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PHARMACOGNOSTICAL STUDY OF AVICENNIA OFFICINALIS L. GROWING IN EGYPT

Part I: Macro and micromorphology of the stems and leaves.

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The macro and micromorphological characters of the stem and leaf of Avicennia officinalis L. 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.

Avicennia officinalis L. known as Avicennia marina (Forssk) Vierh. belongs to the Family Verbenaceae[1]. It is known as Mangrove tree confined to the Red Sea Coasts and adjacent islands. The plant grows on the shore but often invading the sea on muddy flats of shallow water[2]

Root has been used as an aphrodisiac, while the cataplasma of the unripe fruits was used for sores and for healing of the skin lesion of smallpox[3].

The sapwood yields a resin which is used in the Philippines as a local application to snake-bite[4], and in Western Java as a contraceptive. In India as well as in the Philippines, the seed soaked in water was applied as maturative poultice and as a cicatrizing agent in ulcers[5].

In the present work, the macro-as well as micromorphological features of the stems and leaves of Avicennia officinalis L. are illustrated.

Material:

The plant material consisting of overground portion of the plant was collected from the Red Sea Coastal region between El-Quseir and Marsa-Alam in May 1982.

Habitat:

The plant (Fig. 1) trees or shrubs attaining 2-3 meters in height and carrying numerous branches, It bears entire, opposite, coriaceous leaves. The plant showing an aerial root arising above the water surface; gives its flowers during April and May.

A- THE STEM

Macromorphology: (Fig. 2)

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

Micromorphology:

A transverse section in the stem (Fig. 3 A) is circular to slightly irregular in outline, showing hairy epidermis covered with thick smooth cuticle followed by a cortex. The original ring of vascular bundles is bound externally by a continuous ring of sclerenchyma. The phloem is in the form of isolated strands separated by lignified medullary rays. The first ring of bundles is scarcely less than 1 mm, thick. It is followed by parenchyatous tissue and then by a second vascular ring, which arises in an extrafasicular position and is adjoined externally by a sclerenchymatous ring. The first ring of growth is not broader than the original ring of vascular bundles, and its phloem is again differentiated

in the form of groups of cells, separated by strips of woody tissues; the latter which consists of medullary rays, wood fibres and vessels serve to contact the ring of xylem with that of sclerenchyma. This structure is considered as an anomalous structure in this genous[6]. The center of the stem is occupied by wide parenchymatous pith.

The epidermal cells (Fig. 3 B) are square, axially elongated, thin-walled with straight anticlinal walls. They measure 50 - 60 - 90 μ in length and 25 - 30 - 40 μ in width. Glandular trichomes are abundant, being of multicellular uniseriate stalks and unicellular heads. They measure from 120 - 150 - 160 μ in length. Stomata are not observed.

The cortex (Fig. 4) is comparatively wide formed of 2 - 3 outer layers of rounded collenchyma cells with comparatively thickened cellulosie walls followed by parenchymatous cells with wide intercellular spaces. They contain prisms of calcium oxalate and few small rounded starch grains .

The vascular ring is bound externally by a continuos ring of sclerenchymatous tissue. The sclerenchymatous cells are short, lignified with wide lumina measuring from 15 - 20 - 25 μ in diameter.

The phloem is formed of groups of isolated elements with thin cellulosic walls. The phloem elements are isolated by lignified medullary ray cells which constitute bridge-like connections between the xylem and the sclerenchymatous ring.

The cambium consists of 2-3 layers of thin-walled tangentially elongated cells.

The xylem (Fig.4) consists of lignified thick-walled elements, traversed by narrow medullary rays with lignified walls. The vessels are arranged in radial rows. They have spiral, pitted and annular thickening and measure 40 - 50 - 60 μ in diameter. They are accompanied by tracheids, wood fibres and wood parenchyma cells.

The first vascular ring is followed by 2-3 layers of parenchymatous tissue and then by the second vascular ring , which arises in an extrafasicular position and is adjoined externally by a sclerenchymatous ring, composed of 2 - 3 layers of short lignified cells. The pith is comparatively wide consisting of large rounded parenchymatous cells with thick, pitted and lignified walls.

The powder: (Fig. 5)

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

1- Glandular trichomes, with multicellular uniseriate stalk and unicellular head.
2- Fragments of rounded and ovoid thin-walled parenchymatous cells with few starch grains and prisms of calcium oxalate.
3- Fragments of fibres with tapering ends and narrow lumena.
4- Fragments of vessels, pitted, spiral and annular thickening .
5 - Fragments of lignified pitted medullary ray cells.
6- Fragments of sclerenchymatous cells, rounded or oval in shape with lignified and pitted walls.

7- Fragments of tracheids, pitted and lignified.

8- Fragments of parenchymatous cells of pith, pitted and lignified.

B- THE LEAVES

Macromorphology:

The leaves (Fig. 2) are simple; sessile; arranged in opposite decussate manner. They are exstipulate with asymmetric bases. The leaves measure 2.3-5.5 cm. in length and 1-1.5-2 cm. in width. The lamina of the leaf showing different shapes, ovate, ovate lanceolate and cordate with entire margin, apices also different from mucronate, acute and emarginate. The leaves show whitish yellow coloured lower surfaces and dark green upper surfaces. They are leathery in texture and have a faint odour and a bitter taste.

