

PHARMACOGNOSTICAL STUDY OF
TECOMA CHRYSOTRICA (MART. EX.) GROWING IN EGYPT.

M.A. Makboul & D.W. Bishay
Department of Pharmacognosy, Faculty of Pharmacy, Assiut
University, Assiut, Egypt.

ABSTRACT

Preliminary phytochemical screening of the shoots of Tecoma chryso-tricha (Mart. ex.) Bignoniaceae, as well as macro and micromorphological characters of the stem and leaf of the plant were studied. The phytochemical screening proved the presence of sterols, terpenes, flavonoids and traces of alkaloids.

INTRODUCTION

Tecoma chryso-tricha (Mart. ex.) is a small tree belonging to the Family Bignoniaceae¹. Tecoma species contain several monoterpene derived alkaloids of the pyridone skeleton^{2,3}. Some of these compounds were reported to have an antidiabetic effect⁴.

Reviewing the current literature nothing could be traced concerning the pharmacognostical study of Tecoma chryso-tricha growing in Egypt.

The present work showed the preliminary phytochemical investigation as well as, the macro-and micromorphological features in order to identify its constituents and to facilitate the plant identity in entire and powdered forms.

EXPERIMENTAL

Material :

The plant material consisting of leaves and stems were collected from plants cultivated in Aswan Botanic Island at Upper Egypt in May 1981, during flowering stage.

Phytochemical screening : 100 g. of the air-dried shoots including leaves and stems were successively extracted with pet. ether (b.r. 40-60°C.), ether, chloroform and methanol. All extracts were concentrated and subjected to phytochemical screening

RESULTS AND DISCUSSION

- 1- Sterols and triterpenes were detected in pet. ether extract.
- 2- Ether and chloroform extracts showed the presence of sterols and flavonoidal aglycones.
- 3- The alcoholic extract of the plant showed the presence of flavonoid compounds. However, traces of alkaloids were detected in the alcohol extract.

Investigation of the Lipid:

The pet. ether extract was saponified using N/2 alcoholic KOH solution in the usual way.

The unsaponifiable fraction was chromatographed over alumina column. Elution was adopted using pet. ether (b.r. 40-60°C) - ethyl acetate mixtures in increasing polarities, B-sitosterol and α -amyrine were isolated and identified by colour test, chromatography with authentic samples and mixed m.p.

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Investigation of Flavonoid Content:

The alcohol extract was fractionated in a separatory funnel into ether, ethyl acetate and n-butanol soluble fractions. Each fraction was chromatographed using paper chromatography in n-butanol-acetic-water 3 : 1 : 1 : and 15% CH₃COOH. Detection was done using ammonia and AlCl₃ solution in chloroform. Isolation and identification of the flavonoids are still under investigation.

Habitat:

The plant is a garden shrub or small tree with monopodial branches and attaining 4 meters in height. It carries opposite decussate, palmately compound leaves. The plant gives its flowers during April and May.

THE STEM

Macromorphology: (Fig. 1)

The stem is erect; cylindrical to subcylindrical in outline, solid with monopodial branching, young branches having yellowish green colour, old branches are woody, dark green to brownish green in colour . It has faint odour and bitter taste.

Micromorphology: (Fig. 2)

A transverse section in the stem (Fig. 2A) is circular to irregular in outline, showing an epidermis, followed by a cortex and pericycle surrounding a continuous ring of vascular tissue with a relatively wide parenchymatous pith in the center.

The epidermal cells (Fig. 2 B) are polygonal axially elongated thin walled with straight anticlinal walls, covered with thick smooth cuticle . They measure 60-80-95 μ in length and

25-30-35 μ in width. Stellate nonglandular trichomes and stomata of anomocytic types are present.

The cortex (Fig. 2 C) is comparatively narrow formed of outer layers of rounded collenchyma followed by parenchymatous cells with intercellular spaces. They contain prisms of calcium oxalate measuring 6-8-10 μ in length and few small rounded starch grains. The endodermis is formed of tangentially elongated lignified cells with casparian strips.

The pericycle is formed of 2-4 rows of parenchymatous cells interrupted by batches of fibres. The fibres are lignified with wide lumena and tapering apices and measuring 10-12-15 μ in diameter.

The phloem consists of compressed elements with shining thin cellulosic walls. The cambium consists of 3-4 layers of thin-walled tangentially elongated cells.

The xylem (Fig. 2 C) consists of lignified thick-walled radially arranged elements, traversed by narrow medullary rays with lignified walls. The vessels are arranged in radial rows. They have spiral, pitted and scalariform thickenings. They measure 20-25-30 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. 2 D)

The powder of young stems are yellowish green in colour with slight odour and bitter taste. The important diagnostic microscopical features of the powder are:

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- 1- Fragments of polygonal elongated epidermal cells with nearly straight anticlinal walls and covered with smooth cuticle.
- 2- Fragments of stellate nonglandular hairs with yellow contents giving yellow colour with KOH solution.
- 3- Numerous fragments of fibres with tapering ends, wide lumina, some fibres are surrounded by crystal sheath.
- 4- Fragments of vessels pitted, spiral and scalariform types.
- 5- Fragments of lignified pitted wood parenchyma, medullary ray cells and pith.
- 6- Fragments of tracheids; pitted and lignified.
- 7- Fragments of parenchymatous cells containing prisms of calcium oxalate.

