

PHARMACOGNOSTICAL STUDY OF SOPHORA SECUNDIFLORA
(ORTEG.) LAG. GROWN IN EGYPT

PART I. MORPHOLOGY AND HISTOLOGY OF THE LEAVES
AND STEMS

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The morphological and histological characters of the leaf and stem of sophora secundiflora (Orteg.) Lag. growing in Egypt are presented to show the diagnostic characters of these organs by which they could be identified and differentiated in the entire and powdered forms.

Sophora secundiflora (Orteg.) Lag. belongs to the family Leguminosae (1,2). It is extremely poisonous; fruits called Mescal beans, used in necklaces and as intoxicant in red bean dance³.

From sophora secundiflora only the alkaloid cytisine was isolated⁴; no further investigations could be traced in the literature.

In the present work; the macro as well as micromorphological features of the stems and leaves of Sophora secundiflora (Ortag.) Lag. are illustrated.

Material:

Collection was made from plants cultivated in the Aswan Botanic Island.

Habitat:

The plant (Fig. 1) is a tall erect, deciduous tree, attaining 10-12 meters in height and carrying numerous branches. It bears compound, imparipinate; exstipulate; alternate leaves. The plant gives its flowers during march and april

A- The StemMacromorphology: (Fig. 2)

The stem is erect; cylindrical to subcylindrical in outline and solid, with monopodial branching ; young branches having green colour with smooth or slightly hairy surface. The old branches are woody, pale green to yellow in colour. It has a faint odour and a bitter taste.

Micromorphology: (Fig. 3)

A transverse section in the stem (Fig.3) is circular to slightly irregular in outline; showing an epidermis covered with thick smooth cuticle followed by a cortex and a pericycle surrounding a continuous ring of vascular tissue; with a wide parenchymatous pith in the centre.

The epidermal cells: (Fig. 3 B) are square, axially elongated, thin-walled with straight anticlinal walls. They measure 20-36-46 μ in length and 10-15-30 μ in width. Nonglandular trichomes are present, being uniseriate unicellular, bicellular and rarely multicellular formed of 2-4 cells. In case of bi or multicellular hair the basal cells are shorter, while the terminal cell is very long having thin, yellowish-brown or colourless wall and wide lumen, measuring from 100-120-140 μ in length, 14-16-18 μ in width, Stomata of anomocytic type are present. None of the epidermal cells contain mucilage.

The cortex (Fig. 3 B) is comparatively narrow formed of an outer layer of rounded collenchyma, followed by parenchymatous cells with intercellular spaces. They contain prisms of calcium oxalate 10-16-20 μ in length and 10-12-16 μ broad and few small rounded starch grains. The innermost layer of the cortex is formed of slightly tangentially elongated cells, some of which containing prisms of calcium oxalate, especially those abutting the pericyclic fibres forming a crystal sheath.

The pericycle is formed of 3-6 rows of parenchymatous cells with scattered lignified fibres in tangential groups. The fibres have a thin lignified walls and narrow lumens with pointed, acuminate sometimes blunt to rounded, rarely forked tips. They measure 16-20-28 μ in diameter.

The phloem consists of compressed elements with shining thin cellulosic walls. It shows empty cavities (as shown in longitudinal sections). The cambium consists of 3 - 4 layers of thin-walled tangentially elongated cells. The xylem (Fig. 3 B) consists of lignified thick-walled, radially arranged elements, traversed by narrow medullary rays with slightly lignified walls. The vessels are arranged in radial rows. They have spiral, pitted and scalariform. They measure 30-60-80 μ in diameter. They are accompanied by tracheids, wood fibres and wood parenchyma. The pith is comparatively wide consisting of large polyhedral to rounded parenchymatous cells with thick, pitted and lignified walls.

The powder: (Fig. 4)

Powdered young stem is greyish green in colour with slight odour and bitter taste. The important diagnostic microscopic features of the powder are:

- 1- Fragments of polygonal axially elongated epidermal cells with nearly straight anticlinal walls and covered with smooth cuticle.
- 2- Nonglandular trichomes; unicellular, bi. or multicellular with short basal cells and long conical terminal cell; covered with smooth cuticle.
- 3- Fragments of rounded and ovoid thin-walled parenchymatous cells with occasional prisms of calcium oxalate.
- 4- Numerous fragments of fibres with tapering ends, narrow lumens, some fibres are surrounded by crystal sheath.
- 5- Fragments of lignified vessels of pitted, spiral and scalariform types.

