4-Maize or Corn Z*ea mays*, L.

Prepared

By

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Introduction:

Zea mays is an annual grass of the Poaceae family of the genesis Zea. Other grasses in this family include wheat, barley, rye, sugarcane, sorghum, and rice. One main difference between corn and other cereals is that it bears seed heads, ears, that are larger than any other grassy. Also corn has a higher yield of food per unit than any other grain. This productivity is one of the main contributing factors of corn‟s appeal to farmers.

Hypogeal germination:

The grain imbibes water from moist soil. The coleorhiza pierces the base of caryopsis (fruit) and appears as a shining knob. After sometimes, the coleorhiza gets ruptured due to growth of radicle. After sometime coleoptile comes out. The cotyledon do not come out of the soil surface.

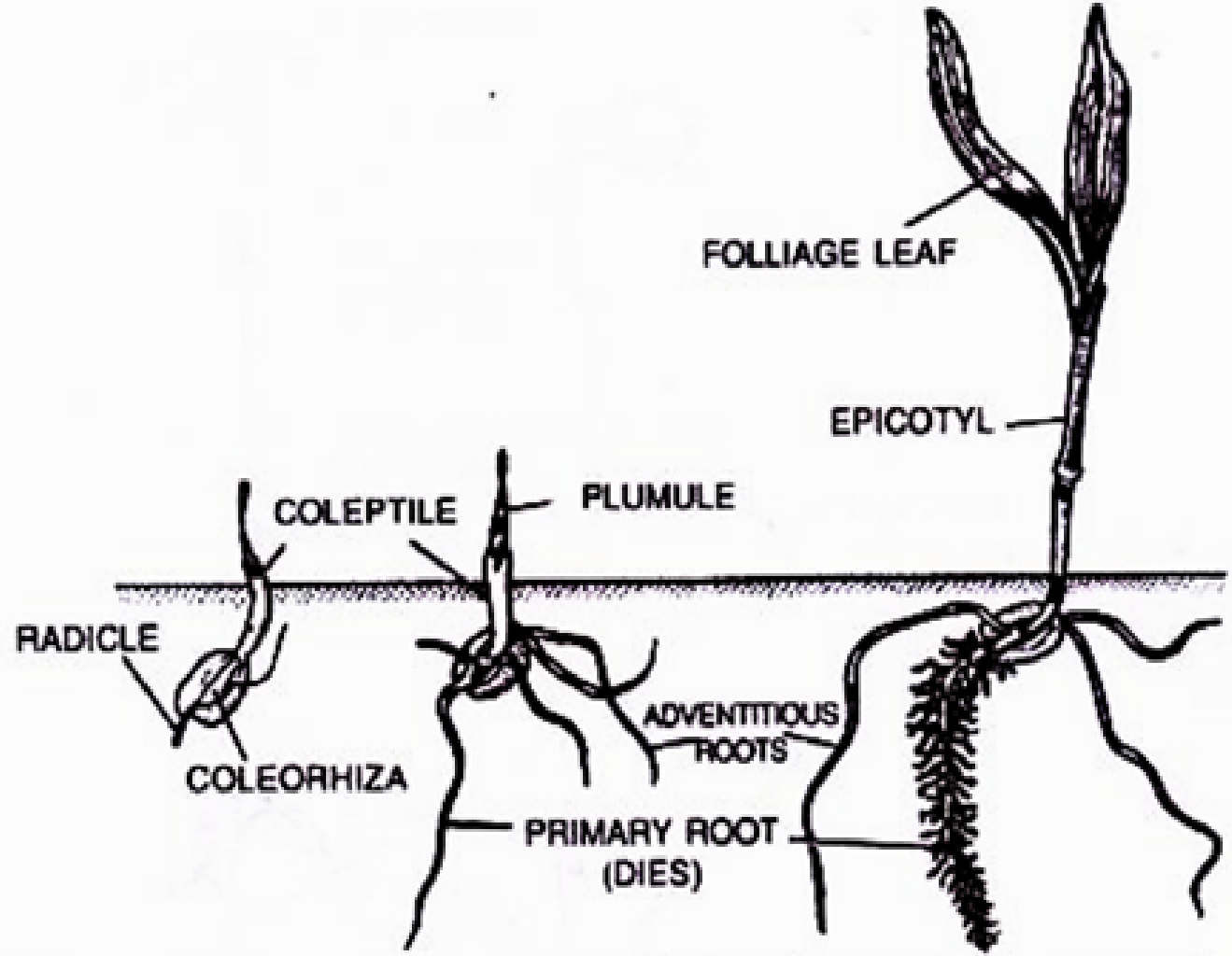
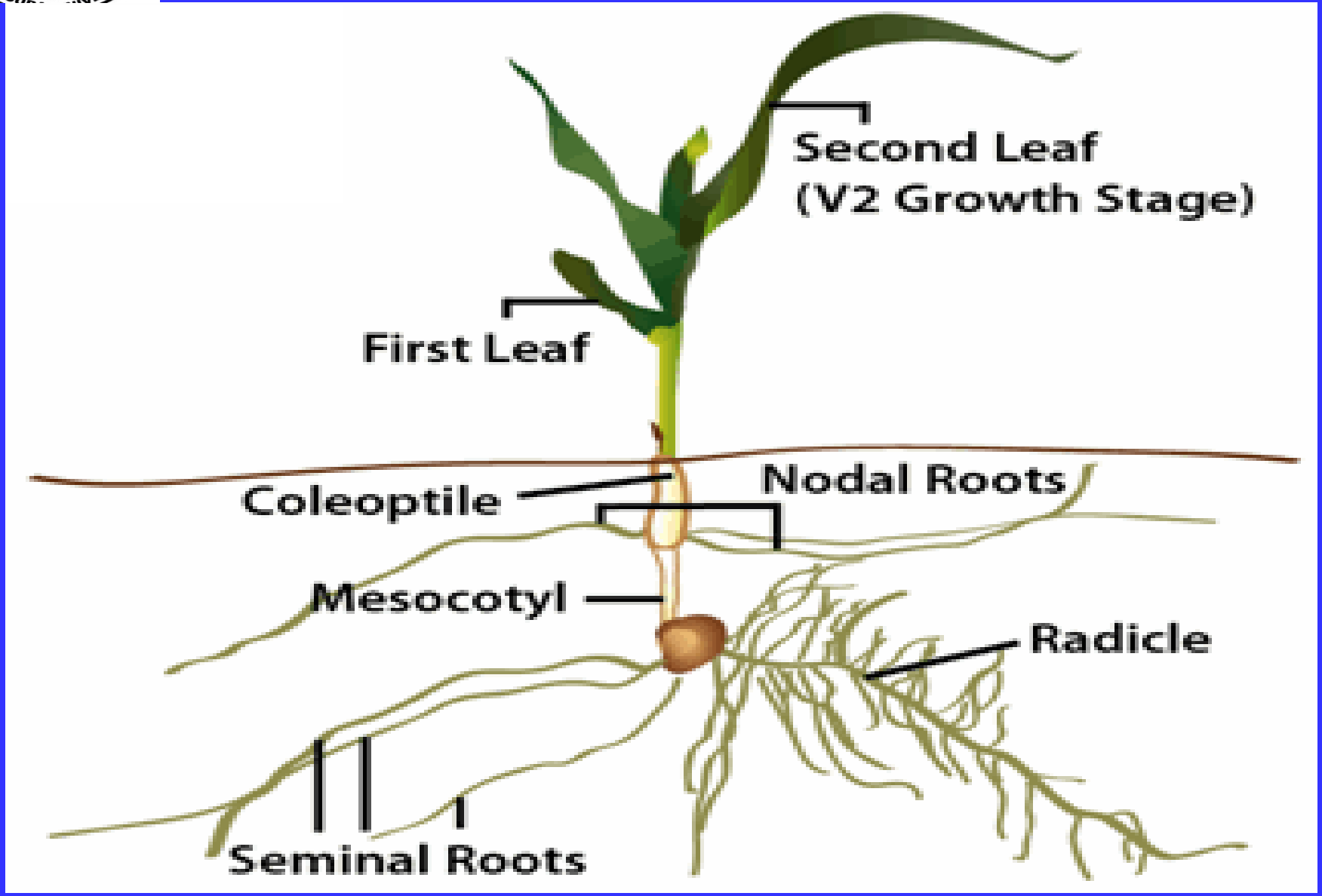