B- THE LEAVES

Macromorphology:

The leaves (Fig. 1) are compound palmate, exstipulate, arranged in opposite decussate manner; each consisting of 5 leaflets. The leaflets are petiolate, ovate in shape, with acute apices and entire margin. They measure 2-3-6 cm length and 2-3-4 cm width.

The leaflets are yellowish green in colour, papery in texture. They have faint odour and bitter taste. The leaf rachis is nearly cylindrical in outline.

Micromorphology:

A transverse section in the lamina (Fig.3. A) reveals the upper and lower epidermises enclosing in between a dorsiventral mesophyll which is replaced in the midrib by the vascular strand and the cortical tissue. The vascular strand consists of several collateral vascular bundles in a circle surrounding central pith.

The epidermis (Fig. 3B,C) consists of slightly tangentially elongated cells (in T.S) covered with thick smooth cuticle. In surface view the cells appear polygonal, isodiametric with straight anticlinal walls and measuring 30-40 45 μ in length and 25-30-35 μ in width.

The lower epidermis is formed of cells slightly differing from the upper epidermis, the cells contains prism of calcium oxalate. Ranunculaceous (anomocytic) stomata are present only on the lower surface.

Trichomes of the glandular type are observed on the lower surface, consisting of a unicellular stalk and multicellular head of 8-16 radiating cells and measuring 150-170-185 μ in diameter.

Also stellate nonglandular hairs are present only on the lower surface and are, filled with contents that give yellow colour with KOH solution. The lower epidermal cells showing prisms of calcium oxalate, measuring 15-20-25 μ in length.

The mesophyll (Fig.4 A) is heterogenous, dorsiventral, with one layer of palisade cells interrupted by a mass of collenchyma in the midrib region. The palisade cells have nearly straight anticlinal walls. They measure 140-160-170 μ in length and 40-50-60 μ in width. The palisade is followed by one layer of parenchyma containing prisms of

calcium oxalate forming a crystal layer. The rest of the spongy tissue is formed of more or less rounded to irregular parenchymatous cells with wide intercellular spaces, containing few starch grains and prismatic crystals of calcium oxalate.

The cortical tissue of the midrib region (Fig. 4 B) shows an upper and lower subepidermal collenchymatous masses. The rest of the cortical tissue is formed of rounded or polygonal parenchymatous cells with wide intercellular spaces and contains few starch grains and prismatic crystals of calcium oxalate.

The vascular tissue (Fig. 4 B):- The pericycle is formed of lignified fibres which possess wide lumina, tapering apices and surrounded with crystal sheath of prismatic crystal of calcium oxalate, measuring 8-13-15 μ in length. The phloem is formed of relatively wide zone of soft elements. The xylem is formed of lignified, spiral, pitted and scalariform vessels. They measure 70-80-85 μ in diameter. The central pith is parenchymatous containing starch grains and prisms of calcium oxalate.

A transverse section in the petiole (Fig. 4 C) is more or less similar to that of the stem, but with two rounded ridges on its upper side and a shallow groove in between.

In addition, there are two lateral vascular bundles corresponding to the two ridges.

The Powder: (Fig. 3 D)

The powdered leaf is yellowish green in colour with characteristic odour and bitter taste. It is characterised by:

- 1- Fragments of the upper epidermis from lamina showing polygonal cells, sometimes elongated with straight anticlinal walls, covered with smooth cuticle.
- 2- Fragments of the lower epidermis containing prisms of calcium oxalate, with numerous anomocytic stomata and glandular hairs with multicellular head of 8-16 radiating cells and a unicellular stalk.

- 3- Fragments of stellate hairs containing yellow contents, give yellow colour with KOH solution.
- 4- Fragments of the crystal layer showing numerous prisms of calcium oxalate forming chequered appearance.
- 5- Fragments of heterogenous mesophyll showing palisade cells and spongy parenchyma.
- 6- Fragments of lignified pericyclic fibres, with wide lumina and acuminate apices, some parts are surrounded by a crystal sheath.
- 7- Numerous fragments of spiral, pitted and scalariform vessels.