Micromorphology:

A transverse section through the lamina (Fig.6,7) shows an upper and lower epidermises enclosing in between a dorsiventral mesophyll which is replaced in the midrib region by vascular strands.

The epidermis (Fig. 6A and B) consists of one layer of tangentially elongated cells covered with somewhat thick smooth cuticle and having almost straight anticlinal walls. The upper epidermal cells measure from 35-50-60 μ in length and 20-25-30 μ in width. Stomata are not observed, but water pores were found on the upper surface.

The lower epidermis is formed of one layer of cells differing from the upper epidermis in being slightly smaller. Trichomes are present only on the lower surface, which are of glandular types, with uniseriate multicellular stalk and

unicellular heads, covered with smooth cuticle. The upper epidermis is followed by 2-3 layers of parenchymatous hypodermis with 2 layers of palisade cells interrup ed by a mass of collenchyma in the midrib region. The palisade cells have nearly straight anticlinal walls. They measure from 50 - 80 - 90 μ in length and 20 - 30 - 35 μ in diameter. The spongy tissue is formed of more or less rounded to irregular parenchymatous cells with wid intercellular spaces. The spongy tissue as well as the hypodermis contain few starch grains and prismatic crystals of calcium oxalate.

The cortical tissue of the midrib (Fig.8) shows an upper and lower subepidermal collenchymatous massess. The rest of cortical tissue is formed of rounded parenchymatous cells with wide intercellular spaces and contains few starch grains and prismatic crystalls of calcium oxalate . The vascular tissue consist of collateral bundles formed of an upper xylem and lower phloem. They are enclosed between nearly complete ring of sclerenchymatous pericyclic fibres which are lignified with narrow lumena and acute apices. They measure from 20 - 25 - 30 μ in diameter. The xylem is formed of lignified, spiral and pitted vessels. They measure from 20 - 30 - 40 μ in diameter. Tracheides are very few and pitted.

The powder: (Fig. 6 D)

Powdered leaf is dark yellowish green in colour, with characteristic odour and slight bitter taste. It is characterised by:

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1- Fragments of the upper epidermis of lamina showing somewhat polygonal isodiametric cells. Water pores are hardly observed in the powder.

2- Fragments of the lower epidermis with numerous trichomes of the glandular types with multicellular uniseriate stalks and unicellular heads covered with smooth cuticle.

3- Fragments of heterogencous mesophyll showing palisade cells and spongy parenchyma.

4- Fragments of lignified pericyclic fibres with thick walls and narrow lumena.

5- Fragments of spiral and pitted lignified vessels.

6- Fragments of lignified tracheids.

