

MACRO- AND MICROMORPHOLOGY OF THE STEMS AND LEAVES OF *ASTERISCUS GRAVEOLENS*

A.A. Attia and S.A. Youssef

Pharmacognosy Department, Faculty of Pharmacy, Assiut University, Assiut, Egypt

ABSTRACT: *The macro and micromorphology of the stems and leaves of Asteriscus graveolens, are presented aiming for their identification both in entire and powdered forms.*

INTRODUCTION

Asteriscus graveolens L. (= *Oclontospermum graveolens* Sch, Bip) (F.compositae, tribe Inuleae, Subtribe Inulinae) is a common perennial herb known in Arabic as "Beheyma"¹.

Current literature revealed the presence of flavonoids², and humulene derivatives³.

Tracing the current literature nothing has been done concerning the macro- and micromorphology of the plant.

In the present study, the macro- and micromorphological investigation of the stems and leaves were performed in order to identify each organ in the entire and powdered forms.

Material:

The fresh, stems and leaves of *Asteriscus graveolens* were collected near Mamer Metla, Sinai desert and in April (1992) identified by Prof. Dr. A.Fayed, Professor of Plant Taxonomy, Department of Botany, Faculty of Science, Assiut University. The separated parts were preserved in alcohol 70% containing 5% glycerin. The powder material was obtained from air-dried plants.

MACROMORPHOLOGY

Habitat:

Asteriscus graveolens (Fig. 1) is a perennial herb with branches stem, 20-40 cm in height. The plant shows dentate or divided leaves, flower heads bright yellow ray florets ligulate, 3 toothed; heads large, several, terminal and in

the forks of the branches. Disk florets are actinomorphic, sessile and hermaphrodites.

1-The Stem (Fig. 1)

It is erect, branched and hairy. It measures 20-40 cm in height and 0.5-1 cm in diameter. Externally, it is yellowish-brown in color with faint odor and characteristic taste.

2-The Leaf (Fig. 1)

The leaf is sessile alternate, simple dentate or divided and with more or less acute to acuminate apex about 2-4 cm and 0.5-1 cm in width. It has a yellowish-green color, odorless with a faint bitter taste. The midrib is big and prominent on both surfaces. The leaves show pinnate reticulate venations.

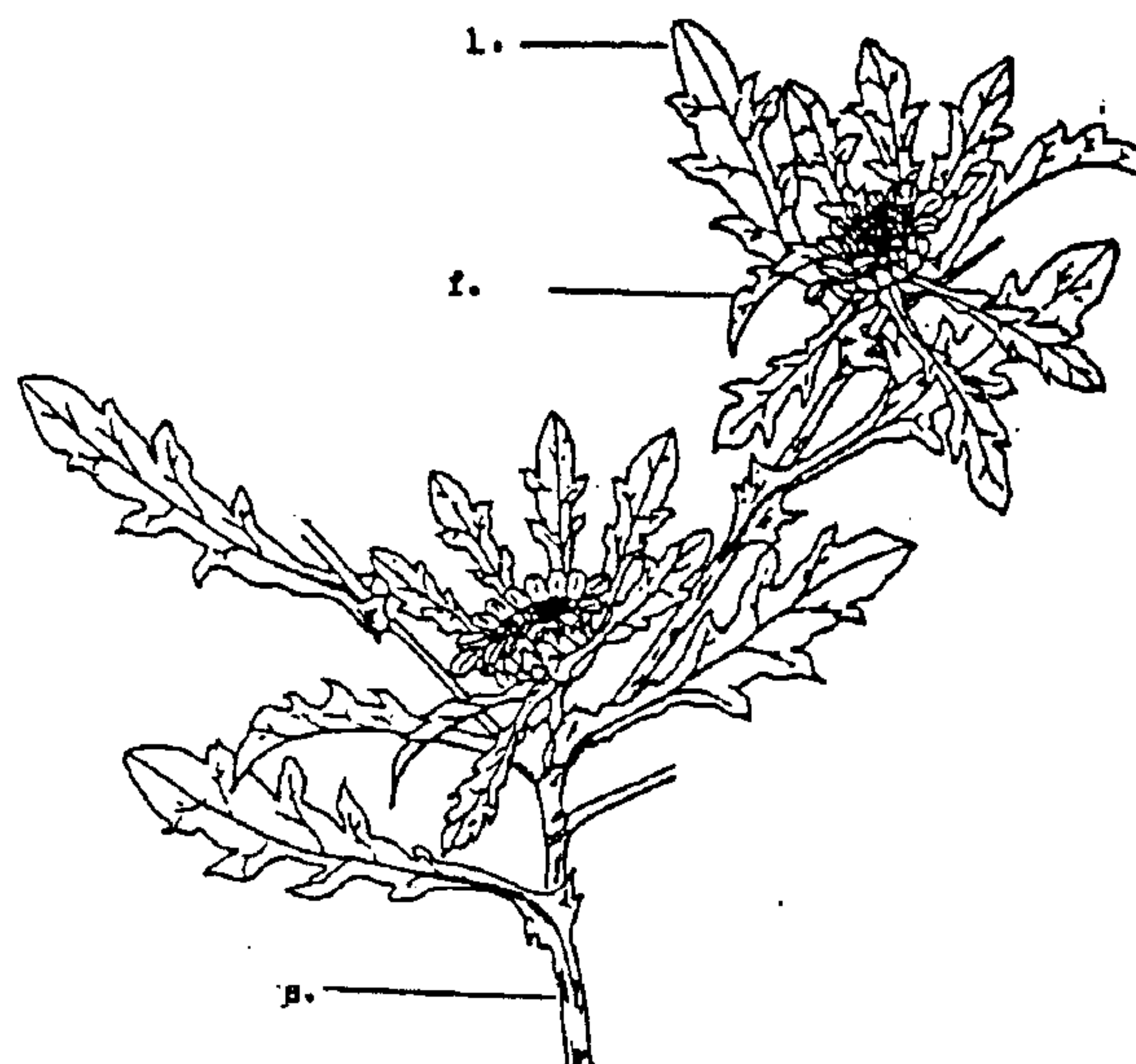


Fig. 1: Sketch of A Branch

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f., flower; l., leaf; s., stem