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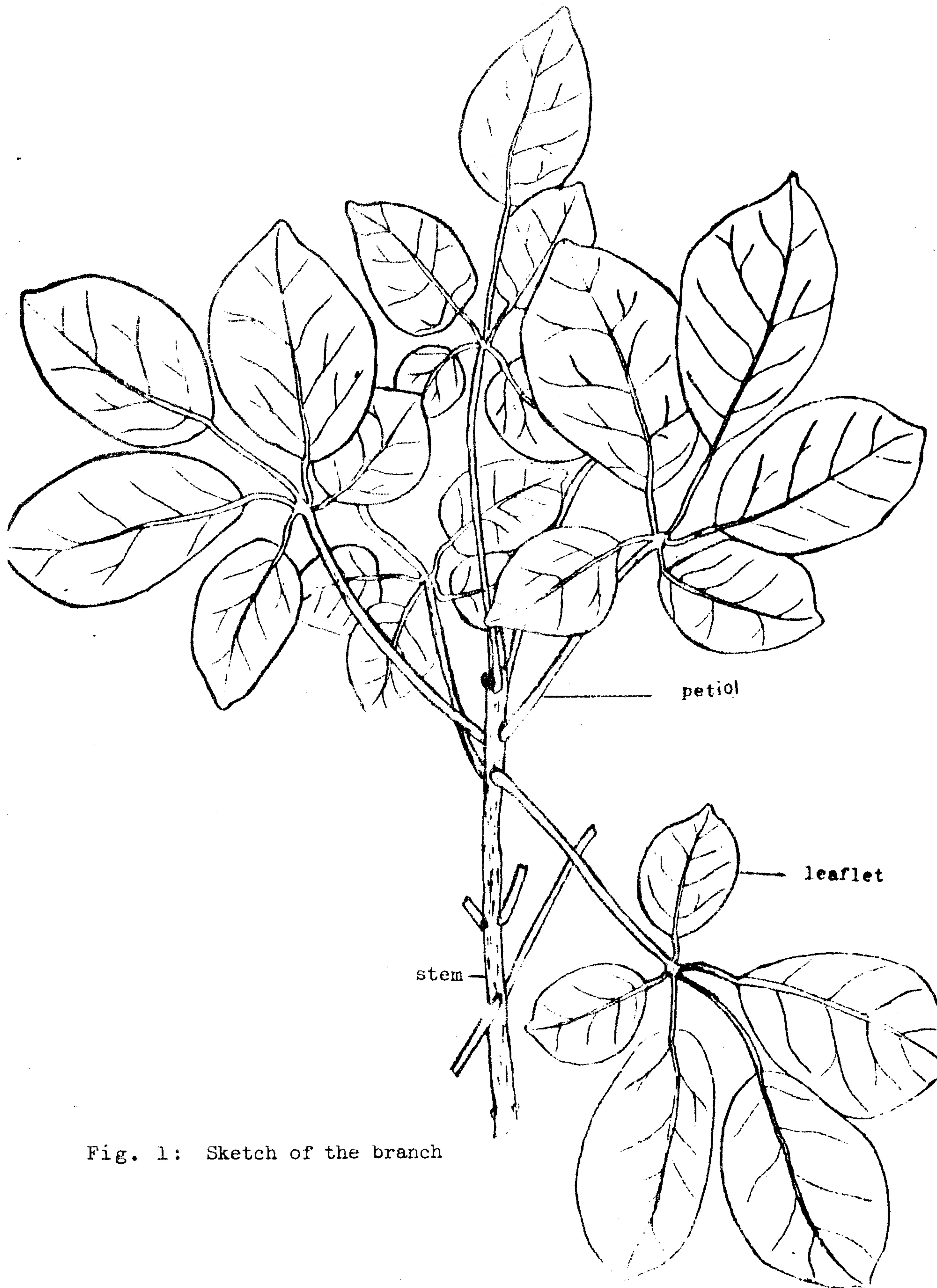


