STRUCTURE OF SUPPORTING TISSUES IN PLANTS

The development of stable supporting elements has been an important prerequisite for the evolution of large terrestrial organisms. Endo or exoskeletons are similar in function to the woody stems or trunks of plants. The architectural design of the plant is very complex. Thin petioles carry heavy and flat laminas, stems support leaves, flowers and fruits. All plant organs are exposed to mechanical strains. Extensive specialized supporting tissues only exist in vascular plants.
Vascular plants have upto three main types of supporting tissue:

1. Collenchyma
2. Sclerenchyma
3. Vascular tissue.

1. COLLENCHYMA

NAMING

The name collenchyma derives from the Greek word "kolla" meaning "glue", which refers to the thick, glistening appearance of the walls in fresh tissues.

LOCATION

Collenchyma is characteristically

ound in leaves and elongating stems.

APPEARANCE

In leaves, it appears as strands, ften located above and below major veins, as well as in petioles and often leaf blade margins.

In stems, it appears as a hollow cylinder around vascular tissues, or as peripheral longitudenal strands.

PRIMARY WALLS

Collenchyma cells have unequally thickened primary walls, especially when observed in cross-sectional view. The different thickness patterns of the wall is a characteristic feature formed during elongation.

SUPPORTING TISSUE

The collenchyma is the typical supporting tissue of the primary plant body and growing plant parts.

It provide support particularly in young plants, herbs and leaves etc (where secondary growth doesnot occur). In stems and petioles it plays more important role in support bcz of its location in peripheral regions near epidermis.

LIVING TISSUE

Collenchyma is a living tissue composed of elongated cells with

thick non-lignified primary walls. It is living so it can grow and stretch freely.

RESEMBLANCE TO PARANCHYMA

Collenchyma cells are most closely aligned physiologically with paranchyma cells. Where collenchyma and parenchyma cells are found adjacent to each other, they frequently intergrade through transitional cells. The resemblance to parenchyma is further stressed by the common occurance of chloroplasts in collenchyma and by the ability of this tissue to undergo reversible changes in wall thickness, and to engage in meristematic activities. Thus, it is entirely appropriate to consider these two cell types in the same unit of study.

TYPES

There are four primary types of collenchyma:

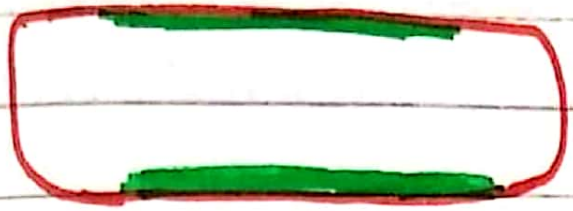
1. Angular
2. Annular
3. Lamellar (or plate)
4. Lacunar

1. ANGULAR

In angular collenchyma, the cellwall is thickened at the corners.

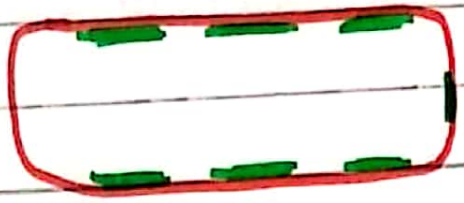
2. ANNULAR

In annular collenchyma, the cell wall is thickened at tengentional sides (opposite sides.



3. LAMELLAR

The irregular thickening of cell wall is found in lamellar collenchyma.



4. LACUNAR

The regular thickning of cell wall is found in lacunar collenchyma

2. SCLERENCHYMA

NAMING

The term "sclerenchyma" is derived from the Greek "scleros", meaning "hard".

TRUE SUPPORTING TISSUE

Sclerenchyma is the true supporting tissue in plants. Sclerenchyma cells are the principal supporting cells in plant parts that have ceased elongation.

THICK WALLS

It is their hard, thick walls that make sclerenchyma cells important strengthening and supporting elements in plant parts that have ceased elongation.

Their cell walls consist of cellulose and/or ligin.

TYPES

Two groups of sclerenchyma cells exist:

1. Fibres
2. Sclareids.

1. FIBRES

OCCURANCE

Fibres are generally long, slender, so-called prosenchymatous cells, usually occuring in strands or bundles. Such bundles or the totality of stem's bundles are colloquially called fibres.

CELL WALL

Their principal cell wall material is cellulose.

PRODUCTION OF FIBRES

Fibres arise from meristematic tissues. Cambium and procambium are their main centers of production.

TYPES OF FIBRES

1. Xalary Fibres
2. Bast Fibres

1. XALARY FIBRES

Fibres are often associated with the xylem of the vascular bundles. These fibres are known as xalary fibres. The fibres of the xylem are always lignified. They are present inside the cambium.

2. BAST FIBRES

Fibres that donot belong to the xylem are called bast fibres. They are present outside the ring of cambium.

ECONOMIC IMPORTANCE

Sclerenchyma fibres are of great economical importance, since they constitute the source material for many fabrics (flax, hemp, jute, ramie).

Their high load-bearing capacity and the ease with which they can be processed has since antiquity made them the source material for a number of things, like ropes, fabrics, or mattresses. The fibres of flax (Linum usitatissimum) have been known in Europe and Egypt since more than 3000 years, those of hemp (Canabis sativa) in China for just as long. These fibres, and those of jute (Corchorus capsularis) and ramie (Boehmeria nivea, a nettle), are extremely soft and elastic and are especially well suited for the processing to textiles.

2. SCLAREIDS

SHAPE

Sclareids are variable in shape. The cells can be isodiametric, prosenchymatic, forked, or branched.

OCCURANCE

They can be grouped into bundles, can form complete tubes located at the periphery or can occur as single cells or small groups of cells within parenchyma tissues.

CELL WALL

The cell walls fill nearly all the cell's volume.

SEED SHELLS

The shell of many seeds like those of nuts as well as the stones of drupes like cherries or plums are made up from sclareids.

EXAMPLES OF SCLAREIDS

Characteristic examples are the stone cells (called stone cells bcz of their hardness) of pears (Pyrus communis) and those of the shoot of the wax plant (Hoya carnosa)

DIFFERENCE BETWEEN FIBRES AND SCLAREIDS

The difference between fibres and sclareids is not always clear. Transitions do exist, sometimes even within one and the same plant.

Compared with most fibres, sclareids are relatively short.