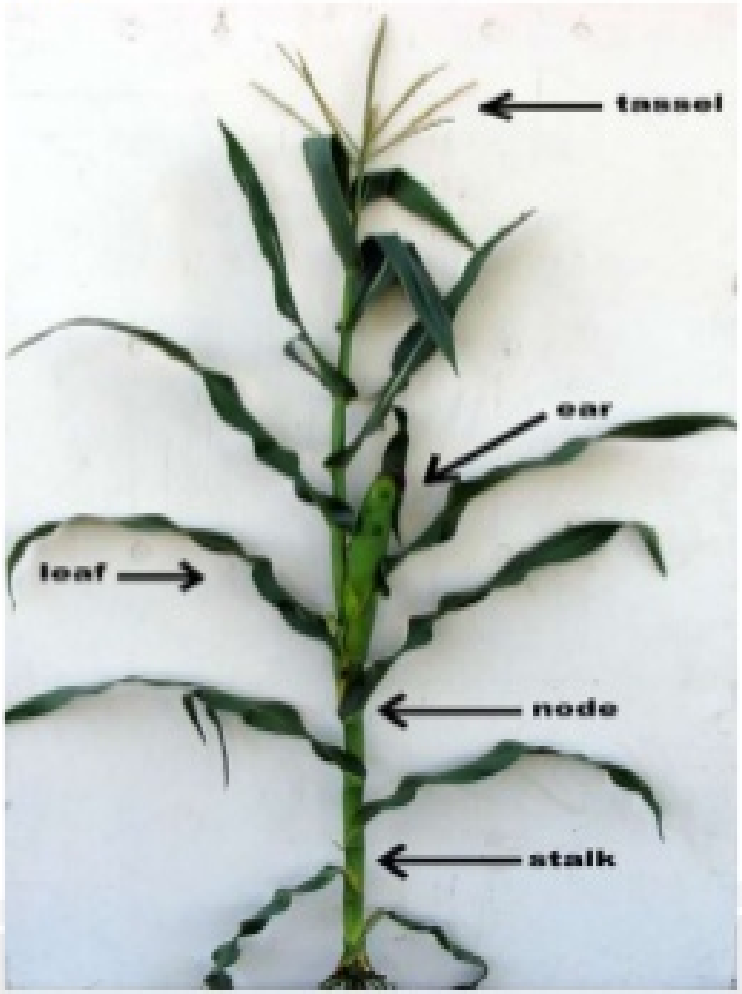
Fig. 4.3. Successive stages of hypogeal germination of monocotyledonous seed : (fruit) of maize.


Second Leaf
(V2 Growth Stage)
First Leaf
Coleoptile
Nodal Roots
Mesocotyl
Radicle
Seminal Roots

Plant height:

Maize typically grows from 1.2 to 3 m tall. Corn stalks can have anywhere from eight to forty-eight leaves and multiple ears. Each stalk produces ears that contain many rows of kernels that grow off of the cob of the ear and are enclosed by a leafy husk.

Plant Morphology of Maize



- 1 to 4 meter tall
- Approximately 30 leaves
- A erect stalk- like structure
- Is a meristem
- Sheath surrounding the stalk
- Expanded blade by blade joint or collar
- Has nodes and internodes

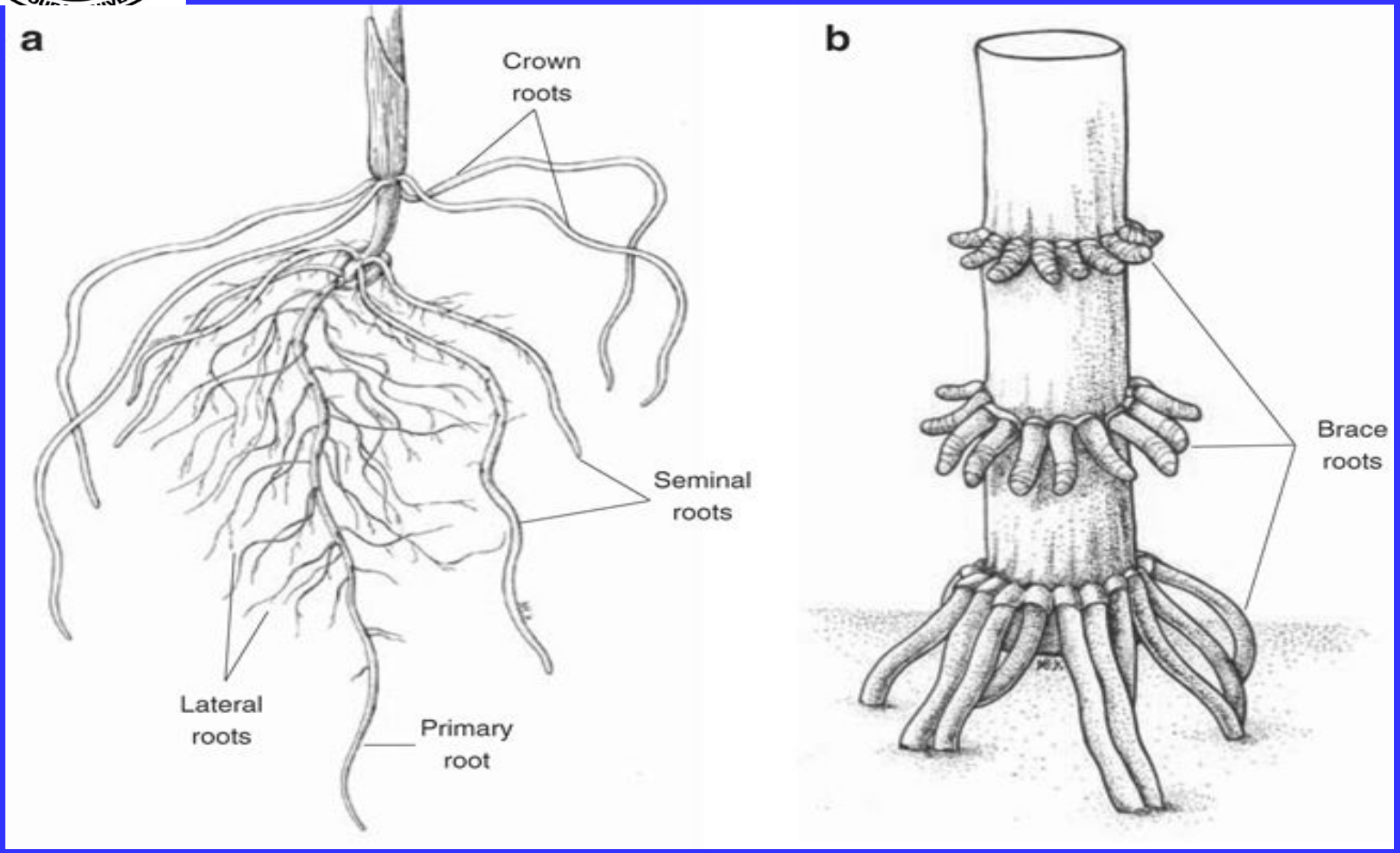

IHFif
IHFor
IHThi
IHSec
IHFir

Roots:

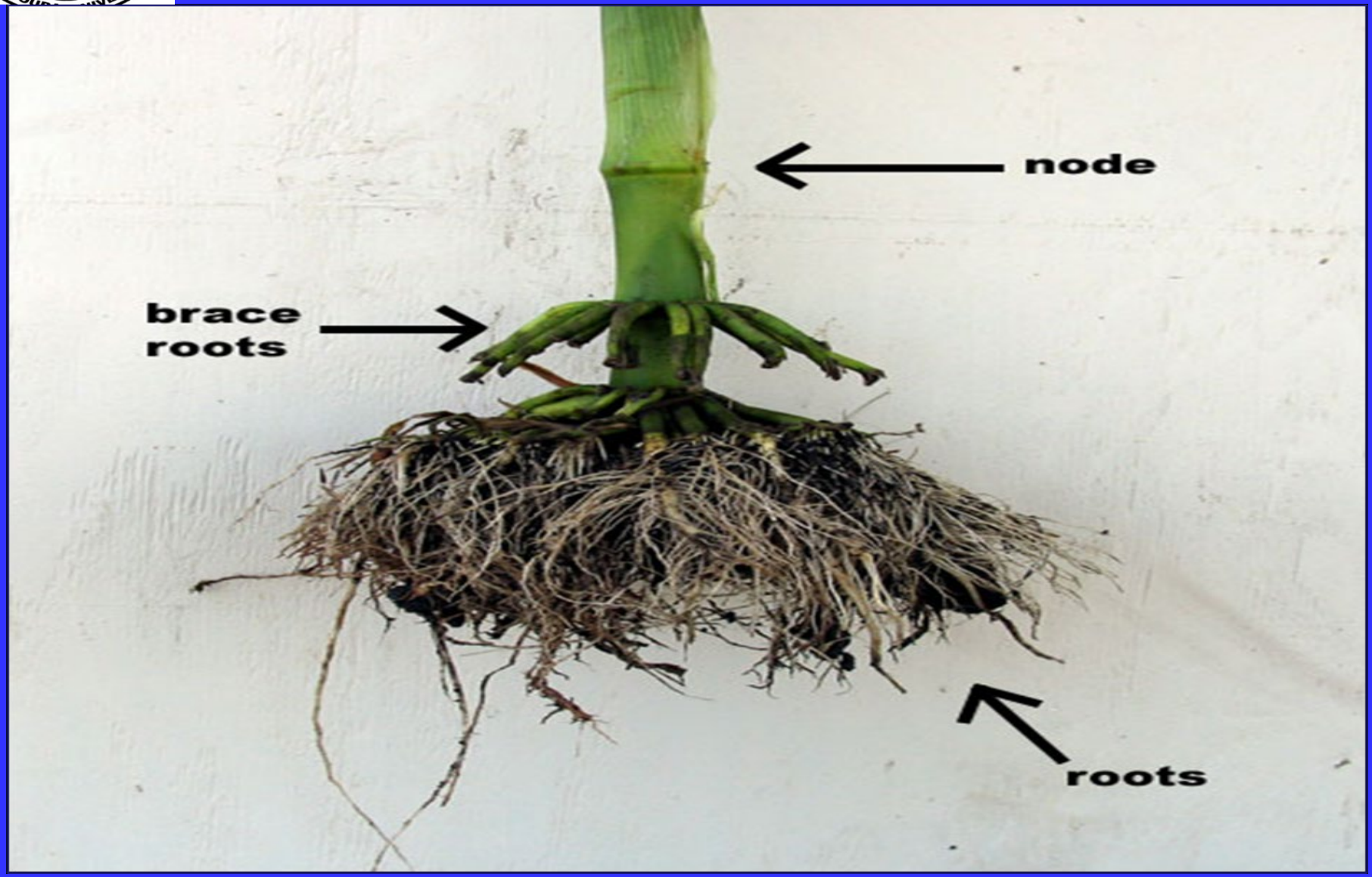
The root system of maize consists of roots that are formed during embryogenesis 4-6 seminal roots.

Maize produces both adventitious (lateral roots). The adventitious roots become thick and fleshy due to the storage of food at nodes below the soil.

The brace roots form above ground after plant emergence. Brace roots are important in reducing lodging.



Types of Roots



Types of Roots

Stem:

Maize has a single stem and a rarely tillers. Maize typically grows from 1.2 to 3 m tall. Corn stalks can have anywhere from eight to forty-eight leaves and multiple ears. Each stalk produces ears that contain many rows of kernels that grow off the cob of the ear and are enclosed by a leafy husk.

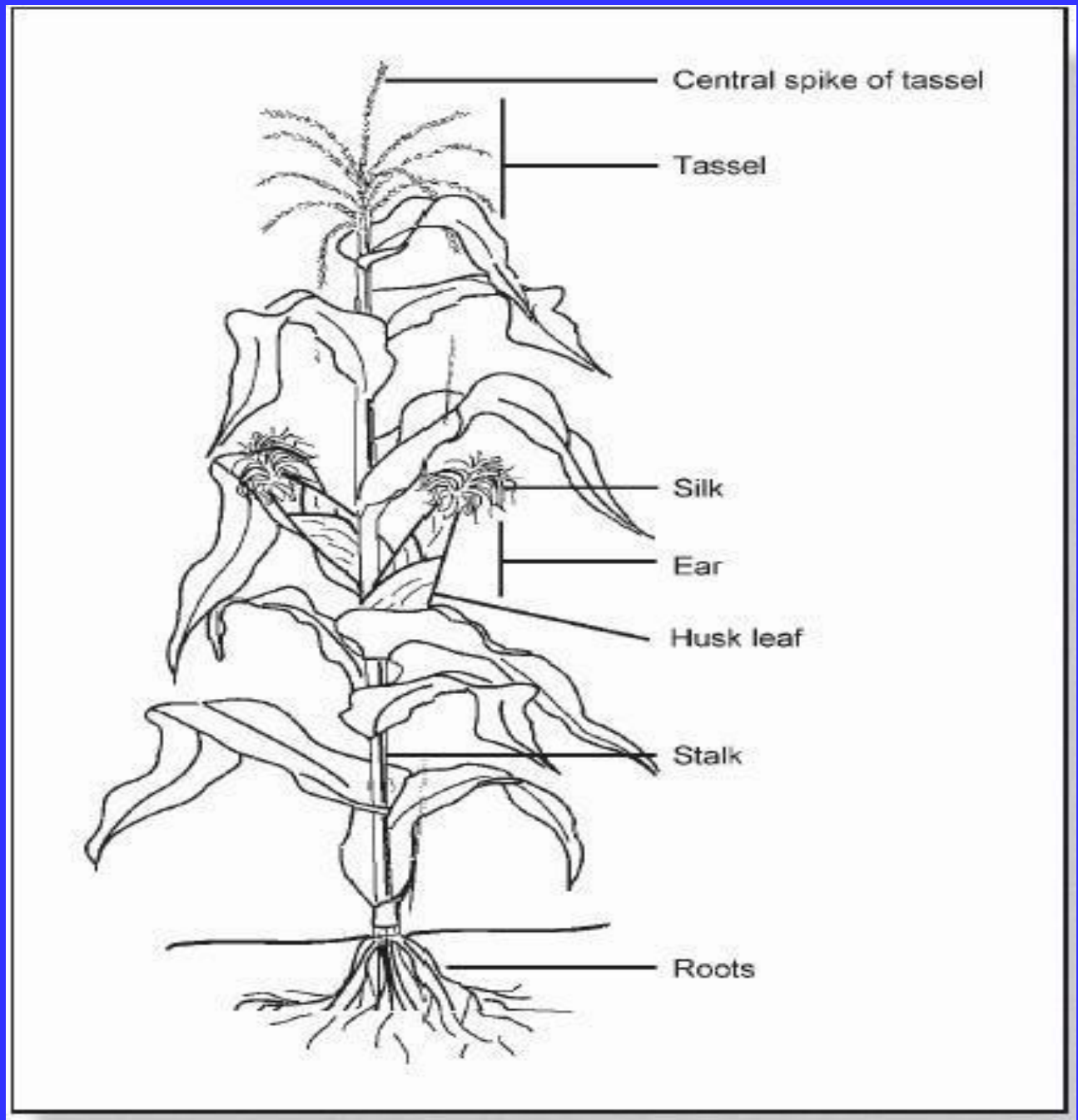
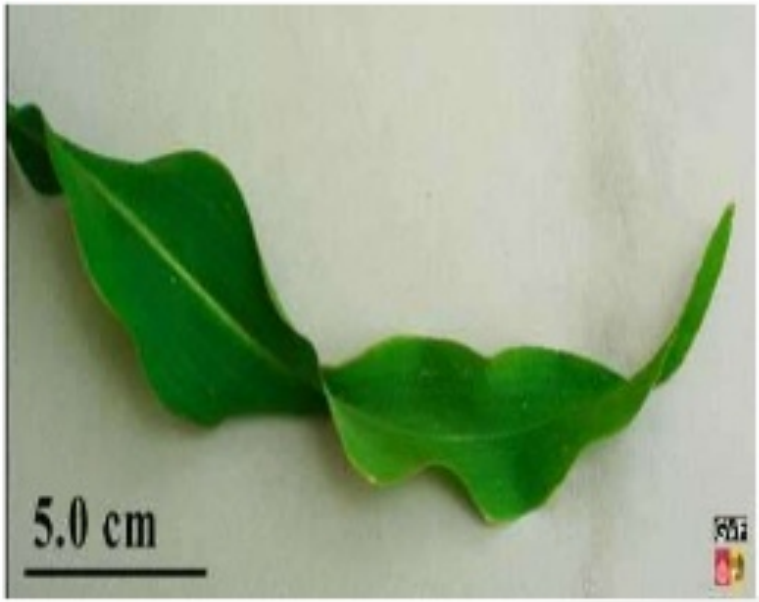