Fig. 1: Sketch of the branch

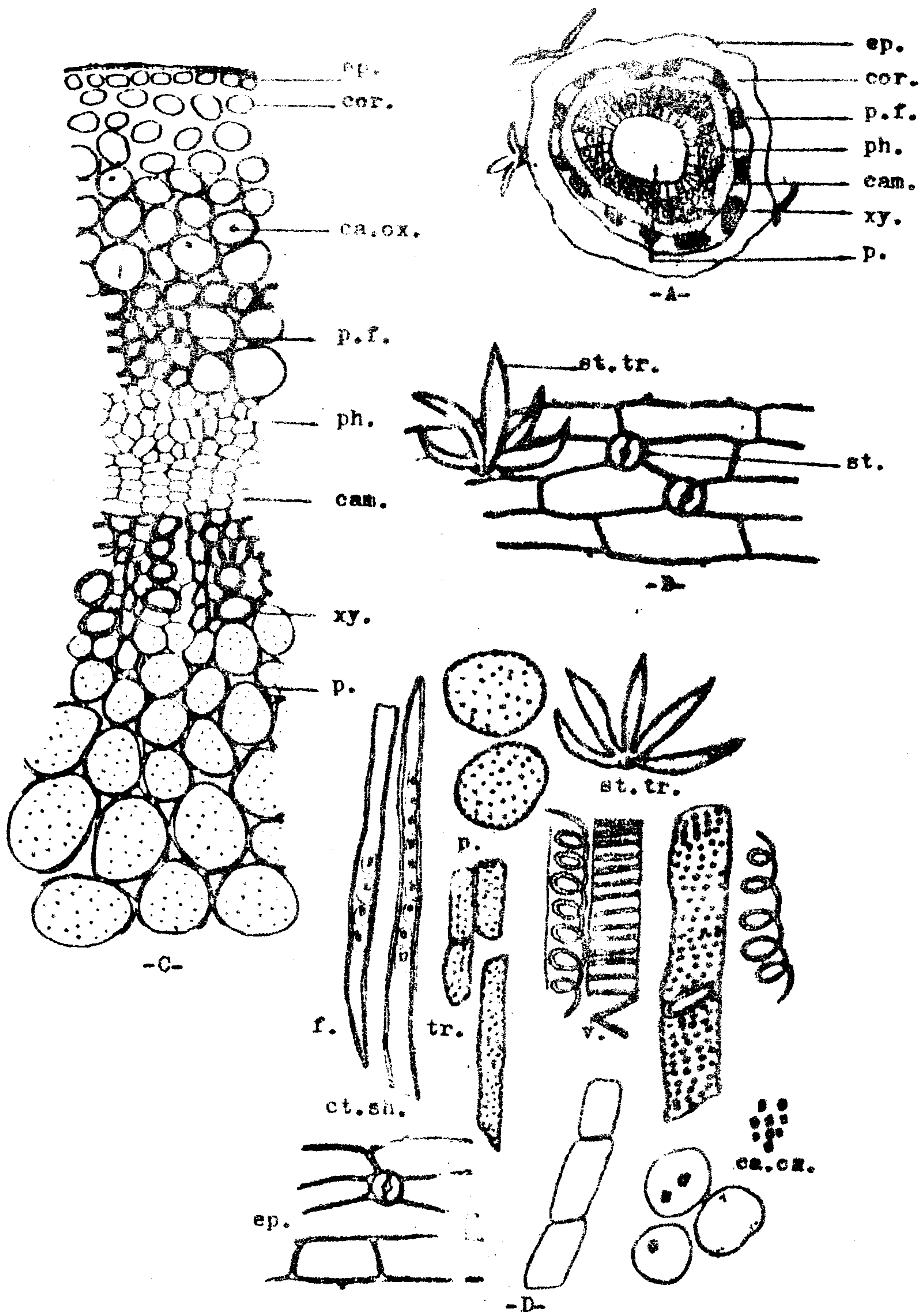


Fig. 2: A- Diagrammatic T.S. of the stem X 30
 B- Surface preparation of the stem X 225
 C- Detailed T.S. of the stem X 225
 D- Isolated elements of the stem. X 225
 ca., cambium; cor., cortex; cr., calcium oxalate; ep., epidermis;
 f., fibres; m.r., medullary ray; non.tr., nonglandular trichomes;
 p., pith; p.f., pericyclic fibres; ph., phloem; st., starch grains;
 sto., stomata; v., vessel; w.p., wood parenchyma; xy., xylem.