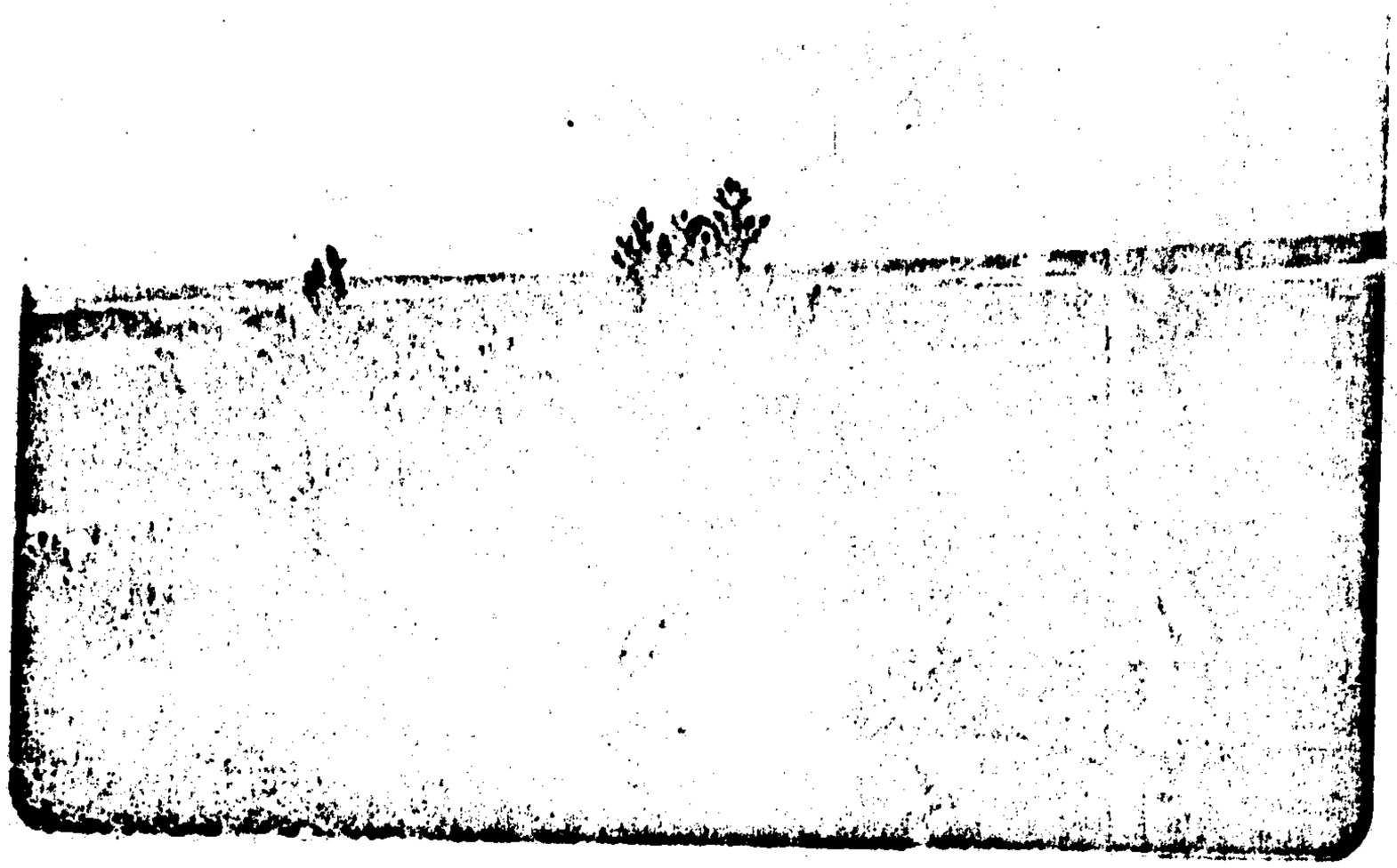

Fig. 1: The photograph of the plant. X 1/30

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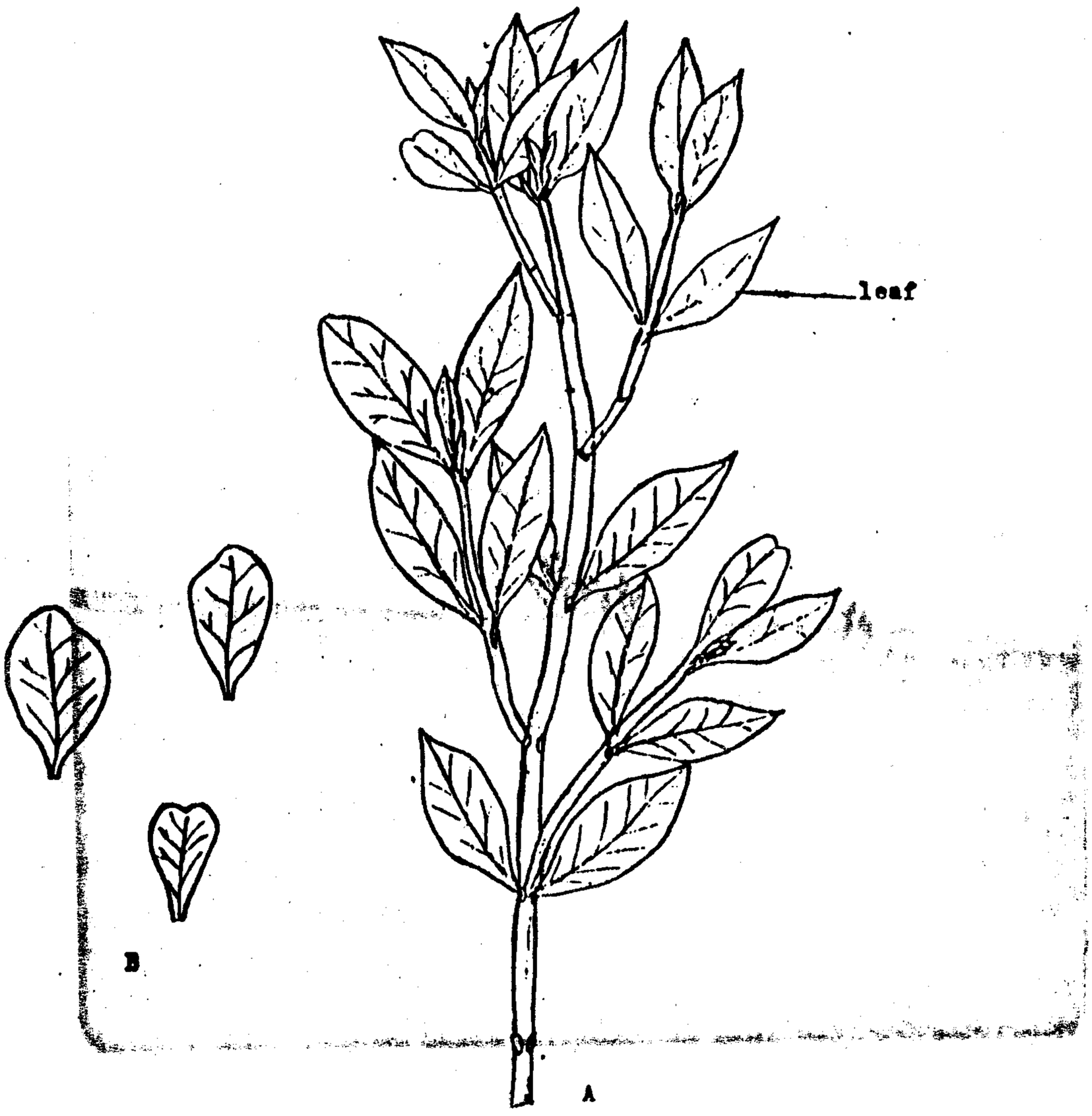

