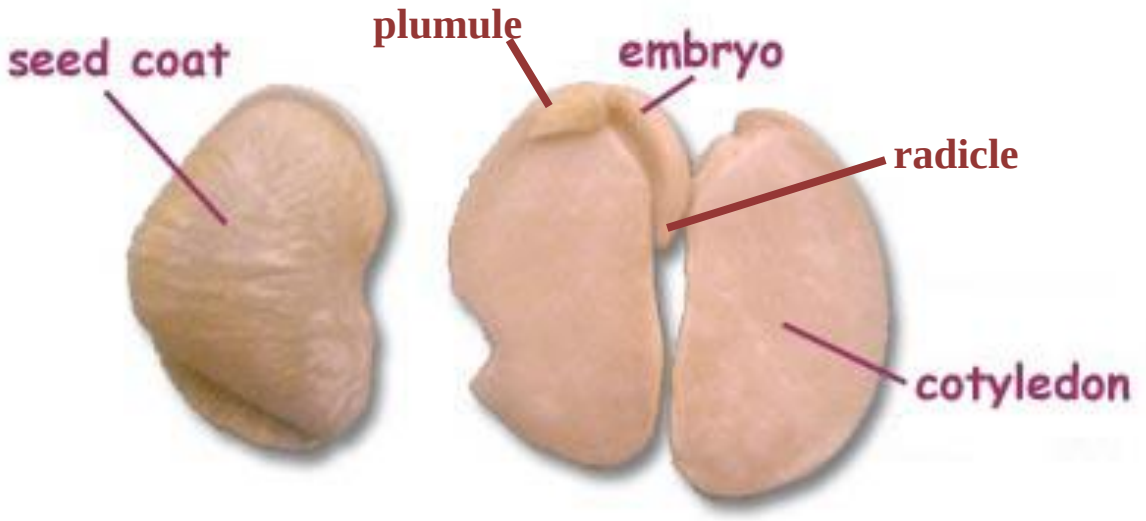
Explant

It is the piece of plant tissue placed on culture media. Potentially all living plant parts can be used as explant. It may be obtained from field-grown plant or plants growing under in vitro conditions. The focus of this section is seed, seedling, stem, root and flower.