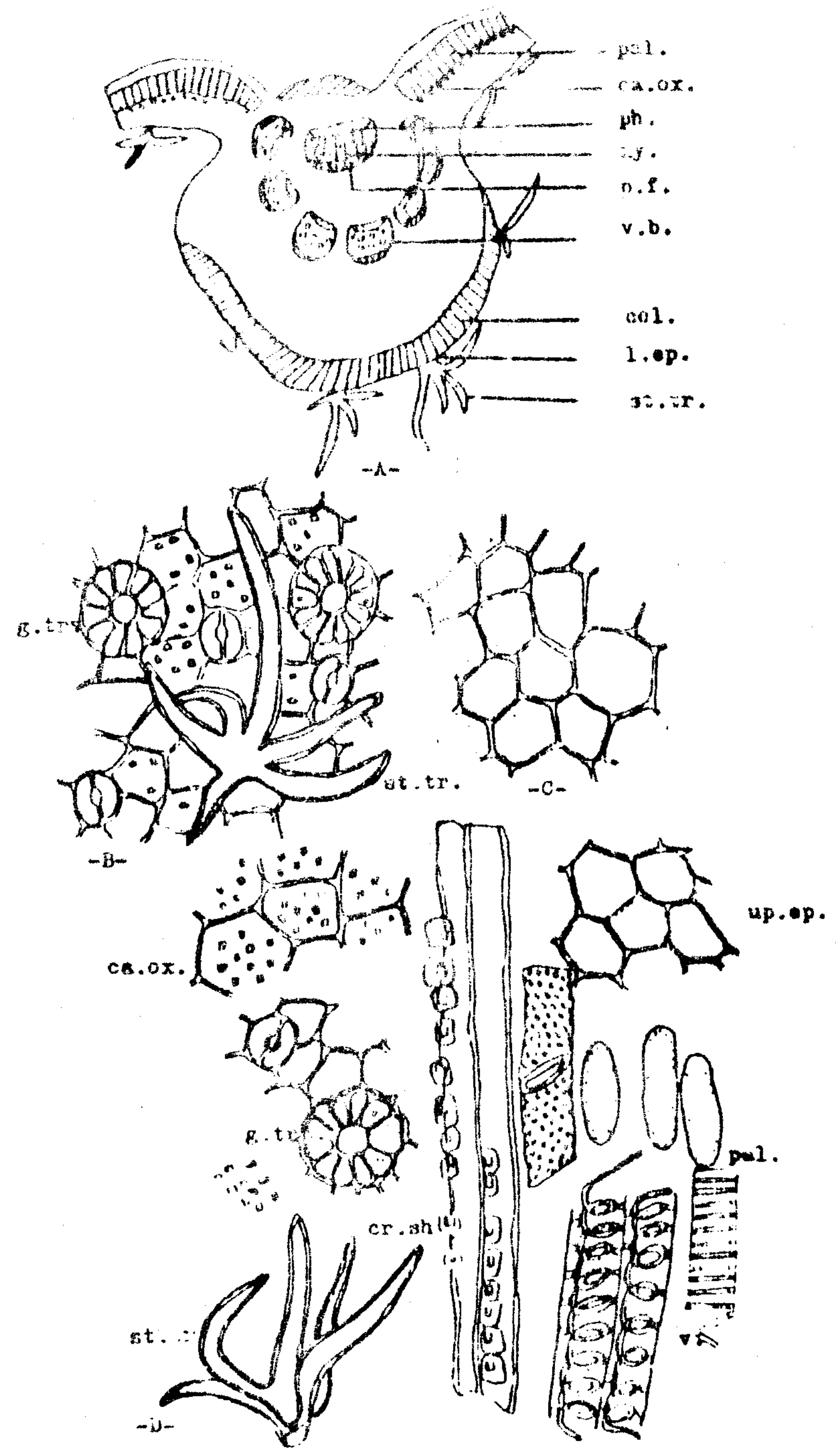


Fig. 3: A- Diagrammatic T.S. of the leaflet X 30
 B- Surface preparation of the upper epidermis X 225
 C- Surface preparation of the lower epidermis X 225
 D- Isolated element of the leaf X 225

coll., collenchyma; cr., calcium oxalate; ep., epidermis; f., fibres; g.tr., glandular trichomes; hyp., hypodermis; l.coll., lower collenchyma; l.ep., lower epidermis; non.tr., nonglandular trichomes; p., pith; pal., palisade; p.f., pericyclic fibres; ph., phloem; sp.t., spongy tissue; st., starch grains; sto., stomata; up.ep., upper epidermis; v., vascular bundles; xy., xylem.

