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A PHARMACOGNOSTICAL STUDY OF IRIS GERMANICA L. VAR. ALBA

PART I: A Pharmacognostical Study of the Rhizome, Root and Leaves

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The Macro and micromorphological characters of each of the rhizome, root and leaf were carried out with view of finding out the diagnostic features of each for the purpose of their identification either in the entire or in the powdered form.

Iris germanica L. var. alba belongs to family Iridaceae which includes 60 genera and about 1000 species[1-3]. The family is divided into 11 tribes[4]. Iris germanica L. is widely cultivated as an ornamental plant in U.S.A and is growing wild in West Virginia , it is also indigenous to Central and South Europe[5]. Cohen and Raymond[6] stated that an aqueous extract of Iris germanica L. decreased smooth muscle in vivo, stimulates respiration, and it was devoid of toxicity in mice. The leaves has antiscorbutic activity[7]. The rhizome is used in tooth-pastes, face-powders and perfumes. The roots of powdered Iris were used as hygiene products which were useful as hair and skin protection preparations and for dental and gum treatment[8]. A phytochemical

study of Iris germanica L. revealed the identification and isolation of a large number of isoflavonoid aglycones and glycosides together with some steroids, carbohydrates and fatty acids[9,10].

Material:

Samples of Iris germanica L. were collected from the Experimental Station, Faculty of Agriculture and Faculty of Pharmacy, University of Assiut and were identified by Prof. Dr. Ibrahim Hassan, Head of Horticulture Department, Faculty of Agriculture, Assiut University .

MACROMORPHOLOGY

Iris germanica L. var. alba is a perennial herb with rhizomes and large showy white flowers. Its subterranean portion consists of horizontal or slightly oblique rhizomes. Roots arise from the lower part of the rhizomes. The aerial part is composed of the green broad and long leaves, and a scape carrying an inflorescence mainly of two flowers. The plant varies from 35 to 55 cm in height. The roots (Fig. 1) are adventitious covering the lower flattened surface of the rhizome. The root is cylindrical , fleshy and soft measuring 15-20 cm up to 25 cm long and from 0.3-1 cm in diameter. The surface of the root is longitudinally wrinkeled. The young roots are pale yellow in colour while the old ones are dark brown. The dried root breaks with short fracture exposing a whitish interior. It has an aromatic odour and slightly disagreeable taste.

The underground stem consists of subcylindrical ,flat thick and annulated creeping rhizome (Fig. 1) which is

horizontally branching. It is pale reddish-brown in colour, shows white interior . The rhizome has an aromatic odour and starchy taste and measure 3-5 cm wide and 6-10 cm long. The rhizome bears a tuft of radical leaves. The leaves(Fig. 1) are sessile, linear with flattened blade. They are sward-shaped and have parallel veins, entire margin and acute to acuminate apex. The leaves are equitant and conduplicate. They are olive-green while the sheathing base is white in colour. The leaf measures 15-25 cm long and about 2-3 cm wide at the middle portion. The surface of the lamina is smooth. The dry leaf breaks with short fracture and odour-less but having disagreeable taste.

MICROMORPHOLOGY

The Root:

A transverse section in the root, (Fig. 2 A) is nearly circular in outline, it shows an outer pale brown protective tissue consisting of an epidermis and exodermis, a wide par-enchymatous cortex limited with an endodermis, a central small stele encloses from 9-12 closed vascular bundles of alternated arcs of 1 ry xylem and phloem.

The epidermis (Fig.2B) consists of a single layer of su-brectangular cells with thickened lignified walls and mostly the epidermal cells are ruptured. From the epidermal cells of young root unicellular non glandular unbranched hairs ar-ise. The hairs measure 560-570-580 u long and 40-44-70 u wide

The exodermis is formed of 3-6 rows of brownish, irrigularly arranged cells with lignified wavy walls. It consists of polygonal, subrectangular somewhat tangentially elongated cells measuring 100-120-140 u wide, 40-60-80 u height and 120-160-240 u long. The cortex is very wide and comprises a broad region of isodiametric, rounded to polygonal thin-walled parenchyma with wide intercellular spaces. The endodermis

consists of a single layer of square to subrectangular cells with thickened, lignified radial and transverse walls with passage cells lie opposite the protoxylem.The cells measure 60-80-100 u wide high and 200-220-240 u long. The pericycle marks the outermost one to two rows of the stele, it consists of cellulosic, thin - walled parenchyma, while the pericyclic cells adjacent to the lry xylem are changed into lignified fibres with thick walls, narrow lumen and measuring from 28-36-44 u wide and 400-440-480 u long The phloem is represented by shining small oval areas consisting of thin walled narrow elements.

The xylem is polyarch, composed of radial groups, the protoxylem towards the periphery of the stele. It comprises lignified vessels with mainly pitted, reticulate or rarely spiral thickening and measuring 60-80-200 u in diameter. Tracheids having lignified , pitted walls with bordered pits and wide lumina with pointed or blunt ends are observed and measuring 270-280-320 u long and 32-40-48 u wide. Fibrous tracheids are also present with pitted lignified walls measuring 480-500-520 u long and 28-34-40 u wide. The central parenchyma is formed of polygonal, isodiametric cells with lignified thickened straight anticlinal walls. In surface view the cells are tangentially elongated with thick pitted walls and wide lumen and measuring 44-50-60 u wide and 80-120-160 u long.

