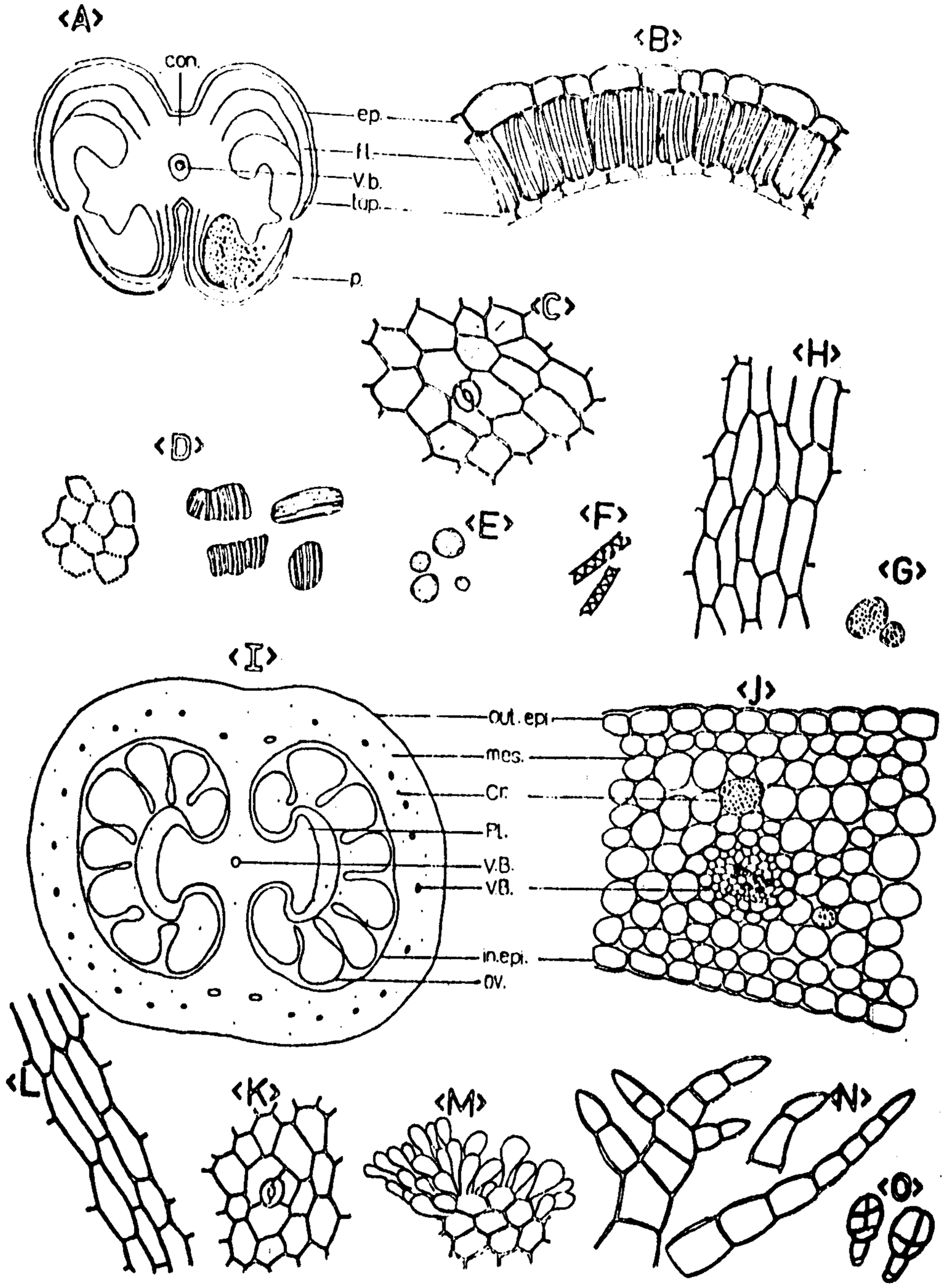


Fig. 5: The Androecium and the Gynaecium

A- Diagrammatic T.S. in the anther	X 24
B- Detailed T.S. in the anther	X 135
C- Epidermis of the anther	X 135
D- Fibrous layer	X 135
E- Pollen grains	X 135
F- Vessels	X 135
G- Idioblasts of microsphenoidal crystals of calcium oxalate	X 135
H- Epidermis of the filament	X 135
I- Diagrammatic T.S. of the ovary	X 135
J- Detailed T.S. of the ovary	X 135
K- Epidermis of the ovary	X 135
L- Epidermis of the style	X 135
M- Epidermis of the stigma	X 135
N- Covering trichomes	X 135
O- Glandular trichomes	X 135

ep., epidermis; f.l., fibrous layer; v.b., vascular bundle, tap., tapetum, p., pollen grains; out. epi, outer epidermis, mes; mesophyll; cr., idioblast of microsphenoidal crystals of calcium oxalate; pl., placenta; in. epi., inner epidermis; ov., ovules; con., connective.