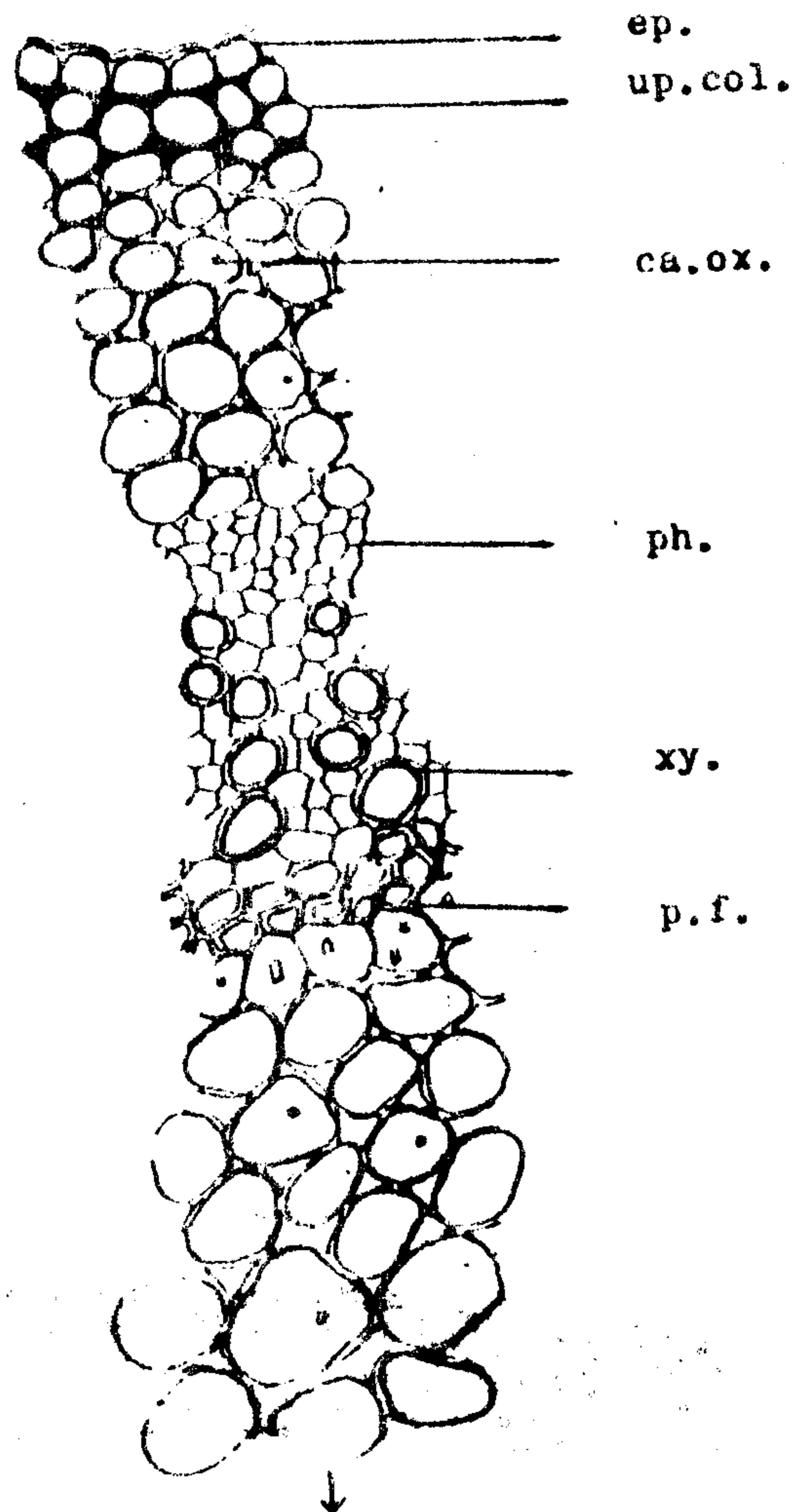
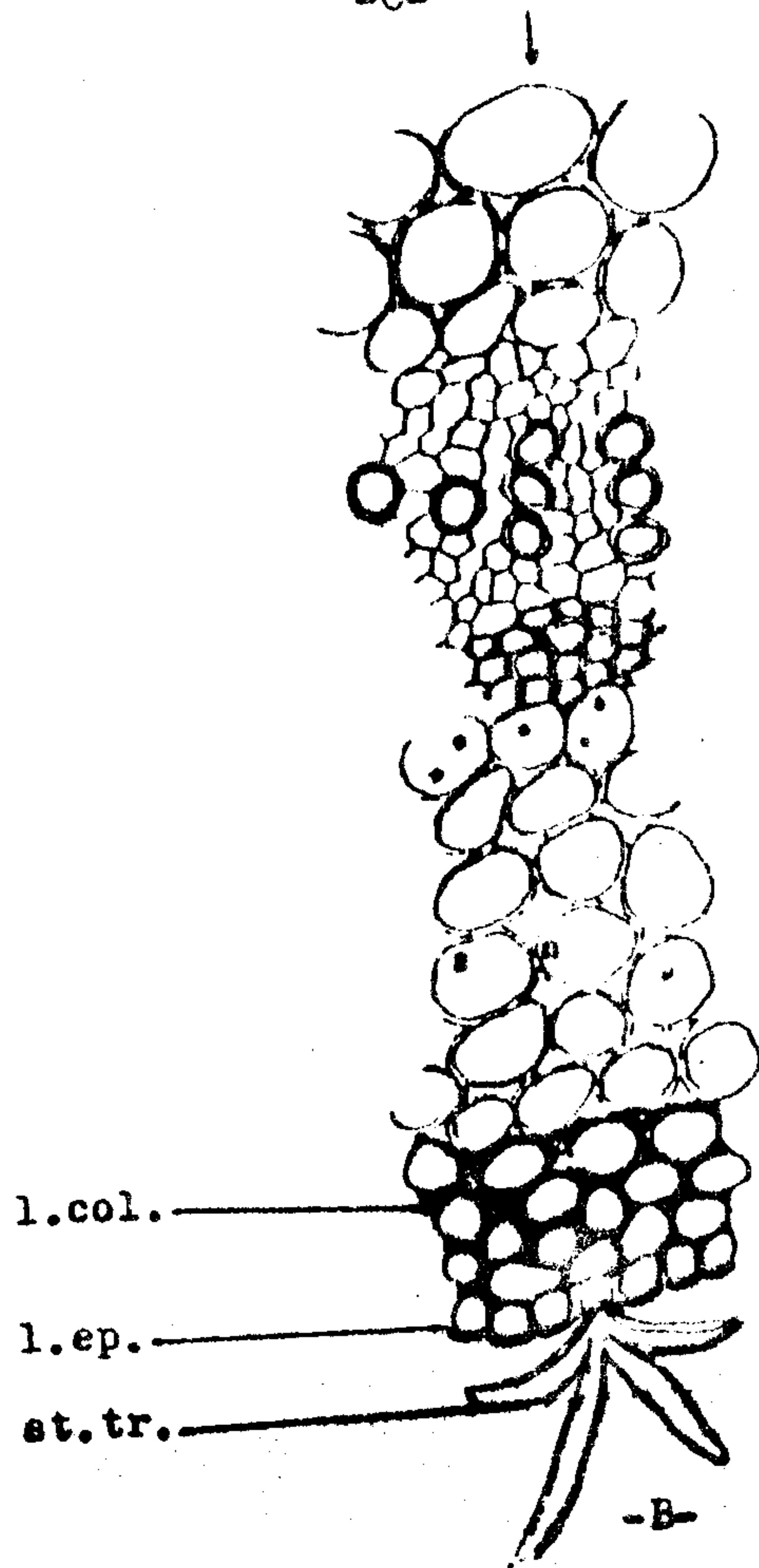