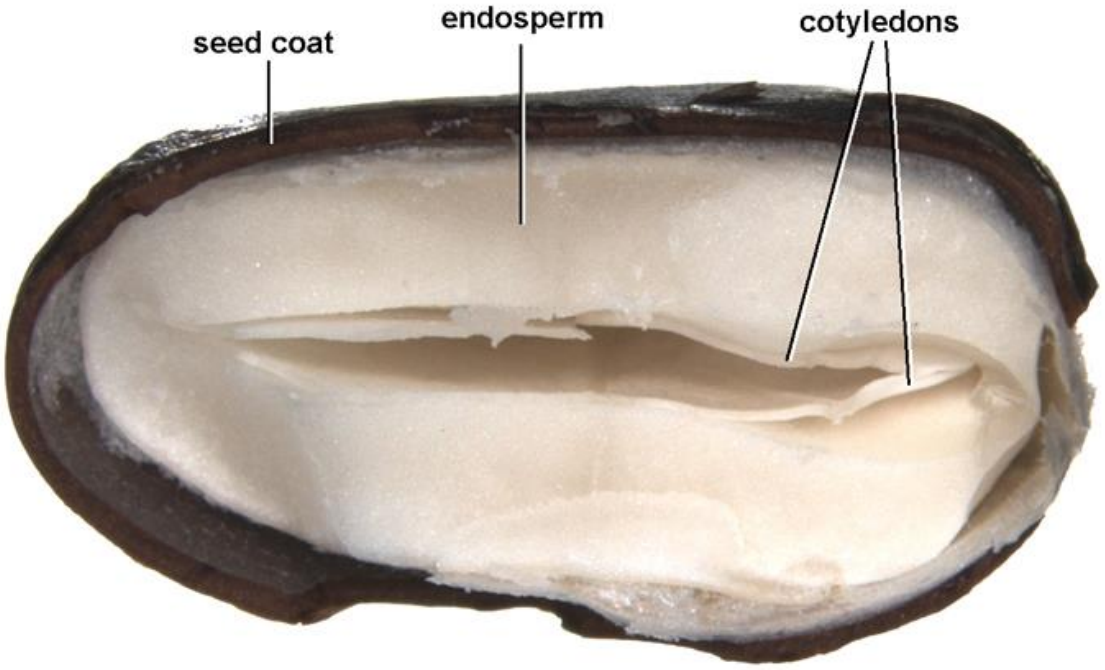
Seeds and Seedlings

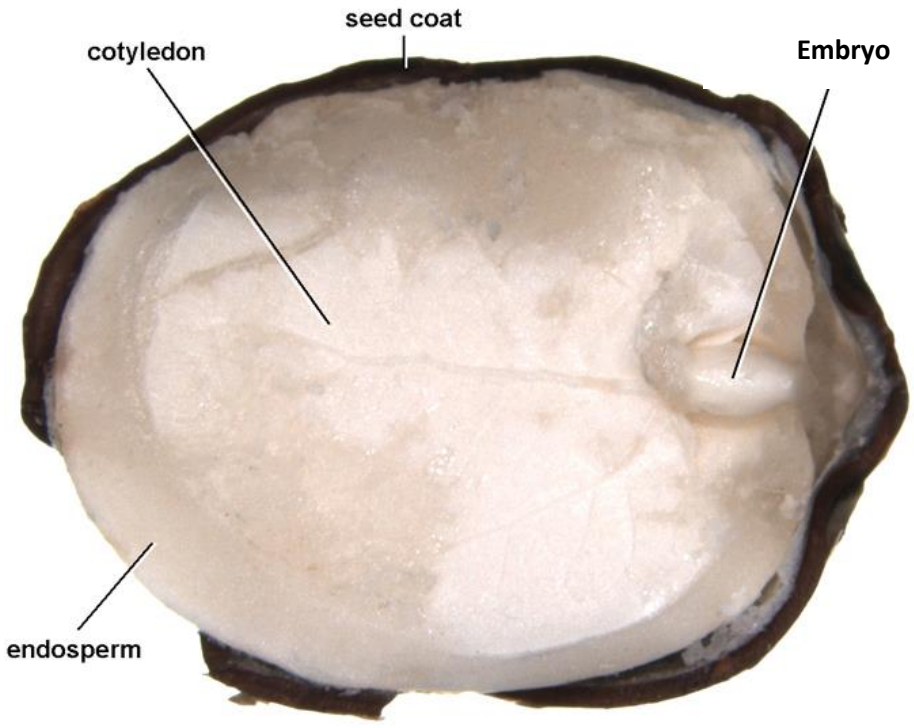
The mature seed consists of seed coat surrounding embryo and storage tissue.

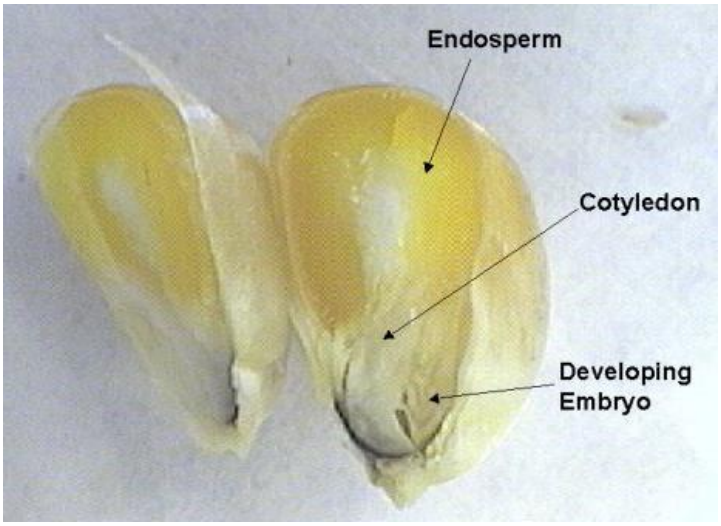
The embryo: Elongated portion called embryo axis. It consists of a short axis at the upper end of which is the plumule and at the other end is the radicle. One (in monocots) or two (in dicots) cotyledons are attached to the embryo axis by very fine and short cotyledonary stalks.