The powdered root (Fig. 3) is light to dark brown in colour with an aromatic odour and disagreeable taste. It is characterised by the presence of :-

1- Fragments of brown polygonal subrectangular lignified cells of epidermis.
2- Fragments of exodermis usually irregular cells with brown lignified walls.
3- Fragments of thin-walled parenchymatous cells from the cortex.
4- Fragments of lignified vessels with spiral, reticulate and pitted thickenings .
5- Fragments of subrectangular parenchyma with lignified pitted walls from the ground tissue of the stele.
6- Fragments of pericyclic fibres, lignified with narrow lumina and pointed ends.
7- Fragments of the endodermis, tangentially elongated cells with very thick stratified walls and narrow lumen.

The Rhizome:

A transverse section in the rhizome(Fig. 4 A) is subcircular to ovoid with irregular dark outline, it shows an outer cork enclosing a broad starchy ground tissue. Numerous small closed collateral vascular bundles are scattered throughout the ground tissue and traverse the rhizome in different directions.

The cork consists of 10 to 15 layers of brownish lignified tabular cells appearing in surface view polygonal with straight anticlinal walls and the cells measure 48-56 -68 u high, 140-160-200 u wide and 120-200-280 u long.The first two or three layers of the ground tissue are of rounded to oval collenchyma cells.

The parenchyma of the ground tissue is rounded to oval having thick cellulosic walls with small intercellular

spaces. The majority of these cells contain starch granules and styloids of calcium oxalate. The starch granules (Fig. 4 E) are simple or compound of two to four components. Simple granules are round to ovoid, sac-shaped or barrel-shaped, somewhat irregular in out-line. The compound granules are subcircular, polygonal or planoconvex in shape. They measure 24-40-80 u in diameter. The hilum is hardly distinct. The majority of the granules show parallel striations, Styloids of calcium oxalate measure 120-200-320 u long and 24-32-40 u wide (Fig. 4 F). The vascular bundles (Fig. 4 B) are closed collateral, each bundle has a wide phloem consisting of a well marked sieve tubes and partially surrounded by a nearly complete or brocken ring of about 25-50 lignified vessels. The vessels (Fig. 4D) have pitted, reticulate and rarely spiral thickening and measure from 28-48-80 u in diameter. Large lignified fibres are also observed with wide lumen and blunt ends. They measure from 600-700-800 u long and 40-60-80 u wide.

The powdered rhizome (Fig. 4 C, D) is dull brown in colour with characteristic aromatic odour and starchy taste , Microscopically it is characterised by:

1- Fragments of brownish polygonal lignified cork cells with straight anticlinal walls.
2- Numerous fragments of thin-walled rounded or oval parenchyma cells with small intercellular spaces and containing starch granules and styloids of calcium oxalate.
3- Numerous starch grains, either free or enclosed in the parenchyma, being variable in shape, with hardly distinct hilum and many granules show parallel striations.
4- Fragments of reticulate, pitted and spiral vessels.
5- Large lignified fibres with wide lumina and blunt tips.

The Leaf:

A transverse section in the blade of the leaf (Fig. 5 A) appears flat with regular outline. It shows an upper and lower epidermises enclosing in between the mesophyll. The vascular system is formed of closed collateral vascular bundles embedded in the mesophyll.

The outer epidermis (Fig. 6 C) is formed of one layer of square to subrectangular cells, in surface view the cells are polygonal axially elongated with straight walls and measuring 520-600-640 u long, 80-100-110 u wide and 90-100-110 u high. The epidermis is covered with thick smooth cuticle. Stomata are of anomocytic type being oval to rounded in shape and surrounded by 4 epidermal cells and measuring 80-100-140 u in diameter. The inner epidermis is formed of one layer of subrectangular cells. In surface view (Fig. 6 D) the cells are polygonal, axially elongated with straight walls and measure 700-800-880 u long 140-200-240 u wide and 64-80-120 u high. The mesophyll consists of a single band of subepidermal collenchyma abutting on the outer epidermis and formed of 2-5 rows of nearly rounded shiny small cells and several rows of large parenchyma with wide intercellular spaces containing styloids of calcium oxalate measuring 120-200-300 u long& 16-25-32 u wide. Under the inner epidermis the cells increase mucn in size. The vascular system (Fig. 5 B) is represented by several closed vascular bundles. each one is composed of an arc of lignified pericyclic fibres towards the outer epidermis, phloem and xylem. The pericyclic fibres(Fig. 5 C) are lignified with pitted walls and somewhat wide lumina measuring 1120-1160-1200 u long and 36-40-48 u wide at the middle. The xylem is formed of radial groups of about 10-20 lignified vessels towards the inner epidermis. The vessels have

reticulate, annular or rarely pitted thickening and measuring 30-60-80 u in diameter. The phloem is well marked and represented by a narrow radial batch between the xylem and the pericyclic fibres and consisting of thin-walled shiny sieve tubes and companion cells.