- 6- Fragments of lignified pitted wood parenchyma and medullary ray cells.
- 7- Numerous prismatic crystals of calcium oxalate.
- 8- Fragments of tracheids; pitted and lignified.
- 8- Fragments of parenchymatous cells containing few small rounded simple starch grains.

B- The Leaves

Macromorphology:

The leaves (Fig. 2 3) are compound imparipinnate; alternate and exstipulate; consisting of 7 leaflets. The leaflets measure 4-5 cm in length and 1.5-2 cm in width; they are oppositely arranged on a nearly cylindrical rachis.

The lamina of the leaflet is ovate lanceolate with entire margin, emarginate apex and decurrent base. Venation is reticulate. Leaflets are yellowish-green in colour, leathery in texture. It has a faint odour and a bitter taste.

Micromorphology:

A transverse section through the lamina (Fig. 5 B) shows an upper and lower epidermises enclosing inbetween a dorsiventral mesophyll which is replaced in the midrib region by vascular strands.

The epidermis (Fig. 5 C, D, and 6) consists of one layer of tangentially elongated cells covered with thick smooth cuticle and having almost straight anticlinal walls. They measure 14-18-140 μ in height, 24-46-66 μ in length and 14-28-40 μ in width. The lower epidermis is formed of one layer of cells differing from the upper epidermis in having slightly papillose and in being somewhat square. Ranunculaceous (anomocytic) stomata are present only on the lower surface, being more frequent on the interneural region, being surrounded by 4 - 7 cells. Trichomes are absent on both surfaces. None of the epidermal cells showed the presence of mucilage. The mesophyll

(Fig. 7 A) is heterogenous, dorsiventral, with 3 layers of palisade cells interrupted by a mass of collenchyma in the midrib region. The palisade cells have nearly straight anticlinal walls. They measure 28-36-46 μ in length and 8-12-16 μ in diameter. The spongy tissue is formed of more or less rounded to irregular parenchymatous cells with wide intercellular spaces. It contains few starch grains and prismatic crystals of calcium oxalate which are scattered in the mesophyll.

The cortical tissue of the midrib (Fig. 6) shows an upper and lower subepidermal collenchymatous masses. The rest of the cortical tissue is formed of rounded or polyhedral parenchymatous cells with wide intercellular spaces and contain few starch granules and prismatic crystals of calcium oxalate; .The vascular tissues consists of collateral bundles formed of an upper xylem and lower phloem. They are enclosed by two arcs of sclerenchymatous fibres. The upper arc consists of 2-4 layers; while the lower 4-6 layers. The pericyclic fibres are non-lignified with narrow lumen, thin or moderately thick shining walls with slit like simple pits and acute apices. They measure 10-14-16 μ in diameter. The xylem formed of lignified, spiral, pitted and scalariform vessels. They are measure 12-20-36 μ in diameter. Tracheids are very few and pitted.

Histology of the rachis: (Fig. 5 A)

A transverse section in the rachis is more or less rounded in outline, with two rounded ridges on its upper side and a shallow groove in-between. It consists of an epidermis surrounding the cortex which is formed of collenchyma from the outside and parenchyma to the inside, containing few prisms of calcium oxalate.

The vascular system consists of centric continuous ring of vascular tissues with a wide central pith and two smaller centric vascular bundles corresponding to the two ridges.

The two lateral bundles are surrounded by a continuous ring of sclerenchymatous fibres; while the pericycle of the main central ring consists of patches of fibres alternating with small groups of parenchymatous cells.

The powder: (Fig. 7 B)

Powdered leaf of *Sophora secundiflora* is yellowish green in colour, with characteristic odour and bitter taste. It is characterised by:

- 1- Fragments of the upper epidermis from lamina showing circular cells surrounded by polygonal isodiametric or subrectangular ones.
- 2- Fragments of the lower epidermis with numerous anomocytic stomata and absence of hairs.
- 3- Fragments of heterogenous mesophyll showing palisade cells and spongy parenchyma.
- 4- Fragments of non-lignified pericyclic fibres, thick with slit like pite; Some parts are surrounded by a crystal sheath.
- 5- Numerous prisms of calcium oxalate.
- 6- Fragments of spiral, scalariform and pitted vessels.
- 7- Fragments of tracheids.
- 8- Fragmnets of nonglandular hairs of rachis; mostly unicellulars few multicellular with short basal cell or cells and long apical one, covered with thin smooth cuticle.