MICROMORPHOLOGY

1-The Stem:

A transverse section in the young stem (Fig. 2A) is more or less rounded in outline. It is formed of an epidermis carrying glandular trichomes, the cortex is formed of 2-3 rows of collenchymatous cells and 5-6 rows of parenchyma. The endodermis is distinct.

The pericycle consists of a group of fibers abutting the vascular bundles and interrupted by parenchyma, surrounding the central cylinder. The vascular tissue is formed of a number of collateral, separated bundles. Each bundle consists of an outer phloem and inner radiating xylem. The phloem and xylem are traversed by uni-or biseriate medullary rays. The central stele encloses a wide parenchymatous pith.

In old stem (Fig. 2B) the vascular tissue consists of a continuous ring of phloem and a continuous ring of xylem surrounding a wide central pith. The pericyclic fibers resemble that of the young stem.

The epidermis (Fig. 2) is formed of one row of cells which are polygonal tabular tangentially elongated with straight, and thin, cellulose anticlinal walls measuring from 40-100 μ in length, 21-35 μ in width and 11-20 μ in diameter. They are covered with thin smooth cuticle carrying covering and glandular trichomes, stomata are not observed. The glandular trichomes are formed of unicellular stalk and multicellular (6-8 cells), biseriate, tabular head measuring from 140-160 μ in length and 80-100 μ in width. The non-glandular trichomes occur either as single or multicellular (2-4 cells), uniseriate with thin smooth cellulose walls wide lumens and acute apices, measure from 100-266 μ in length and 200-35 μ in width.

The cortex (Fig. 2C) is comparatively wide and formed of 6-8 rows of the walled parenchymatous cells.

The endodermis (Fig. 2C) is formed of thin-walled parenchymatous cells.

The pericycle (Fig. 2C) is formed of successive groups of fibers which are tangentially arranged. They have thick lignified walls, narrow lumen and acute apices measuring from 335-445 μ in length, 25-33 μ in width.

The phloem (Fig. 2C) is formed of phloem tissue consisting of sieve tubes, companion cells and phloem parenchyma.

The cambium (Fig. 2C) is represented by 2-3 rows of tangentially elongated, radially arranged, thin-walled meristematic cells.

The xylem (Fig. 2C) consists of lignified elements. The vessels (Fig. 2C) are solitary or in small groups of 2-3 vessels showing spiral and pitted thickening measuring from 33-45 μ in diameter. The vessels are accompanied with tracheids, wood fibers and wood parenchyma. The fibers are abundant, spindle-shaped having thin-lignified walls, wide lumen and blunt or tapering apices measuring from 22-34 μ in width. The wood parenchyma consist of elongated cells with pitted lignified walls. The medullary rays are 2-3 cells wide. The cells are radially elongated lignified and pitted in the xylem region but with non-lignified walls in the phloem region.

The pith (Fig. 2C) is formed of large more or less rounded wide parenchymatous cells and wider intercellular spaces, free from starch and calcium oxalate crystal.

Powdered stem (Fig. 3) is greenish-yellow in color, odorless and having somewhat bitter taste. It is characterized, microscopically by the following:

- 1- Fragments of polygonal mainly axially elongated epidermal cells with straight anticlinal walls and smooth cuticle, carrying non-glandular and glandular trichomes. Stomata are not observed.
- 2- Numerous glandular and covering trichomes.
- 3- Fragments of pericyclic fibers. With straight, thick, lignified walls, narrow lumen and blunt to rounded apices.
- 4- Wood fibers with straight, wide lumen acute ends.
- 5- Fragments of tracheids, wood parenchyma and medullary rays with pitted lignified walls.
- 6- Fragments of xylem vessels with spiral and pitted thickening.
- 7- Calcium oxalate and starch granules are not observed.