The Sheathing Base:

A transverse section in the sheathing base(Fig. 7 A)of the leaf appears different from that of the blade in some respects:

- The epidermal cells of the outer epidermis (Fig. 7C) is nearly isodiametric and measuring 40-50-60 u wide 40-55-70 u high and 380-420-440 u long. Stomata of anomocytic type are present and measuring 40-50-60 u in diameter.
- The cells of the inner epidermis (Fig. 7 D) are nearly isodiametric with beaded walls, measuring 140-160-180 u wide, 120-132-148 u high and 240-480-520 u long.
- The parenchyma cells of the mesophyll surrounding the vascular bundles are filled with starch grains(Fig. 5 D) which are mainly simple and rarely compound of 2-3 components. The simple granules are mostly rounded and the components are oval or polygonal with rounded angles measuring 4-8-12 u in diameter. The hilum is hardly distinct.
- No collenchyma under the epidermal cells.

Powdered Leaf (Fig. 5C, D & 6 B,C,S, and 7 C,D). The dried powder of the leaf is green in colour with slight odour and disagreeable taste. It is characterised microscopically by the following:

1- Fragments of the outer epidermis with straight anticlinal walls, showing anomocytic stomata and smooth

thick cuticle.

2- Fragments of the inner epidermis with polygonal cells having straight anticlinal walls and covered with smooth thick cuticle and showing no stomata.

3- Fragments of the mesophyll consisting of rounded cellulosic thin walled parenchyma and rounded to oval collenchymatous cells containing styloids of calcium oxalate.

4- Fragments of vascular tissue consisting of lignified reticulate pitted and annular vessels and soft cellulosic sieve tubes.

5- Fragments of lignified fibres with pitted walls and wide lumina.

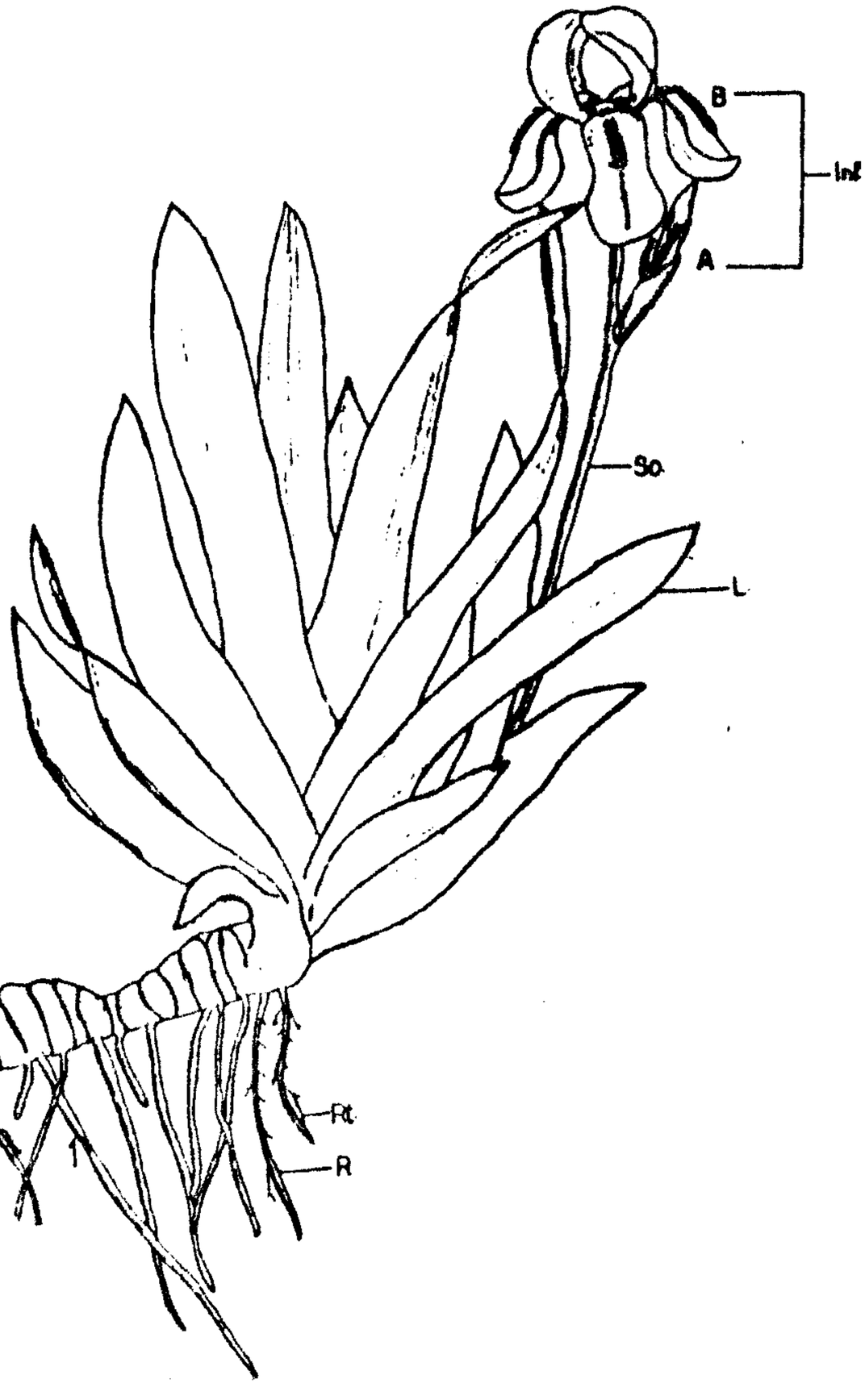

Fig. 1: Sketch of Iris germanica L.
Var. alba X 1/3
A- Unexpanded flower X 1/3
B- Expanded flower X 1/3

Inf. inflorescence; L., leaf; R., root; Rh., rhizome; Rt., rootlet; Sc., Scape.