Fig. 1: Photograph of *Sophora secundiflora*(Orteg.) Lag.

X 1/30

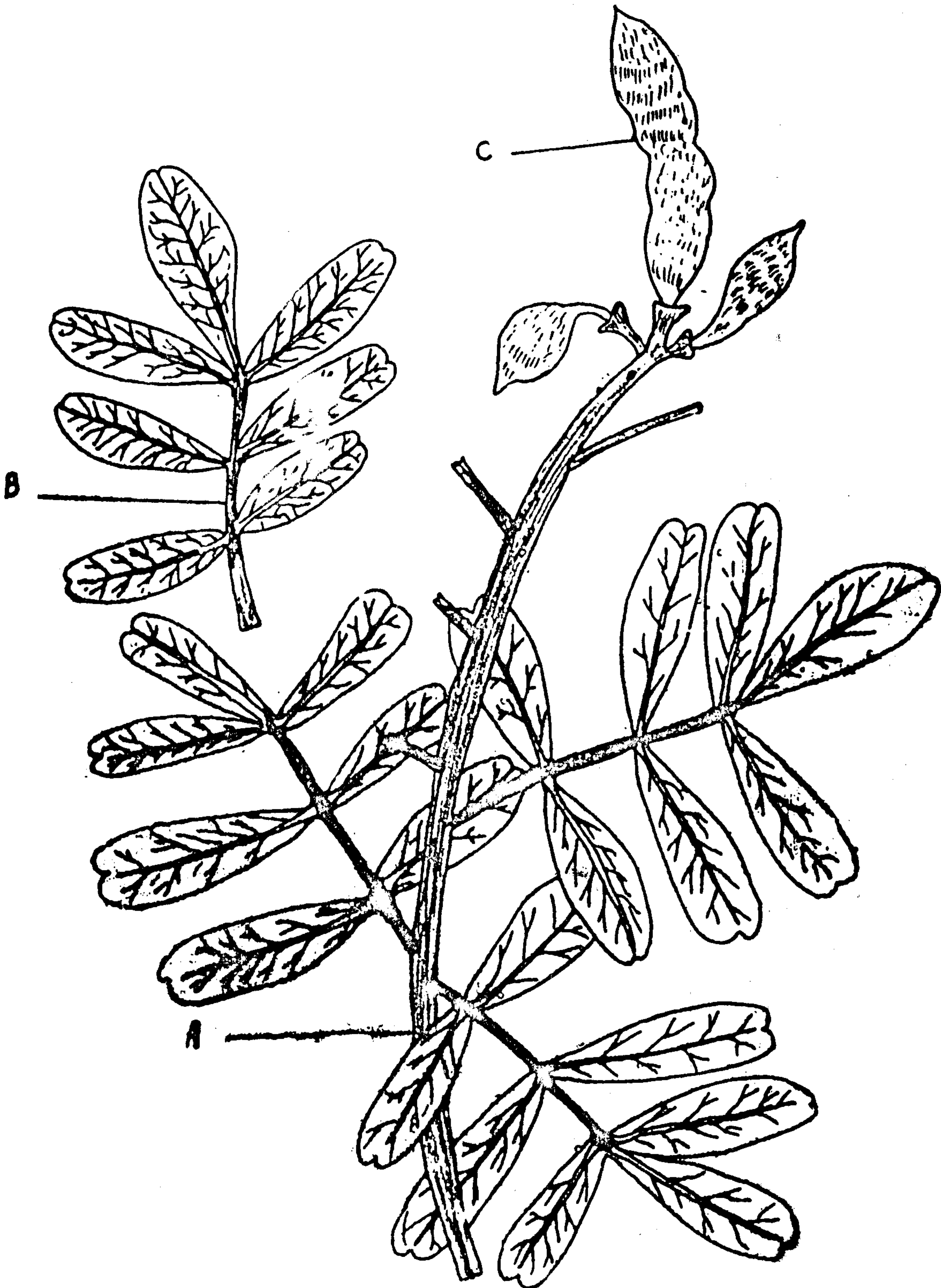


Fig. 2: Sketch of the branch
A- Branch
B- Compound leaf
C- Fruit

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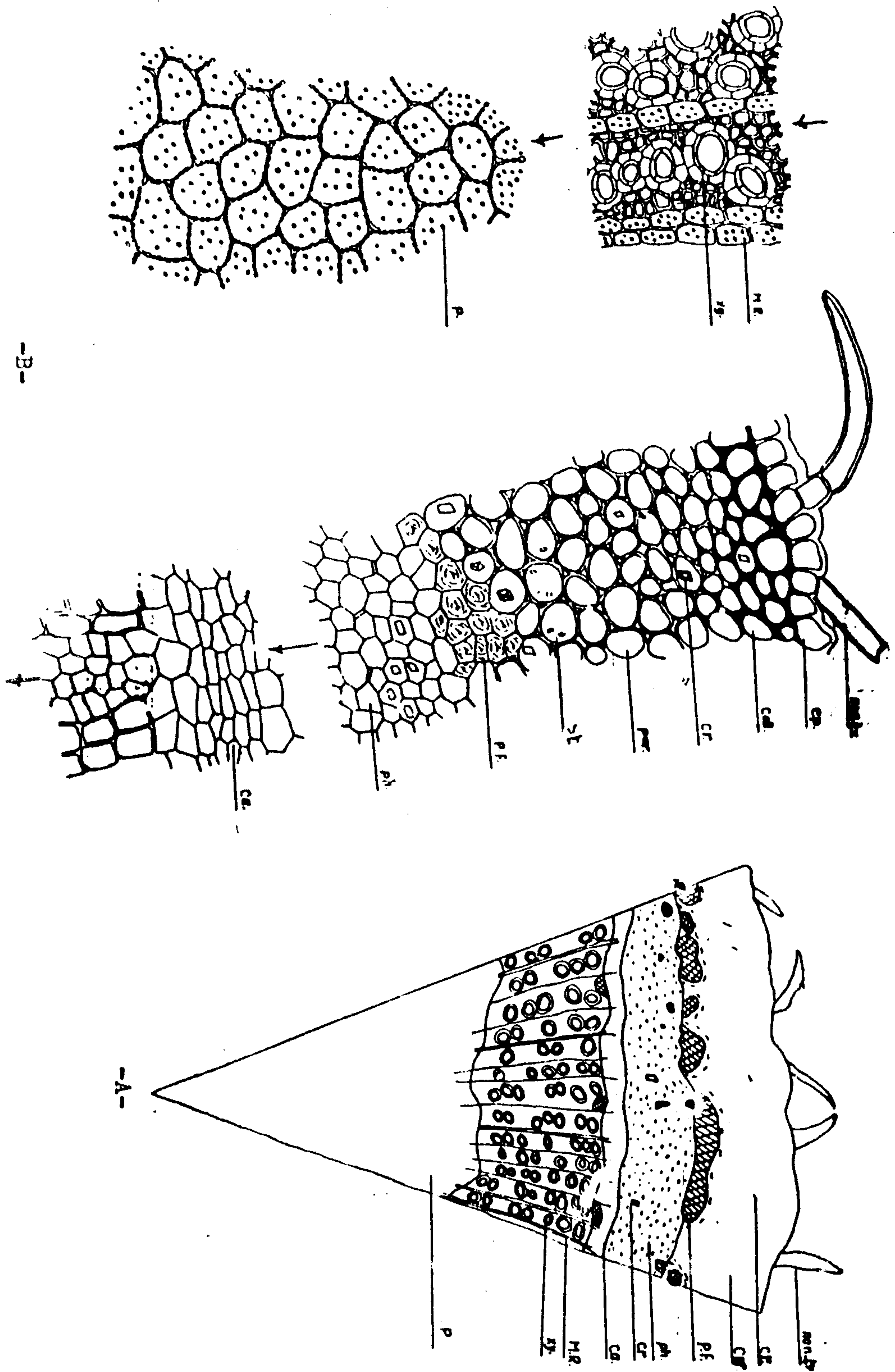


Fig. 3- A- Diagrammatic T.S. of the stem
B- Detailed T.S. of the stem

ca., cambium; coll., collenchyma; cor., cortex; cr., cortex ray; prism of calcium oxalate ep.; epid. mass; m.r., medullary ray; non. tr., non-glandular trichomes; n.g.t., non-glandular trichomes; p.c., pericycle; ph., phloem; xyl., xylem; st., starch; grains.