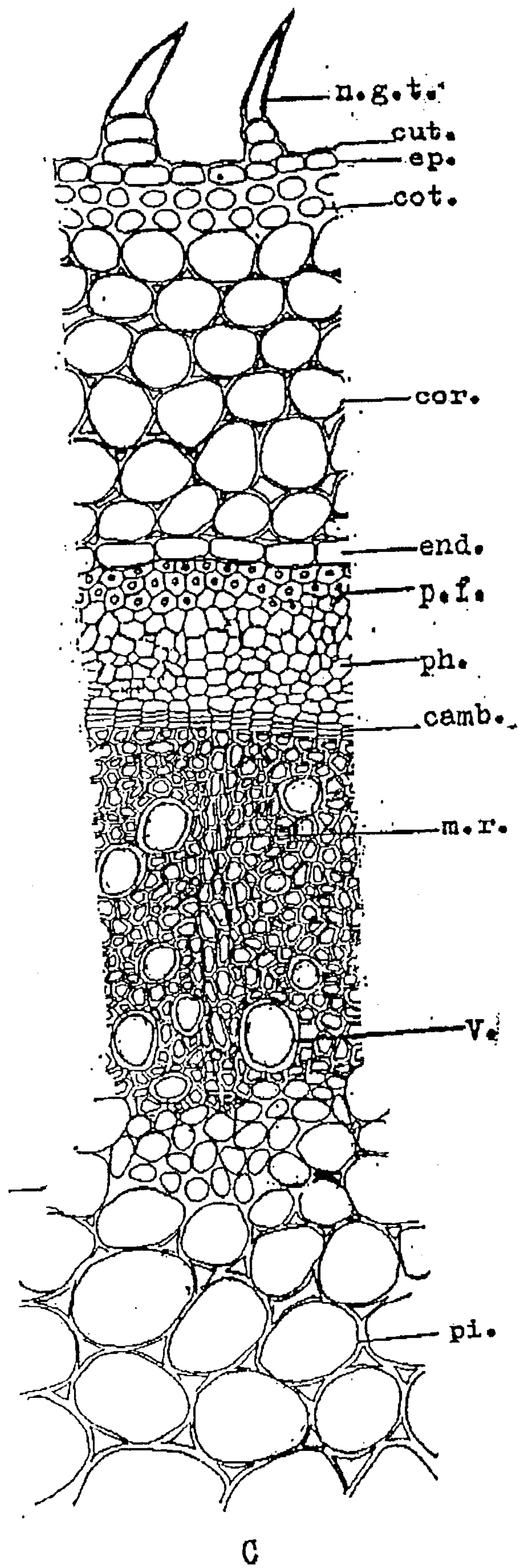
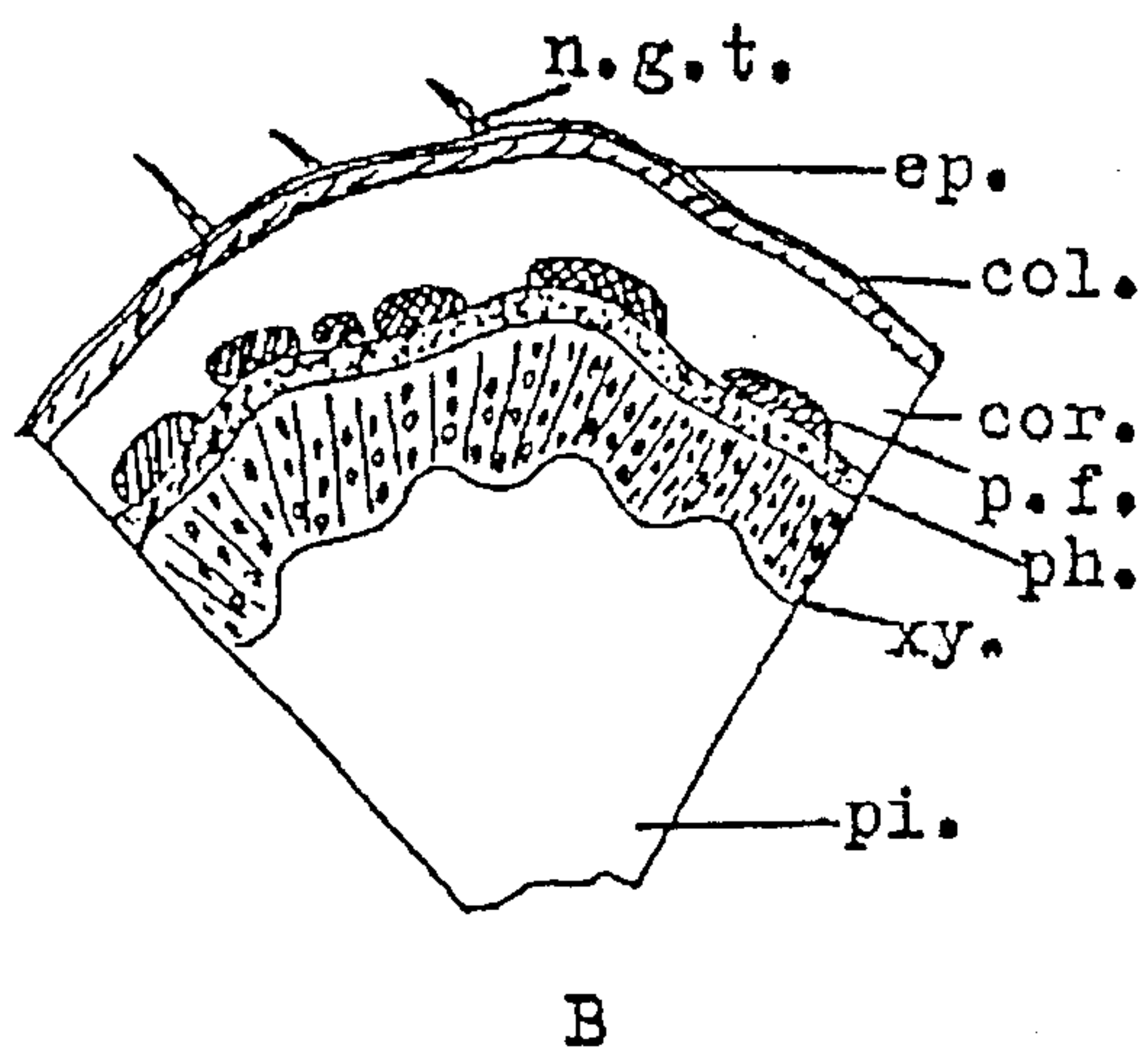