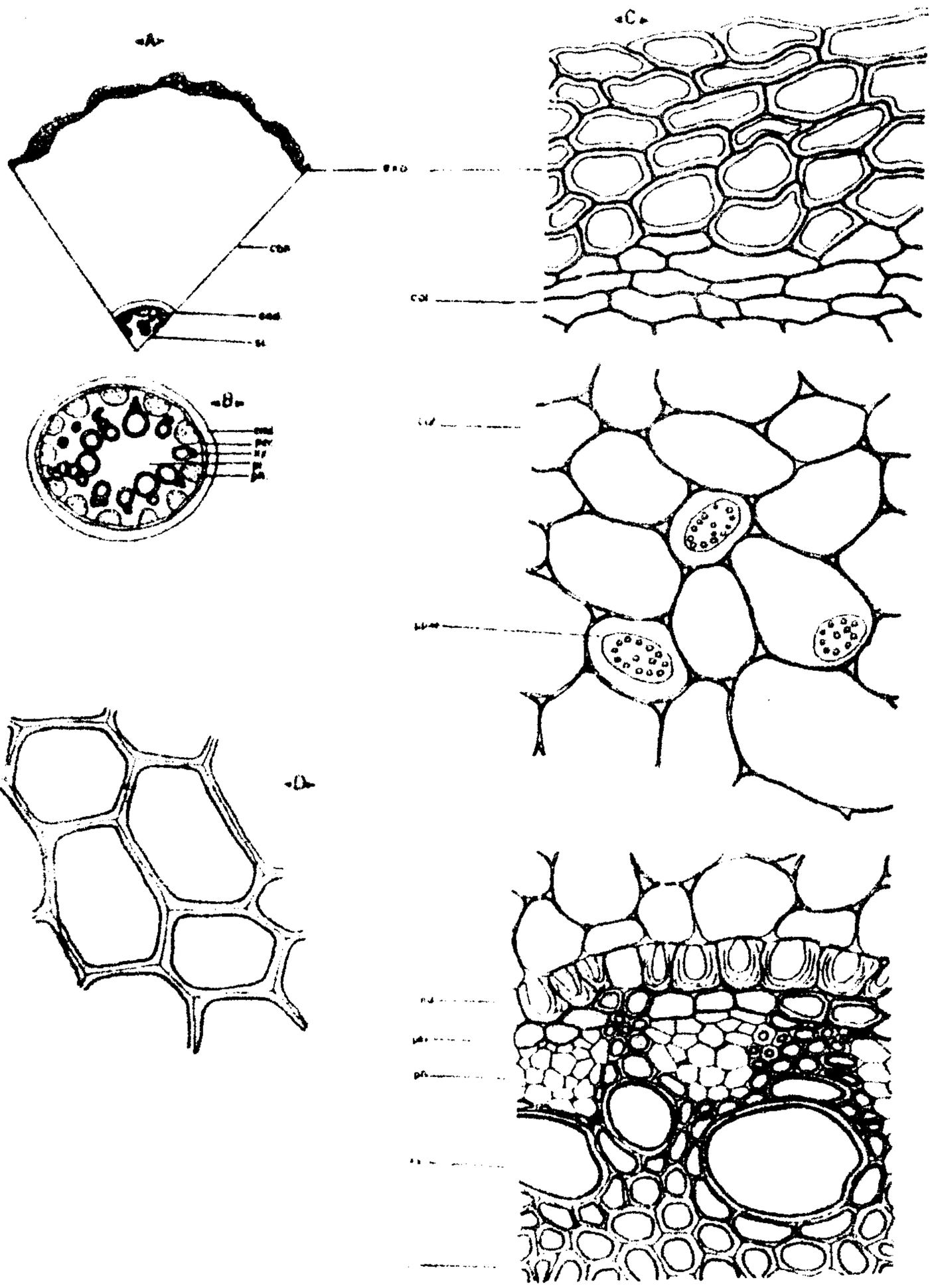

Fig. 2: The Root

A- Diagrammatic T.S. in the root. X 30
B- Diagrammatic T.S. in the stele. X 60
C- Detailed T.S. in the root. X 125
D- Surface preparation of the root X 125

col., collapsed layer; cor., cortex; end., endodermis; exo., exodermis; per., pericycle; ph., phloem;pi., pith; p. par., pitted parenchyma; st., stele; xy., xylem.