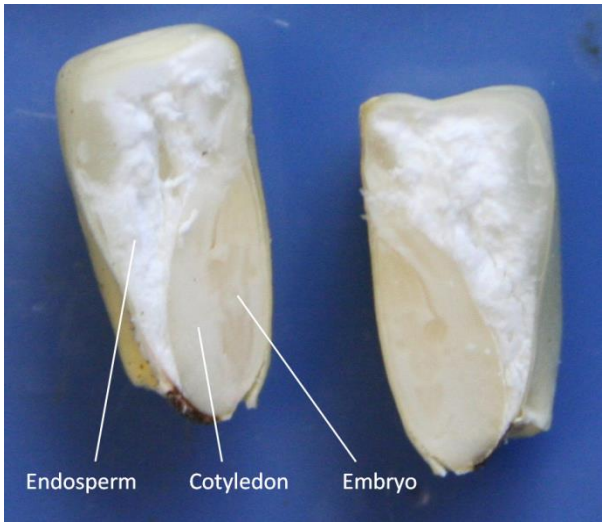


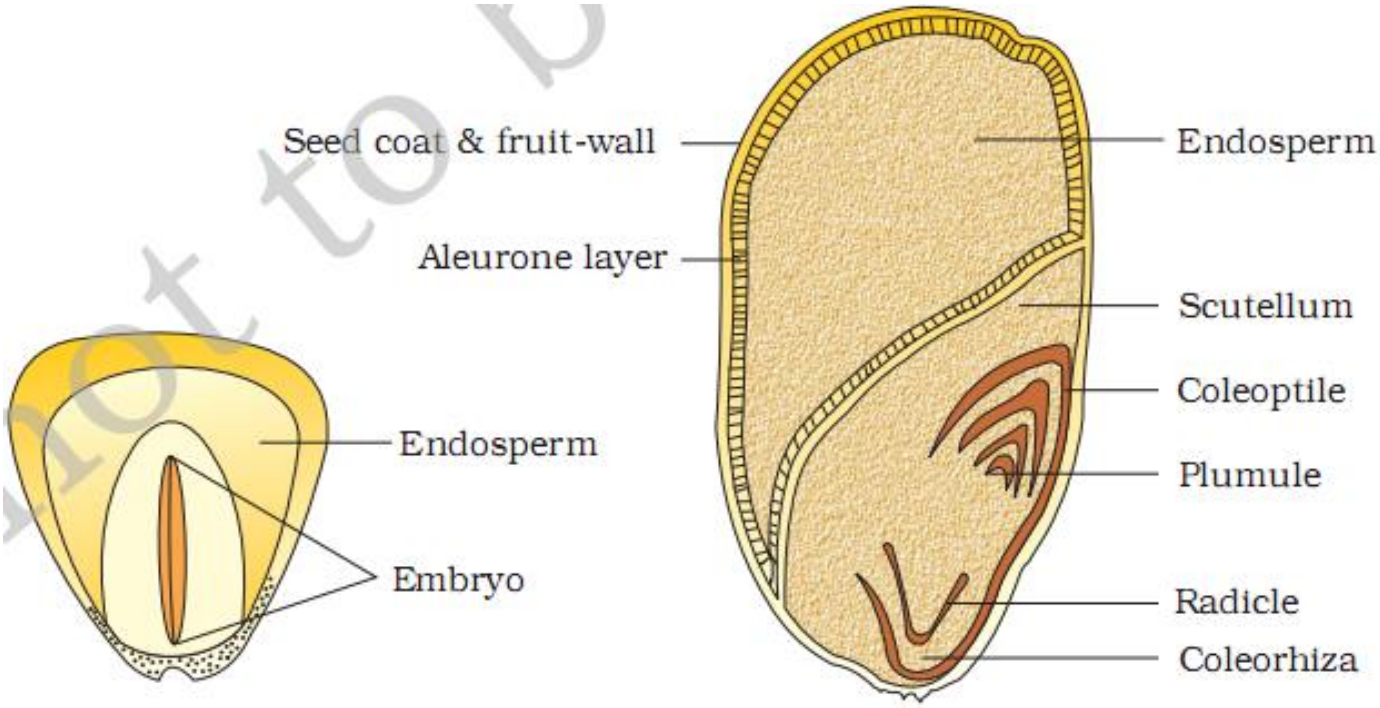
The storage tissue (endosperm): It contains the food reserve that support embryo during germination. Seeds having endosperm are called endospermic seeds while those lacking endosperm are called exendospermic seeds and the food reserve is stored in cotyledons.