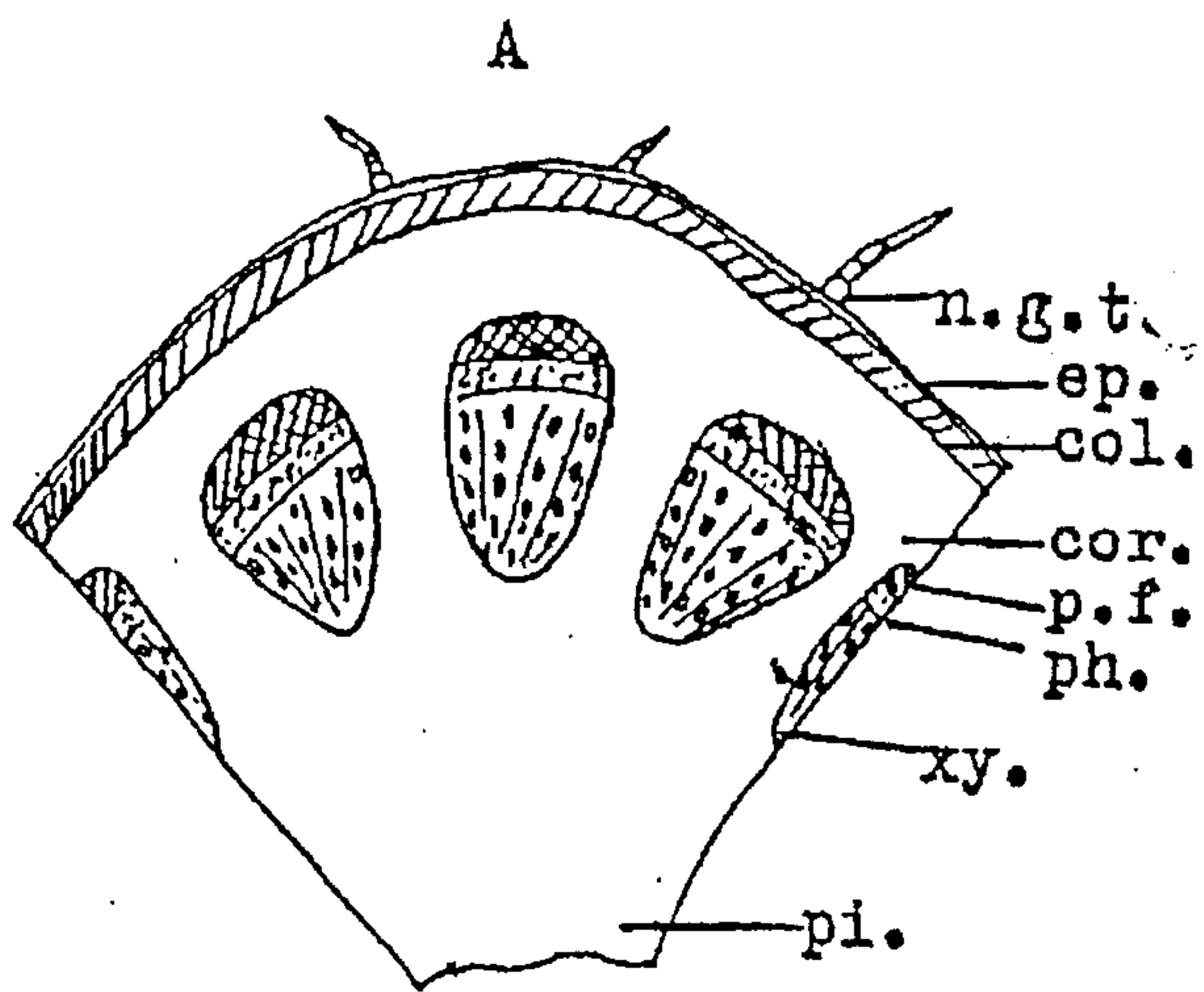