Figure 1. Corn plant showing ears (female) and tassels (male).

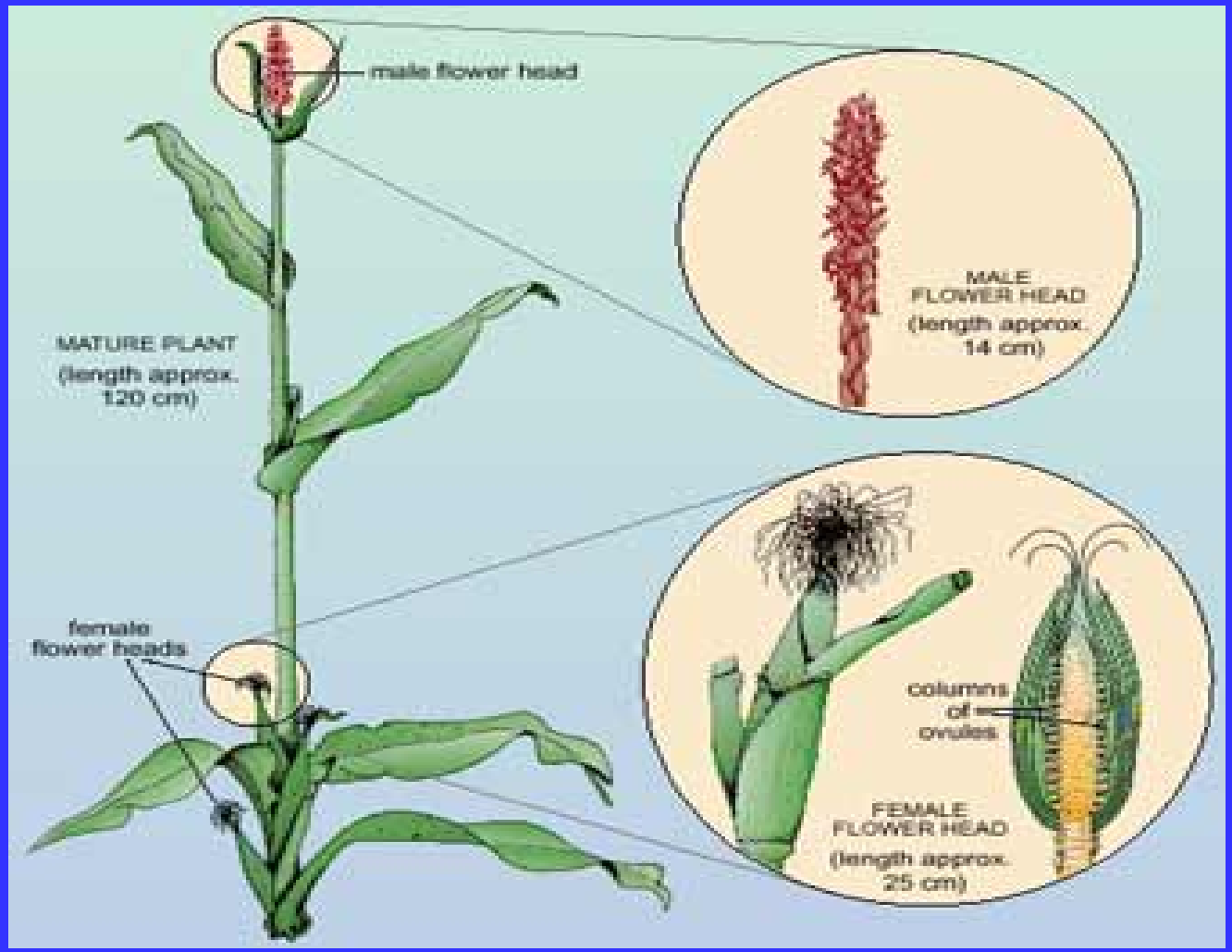
- **Leaves:** Maize forms from 16 to 22 leaves per plant. Leaves form at each node and alternate i.e., they appear on opposite sides of the plant.

