LATICIFERS

Latex is one of the most important secretory products of the plants. It is found in representatives of about 20 families, including 12,500 species in 900 genera of dicotyledous and monocotyledons. Latex is secreted by specialized cells or groups of cells known as **laticifers**.

Laticifers have unique structures and interesting growth patterns.

Classification of laticifers- they are grouped in two major groups on the basis of their structure.

1. **Articulated (jointed)** and **2. Non-articulated.**

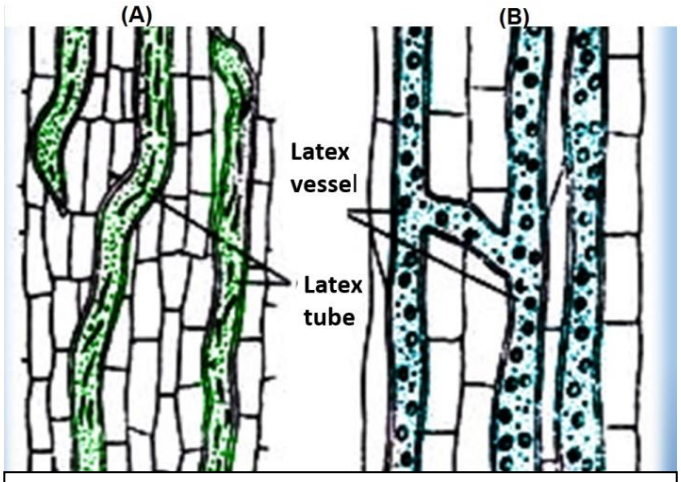
1. Articulated-

There are compound in origin (originated from the no. of cells), consisting of longitudinal files of cells, the end walls of which break down wholly or in part. Such perforation of and walls gives rise to laticifers that are tube- like in form and resemble xylem vessel in origin. This type of laticifers have been formerly called laticiferous vessels.

Now these Articulated liticifers are grouped into two groups:-

(i) Articulated anastomosing

(ii) Articulated non-anastomosing



A. Non-articulated laticifers of *Euphorbia* sp.
B. Articulated laticifers of *Carica papaya*

(i) ***Articulated anastomosing***-These laticifers consists of long cell chains or compound tubes connected with each other laterally, all combined into a net-like stc. or reticulum.

(ii) ***Articulated non-anastomosing***-These consist of long cell chaim or compound tubes not connected with each other laterally.

2. **Non-articulated-**

These are originated from single cell, (simple in origin), which through continued growth develop into tube-like stc. often much branched, but typically they undergo no fusion with other similar cells. These types of laticifers are called laticiferous cell.

It is also two kinds- (a) branched and (b) unbranched

Examples:-

(i) Articulated anastomosing- In Compositac (*Lactuca*,*Taraxcum*, *Sonchm* etc.); Compamulaceae; Caricacea (*Carica papya*); Papaveraceae (*Papaver*, *Argemone*); Euphorbiaceae (*Hevea*, *Manihof*).

(ii) Articulated non-anastomosing- In Comvolvulaceae (*Convolvulus*, *Ipomoca*); Papaveraceae; Sapotaceae (*Achra sapota*); Liliaceae (*Allium*), Musaceae (*Musa*).

(iii) **Non-articulated branched-** In Euphorbiaceae (*Euphorbia*); Asclepiadaceae (*Asclepias*, *Cryptostegia*); Apocynaceae (*Nerium olcauder*) , Moraceae (*Ficus, Macura*) etc.

(iv) non-articulated unbranched- In Apocynaceae (*Vinca*), Urticaceae(*Urtica*), Moraceae (*Cannabis*).

The list given above shows that the type of laticiferous element is not contant in a given family. In Euphorbiaceae, for example, *Euphorbia* has non-articulated laticifer, but *Hevea* contain articulafer laticifers. Such type of instances is very frequent in many families of laticiferous groups. So, by comparative study of laticifer, if not possible to drawn a systematic phylogeny among the groups of laticiferous plants.

Cytology of laticifers:-

According to the common concept, the laticifers maintain a living protoplast, the nuclei remain in this protoplast upon maturation of the elements, and the cytoplast occur as a parietal layer enclosing the vacuolar sap, or latex. In non-articulated laticifers of many plants the nuclei are known to under go division resulting in a multinucleate coenocytic condition. Articulated laticifers, in a which communicated established in between the individual cells, are also multinucleate but apparently only because the protoplasts fuse and not because of a subsequent multiplication of nuclei. In young laticifers the nuclei are readily distinguished; but later the dense latex obscures their visibility. It was also reported that the nucleus degenerate in mature laticifers after an exudation of nucleoli (Milanez- 1946, 1949).