Fig. 2: A- Diagrammatic T.S. of young stem.
 X 19
 B- Diagrammatic T.S. of old stem.
 X 19
 C- Detailed T.S. of young stem.
 X165

Col., Collenchyma; cor., cortex; ep., epidermis; end., endodermis; m.r., medullary ray; p.f., pericyclic fibre; pi., pith; v., vessel; xy., xylem.

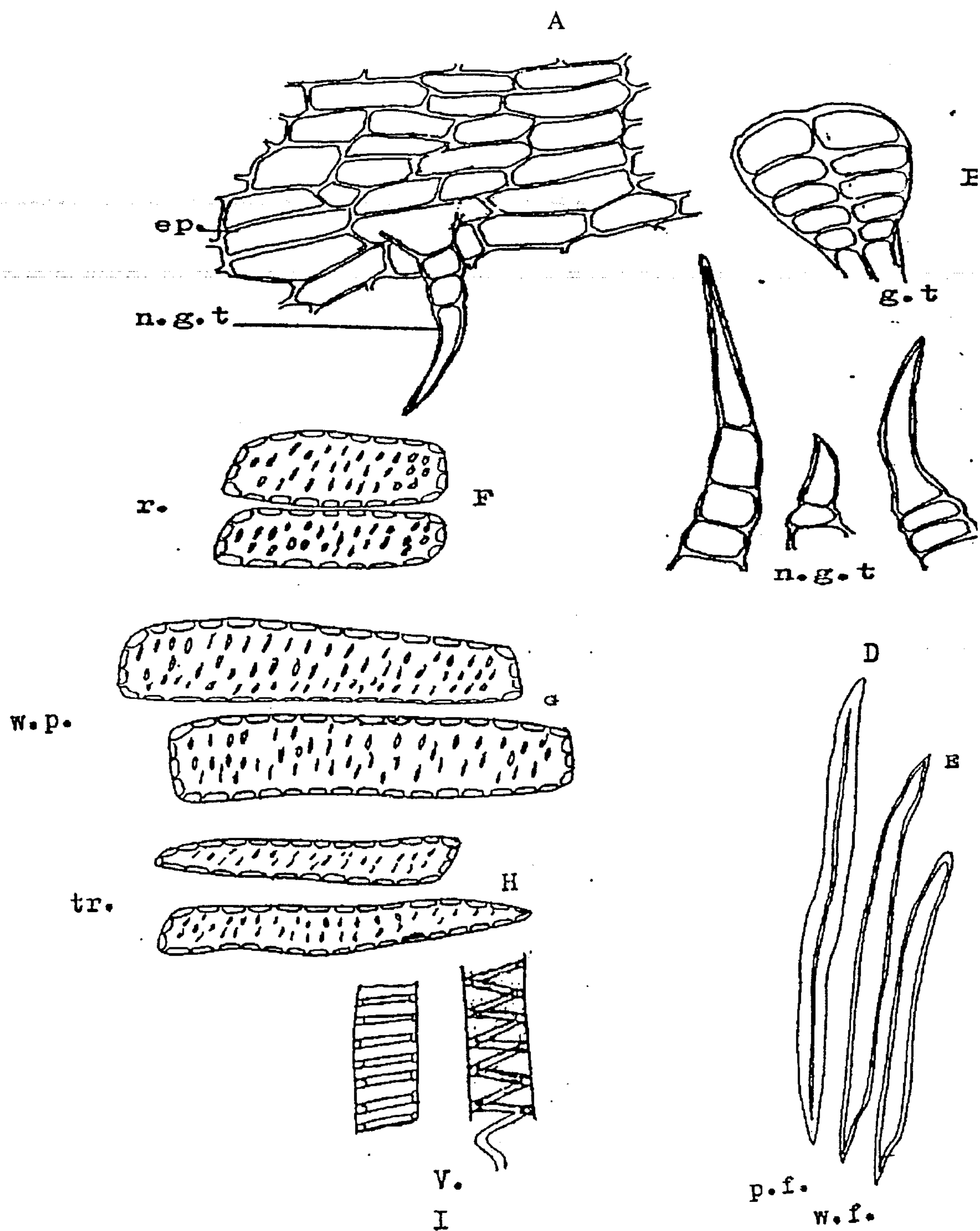


Fig. 3: A. Surface preparation of the stem B, C, D, E, F, G, H and I isolated elements of the stem.

ep., epidermis; g.t., glandular trichome; m.r., medullary ray; n.g.t., nonglandular trichome; p.f., pericyclic fibre; tr., tracheid; v., vessel; w.f., wood fibre; w.p., wood parenchyma.

II-The Leaf:

A transverse section in the lamina through the midrib (Fig. 4A) appears biconvex in outline in the midrib region. It shows an upper and lower epidermis enclosing in between isobilateral mesophyll and in the midrib region 2 vascular strands of 3 V.B. subepidermal collenchyma both epidermis.

Upper epidermis (Fig. 4 & 5C) is formed of polygonal tabular cells with wavy thin-cellulosic anticlinal walls and covered with thin smooth cuticle. They measure from 22 to 34 μ in length, 22 to 66 μ in width and 11 to 16 μ in height. The cells carry few glandular trichomes and numerous non glandular trichomes resembling those of the stem.

The lower epidermal cells (Fig. 5A) are polygonal nearly isodiametric to slightly elongated with wavy anticlinal walls and covered with thin smooth cuticle. They measure 22-66 μ in length, 16-48 μ in width and 13-21 μ in height. The cells carry few glandular trichomes and non-glandular trichomes resembling those of the stem.

The stomata are present on both surfaces being more frequently on the lower one. They are oval in shape and of anomocytic type being surrounded by 3-5 epidermal cells.

The mesophyll (Fig. 4B,C) is isobilateral. The palisade is formed of two layers of columnar cells, filled with chloroplasts. The spongy tissue consists of thin walled, rounded or slightly irregular cells with intercellular spaces.

The cortical tissue (Fig. 4B,C) is formed of an upper and lower subepidermal masses of collenchyma, each of 2-3 rows of polygonal collenchymatous cells with thick cellulosic walls showing no intercellular spaces. The rest of the cortical tissue is formed of almost rounded, large thin-walled parenchymatous cells, with intercellular spaces.

The vascular system (Fig. 4C) is represented in the midrib region by one central and 2 lateral and smaller vascular bundles. Each

vascular bundle is collateral with xylem above and phloem below. A small batch of pericyclic fibre is present beneath each phloem tissue. The pericyclic fibers shows acute apices, wide lumen and lignified walls, measuring 323-500 μ in length, 16-37 μ in width.

The endodermis (Fig. 4C) is distinct and formed of polygonal elongated cells.

The phloem (Fig. 4C) is formed of small, thin-walled shining cellulosic cells, hardly differentiated into sieve tubes, companion cells and phloem parenchyma. The cambium is indistinct.