Leaves Morphology of Maize



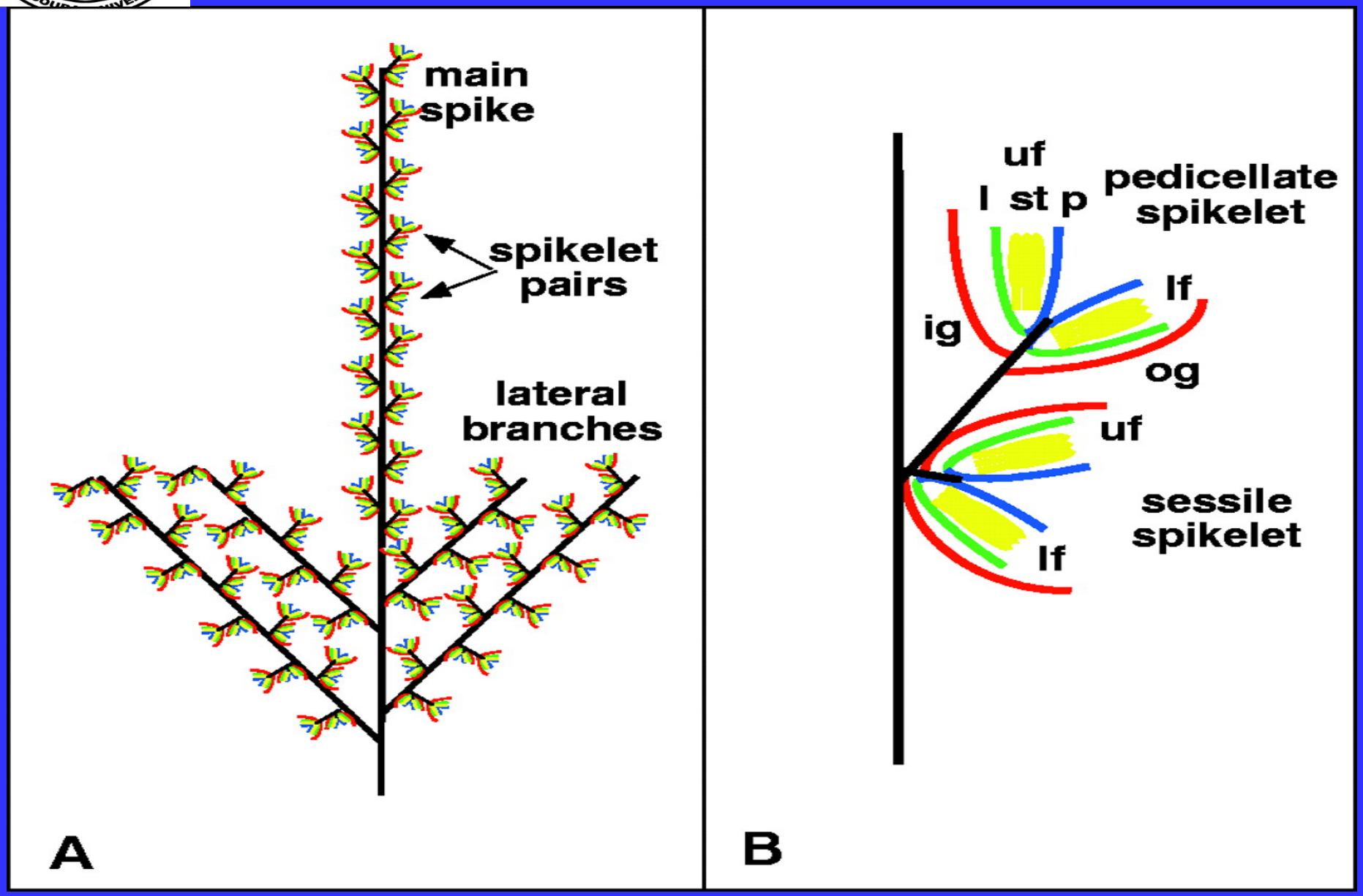
- Leaves are broad and a single leaf.
- Leaves are arranged in two vertical rows on the opposite sides of an axis. (distichous)
- Long, large, alternate, parallel veins

- **Tassel:** The tassel forms at the top of the plant and provides the pollen for fertilizing the ear **(also known as a cob).**



Flowering:

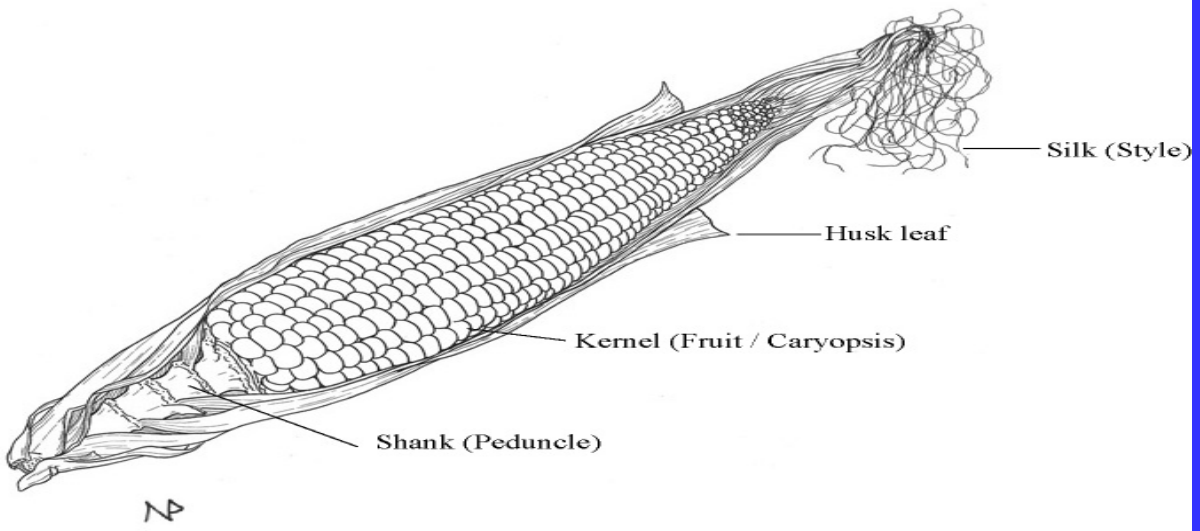
Maize usually forms a single ear (or cob). Each corn plant contains both male and female reproductive organs. The tassels, the terminal flowers, ordinarily develop only male spikelets which grow in pairs with one being sessile, having no stalk, and the other pedicellate, a single blossom on a lean stalk. Each tassel contains some twenty-five million pollen grains.


main spike
spikelet pairs
lateral branches
A
uf
l st p
pedicellate spikelet
lf
ig
og
uf
sessile spikelet
lf
B

The cob:

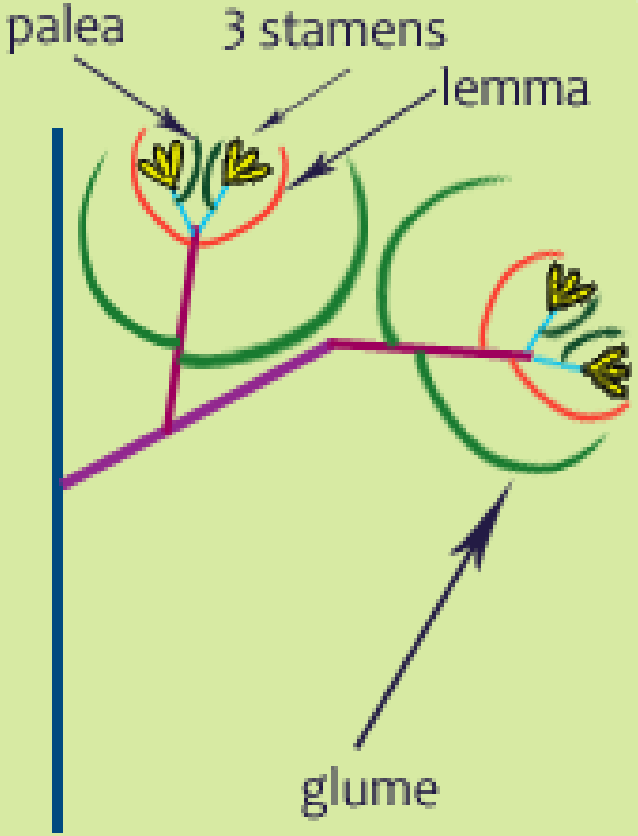
The lateral organ or female inflorescence is the ear. Each ear of corn contains upwards of one thousand potential kernels. Like the male tassels, the ears also bear spikelets, once again with only one of the flowers developing. Each of these flowers has one ovary "terminated by a long style known as the „silk. Fine hairs cover the end of the silks to catch the pollen that is blowing in the wind. If the silk, which will develop into one kernel, is not pollinated. This characteristic results in the process of *xenia* in which the two breeds of corn combine, generally with the kernels taking on the characteristics of the male pollen A unique characteristic of corn is that unlike most plants the kernels are completely enclosed by the outer layer known as the husk or shuck.

