# Medicinal Barks

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**Medicinal Barks**

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**Duration of Course: 6 h**

**Skills:** The ability of identification of medicinal Barks (Knowledge).
The ability to relate the use and biological activity to the major constituents (intellectual).

**Course Objectives**

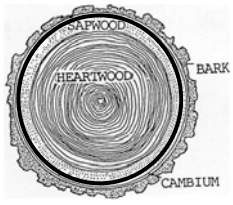
1. The study of the diagnostic characters of Bark in general.
2. The study of selected medicinal barks.
3. The study of active constituents of medicinal Barks and how to test them.
4. The study of the uses of medicinal woods in correlation with the type active constituents.

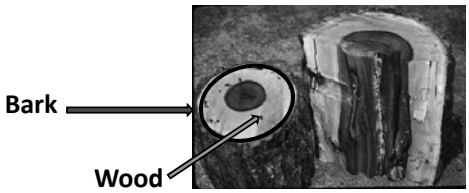
**Associated tools:** 1. Multimedia (power point slides)
2. Visual demonstration for samples and applications.
3. Open discussion in lecture hall or in office.



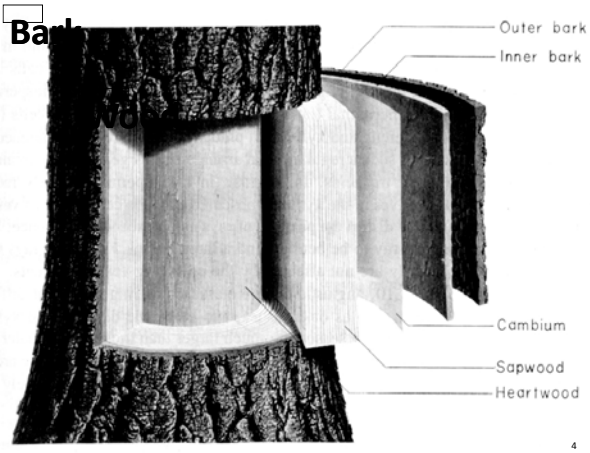
## Bark (Cortex)

**All tissues lying exterior to the vascular cambium of roots or stems of woody trees.**




## Bark

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## Methods of Collection

**(Felling – Uprooting – Coppicing)**

**Bark is stripped off from trunks, branches, or roots through circular and longitudinal incisions after:**

**1.<u>Felling</u>: The process of cutting down standing trees, Rarely used now. Why?**

**→ destruction of natural resource (except if it is done in programmed trees colonies and root bark is needed)**

**2.<u>Uprooting</u>: Trees are cut down and their roots are dug up. Mechanical whole tree extraction is also used. (When bark from trunks and roots are needed - Carried out in trees colonies . e.g. *Cinchona* bark) - unfavorable.**



**3.<u>Coppicing</u>: Trees at suitable age (8 years for tropical type e.g. *Cinnamon* and *Cinchona*, or >12 years for temperate type e.g. *Oak*) are cut down near the ground then bark is removed from trunk and branches. Remained stocks are allowed for 2-7 years to send numerous shoots. The best method, why?.**

**<u>High surface area for bark collection + save vegetation</u>**




## Time of Collection

**Spring or early summer (why?)**
**- Cambium activity is optimum.**
**- Tissues are delicate and soft.**
**→ Barks become easily separated.**

## Preparation

1. **Longitudinal incisions**
2. **Horizontal incisions**
3. **Stripping.**



## *Macroscopical Characters (Bark Morphology)*

**<u>I. Shape</u>**

**Barks during drying tend to curve transversely to give the following forms:**

***1. <u>Flat:</u>***
**- Thick dried barks from old trunks**
**- Barks dried under pressure**
**e.g. Quillaia Bark.**

***2. <u>Curved</u>:* inner side = concave surface**
**e.g. Wild Cherry Bark.**

***3. <u>Recurved</u>:* inner side = convex surface**
**e.g. Pomegranate Bark.**

***4. Channeled:*** **curved with deeply concave inner side e.g. Cassia Bark.**

***5. Single Quill:*** **channeled with overlapped edges e.g. Cinchona & Cascara Barks.**

***6. Double Quill:*** **both edges are separately enrolled to form two internal quills e.g. Cinchona & Frangula Barks.**

***7. Compound Quill:*** **when single or double quills are packed inside on another e.g. Cinnamon Bark.**



***Training on shapes of bark***



**II. Outer Surface**

**It exhibits some important features:**

**1. *Adherent epiphytes* such as:**

**- *Lichens* (grayish thalloid structure) e.g. in Cinchona Bark.**

**- *Liverwort* (foliaceous flat structure, consists of very small slender stem to which small leaves attached in one plane) e.g. Cascara Bark.**