X 21
X225

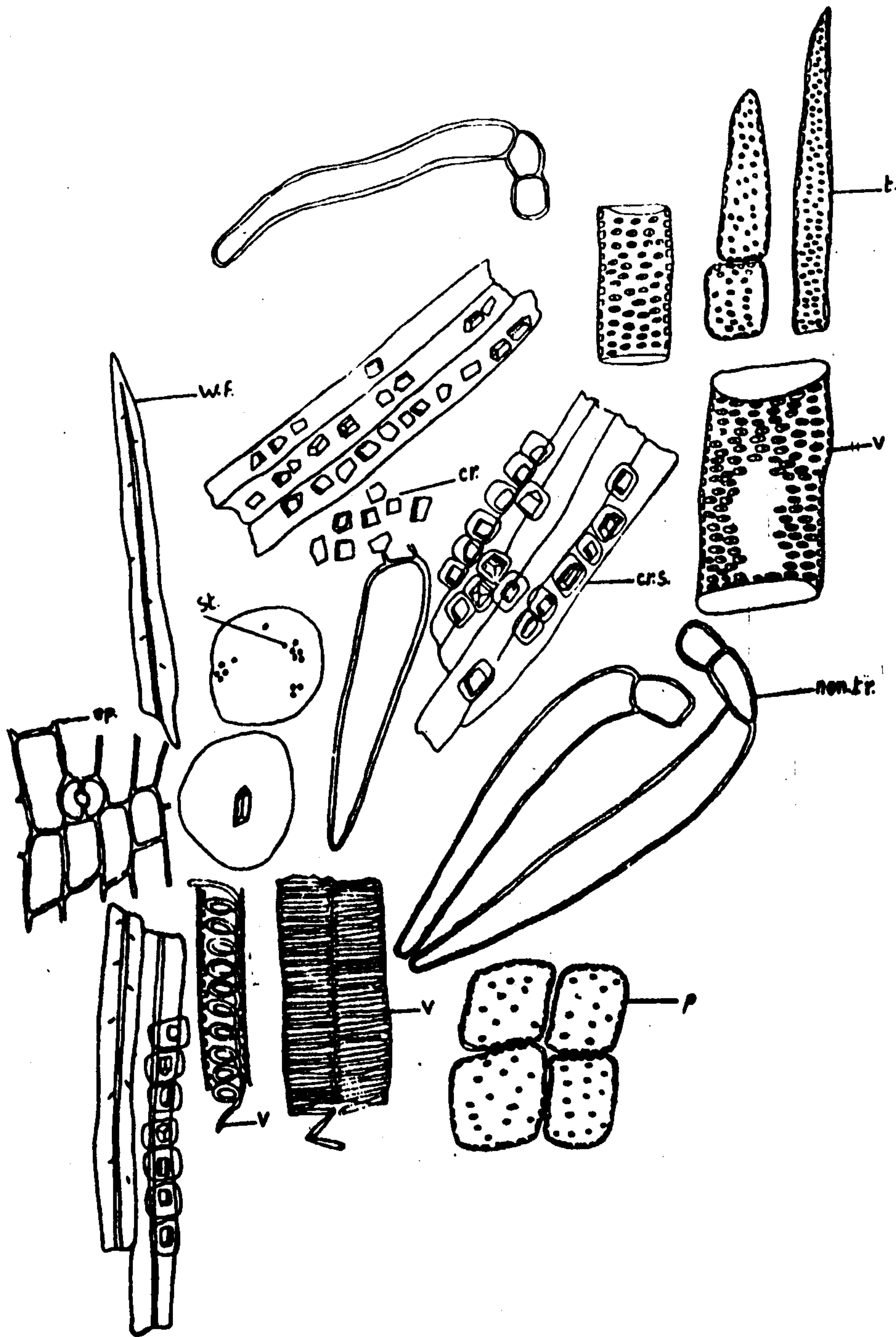


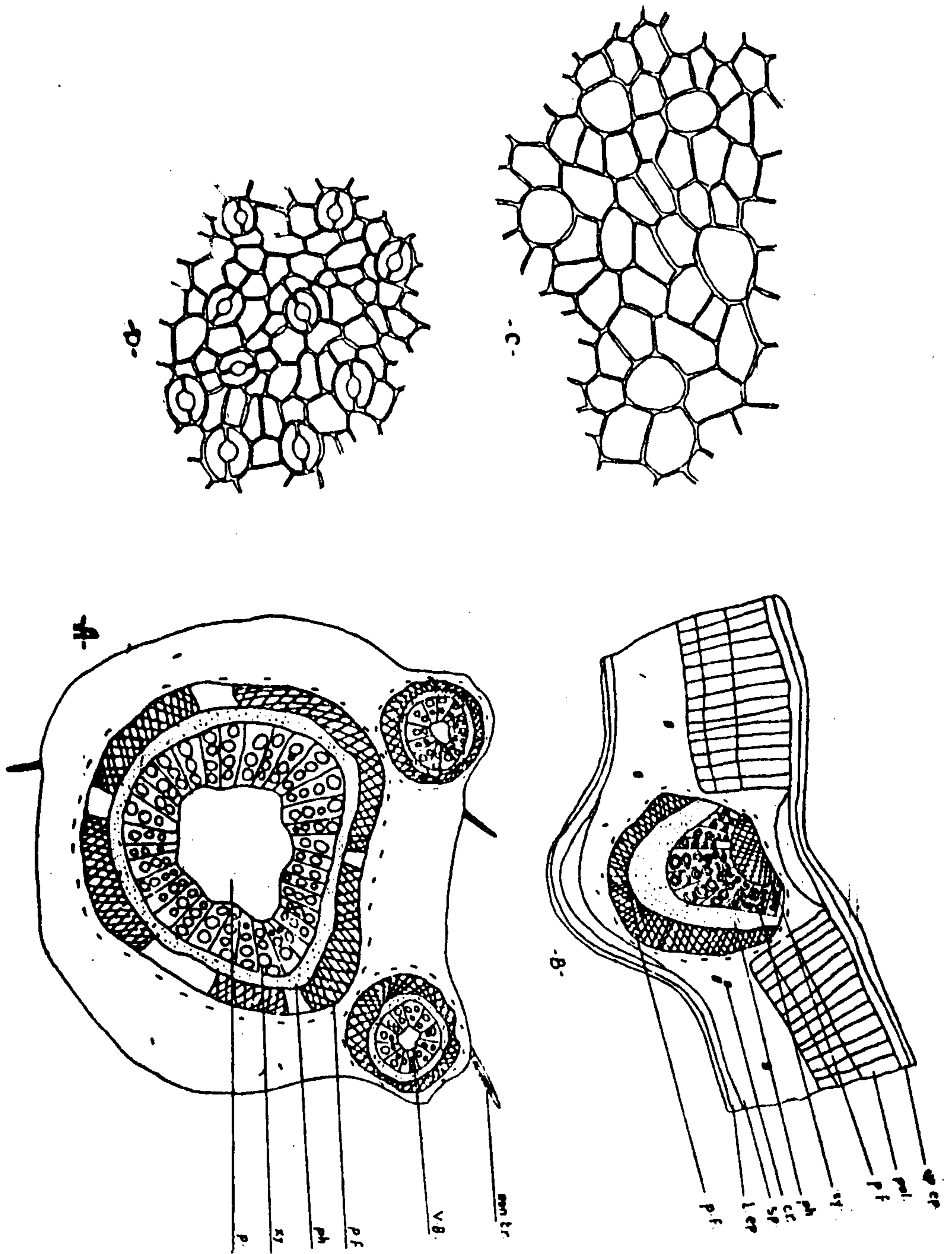
Fig. 4- Isolated elements of the stem

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cr., prisms of calcium oxalate; cr.s., crystal sheath; ep., epidermis; non. tr., non-glandular trichomes; p., pith; st., starch grains; t., tracheids; v., vessels w.f., wood fibre.

Fig. 5 A- Diagrammatic T.S. of the rachis
 B- Diagrammatic T.S. of the leaf
 C- Upper epidermis of the leaf
 D- Lower epidermis of the leaf

cr., prisms of calcium oxalate; ep., lower epidermis; non. tr., non-glandular trichomes; pal., palisade; p.f., pericyclic fibre; ph., phloem; sp., spongy tissue; up.ep., upper epidermis; v.B., vascular bundle xy., xylem.