Fig. 2: Sketch of green branch
A- Branch
B- Different forms of the leaf

X 3/4

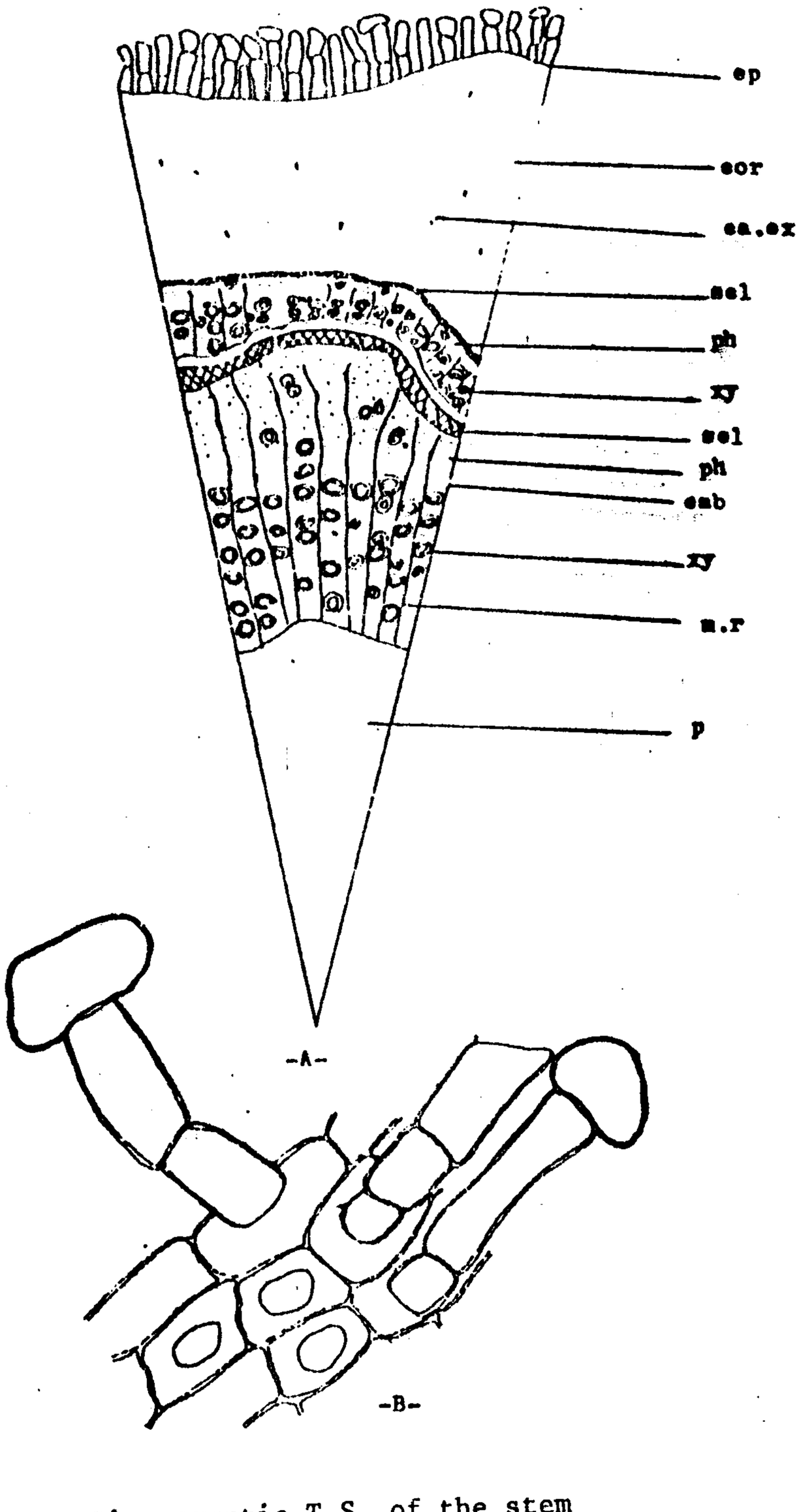

Fig. 3: A- Diagrammatic T.S. of the stem X 15
B- Surface preparation of the stem X 150

ca. ox. calcium oxalate; cab., cambium; cor., cortex; ep., epidermis; m.r., medullary ray; p., pith., phloem;scl., sclerenchyma; xy., xylem.