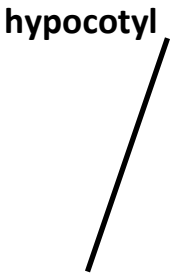


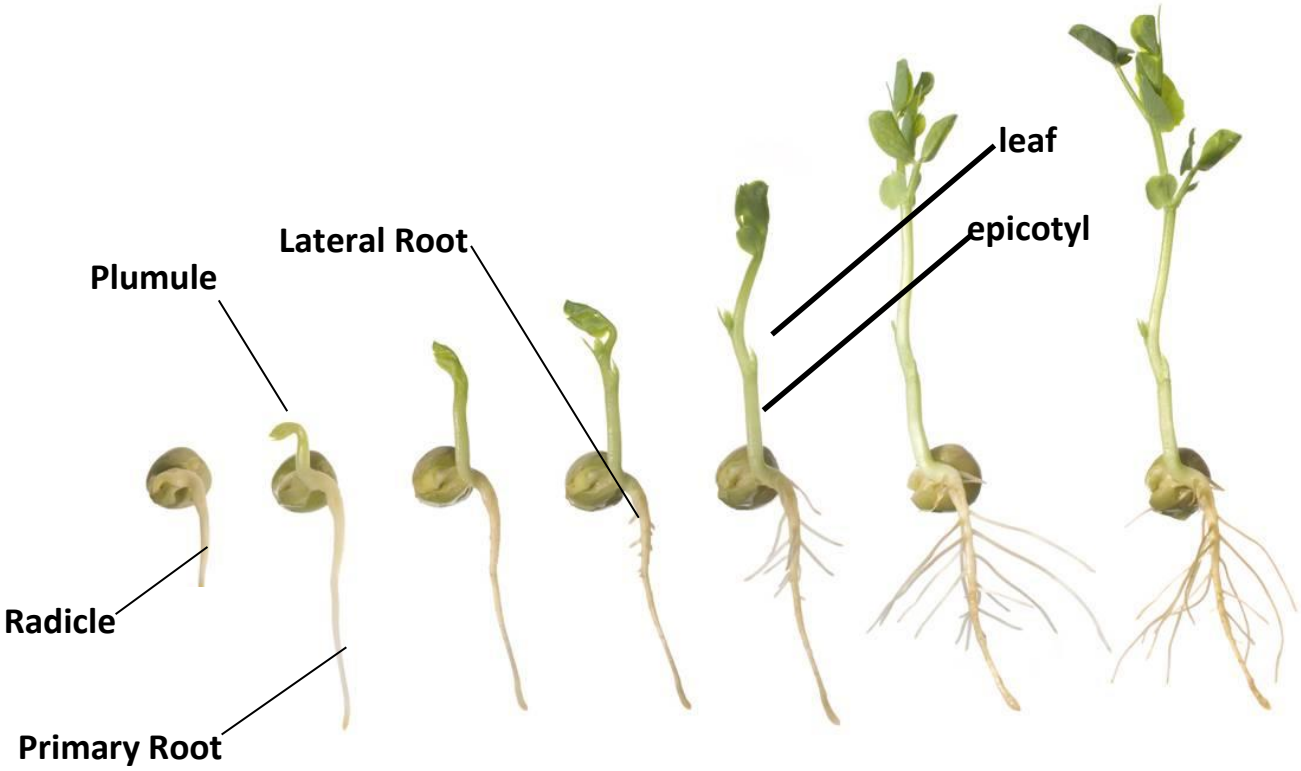

Endosperm
Cotyledon
Developing Embryo


Endosperm
Cotyledon
Embryo

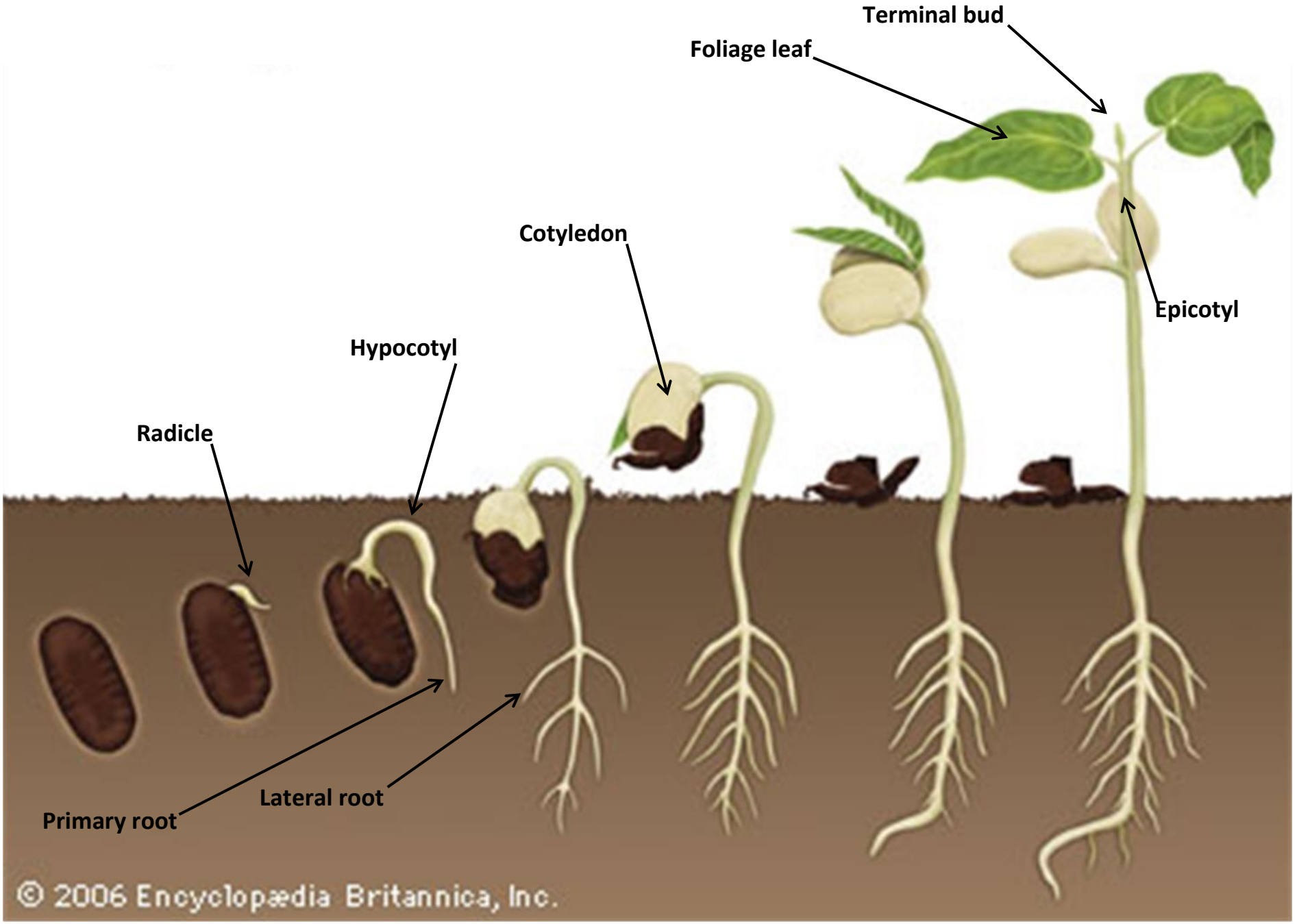

Seed coat & fruit-wall
Aleurone layer
Endosperm
Embryo
Endosperm
Scutellum
Coleoptile
Plumule
Radicle
Coleorhiza

Seedling is the young plant from the time its radicle emerges out of the seed coat to the time it becomes independent in its nutrition.