**- *Mosses* (structure with minute thin leaves spirally arranged around slender stem) i.e. Cinchona & Cascara Barks**

**A character of stem bark only.**

**2. *Lenticels*: They are breathing transverse furrows, larger but less abundant than stomata.**



**3. Longitudinal or transverse cracks or fissures (as a result of continuous growth and lack of elasticity).**

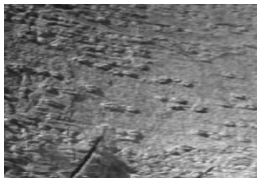
**4. Transverse wrinkles and furrows: (as a result of shrinkage of softer tissues during drying).**

**5. Rhytidome: Give a scaly appearance to the surface.**

**6. Smooth: When the cork is evenly developed.**

**7. Color.**

***Training on outer surface of bark***

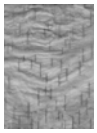





**III. Inner Surface**

1. **Striated: presence of longitudinal fine or coarse shrinkage e.g. Cinnamon.**
2. **Reticulate: Presence of network of longitudinal shrinkage).**
3. **Corrugated: presence of transverse shrinkage.**
4. **Smooth: due to the presence of uniform soft phloem e.g. Quillaia**
5. **Color.**








**IV. Texture**

**It is the response of bark toward pressure (Being brittle, hard, leathery, ….)**

**V. Fracture**

**It is the behavior of barks when broken transversely + character of the fractured surfaces. It is a diagnostic character (referred to the histology) for each bark.**

***1. Short:*** **Smooth fractured surfaces (No Phloem fibers)**

***2. Granular:*** **short but shows small rounded prominences.**

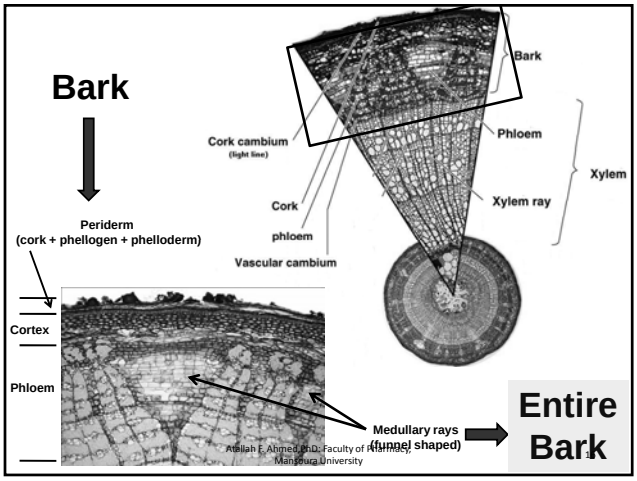
***3. Splintery:*** **Surface shows jagged projecting points e.g. Cinnamon.**

***4. Laminated:*** **splintery but shows broken tangentially arranged layers e.g. Quillaia**

***5. Fibrous:*** ***surface shows fibrous threads.***



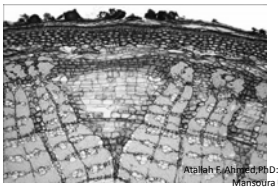


***Microscopical Characters (Bark Structure)***

**Classification of Barks**

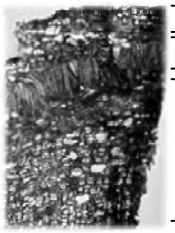
***1. Entire (Typical)*:**
**It consists of:**
**- Peridem (cork + phellogen + phelloderm)**
**- Cortex**
**- Pericycle**
**- 2ry phloem (1ry phloem ?)**
**- Other structures (fibers, sclereids, secretory organs, etc.)**



***Examples:***
***Cassia Bark***
***Cinchona Bark***
***Pomegranate Bark***



***2. Decorticated Bark (need human interfernce)*:**
**During preparation of some *commercial barks*, a part or whole of the tissues lying outside (above) the 2ry phloem may be removed *(decortication)* as they are lacking a medicinal value or containing undesirable constituents such as tannins, coloring matters.**
**It means a bark deprived of its most cortex.**

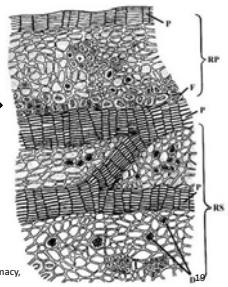



***Example:***
***Cinnamon Bark***



***3. OuterBark = Rhytidome = Shell or Scale Bark = Botanist's Bark (naturally produced)*:**
**It is composed of alternative layers of dead periderm and other collapsed tissues of cortex or phloem, being formed after the formation of internal phellogen.**
**It has no commercial value e.g. Rhytidome removed from Quillaia or Oak during preparation.**