Zea mays Ear (Female Inflorescence)

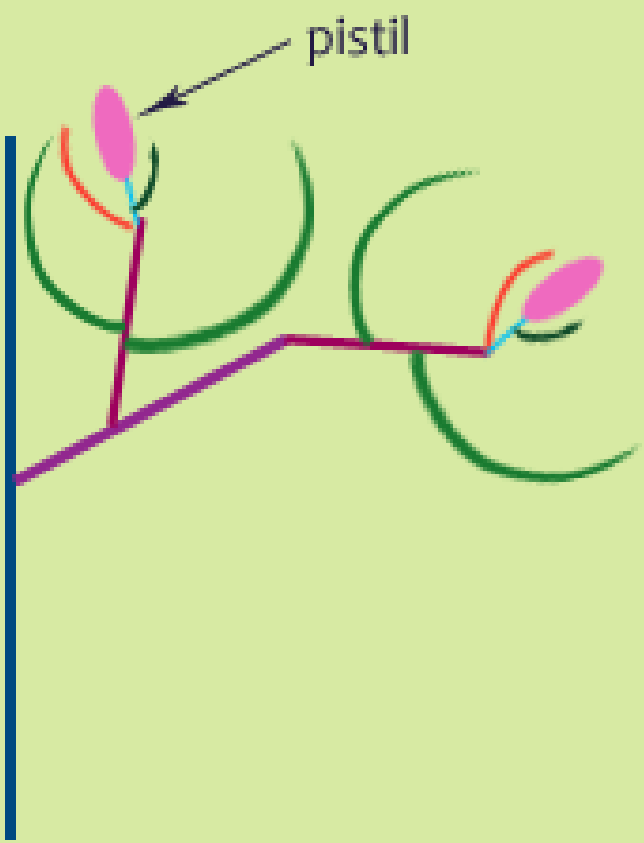


Maize Cob

Maize flowers



Male (staminate flowers)

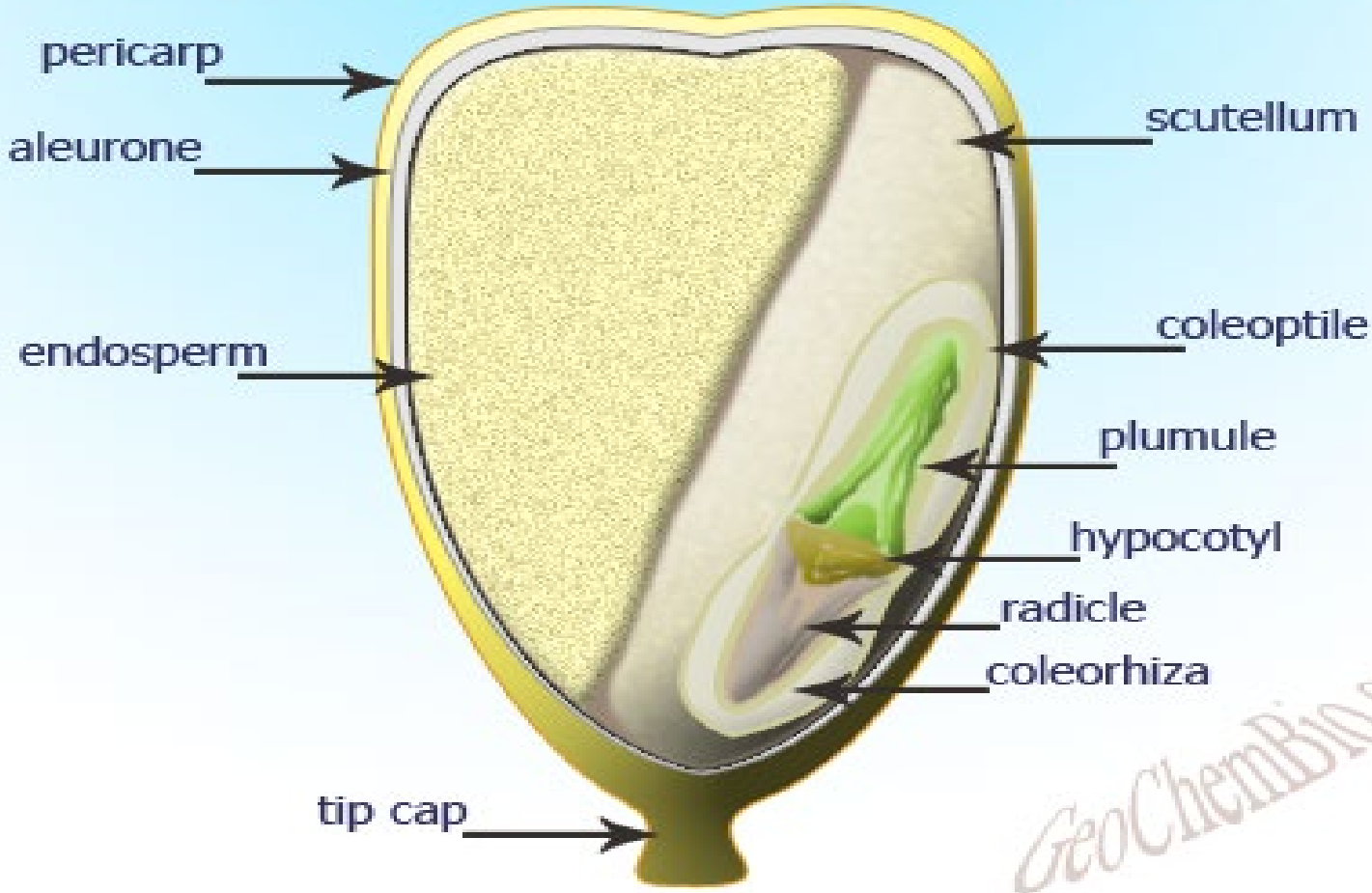


Female (pistillate flowers)

Seed:

Maize grains usually weigh around 25-40 g per 100 kernels. The kernels that develop as a result of the pollination of the silk are firmly attached to the solid core of the ear, the cob. A mature kernel has three parts: the pericarp or thin shell, the endosperm or food storage organ, and the embryo or germ. The pericarp is a thin layer of maternal tissues that encloses the entire seed. The pericarp is usually colorless but can be red, brown, orange, and cherry.

Corn seed


pericarp
aleurone
endosperm
tip cap
scutellum
coleoptile
plumule
hypocotyl
radicle
coleorhiza
GeoChemBio.com