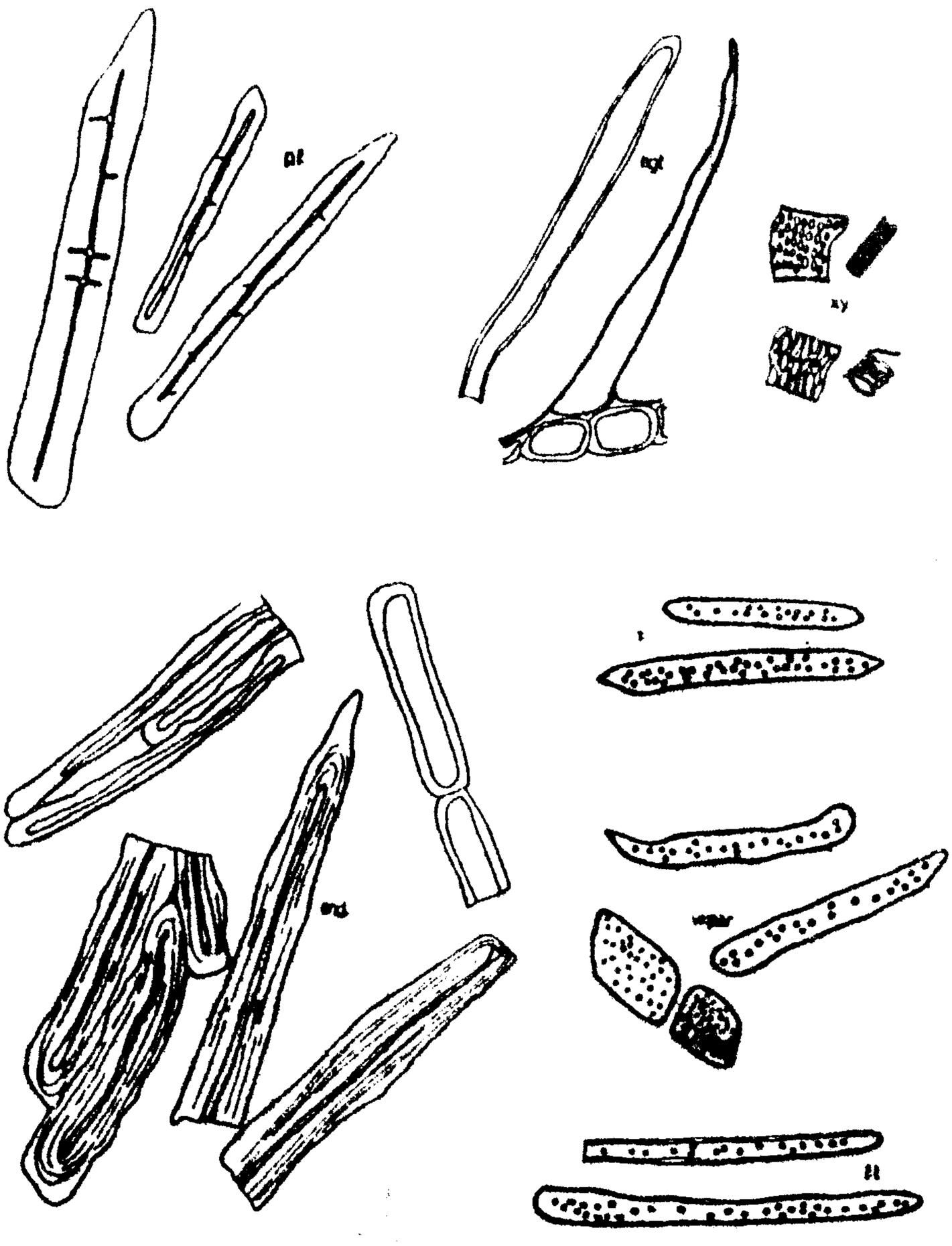

Fig. 3: Isolated elements of the root X 125

end., endodermis; f.t., fibrous tracheids; n.g.t., non glandular hairs; p.f., pericyclic fibres; t., tracheids; w.p., wood parenchyma; x., xylem vessels.