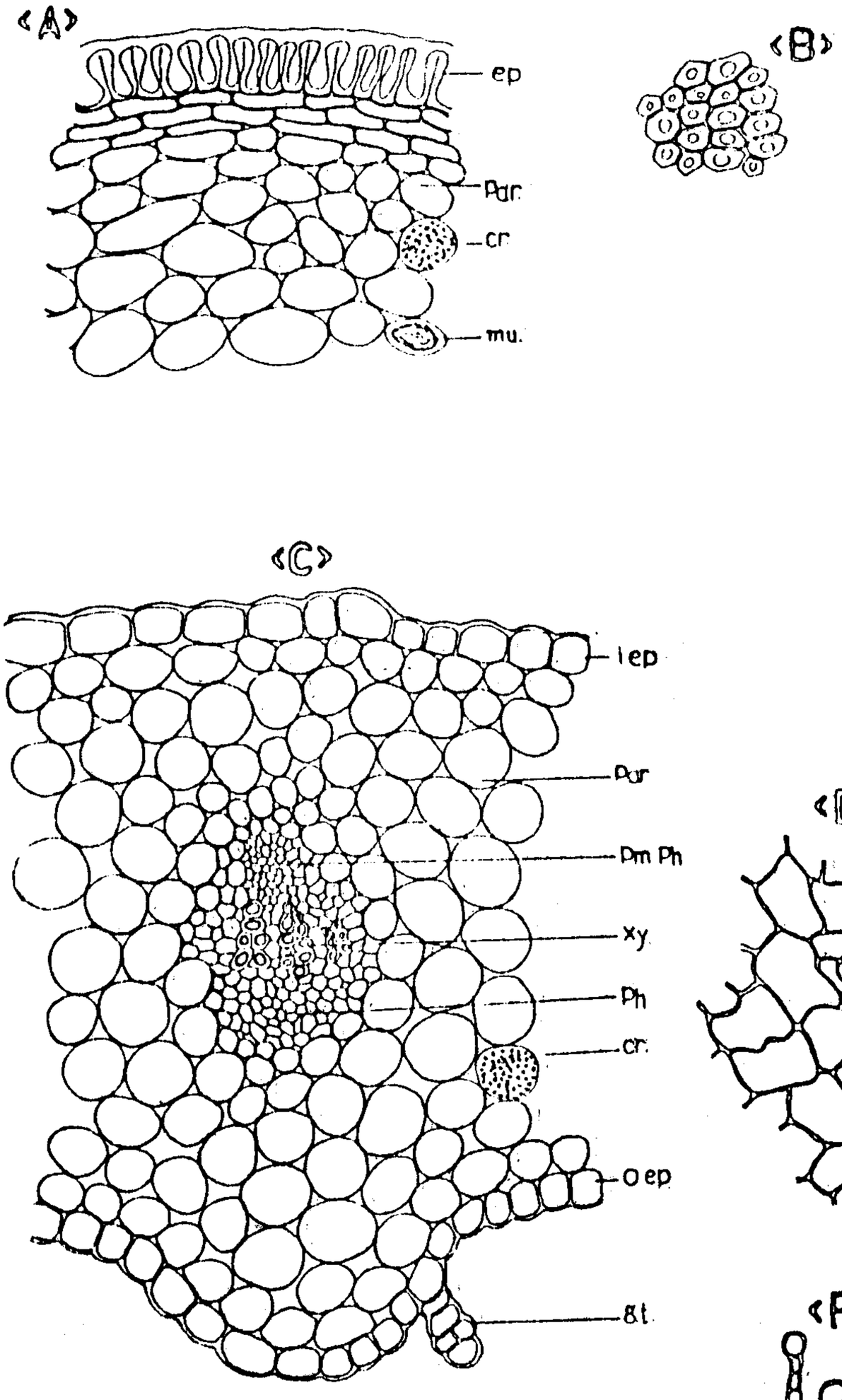
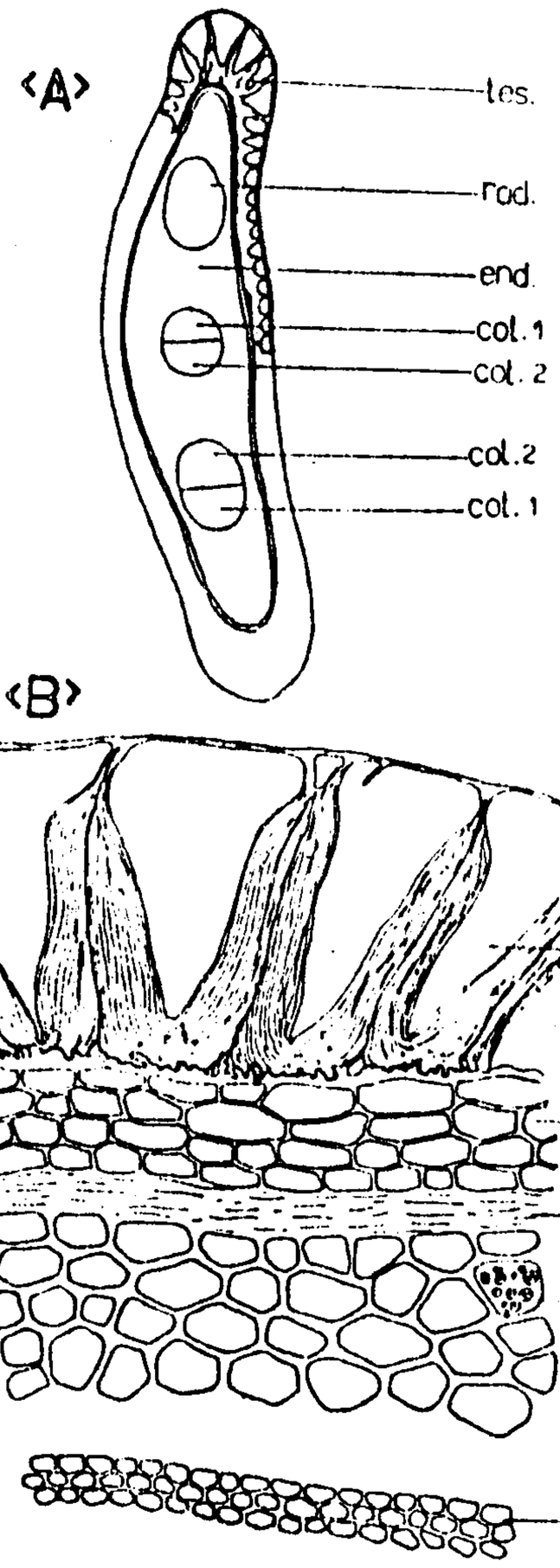
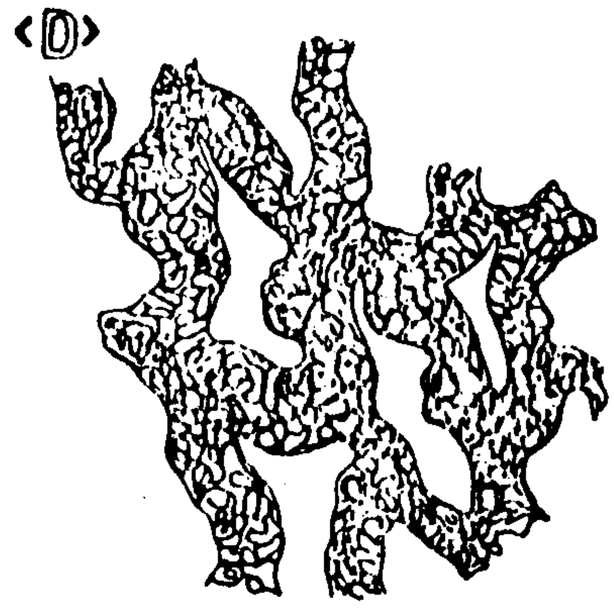