The xylem (Fig. 4C) is formed of lignified vessels fibers and wood parenchyma. The vessels (Fig. 5C) are lignified showing spiral and annular thickening of 28-40 μ in diameter.

The fibers (Fig. 5C) have thickened and lignified walls with tapering apices, they measure 266-350 μ in length and 22-40 μ in width. The wood parenchyma (Fig. 5C) are abundant with pitted and lignified walls.

The Powder and Isolated elements

Powdered leaf (Fig. 5C) is green in color, odorless and has faint bitter taste, it is characterized microscopically by the following:

- 1- Fragments of palisade cells.
- 2- Fragments of upper and lower epidermal cells.
- 3- Numerous glandular and non-glandular trichomes.
- 4- Fragments of lignified vessels with spiral and pitted thickening.
- 5- Fragments of wood fibers with wide lumen and acute to acuminate apices.
- 6- Fragments of wood parenchyma which are pitted and lignified.
- 7- Fragments of pericyclic fibers with wide lumen, shorter than the wood fibers.
- 8- No calcium oxalate or starch granules were detected.

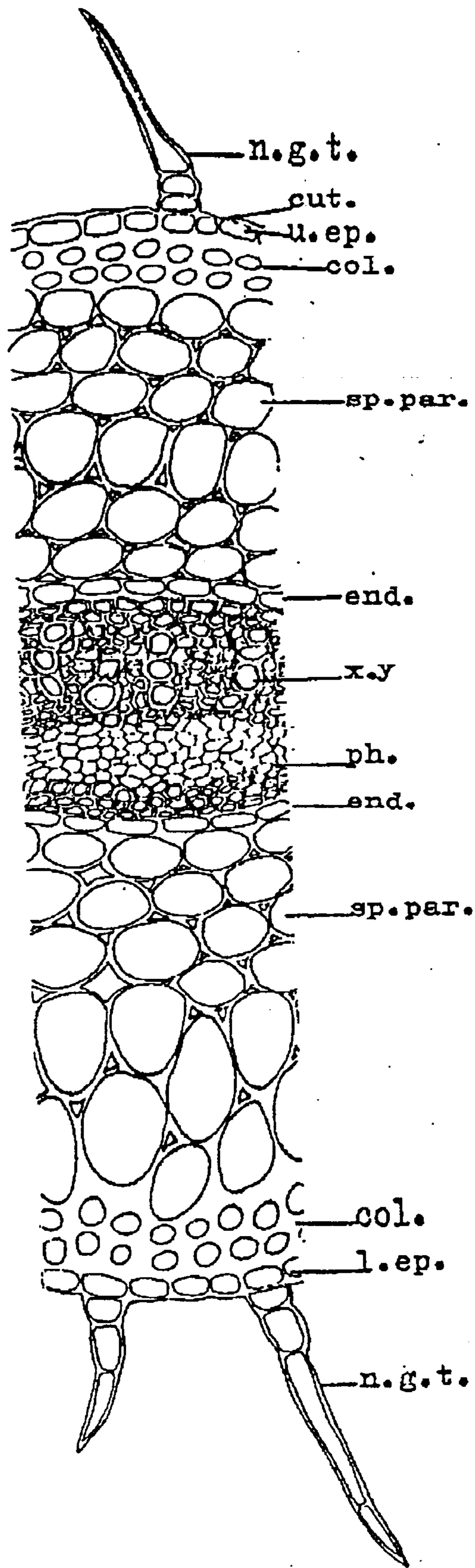
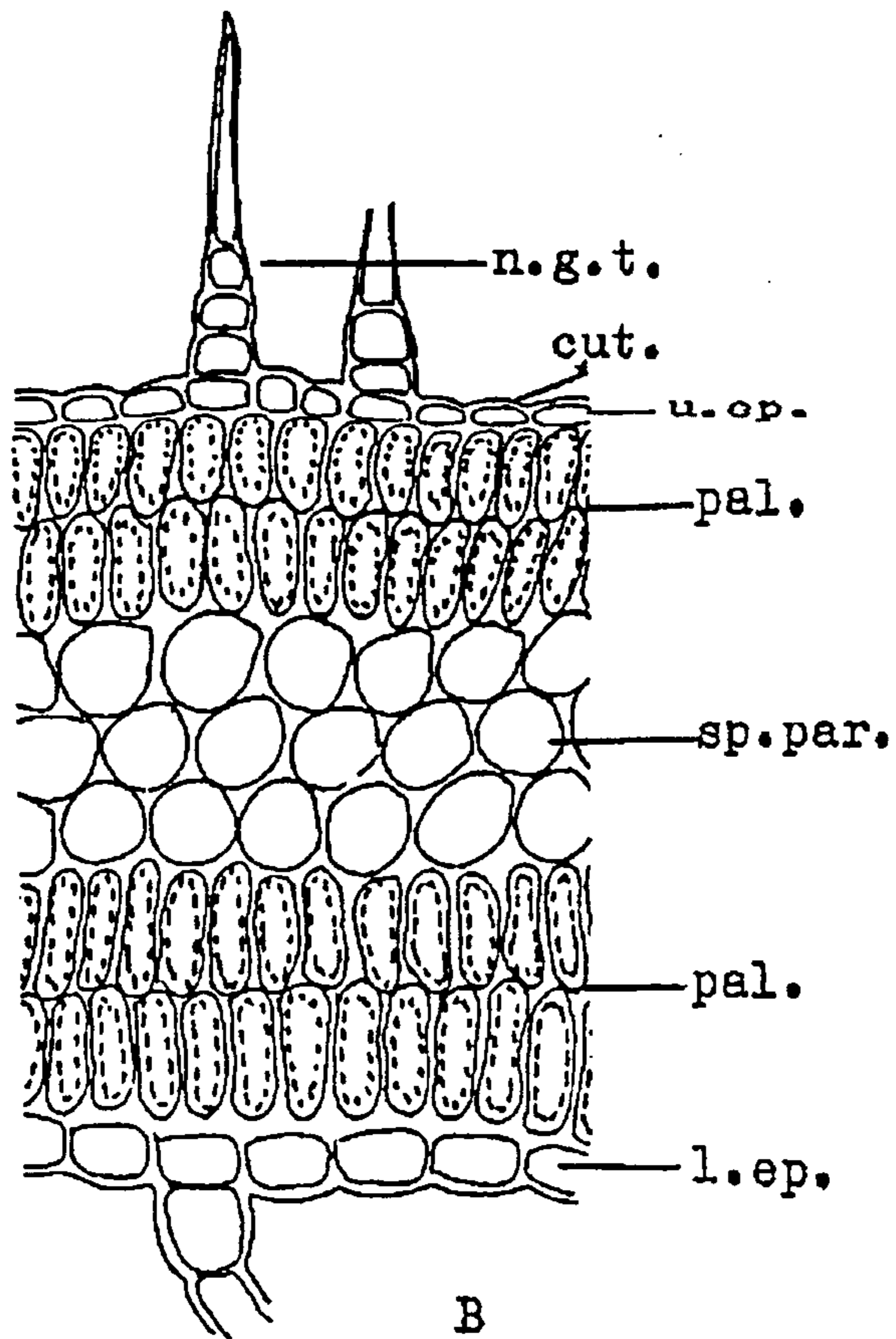
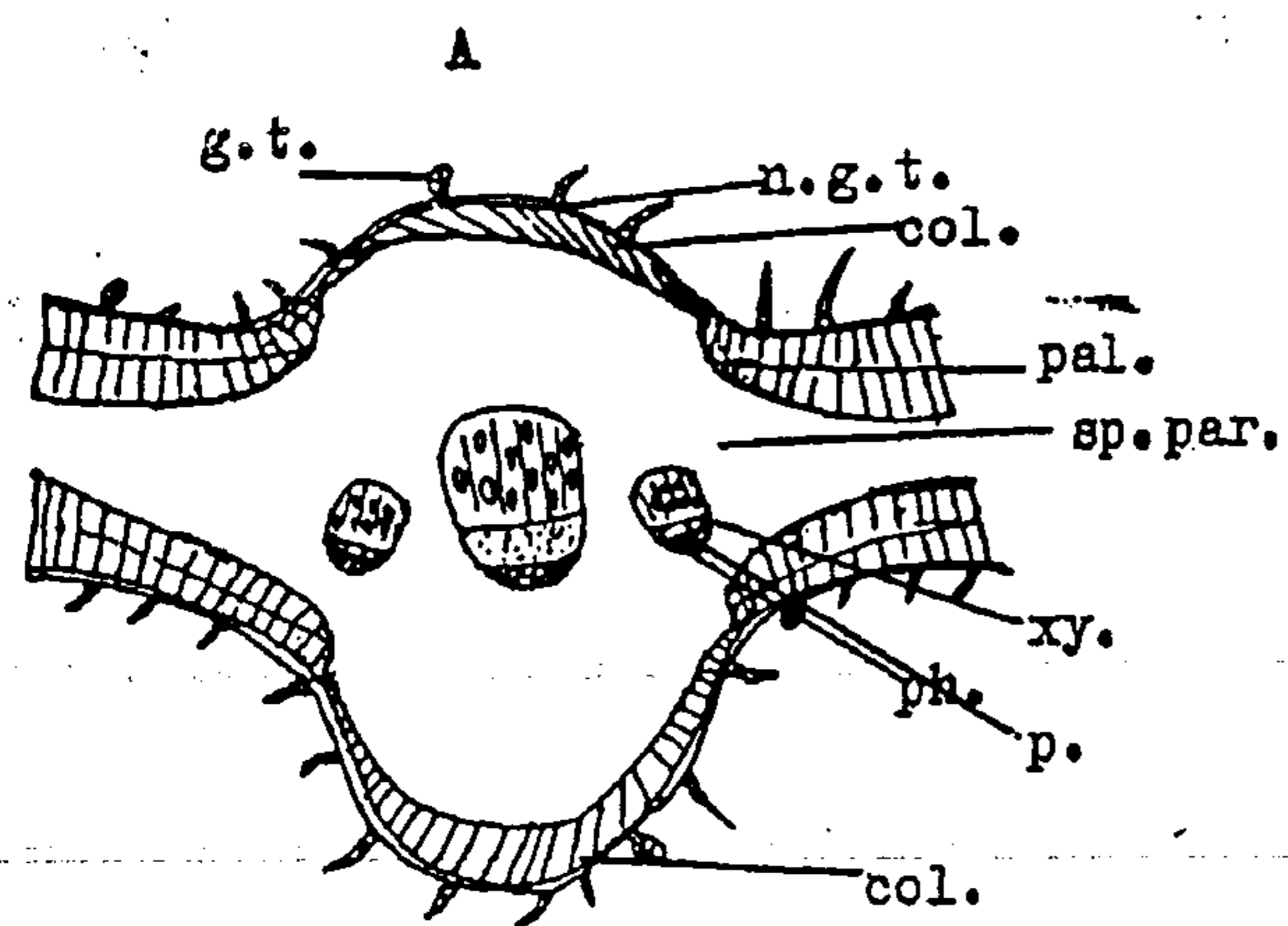


Fig. 4: A- Diagrammatic T.S. of the leaf.