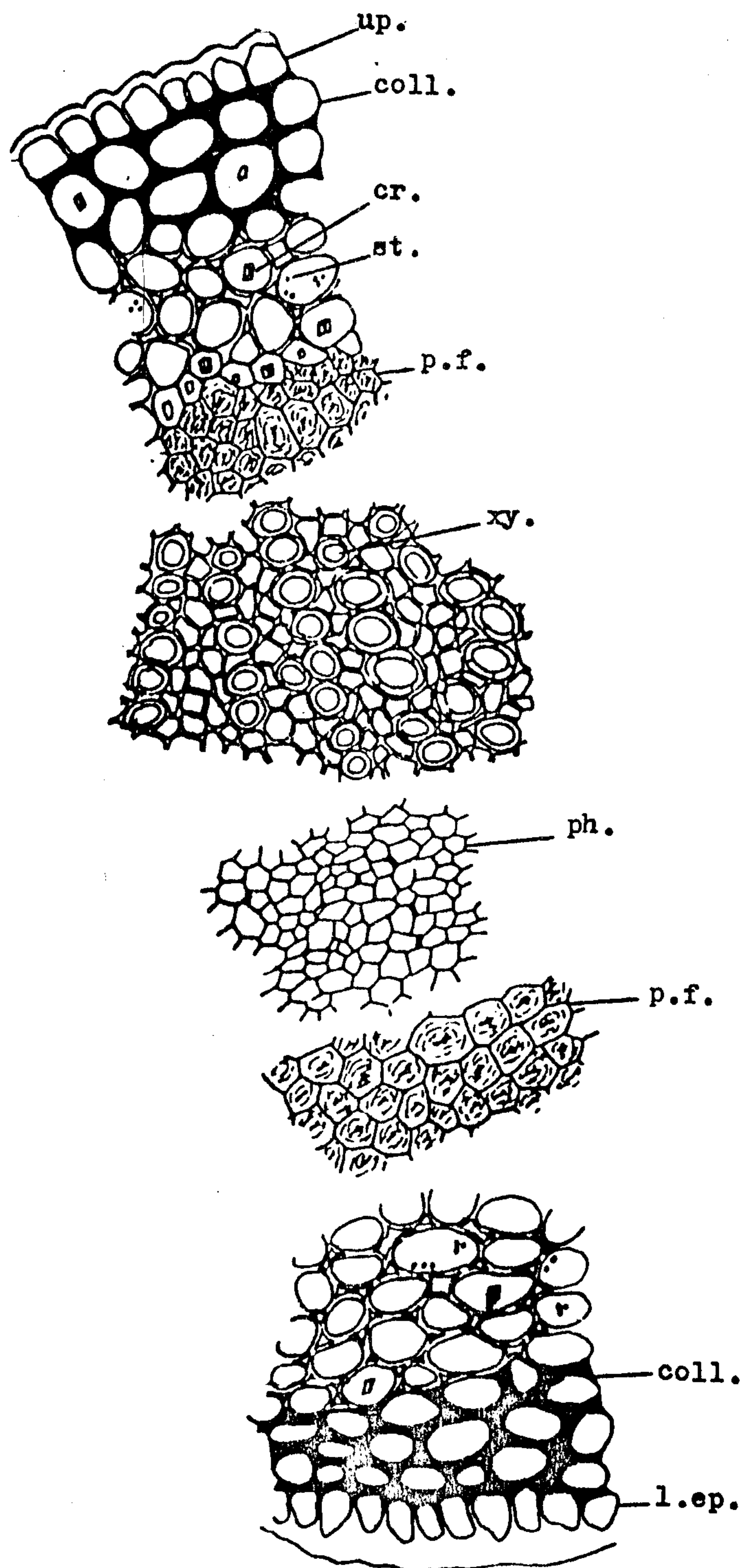


Fig- 6- Detailed T.S. of the midrib region

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coll., collenchyma; *cr.*, prisms of calcium oxalate; *l.ep.*, lower epidermis par., parenchyma; *p.f.*, pericyclic fibre; *ph.*, phloem; *st.*, starch grains; *up.ep.*, upper epidermis *xy.*, xylem.