Fig. 6: The Pericarp and the Sepal

A- Detailed T.S. in the pericarp	X 135
B- Epidermis of the pericarp	X 135
C- Detailed T.S. in the sepal	X 135
D- Outer epidermis	X 135
E- Inner epidermis	X 135
F- Glandular trichome	X 135
G- Idioblasts of microsphenoidal crystals of calcium oxalate	X 135
H- Parenchyma	X 135
I- Vessel	X 135

ep., epidermis; par., parenchyma; i.ep., inner epidermis; ph., phloem; pm.ph., perimedullary phloem; xy., xylem; o.ep., outer epidermis g.t., glandular trichomes; cr., idioblast of microsphenoidal crystals of calcium oxalate.





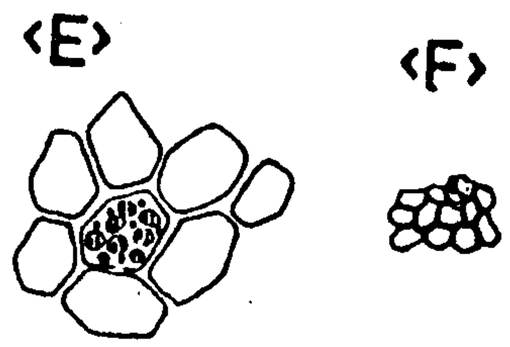
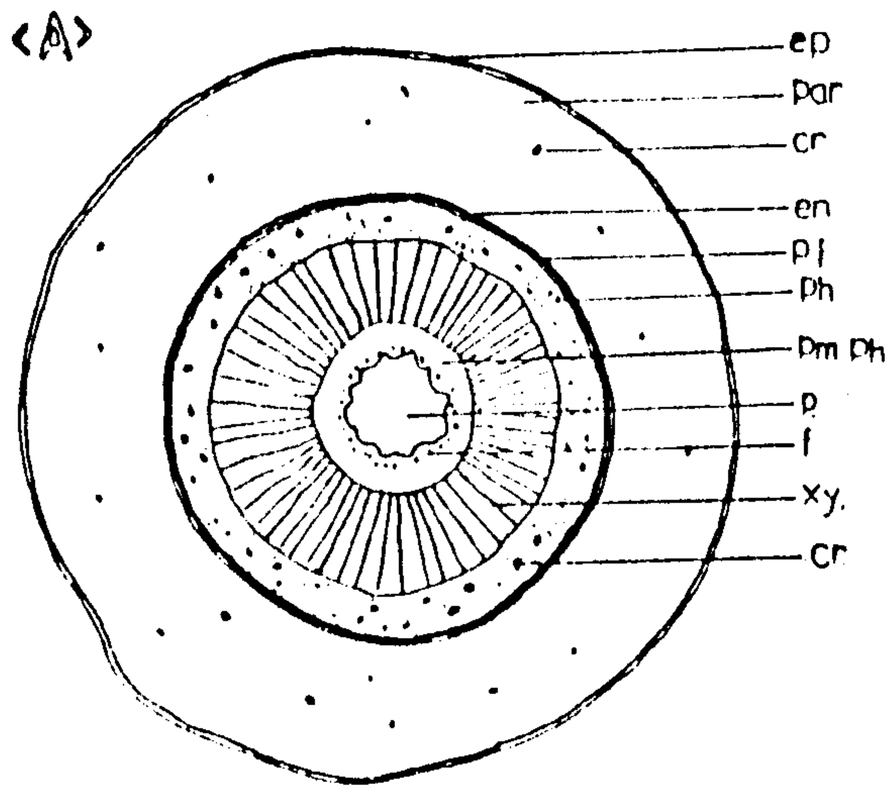
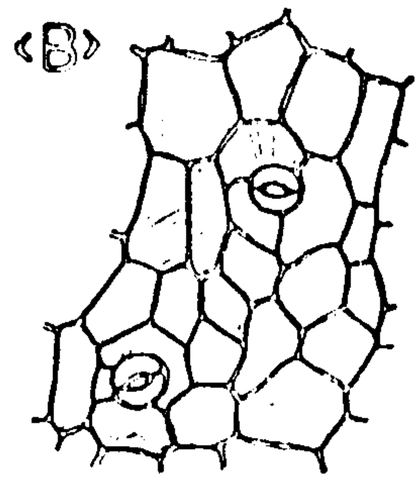


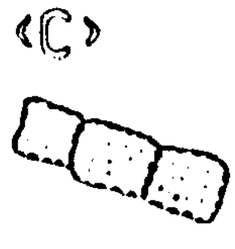
Fig. 7: The Seed

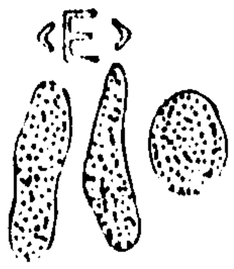
A- Diagrammatic T.S. of the Seed X 48
B- Detailed T.S. in the seed X 135
C,D- Epidermis X 135
E- Endosperm X 135
F- Embryo X 135