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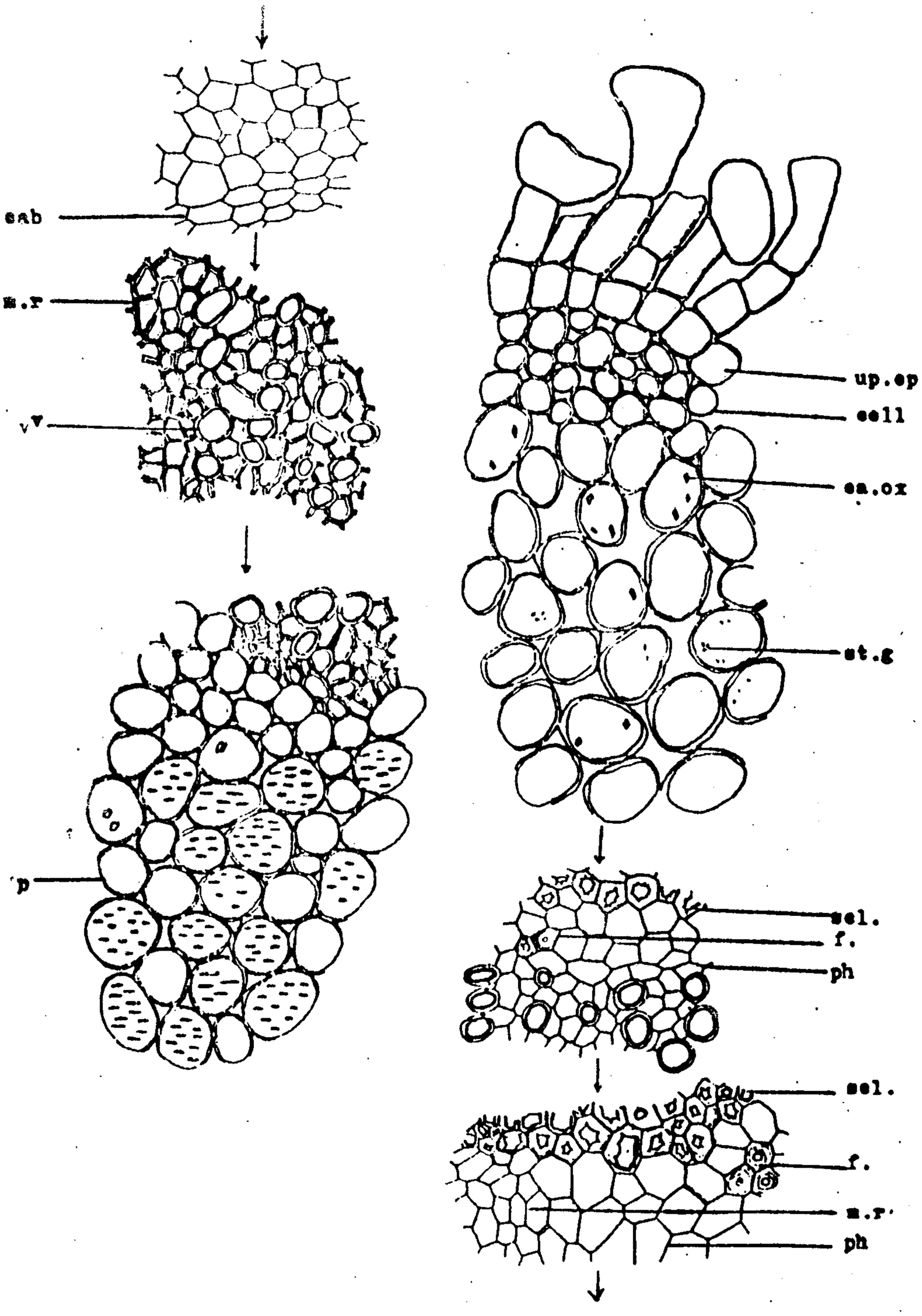

Fig. 4: Detailed T.S. of the stem X 115

ca. ox., calcium oxalate; cab., cambium; coll., collenchyma; f., fibres; m.r., medullary ray; p., pith; ph., phloem; scl., sclereides; up.ep., upper epidermis; v., vessel; xy., xylem; st.g., starch grains.