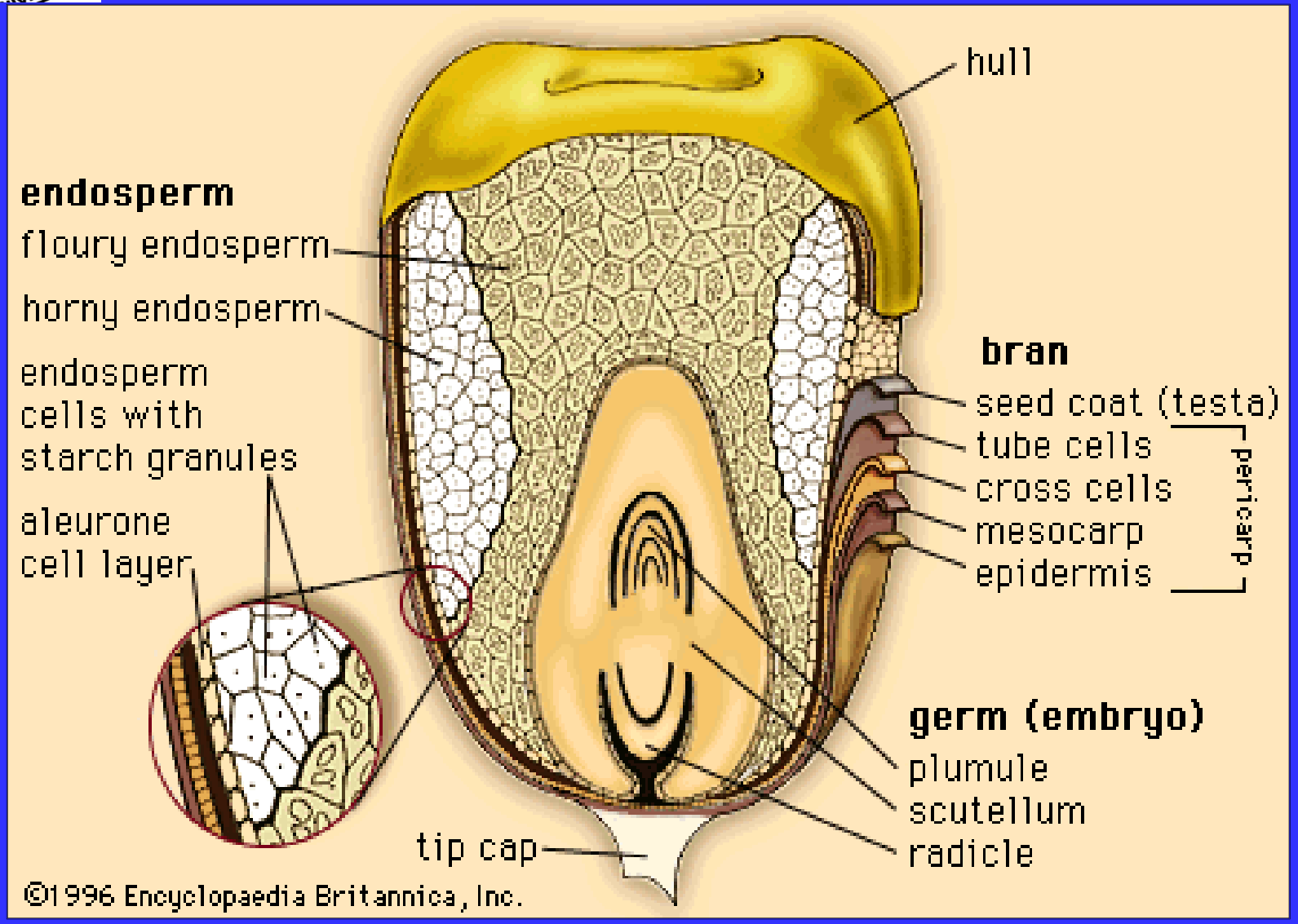


Fig.3 Structures of corn kernel

Types of corn grains:

1-Dent corn derives its name from the dent or depression that is visible its dried, matured kernel. **This dent is caused by the shrinking of the soft, floury starch within the hard starch which is contained to one side of the kernel.** Most dent corn is yellow or white in color and is used primarily a livestock feed. Though white dents are a preferred food in Mexico, Central America and southern Africa. As a result, dent corn is by far the most produced type of corn.

An ear of corn with shank and husk

Grain Dent

2-Flint corn:

It has a smooth kernel due to a limited to non-existent amount of soft starch contained within the hard endosperm. It ranges in color from white to deep red. Flint corn thrives in cool climates with wetter soil and generally performs better at higher altitudes. It matures earlier than other varietals of maize. Flints also store more durably than other varietals because the kernels absorb less moisture and are more resistant to fungi and insects.

Flint corn

3-Flour corn:

It resembles flint corn in size and shape but is mostly white or blue in color. Soft, mealy starch dominates the endosperm so the kernel can easily be crushed into flour. Flour corn is cultivated primarily in the southwestern United States and Andean highlands of South America. One interesting characteristic of flour corn is that in South America it is used for beer making and used in special food preparations.

Flour corn

4-Sweet corn:

Sweet corn which is what most Americans commonly identify with, is easily recognized by their wrinkled kernels, which are typically white or yellow. The sweetness is a result of a genetic defect in metabolism that prevents the sugars from being completely transformed into starch. It has a soft, sugary endosperm and thus is bred especially for consumption in an immature state like corn on the cob. It is grown mainly in the United States

Sweet corn

5-Pod corn:

It is grown almost exclusively for scientific research in an effort to trace the genetic roots of corn. Each kernel of pod corn is enclosed in a glumes, or husks.

6-Popcorn:

It has small, hard kernels that contain high levels of starch in the endosperm. They are extremely hard kernels of the flint variety. A fascinating characteristic of popcorn is that when heated the water in the starch steam-pressure the endosperm to explode causing the small kernels to well and burst producing an edible white flakei. Though the pericarps of popcorn can be multicolored, the most common are yellow and white.

Popcorn

Popcorn

7- Wax corn:

Finally, the starch in **wax corn is made solely of amylopectin without the 22 % amylose** which is characteristic of dent corn". Thus wax corn is used in industrial starches in the United States and for a few specific dishes in Asia.

Corn by products showed in Fig.5.