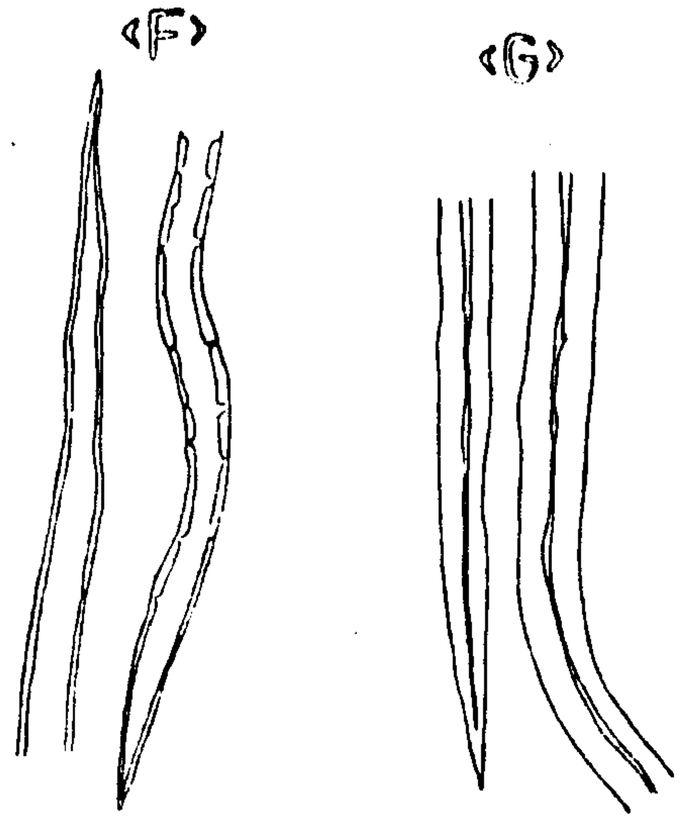
tes., testa; rad., radicle; end., endosperm; cot., cotyledon; ep., epidermis; par., parenchyma; n.l. neutritive layer., end., endosperm.

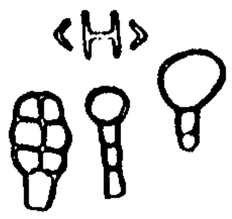


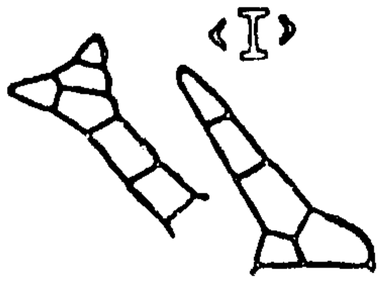












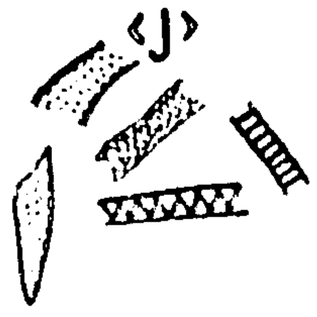


Fig. 8: The Fruit Stalk

A- Diagrammatic T.S. of the fruit stalk X 24
B- Epidermis X 135
C- Medullary ray X 135
D- Wood parenchyma X 135
E- Idioblasts of microsphenoidal crystals of calcium oxalate X 135
F- Wood fibres X 135
G- Pericyclic fibres X 135
H- Glandular trichomes X 135
I- Covering trichomes X 135
J- Vessels and tracheids X 135

ep., epidermis; par., parenchyma; en., endodermis; p.f., pericyclic fibre, ph., phloem; cam., cambium; xy., xylem; f., fibre; pm. ph., perimedullary phloem; cr., idioblast of microsphenoidal crystals of clacium oxalate.