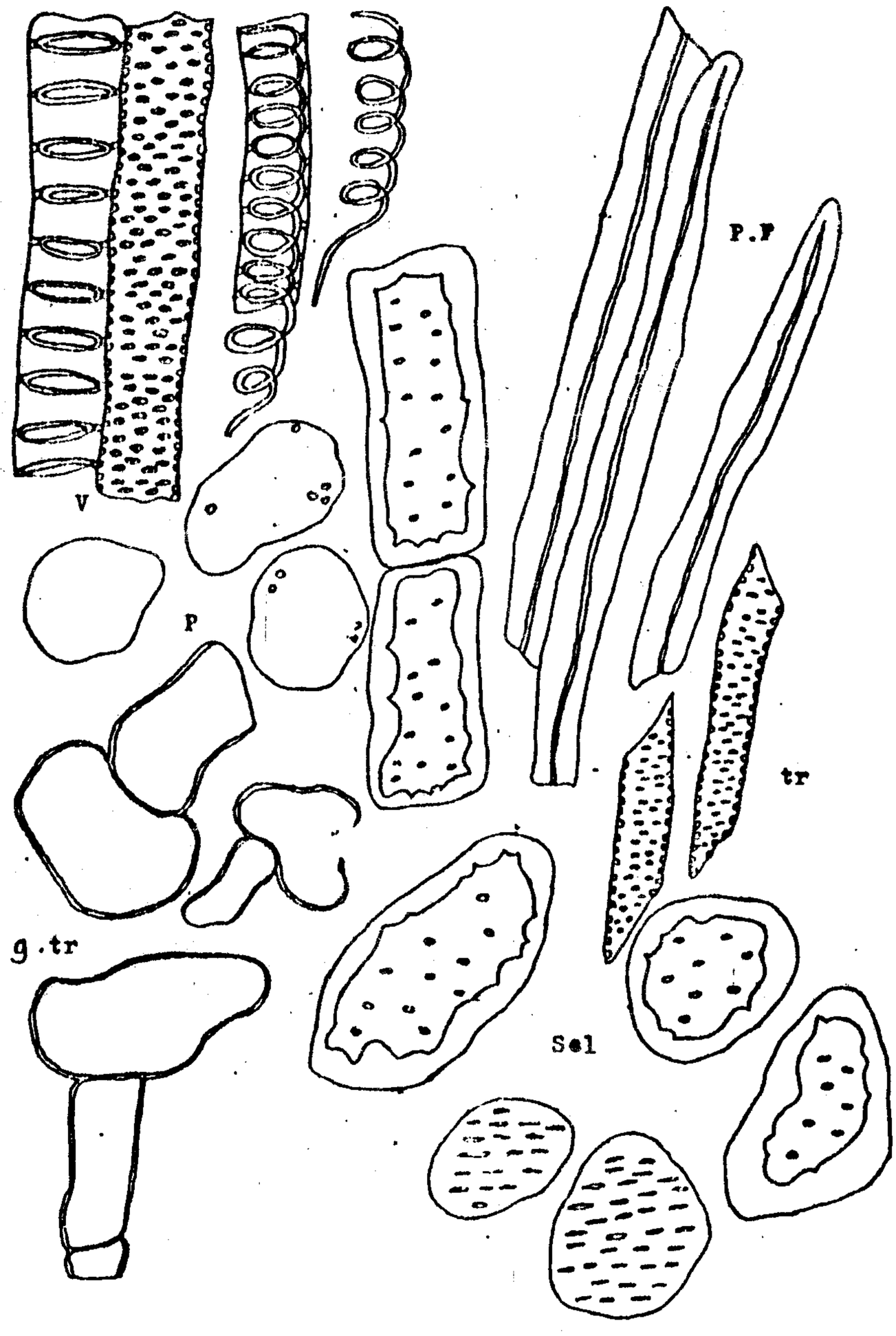

Fig. 5: Isolated elements of the stem X 150

p.f., pericyclic fibre; scl., sclereides; tr.. tracheid; v., vessels.

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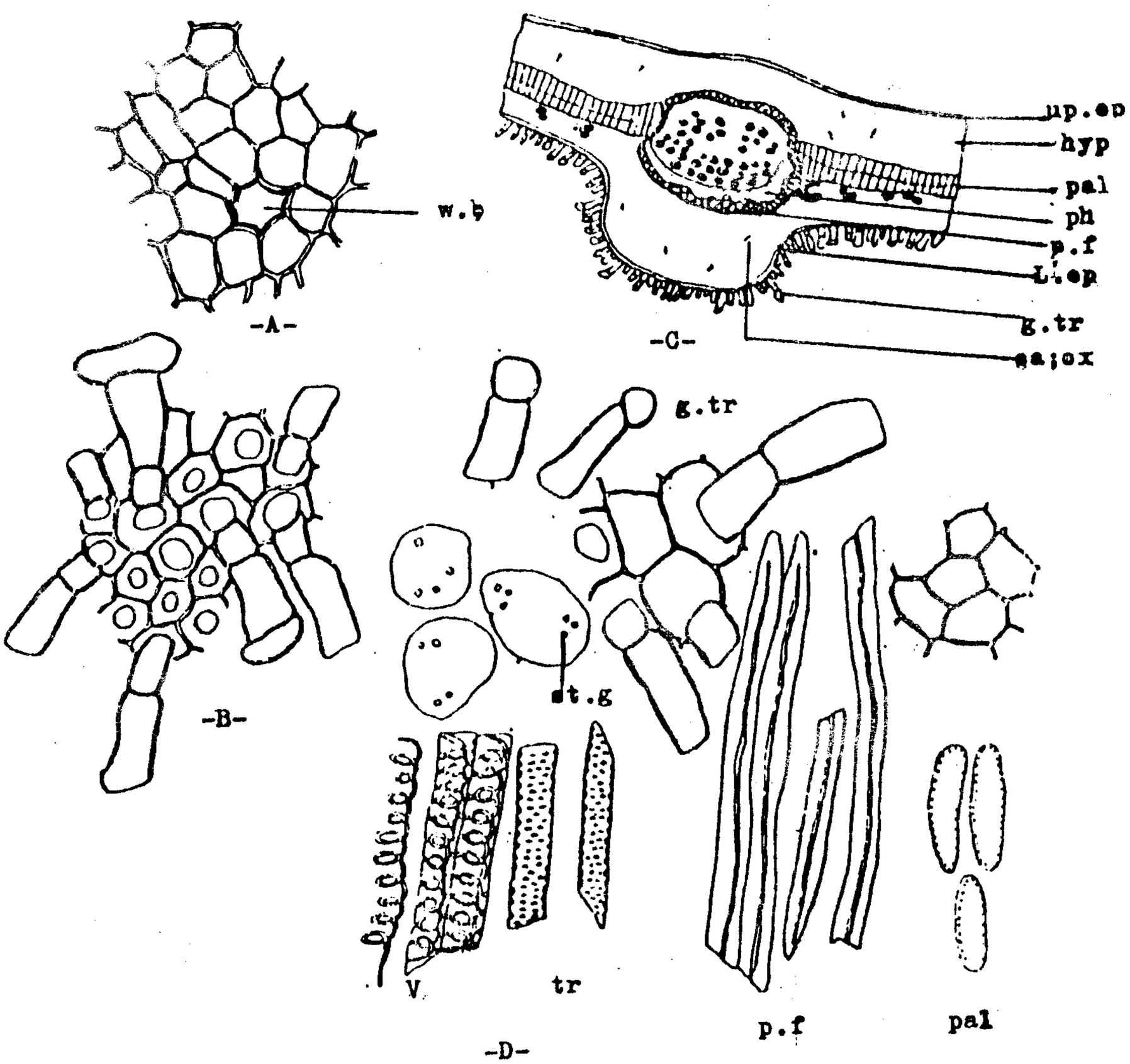

