Introduction
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The vascular plant, or tracheophytes, which possess a specialized conducting system include four phyla of the plant kingdom:

1. Psilopsida (chiefly fossils)
2. Lycopsida (clubmosses)
3. Sphenopsida (horsetails)
4. Pteropsida (fern, gymnosperms and angiosperms)

The angiosperms represent the most recently evolved group of plants and form the main part of the natural and cultivated vegetation on the earth. The angiosperms have a highly evolved body bearing evidence of structural and functional specialization expressed in the differentiation of this body, externally into organs and internally into various categories of cells. The arrangement of tissue and tissue system in the plant as a whole and in its major organs reveals a definite structural and functional organization. The tissues concerned with conduction of food and water, the vascular tissues, forms a coherent system extending continuously through each organ and the entire plant.
These tissues connect places of water intake and food synthesis with regions of growth, development, and storage. The non-vascular tissues are similarly continuous and their arrangement are indicative of specific inter-relation and of specialized function (Esau 1965, Esau and Rinehart 1965 and Fahn 1982).

Most of the tropical trees, unlike temperate ones, do not exhibit a sharply rhythmic and cyclic pattern of growth. Instead, because of the prolonged favourable climate conditions prevalent in tropical regions, they generally grow in multiple flushes, intermittently, or in some cases even continuously throughout the year. Close correlations between apical and radial growth exist in both temperate and tropical taxa. In most dicotyledons and gymnosperms, stems continue to grow in thickness even after they have ceased to elongate and, therefore, the older the stem, the greater its circumference. This increase in thickness is due to the regular addition of secondary tissues, viz. phloem and xylem, to the plant axis. These tissues originate from the vascular cambium. It develops from provascular elements between phloem and xylem of primary vascular system forming a continuous sheath about the xylem core of stem and roots, and extending in the form of strips into leaves, if they have secondary growth.
In a three dimensional view, the cambium is a continuous cylindrical sheath about the xylem.

In most of the plants the cambium is reported to exhibit successive active and dormant phases during a calendar year with a few exceptions of tropical species in which meristematic activity continues throughout the year. This specific behaviour of the cambium is believed to be regulated by several internal and external factors which include heredity constitution, physiological phenomena and environmental conditions of the habitat (Philipson et al. 1971). Therefore, there is a need to investigate the influence of different physical and climatic factors on cambial makeup and its activity and then to suggest measures for the maintenance of desirable growth pattern to ensure a vigorous production of derivative tissues and their content.

**Concept of cambium**

There are two conceptually different views regarding the nature of cambium. One school of thought postulates a multiseriate zone in which all the cells are equally endowed with multiplication capacity. This view, proposed by Raatz (1892) has
been strongly supported by Catesson (1964). She defines the cambial zone as those cell layers which are characterized by the greatest R N.A contents, are the site of most abundant mitoses and are distinguished in section by radially narrow cells with thin walls. The other school pleads for the uniseriate nature of cambium. There are two interpretations of this uniseriate concept based on terminological differences. According to one, there exists a single initials cell which, in each radial file of cambial cells lies somewhere between the phloem and xylem mother cells, and is responsible for the production of cambial derivatives on both outer and inner sides. This view mainly advocated by Bannan (1955, 1968) and Newman (1956), has been supported by ultra structural studies of Mahmood (1968) and Murmanis (1970) pertaining to tangential wall characteristics. According to another group of workers Wilson et al. (1966) Zimmermann and Brown (1971) the term cambium is applicable only to the initial cells, not the immediate derivatives. Thus, admittance of a single initiating layer is common in both the interpretations, the only difference being that one group of worker applies the term cambium to the entire meristematic zone consisting of the initiating layer as well as the tissue mother cells, i.e. the zone of periclinal division, while the other restricts it to the initiating
layer only (Iqbal and Ghouse 1985a, 1987 and Iqbal 1989). Following the former terminology, Butterfield (1975) defines the cambium as a multiseriate zone of periclinaly dividing cells lying between the differentiating secondary xylem and phloem, with distinct initials capable of both periclinal and anticlinal divisions lying somewhere within each radial file of cells. The same terminology has been adopted for describing the cambium in the present study.

In spite of the fact that Indian sub-continent encompasses one of the richest floras of tropical trees, information on tree growth is insufficient. A limited number of such trees have so far been explored with respect to the behaviour of vascular cambium and production of vascular tissues. Further, most of the studies carried out in the past, lack proper statistical analysis. Much, therefore, remains to be known about the patterns of radial growth in Indian tropical trees and their cellular organization, with age and varying climatic conditions.

A survey of literature on tropical and subtropical trees has revealed that the vascular cambium and its periodic behaviour has been worked out in some selected species. Chowdhury (1940, 1957, 1968, 1969), Chowdhury and Tondon (1950), Deshpandey

In fact no information is available with regard to the cambial activity and formation of its derivatives in *Jacaranda mimosaeefolia, Pterospermum acerifolium* and *Terminalia arjuna*. It is worth noting that all of them are of immense economic importance as they are timber yielding plants, while *Jacaranda*
*mimosaefolia* and *Terminalia arjuna* are also important from medicinal point of view.