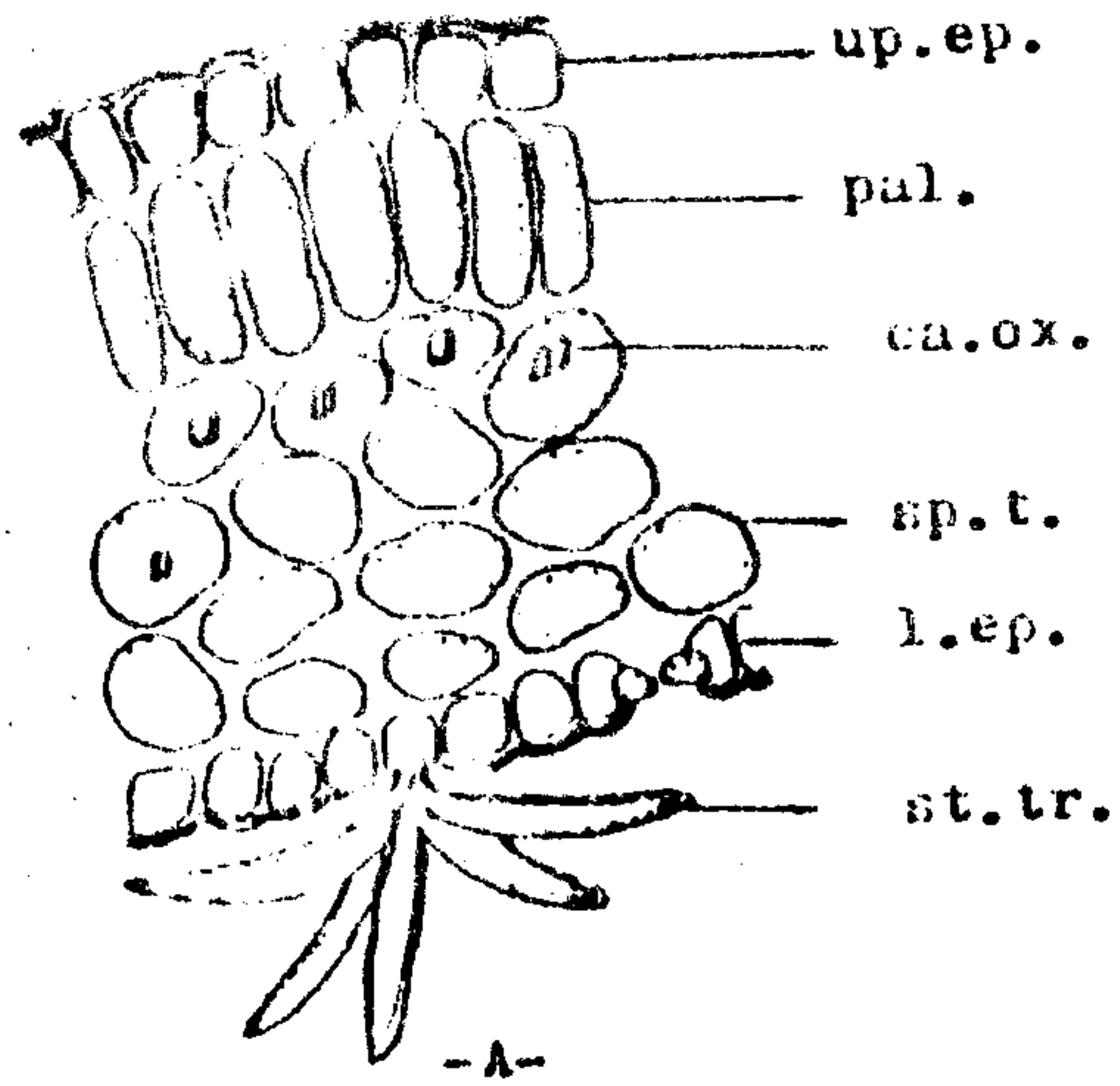
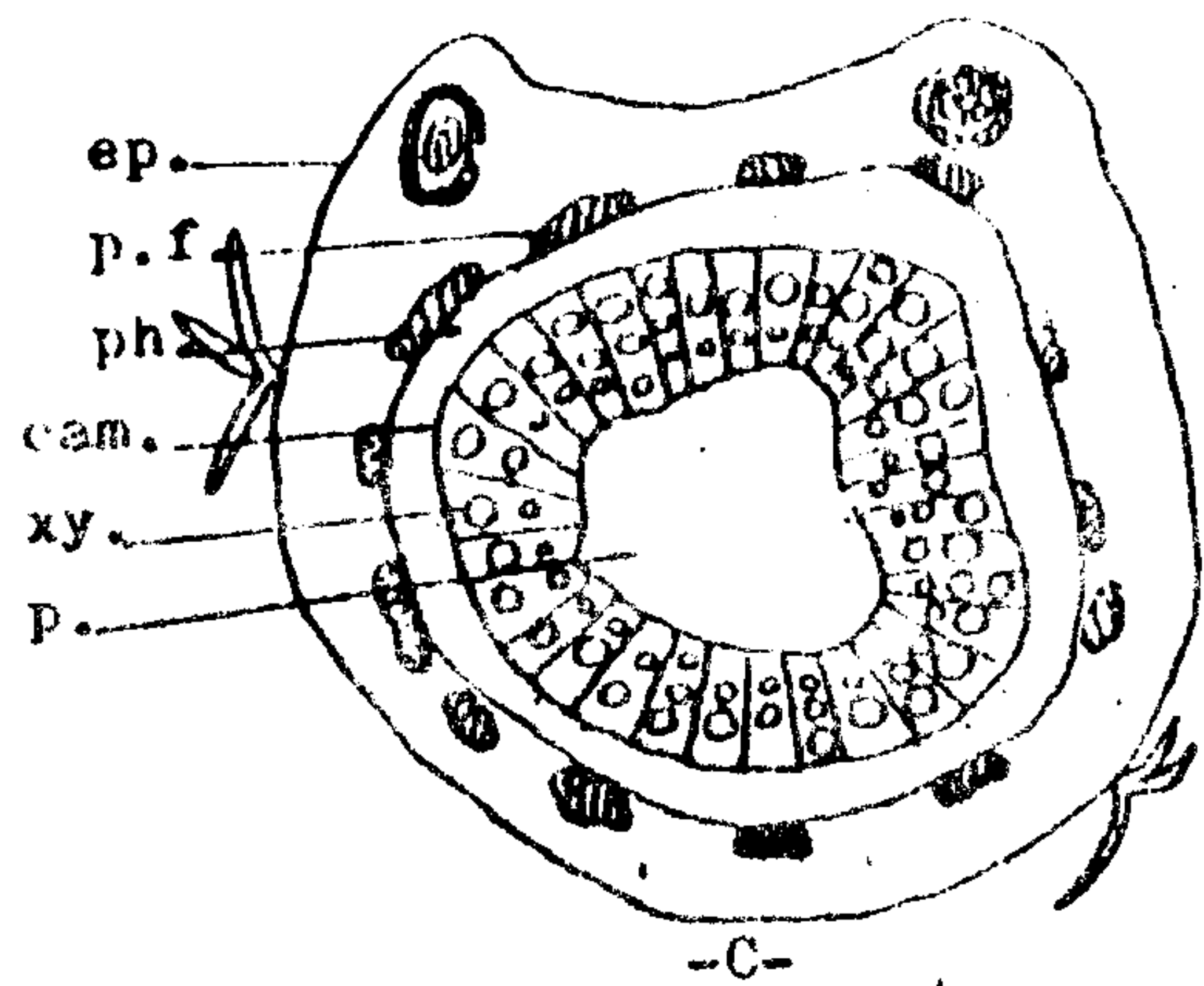