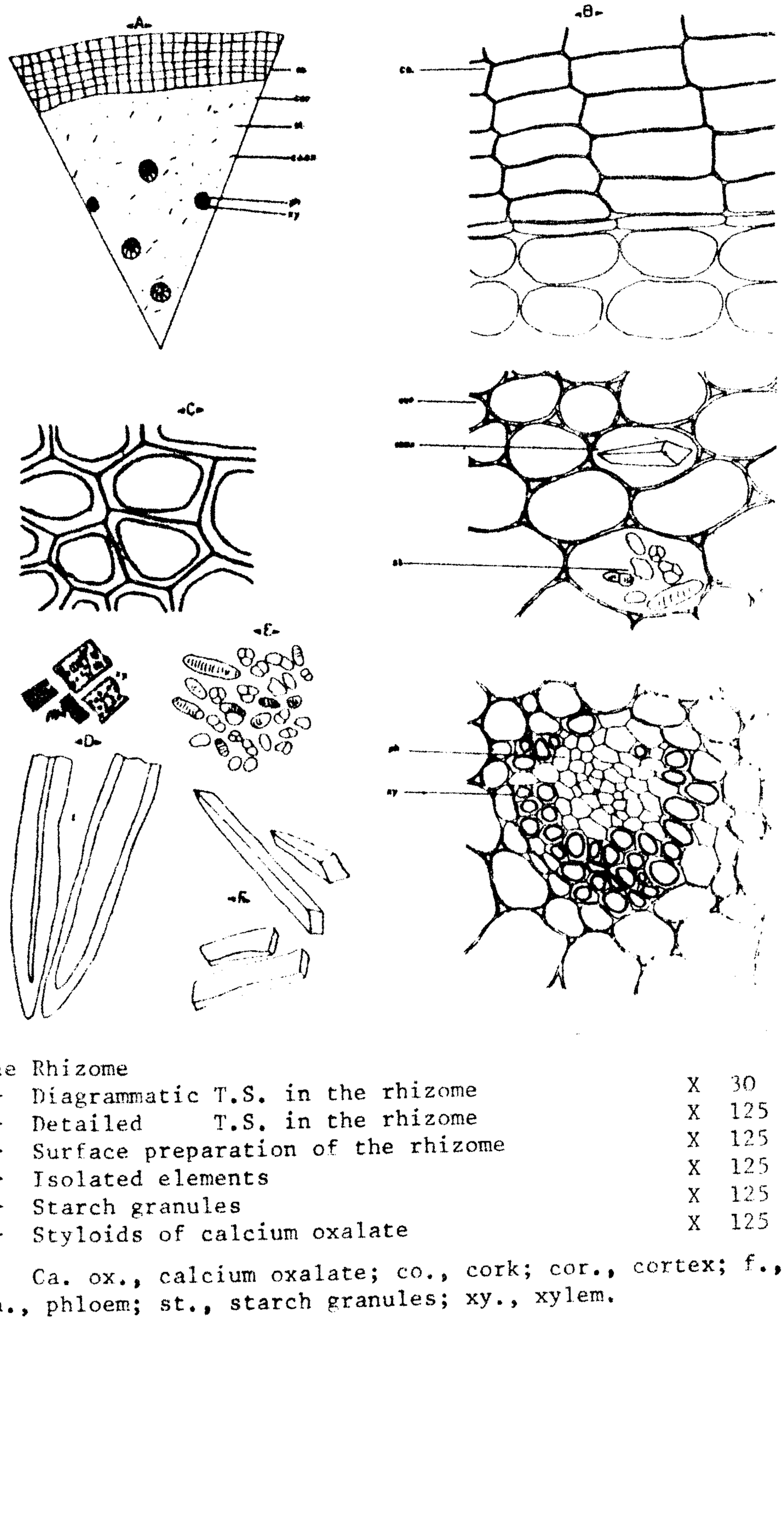

Fig. 4: The Rhizome
A- Diagrammatic T.S. in the rhizome X 30
B- Detailed T.S. in the rhizome X 125
C- Surface preparation of the rhizome X 125
D- Isolated elements X 125
E- Starch granules X 125
F- Styloids of calcium oxalate X 125

Ca. ox., calcium oxalate; co., cork; cor., cortex; f., fibres; ph., phloem; st., starch granules; xy., xylem.