Fig. 6: A- Surface preparation of the upper epidermis X 115
B- Surface preparation of the lower epidermis X 115
C- Diagrammatic T.S. of the leaf X 15
D- Isolated elements of the leaf X 115

ca. ox. calcium oxalate; g. tr., glandular trichomes; hyp., hypoderm; l. ep., lower epidermis; pal., palisade; p.f., pericyclic fibre; ph., phloem; st.g., starch grains; tr., tracheid; up., upper epidermis; v., vessel; w.b., water bores.

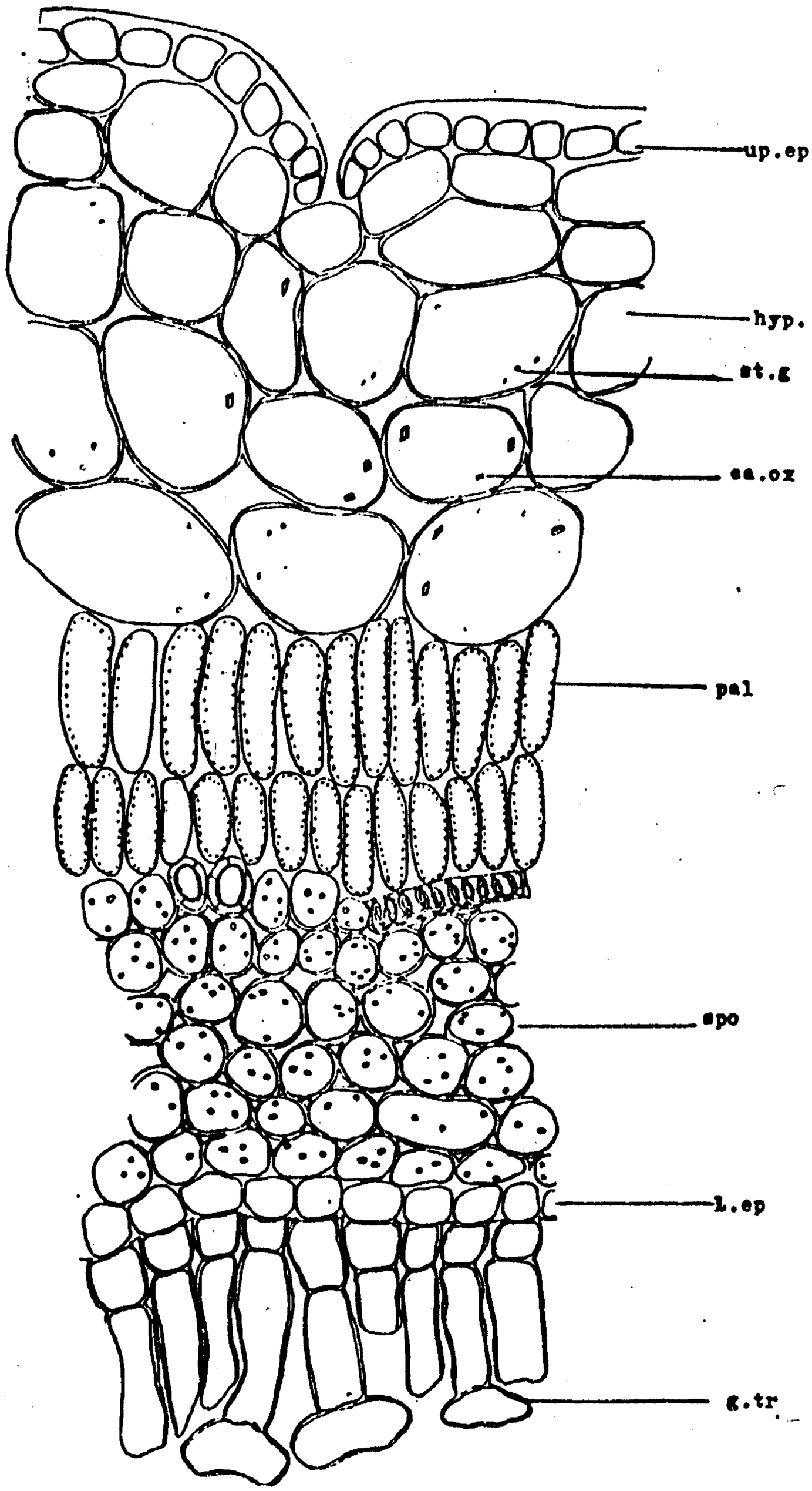

Fig. 7: Detailed T.S. of the lamina X 175

