

Welcome students myself,

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in Botany from Government,

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Sanquelim. The program is

Bachelor of Science, first year.

The subject is Botany Generic

Elective. semester is II, course

code is BOG 102.

Course title is coastal.

And mangrove ecology. Title of the

unit is biology of mangroves.

Module name is temporal and regional

variations in relation to anatomy of mangroves.

These are the outlines of the module.

In this module we are going to

learn in general about mangroves.

Also we are going to learn

about the anatomy of root, stem,

wood, leaves and seed of mangroves.

These are the learning outcomes

of the module.

At the end of the module you will be

able to explain the anatomy of root.

Stem, wood, leaves and seed of mangroves.

Also you will be able to cite

the differences between the types

of root systems found in mangroves.

Also,

you will be able to describe the

anatomical features of mangroves.

Now let us learn in general about mangroves.

Mangroves are woody plants that grows

at interface between land and sea in

tropical and subtropical latitude,

where they exist in conditions

of high salinity, extreme tides,

strong winds,

high temperature and muddy anaerobic soils.

The plant have a complex anatomical.

Adaptations such as the cuticle,

Multilayered epidermis,

sunken stomata,

salt glands and lenticels which allows

them to survive in high stress salinity.

They are highly adapted to

coastal environment with exposed

root system, support root system,

Salt excreting glands present in leaves.

And viviparous water dispersed propagules.

These anatomical adaptations of

mangroves help them to survive in

high saline environment.

Now let us learn about the

root anatomy of mangroves.

First,

let us learn about the types

of roots found in mangroves.

Roots in mangroves are divided

into ground root system.

An aerial root system. groundwater system

is further divided into flat root System,

Heart Root system and tap root system.

Whereas the aerial root system

are divided into.

Stilt Root system, knee root

System, pneumatophores,

which is also called as breathing

roots and buttress root system.

Let us learn about ground root system.

The first is flat root system.

It has strongly developed lateral roots

which helps the mangroves to grow in Sandy,

Stony. Coastline. second is heart root system.

It develops many strong main roots

which grows vertically into the ground

which helps the mangroves to grow in

Areas like Muddy Sandy or coral soils.

3rd is taproot system.

It develops one single strong main

root that grows vertically into the

ground which helps the mangroves to grow

In dry and well drained soil.

Next is aerial root system.

The first is the stilt root system.

They are

The looping roots arise from
the trunk and lower branches.

Second is the knee root system.

There are the horizontal roots
growing vertically upward and forming
loop downwards to resemble a bent knee.

The pneumatophores which is also called
as breathing root.

They are erect root that
grows vertically up from the.

Underground root system,
which obtains oxygen in an
anaerobic condition. Fourth is

buttress root system. they are wavy,
snake like roots that radiate
outwards from the trunk base.

Now let us learn about the
anatomy of Root of Mangrove.

First is the anatomy of stilt root.

The general structure of root of mangrove

is similar to that most of vascular plants.

Vascular plants are the plants which possess

vascular tissues such as Xylem and phloem.

Stilt root shows the normal features like

the outermost layer is the epidermis,

the exposed surface of the root

shows numerous lenticels

which are the air breathing cells,

which is an important feature of

root of mangrove for gas exchange.

Lenticels maybe found fully closed,

partially closed or fully open,

through which the oxygen diffuses passively.

As you can see the diagram on the

Screen. transverse section of stilt root

example is *Rhizophora mucronata*.

It has an aerenchymatous

cortex contains sclereids,

Secretary Pericycle and Normal

Endodermis. In mangrove root

The endodermis act as an effective absorbing layer.

As they lack root hair. coming to its vascular bundle.

Stilt root shows radially arranged

Xylem and phloem extensively

Developed pith with oil cells.

The next is anatomy of

Pneumatophores. As you all can see,

the diagram on the screen

transverse section of pneumatophores which is

also called as a breathing roots.

It develops number of lenticels on their

surface which helps in absorbing air.

The cortex is spongy.

And consist of extensively

developed aerenchyma

enclosing large air chamber. pneumatophores shows variations

in their internal structure.

It shows conjoint collateral vascular bundle,

meaning the Xylem and phloem are

arranged together in the same radius

where Xylem is present towards

the interior side and phloem is

present towards the exterior side.

It also shows an endarch type of

Xylem condition at maturity.

endarch is the kind of arrangement

where Proto Xylem is directed

towards the center and

metaxylem is directed towards the periphery.

Now let us learn about the stem and

Wood anatomy of mangrove.

The first is anatomy of stem of

Mangrove. as you all can see the diagram on

the screen transverse section of young stem.

Example is Rhizophora. stem of mangroves

possess thin walled water

storing parenchymatous cells.

It shows the presence of thick cuticle.

Epidermal cells contain large quantities

of tannin and oil droplets. Cortex is

fleshy and is divided into outer cortex,

an inner cortex. outer cortex

consists of tannin cells and lacunae

lacunae meaning air spaces

and inner cortex consists of sclereids.

Endodermis in mangroves shows

the presence of starch grains.

It also shows the presence of conjoined.

Collateral vascular bundle

with endarch type of Xylem.

Now let us learn about the anatomy

of wood of mangrove. In wood of mangrove

growth rings are completely absent.

Hence it is difficult to find

out the age of

the tree. Numerous narrow vessels are

found running through the woods and

water conduction through the wood

is strongly influenced by size

and distribution of vessels.

Water moves more quickly through ring porous

wood where vessels are larger in size,

whereas conduction is much slower

in diffuse porous wood where

vessels are smaller and more uniform

in size and distribution.

Now let us learn about the

leaf anatomy of mangroves,

An anatomy of leaf of mangroves. as you

all can see the diagram on the screen.

Leaf of mangrove.

Example is *Sonneratia apetala*.

Leaf of mangoes appears leathery

with obscure leaf vein meaning blurred

leaf veing. the cuticle is thick and

smooth with small hairs which gives

a glossy appearance to the leaf

of the mangroves and sunken stomata.

The palisade consist of several

layers of narrow cells with tannin

and oil cells. In most species,

a horn or beak like

Cuticular outgrowth covers either the outer side of the stomatal pore, or both the inner and outer side.

This structure reduces stomatal transpiration.

Leaves of mangroves also shows

Specialized idio blast cells, including laticifers

meaning the cells which stores latex.

It also shows the presence of tannin, mucous,

Crystalliferous and oil cells.

Water storage tissues are also

present in leaves of mangroves,

which helps in filtering off heat rays.

leaves of mangroves lack bundle

sheath fibers and bundle sheath extension.

But it possess Enlarged tracheids terminating in vain endings.

Thus sclereids gives mechanical

support to the leaves.

Leaves of the mangroves also shows the

presence of salt glands through which they

excrete excess oil from the plant body.

Now let us learn about the seed anatomy

and the seedling of mangroves. as you all

can see the picture on the screen,

it shows the viviparus type of reproduction

Found in mangoes,

vivipary meaning embryo or a seed develops

Before it detached from the parent plant,

the anatomical features of seedling

allow them to tolerate flooding.

Seedlings of mangroves shows the

presence of lacunae in the ground

tissue that conserves oxygen,

which helps seedlings to maintain

aerobic metabolism during flooding.

It shows the presence of tannin cells,

aerenchyma tissue,

stone cells in the outer cortex and trichosclereids

in both Cortex and medulla since

epidermis lack stomata.

Numerous lenticels are found

in seedlings of mangroves.

Which facilitate the exchange of gas.

These are the references of my module.

Thank you.