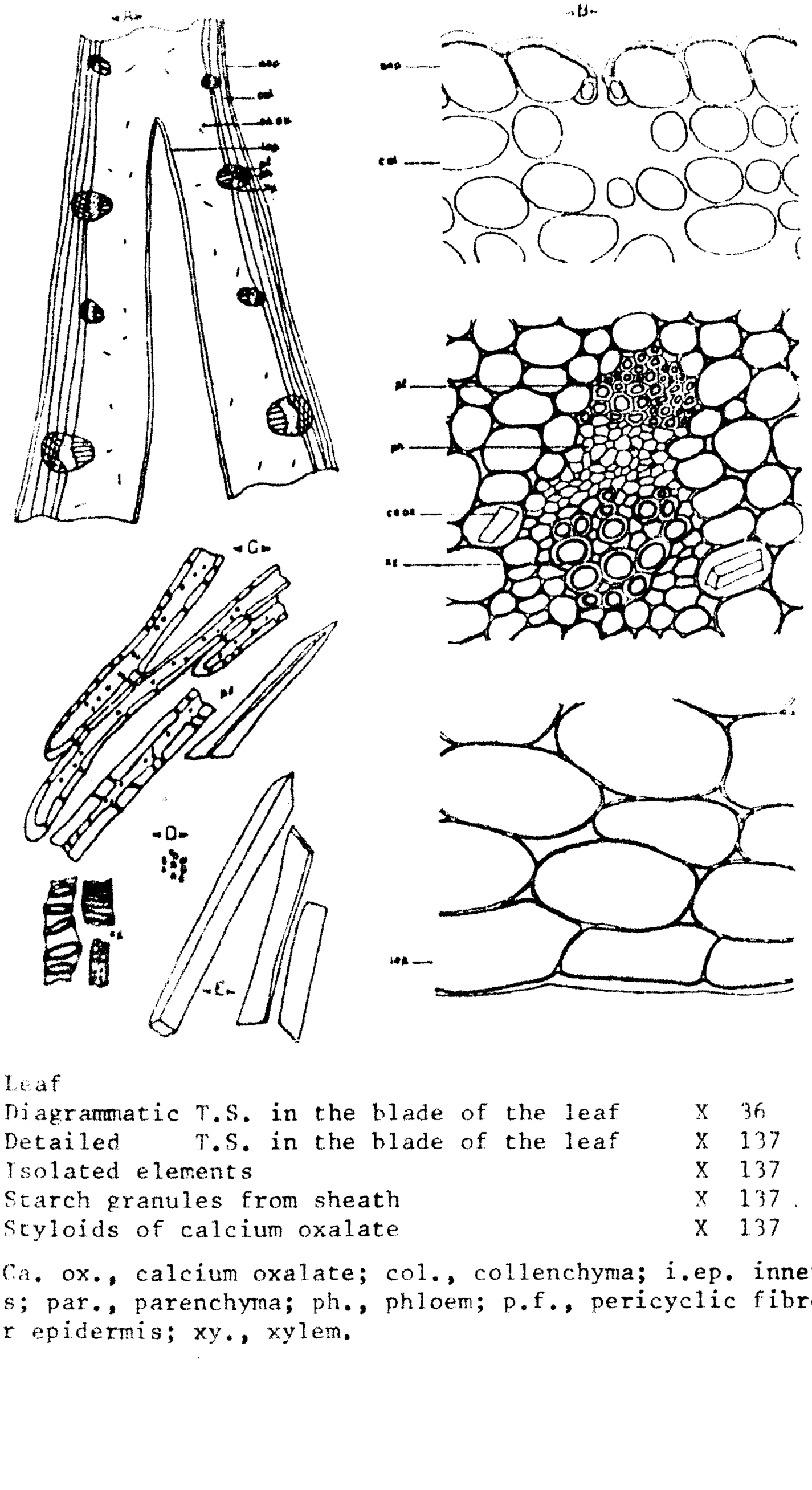

Fig. 5: The Leaf

A-	Diagrammatic T.S. in the blade of the leaf	X 36
B-	Detailed T.S. in the blade of the leaf	X 137
C-	Isolated elements	X 137
D-	Starch granules from sheath	X 137
E-	Styloids of calcium oxalate	X 137

Ca. ox., calcium oxalate; col., collenchyma; i.ep. inner epidermis; par., parenchyma; ph., phloem; p.f., pericyclic fibres; o. ep., outer epidermis; xy., xylem.

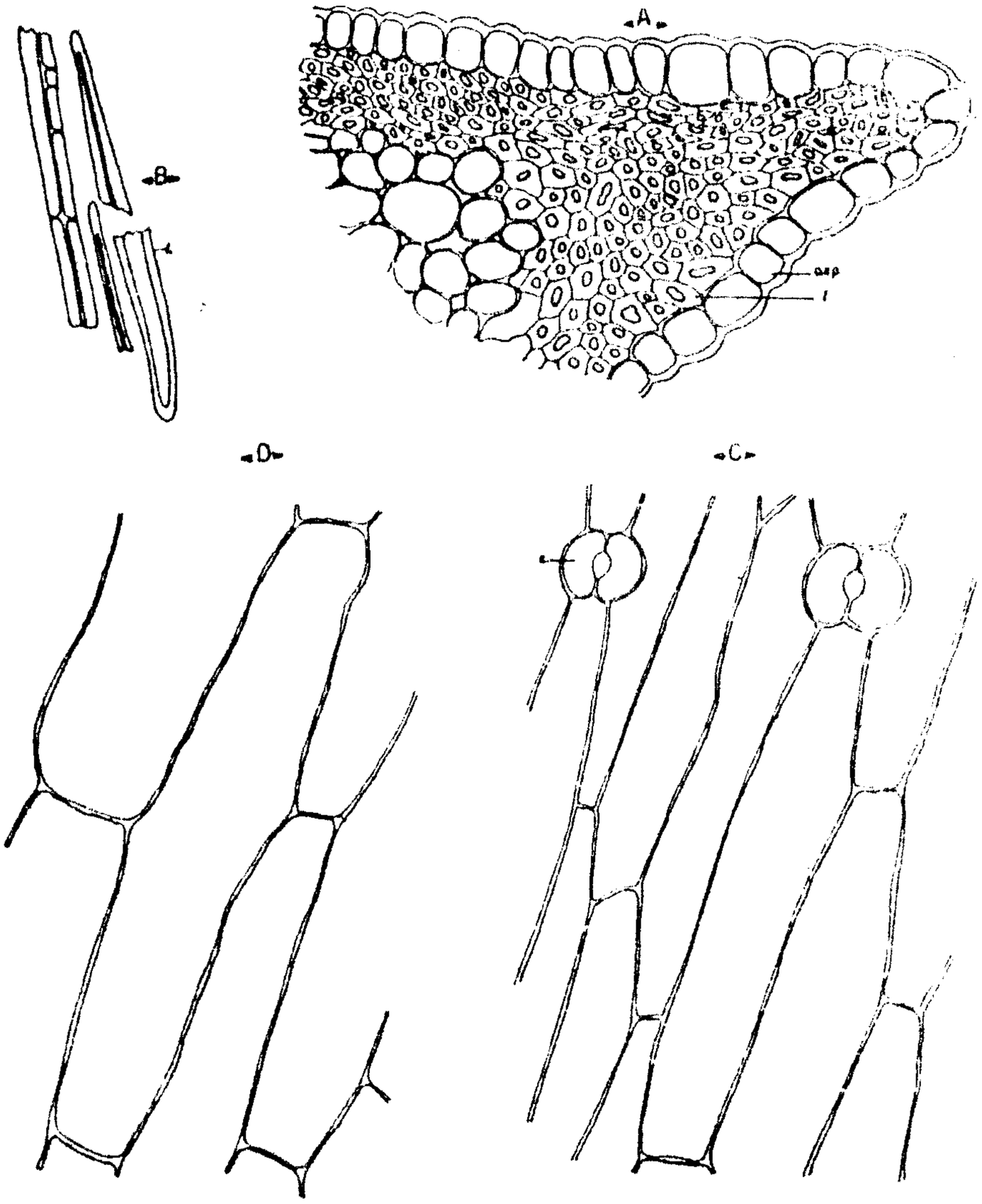

Fig. 6: The Leaf.