ca. ox., calcium oxalate; g. tr., glandular trichomes; hyp., hypodermis; l.ep., lower epidermis; pal., palisade;spo., spongy tissue; st. g., starch grains; up. ep., upper epidermis.

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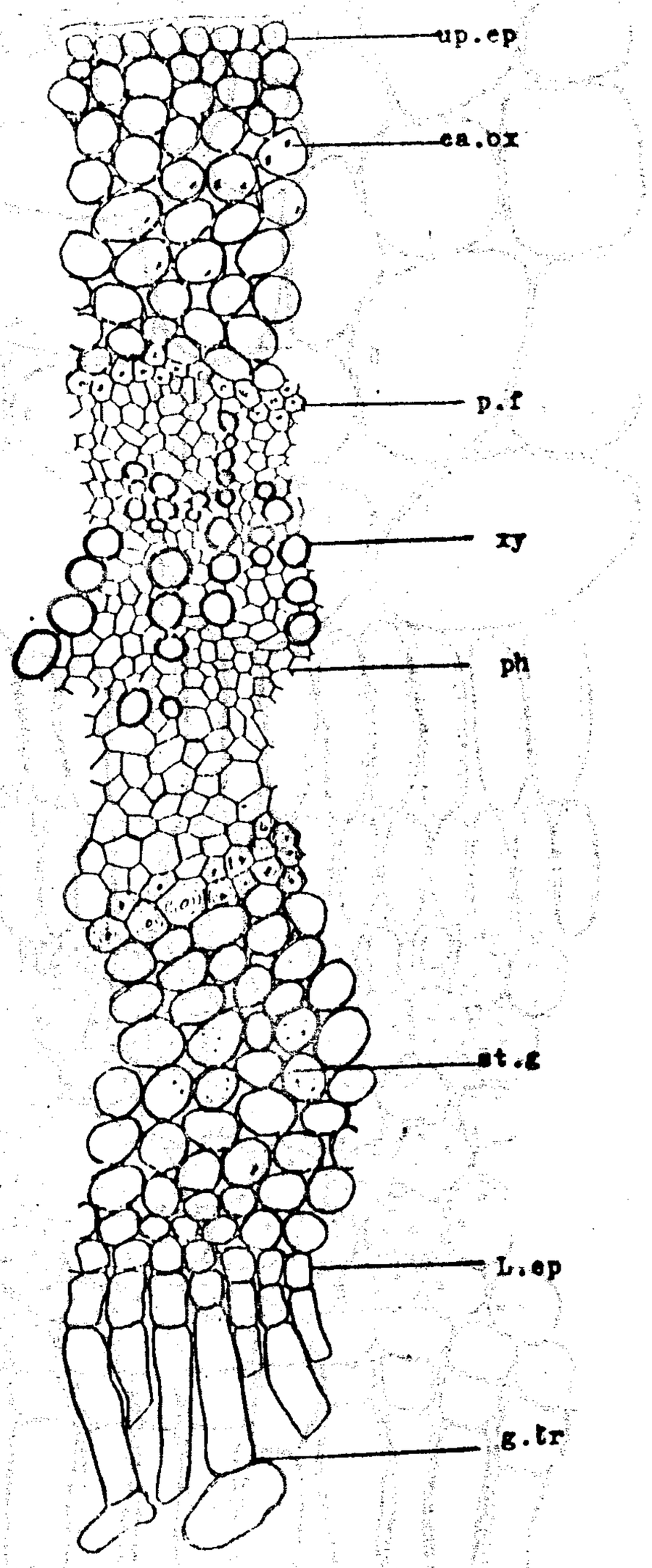

Fig. 8: Detailed T.S of the midrib region × 75

ca. ox., calcium oxalate; g. t., glandular trichomes; p. f., pericyclic fibre; ph., phloem; st. g., starch grains; l. ep., lower epidermis; up. ep., upper epidermis.

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الدراسة العيانية والمجهرية لساق

وورقة نبات الاثيسينيا اوفيسنال(لينيه) المنزرع ي مصر

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