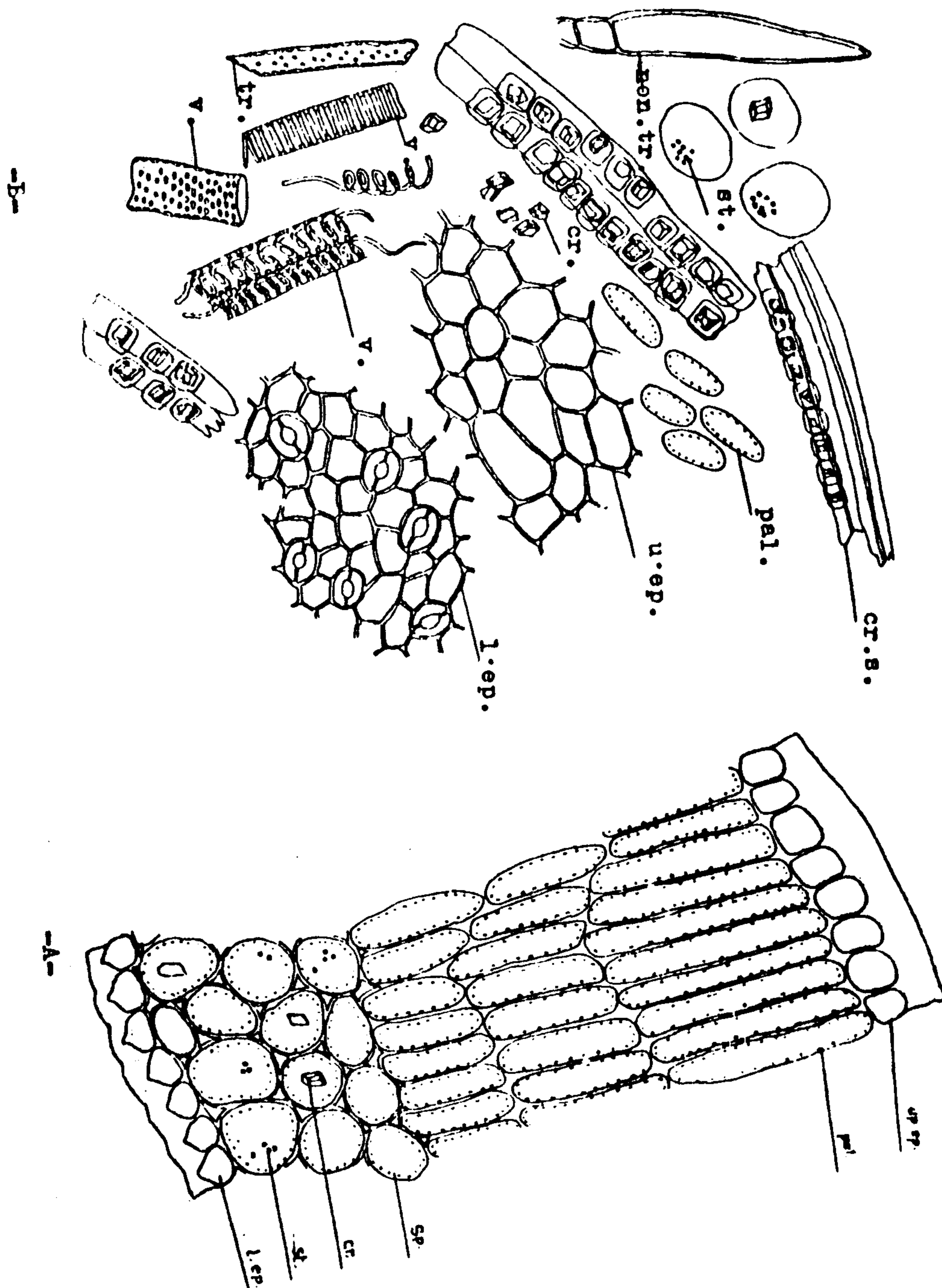


Fig. 7- A- Detailed T.S. of the lamina
 B- Isolated elements of the leaf

cr., prisms of calcium oxalate; cr.s., crystal sheath; l.ep., lower epidermis; non. tr., non-glandular trichomes; pal. palisade; st., starch grains- tr., tracheid up.ep., upper epidermis; v., vessel.

X225
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الدراسة العيانية والمجهرية لساق وورقة نبات

السوفوراسكنديفلورا المنزرع في مصر
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received in 21/7/1981 & accepted in 27/10/1981