X 20

B- Detailed T.S. of the leaf.

X210

C- Detailed T.S. of the leaf.

X210

col., collenchyma; end., endodermis; g.t., glandular trichomes; n.g.t., nonglandular trichome; l.ep., lower epidermis; pal., palisade; p., pericycle; ph., phloem; u.ep., upper epidermis; v., vessel; sp.par., spongy parenchyma; xy., xylem.

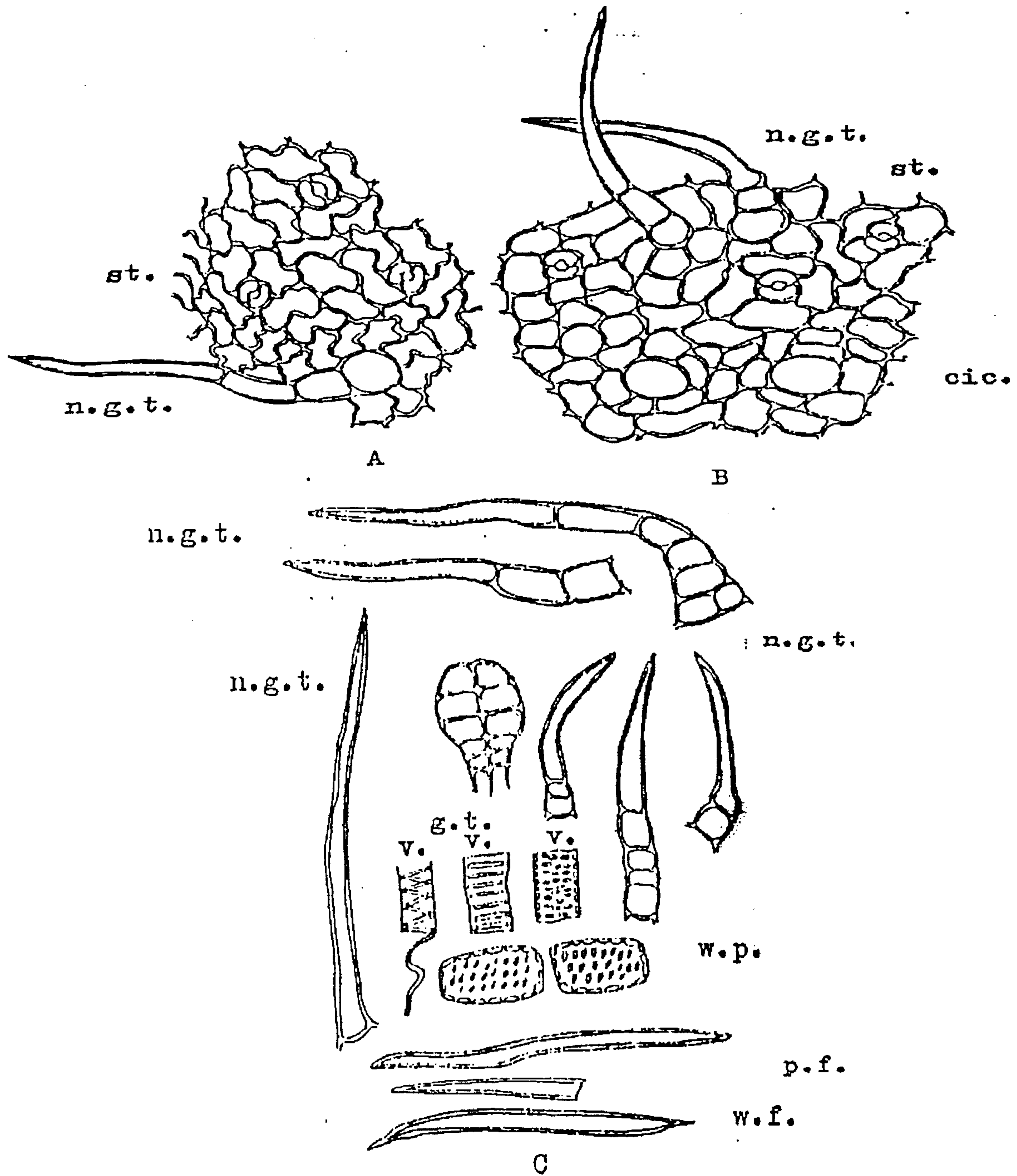


Fig. 5: A- Surface preparation of the leaf (lower epidermis). X165
 B- Surface preparation of the leaf (upper epidermis). X165
 C- Isolated elements of the leaf. X220

cic., cicatric; g.t., glandular trichome; n.g.t., nonglandular trichome; p.f., pericyclic fibre; st., stomata; v., vessel; w.f., wood fibre; w.p., wood parenchyma.

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الصفات العيانية والمجهرية لسيقان وأوراق نبات

الاستربسكس جرافيوولينز

أحمد عابدين عطية - سامية عباس يوسف

قسم العقاقير - كلية الصيدلة - جامعة اسيوط

تمت الدراسة العيانية والمجهرية لسيقان وأوراق نبات الاستربسكس جرافيوولينز - وذلك بغرض التعرف عليها كاملة أو على هيئة مسحوق.

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