Structure of the cell wall:-

The walls of the laticifers are non-liguified and aparently plastic. They may be no thinker than the walls of the adjacent cells, or they may be noticeably thinker. The walls often increase in thickness with the age of the element. The thick walls are highly hydrated, and contain cellulose and high proportion of pectic substances and hemicelluloses. The thickness may be uneven, but primary pit fields are rarely observed. Plasmodesmata are present in between the laticifers and adjacent parenchyma cells. The callose has been recorded in laticifers.

Development of laticefers:-

(i) **Non-articulated-**

The branched non-articulated laticifers of Euphorbiaceae, Apocynaceae and Asclepiadaceae arise during the development of embryo in the form of relatively few primordial, then grow concomitantly with the plant into pranched systems permeating the whole plant body.

In *Nerium* oleander, and *Euphorbia marginata* where the primordia of laticifers appear in embryo when cotyledons are initiated. They are located at the cotyledonary node. In *Nerium* embryo 28 primordia and *Euphorbia* 12 primordia are present (Mahlberg, 1961). The primodial cells grow more rapidly than neighbouring cells, and their nuclei also enlarge and subsequently divided without accompanying the wall formation.

Thus developing non-articulated laticifers become multinucleate cell; it also characterized by extensive growth. Then they branched in various directions by forming protrusion in different direction and spices of these protrusions push their way among the surrounding cells by intrusive growth.

It is found in *Nerium*, where the laticifers young cell branched repeatedly and the laticifers become continuous with branches formed in the cotyledonary node of the embryo. These cells thus ramify through the tissues, by means of rapid and predominant apical growth. Laticifers grow intrusively and occupying the intercellular spaces.

In case of non-articulated unbranched laticifers, where the pattern of growth is very simpler then the branched ones. The primordial have been recognized here, not in embryo, but in growing shoot (*Vinca rosea*) or in shoot and root (*Eucommia*) new primordial arise beneath the apical meristems repeatedly and each elongates into a unbranched tube, apparently by a combination of intrusive and symplastic growth.

It has recently been shown that the enzyme *Pectinase* is present in abundance in the latex of milkweed, *Asclepias syriaca*. It is thought that the intrusive growth of the ramifying laticifers of this species is facilitated by secretion of pectinase by the growing tip of laticifers, resulting in pectolytic dissolution of middle lamella of the adjacent cells.

(ii) **Articulated laticifer**:-

As these are compound in origin, so they are not developed from the single cell. They develop into extensive tube like stc. by constant addition of new primordial to existing ones. Thus they differentiate acropetally in various directions. The direction of differentiation is similar to that of non-articulated branched laticifers, but it occurs by successive conversion of cells into laticiferous elements instead of by apical intrusive growth.

Now when these tubes become anastomosed

(i) by dissolving the common wall of the tubes lie side by side, or

(ii) by transforming the intervening cells into laticifers with resorbtion of the common wall when the vessels are apart from each other, or

(iii) the existing vessels may send out lateral protuberances that fuse with those from another vessel.

In *Hevea* sp., the vessels associated with the vascular bundles of the embryo in late development. Perforation of lateral walls is apparently more advanced than that of end wall and a complex anastomosing system become established early in ontogeny.

In *Achras sapota*, disappearance of end walls is also gradual. The laticifers of *Nelumba nucifera* with the electron microscope conform the presence of single perforation in the end wall of the laticifers.

In many cases where the primordia of articulated laticifers are not found in embryonic stage. In *Papaver somniferum* the laticifers are absent in the embryo, but differentiated in the pericycle of the primary root of soon after germination.

Arrangement or distribution: -

Laticifers are frequently distributed rather generally through the plant but sometimes they are more or less restricted to certain tissues. Most commonly they are associated with the phloem.

Nor-articulated :- In the genus *Euphorbia*, the main tube of branched non-articulated laticifers commonly are located in the outer part of the vascular cylinder. From here the branches extend into the cortex and sometimes also into the pith.

In some Apocynaceae, Asclepiadaceae and Moraceae (Ficus) laticifers appears rather generally dispersed in various tissues, including the vascular tissue.

Branched non-articulated are found mainly in the leaves. Here they follow vascular bindles, and ramify in the mesophylls. The unbranched non-articulated laticifers of *Vinca*, *Cannabis* occurs in the primary pholoem but are apparently absent in secondary tissues.

Articulated:-

Such types of laticifers also show various arrangements and a frequent association with the phloem. In Cichorieae, the peripheral pertion of primary phloem contain it.

The secondary phloems of the root of Taraxacum contain articulated anastomosing laticifers. *Hevea*, have its main laticifers system in the secondary.