Wax corn

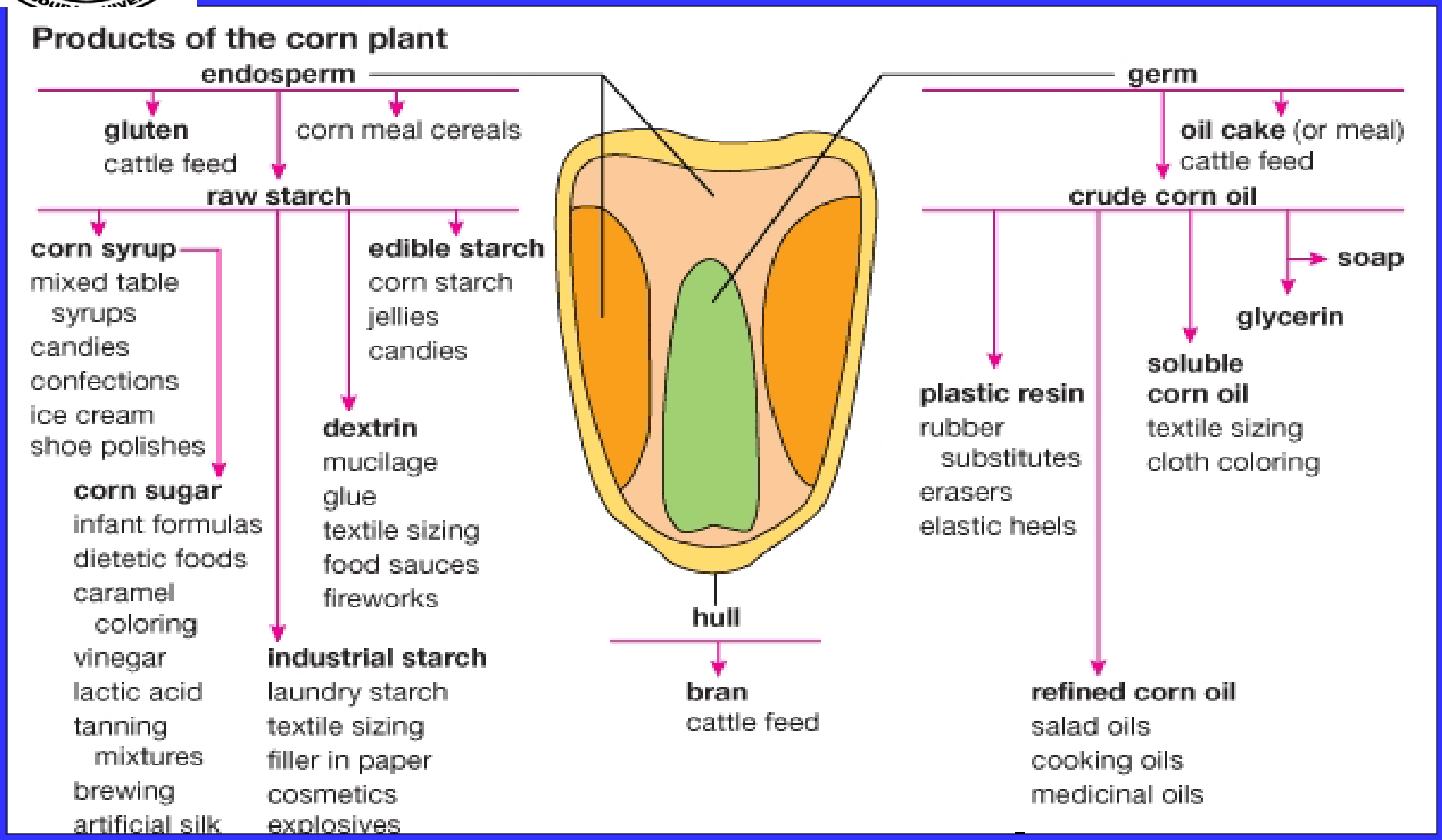


Fig. 22 Corn Products

e	Corn (*Zea mays* L.) Germaine Poacese
Germination	Hypogeal: grains remains below the ground
Root	Fibrous included 1- 4-6 seminal roots. 2-Adventitious roots (node) reached 150 cm in the soil. 3-brace root (from the base node) above the soil.
Stem	Erect, cylindrical, and hollow except at the nodes, 1-3 m tall-the short node in the base-the long one in uppermost-Tassel at the top-ear or cop at the middle
Leaf	Compound include 1-Broad blade with midrib. 2-Sheath cylindrical tubular on the stem. 3-Ligule. 4-Aurticles. Flag leaf surrounded the ear.
Inflorescence	Tassel (male organs) in the top of plant- cob or ear (in the middle) the female organs.
Flowers	Male flower-palea-lemma -stamens include 3 stamens- Female flower- stigma (silks)-ovary- Cross pollination
Fruits	Grain-Kernel – Caryopsis.

Questions

1-The main difference between corn and other cereal crops is

a-it bears seed heads, ears, that are larger than any other grass.

b-corn has a higher yield of food per unit than any other grain.

c- it has a brace roots form under ground after plant emergence

d-answer a+b

2- Maize produces both …….. roots.

a-Seminal roots

b- secondary roots

c- tap root

d-answer a+b

3- The brace roots originated form ……ground after plant emergence.

a- above b- under c- nearly d- a long stem

4- True or false:

(false) If the plant is drought, brace roots may not form adequately reducing lodging.

5- …… at the top of the plant and provides the pollen for fertilizing the ear.

a- The tassel b- the ear

c- kernels d- the silk

6-True or false:

(True) Corn plant contains both male and female reproductive organs, this mean is monoecious plant.

7-Corn tassel contains about ..... pollen grains.

a- twenty five million

b- thirty-five million

c- fifty-five million

d-Ten million

8- …….. collect of tubes that run from each potential grain on the ear kernel will not appear.

a-ear

b-tassel

c- the silk

d-no one of the above.

9- Maize grains usually weigh around ……..

a-25-40 g per 100 kernels

b-35-50 g per 100 kernels.

c-55-60 g per 100 kernels.

d-65-70 g per 100 kernels

10- A mature kernel has three parts .....

a- the pericarp, the endosperm, and the embryo or germ.

b- the ear, the endosperm, and the embryo or germ.

c- tassel , the endosperm, and the embryo or germ.

d- the ear, the endosperm

11- ..... its name from the depression that is visible its dried, matured kernel. This dent is caused by the shrinking of the soft, floury starch within the hard starch.

a-flint corn b- Dent corn c-white corn d- Popcorn

12- …… corn has a smooth kernel due to a limited to non-existent amount of soft starch contained within the hard endosperm.

a- Flint corn b- Dent corn c-white corn d- Popcorn

13- …… resembles flint corn in size and shape but is mostly white in color. Soft, mealy starch dominates the endosperm so the kernel can easily be crushed into flour.

a- Flour corn b- Dent corn c-white corn d- Popcorn

14- …… It is easily recognized by their wrinkled kernels, which are typically white or yellow.

a- Flour corn b- Dent corn c- Sweet corn d- Popcorn

15- ……. is grown almost exclusively for scientific research in an effort to trace the genetic roots of corn, and its kernel is enclosed in a glumes.

a- Flour corn b- Dent corn

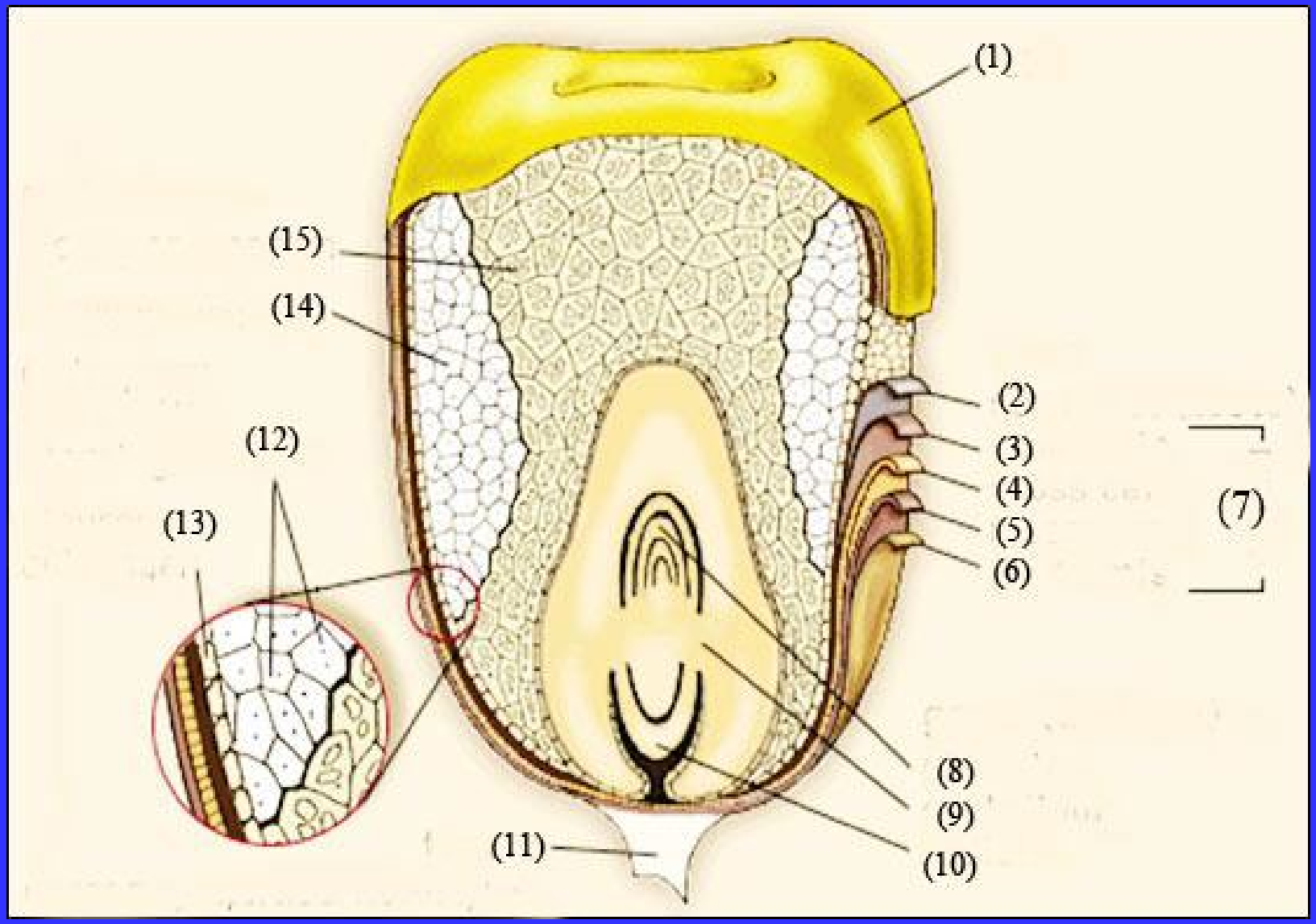
c- Sweet corn d- Pod corn

16- …… has small, hard kernels that contain high levels of starch in the endosperm. They are extremely hard kernels of the flint variety.

a- Flour corn b- Dent corn c- Sweet corn d- Popcorn

17- The corn flower consists of a pistil (female organ) and …… stamens in the male organs.

a-three b- six c- five d- tow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Thank
You!