The present study mainly deals with the following aspects:

1. Formation of vascular cambium and its derivatives i.e. phloem and xylem.
2. Ontogenetic changes in the structure of cambium and its derivatives.
4. Periodicity of cambium and the production of its derivatives.
5. Statistical analysis of the observations recorded on various parameters.
The following trees have been selected at random for detailed investigations:

1. *Jacaranda mimosaeefolia* D.Don.

Class

Dicotyledons

Family

Bignoniaceae

Genus

*Jacaranda*

Species

*mimosaeefolia*

Common name

Blue gulmohar

Description:

A medium sized tree, commonly cultivated in Indian gardens for its finely divided foliage and beautiful flowers. Leaves: alternate or almost opposite, bipinnate, pinnae in many pairs, each with 10-24 or more pairs of oblong- rhomboid leaflets with the end one larger. Flowers: bluish violet, in loose panicles. Flowering: February to May. Fruit: an oblong, ovoid or broad capsule.
Distribution:

The plant is distributed in many parts of India and commonly cultivated in Indian gardens for its flowers and also found in South America and Brazil.

Economic Importance:

The wood is beautiful, fragrant, moderately hard and heavy and fine textured. It is easy to work and useful for tool handles.

In South America, the bark and leaves of the plant are used for syphilis and blennorrhagia. An infusion of the leaves is given as a pectoral and powdered leaves used as vulnerary. An infusion of the bark is employed as a lotion for ulcers. Several species are employed in syphilis in Brazil and other parts of S.America under the names caroba, carabiha etc.

Class          Dicotyledons  
Family         Sterculiaceae 
Genus          *Pterospermum*  
Species        *acerifolium*  
Common name    Kanak-Champa 

**Description:**

A medium sized evergreen tree that grows upto 24mts in height and 25 mts in girth with smooth ash-coloured bark. Young branches and calyx covered with thick ferruginous tomentum. Leaves are large, peltate or obovate-oblong, sinuately lobed, glabrous above, grey-tomentose beneath; stipules many-cleft and caducous. Flowers: large 12-15cm in diameter, axillary on short pedicels, with many cleft-bracts, pure white, fragrant. Calyx deeply 5-cleft; segment linear upto 5 inches long. Petals linear or obliquely cuneate and revolute. Capsule 2-6 inches long, woody, 5-angled and brown tomentose, white and fragrant. Flowering: March to June. Fruit: capsule, oblong, 5angled, dark brown and woody.
Distribution:

It is a small genus of trees and shrubs, distributed in tropical Asia. About 12 species occur in India. All of them yielding timber. The tree is found in a variety of situations, such as swamp forests of Dehra Dun, evergreen rain forests of North Kanara and along river banks of Sub-Himalayan tract. It is also commonly planted in gardens and avenues. It is moderate shade bearer and fairly frost hardy.

Economic Importance:

It's timber is easy to work, both by hand and on the machine, and to turn and peel, it finishes to an excellent surface taking a fine polish. The timber is used for planks, packing cases and turnery articles. It is suitable for veneers, plywood, constructional work, paneling, bridges, boats, tool handles, matches and match boxes.

**Class**  
Dicotyledons

**Family**  
Combretaceae

**Genus**  
*Terminalia*

**Species**  
arjuna

**Common name**  
Arjun

**Description:**

A large evergreen tree, with a spreading crown and drooping branches, common in most part of India and also planted in many parts for shade and ornaments. Stem rarely long or straight, generally always buttressed and often fluted, bark very thick, grey or pinkish green, smooth, exfoliating in large thin irregular sheets, leaves: sub-opposite, oblong or elliptic, coriaceous, usually 10-15cm long, occasionally 25 cm, cordate, shortly acute or obtuse at the apex. Flowers: small, spicate, hermaphrodite or upper flowers of spikes male; a narrow bract at the base of each flower. Calyx tube produced above the ovary with a compaounate mouth, limb of 5 short valvate triangular lobes. Petals: zero. Stamens: 10, inserted on calyx tube. Ovary:
1- celled, inferior style long, simple. Ovules: 2 or 3, pendulous, light yellow colour. Flowering: April to May. Fruit: Ovoid, variable in size, smooth or angular or with 5-7 hard coraceous narrow wings.

**Distribution:**

The genus *Terminalia* has about 105 species, inhabiting the tropics of the whole world. About 16 species are reported from India spreading from forests of Rohilkhand and North Owadh, Bundelkhand, usually on the banks of streams planted as an avenue tree in DehraDun. It is also distributed from Bengal, Central and south India to Punjab and Cylon.

**Economic Importance:**

The timber is employed for carts, agricultural implements, boat building and for other domestic purposes. It is used as mine- props in the Kolar Gold Fields and for solid cart wheels in Chota Nagpur, India. The timber is suitable for making plywood for tea chests. Bark is acrid, and credited with styptic, tonic, febrifugal and antidysenteric and antihypertensive properties. The bark and ashes are also used in dyeing and tanning. In fractures and contusions with excessive ecchymosis the powdered bark is taken with milk. A decoction of bark is used as wash in ulcers. Fruit is tonic and deobstruent. Juice of fresh leaves is used as earache.