A-	Detailed sector in the corner of the leaf	X 137
B-	Isolated elements of the corner of the leaf	X 137
C-	Outer epidermis	X 137
D-	Inner epidermis	X 137

f., fibres; o.ep., outer epidermis; s., stoma.

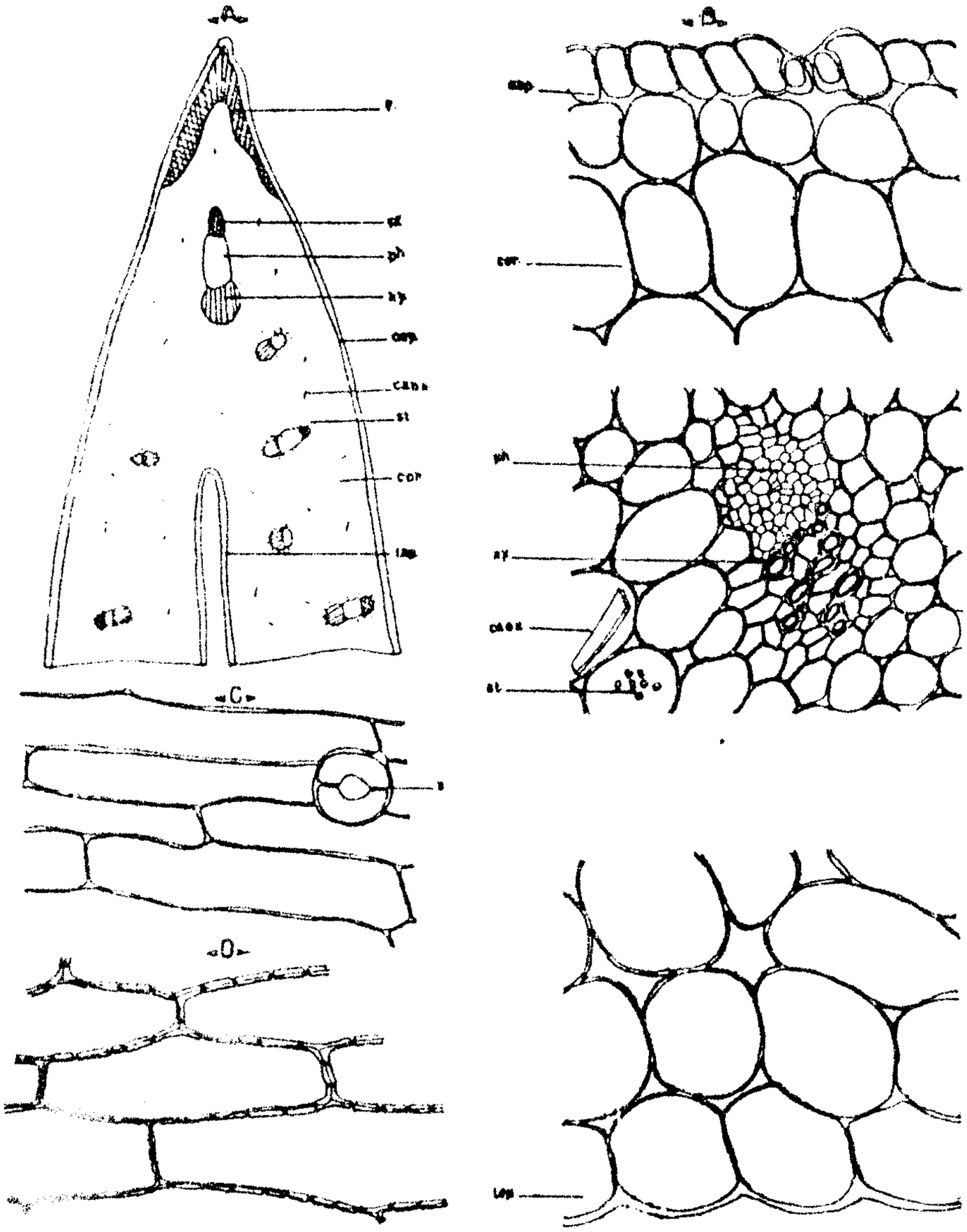

Fig. 7: The Sheath of the leaf

A- Diagrammatic T.S. in the sheath of the leaf X 36
B- Detailed T.S. in the sheath of the leaf X 137
C- Outer epidermis X 137
D- Inner epidermis X 137

ca., ox., calcium oxalate; cor., cortex; i. ep., inner epidermis; ph., phloem; p.f., pericyclic fibres; o. ep. outer epidermis; s., stomata; st., starch grains xy., xylem.

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دراسة عقاقيرية لنبات الايرس الالمانى
ذو الزهرة البيضاء

الجزء الاول : دراسة الريزومة والجذر والاوراق

نصر أحمدمحمد العمرى - أحمدمحمد المغازى - أحمدعبد الرحمن على
فاتن مصطفى درويش
قسم العقاقير - كلية الصيدلة - جامعة أسيوط

تم فى هذا البحث دراسة الصفات العيانية والميكروسكوبية للريزومات والجذر والاوراق فى حالتهم الكاملة وكذلك على هيئة مسحوق وتوضيح الصفات التى يمكن بها التعرف على كل منهم.

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