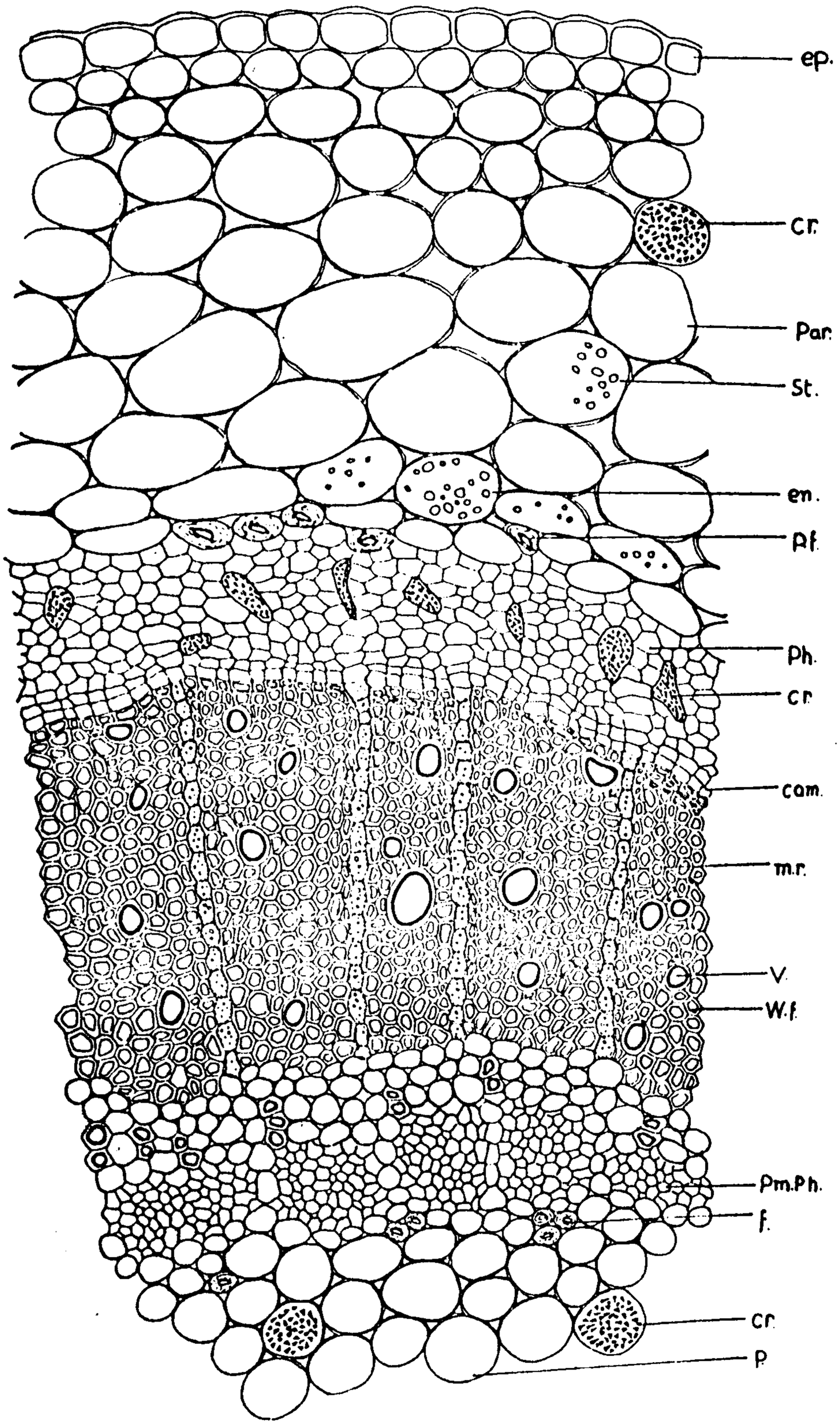


Fig. 9: Detailed T.S. in the Fruit Stalk X 135

ep., epidermis; par., parenchyma; en., endodermis; st., starch grandules; p.f., pericyclic fibre, ph., phloem; cam., cambium; m.r., medullary ray; w.f., wood fibre; v., vessels; pm. ph., perimedullary phloem; f., fibre; cr., idioblast of microsphenoidal crystals of calcium oxalate.

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دراسة عيانية ومجهرية لنبات السولانوم بسود وكابسيكام (لينيه) المنزرع فى مصر

الجزء الثانى : الزهرة والثمرة

نصرا حمد العمرى ـ احمد عبد الرحمن على ـ فايز زكى مقار

فى هذا البحث اجريت دراسة عيانية ومجهرية لزهرة وثمرة نبات السولانوم بسود وكابسيكام (لينيه) وهذه الدراسة تساعد على التعرف عليها سواء كانت كاملة او على هيئة مسحوق .

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