Fig. 4. A- Detailed T.S. of the lamina X 225
 B- Detailed T.S. in the midrib region of the leaf X 225
 C- Diagrammatic T.S. of the rachis X 30
 coll., collenchyma; cr., calcium oxalate; f., fibres; l.ep., lower epidermis; non.tr., nonglandular trichomes; par., parenchyma; p.f., pericyclic fibres; ph., phloem; st., starch grains; u.ep., upper epidermis; w.p., wood parenchyma; xy., xylem.

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REFERENCES

- 1) *Index Kewensis " Flowering Plants"*. The Clarendon Press, Oxford Part V 1040 (1893).
- 2) G. Jones, H.M. Fales and C. Ildman. *Tetrahedron letters*, 397 (1963).
- 3) D. Gross, W. Berg and H.R. Schutts. *Phytochemistry*, 12, 201 (1973).
- 4) Y. Hammouda and M.M. Motawi. *Egypt. Pharm. Bull.* 41, 73 (1959).

دراسة عقاقيرية لنبات التيرماكريزو تريكا (مارت اكس)

الذي ينمو فى مصر

مقبول احمد مقبول - داود ونيس بشاى
كلية الصيدلة - جامعة اسىوط - اسىوط

يشمل هذا البحث المسح الكيماوى الاولى الذى اثبت وجود مسادة
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