***P* = periderm**
***RP* = remains of 1ry phloem**
***RS* = remains of 2ry phloem**
***F* = fibers**
***D* = calcium oxalate clusters**
***Oak Rhtyidome***




***4. Inner Bark (naturally produced)*:**
**It is composed mostly of 2ry phloem and remained after shedding or removal of rhytidome e.g. Quillaia Bark.**



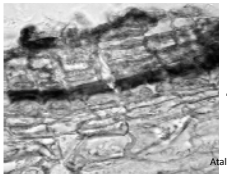
***Microscopical Characters (Bark Structure)***

## Tissues of Barks

**Periderm – Cotex – Pericycle – 1ry & 2ry Phloem – MR**

**I.Periderm**

**Cork (Phellum): Outer protective tissue of 2ry origin developed from phellogen.**
**Cork cells are dead polygonal cells, arranged in compact radial rows - Dark brown in color due to brownish tanniferous pigments – Walls are suberized or lignified (e.g. Cassia, Cascarilla Bark) and varied in thickness.**



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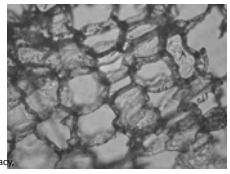
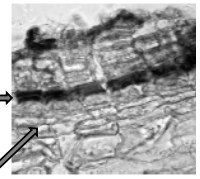
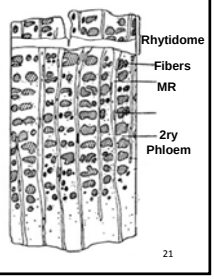


**Phellogen** ***(cork cambium):*** **single row of 2ry meristimatic cells → producing suberized cork to outside and unsuberized phelloderm to inside. It may originate in hypodermis (e.g. Cinnamon), cortex, pericycle (e.g. Cinchona calisaya) or phloem (e.g. Quillaia).**



**Phelloderm: developed internally from phellogen - unsuberized and devoid of pigments (c.f. cork), but may contain starch grains.**
**It may be parenchymatous (root bark), collenchymatous (stem bark) or selerenchymatous (e.g. Canella Bark).**






**II. Cortex** ***(primary cortex):***
**May be absent due to:**
**- decortication process (e.g. Cinnamon).**
**- exfoliation occurred after deep phellogen formation (e.g. Cinchona calisaya).**

**Although, it is usually parenchymatous in nature, the outer layer may become:**
**- collenchymatous (e.g. Oak).**
**- containing sclereids (e.g. Cassia), fibers (e.g. Oak).**
**- containing oil cells (e.g. Cascarilla), oil glands (e.g. Cusparia), laticeferous ducts (e.g. Cinchona) or mucilagenous cells (e.g. Cinnamon, Cassia, Frangula).**

**The term *middle bark* is used to indicate 1ry cortex alone or both 1ry and 2ry cortex (phelloderm).**



**III. Pericycle: very narrow zone – parenchymatous - undifferentiated from cortex (e.g. Cinchona) or in the form of interrupted (e.g.Cinnamon) or continuous (e.g. Witch-Hazel) band of sclerenchyma associated with pericyclic fibres.**

**VI. Phloem** ***(Bast):*** **The commercial bark (mainly 2ry phloem consists of sieve tubes + campanion cells + phloem parenchyma + medullary rays, MR) and usually associated with phloem fibers, sclereids and secretory cells .**

**- *Ceratenchyma:* It is an area of dead 1ry phloem (collapsed compact hyaline mass of sieve tubes) in which sieve plates are permanently blocked by callose (a polysaccharides related to hemicellulose and stained red with corallin soda).**



-**Phloem parenchyma may contain:**
**Starch, calcium oxalate crystals which may form crystal sheath around groups of phloem fibers e.g. Cascara, Frangula and Hamamelis.**

-**Phloem (Bast) fibers:**
**1. Usually are fusiform (e.g. Cinnamon) in shape but may be tortuous and irregular (e.g. Quillaia).**
**2. Walls are thick lignified, sometimes stratified (e.g. Cinchona), rarely cellulosic (e.g. Elm).**
**3. Occur singly or in groups (e.g. Cinnamon).**
**4. Their dimensions are good tool in identification and differentiation of closely related barks (e.g. Cinnamon & Cassia).**

**- Medullary rays (MR): They originate from pith and traversing phloem from xylem. Usually are cellulosic (not lignified as in wood) except in Quillaia Bark.**