leaf
epicotyl
Lateral Root
Plumule
Radicle
Primary Root


©Warren Photographic


Terminal bud
Foliage leaf
Cotyledon
Epicotyl
Hypocotyl
Radicle
Primary root
Lateral root
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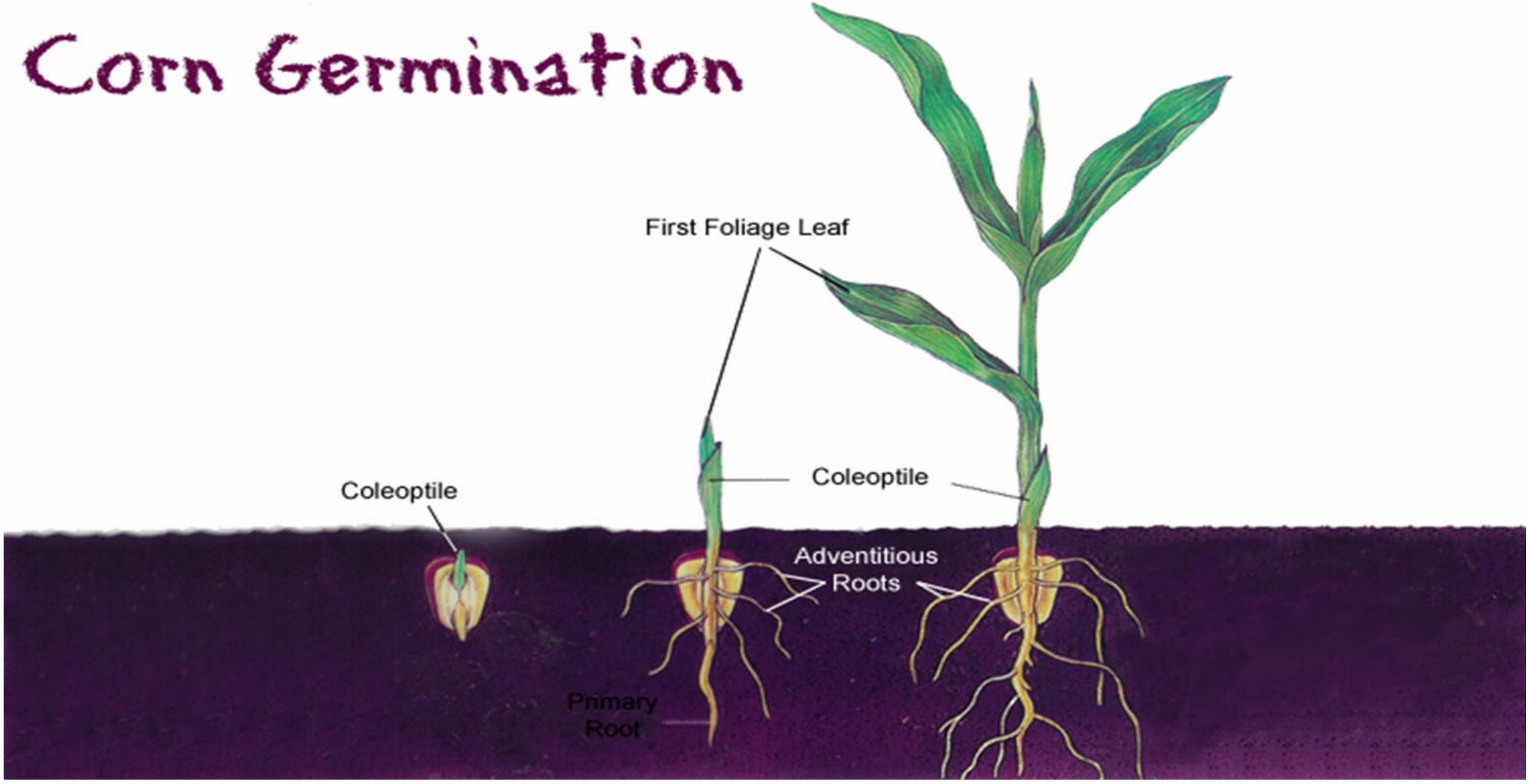
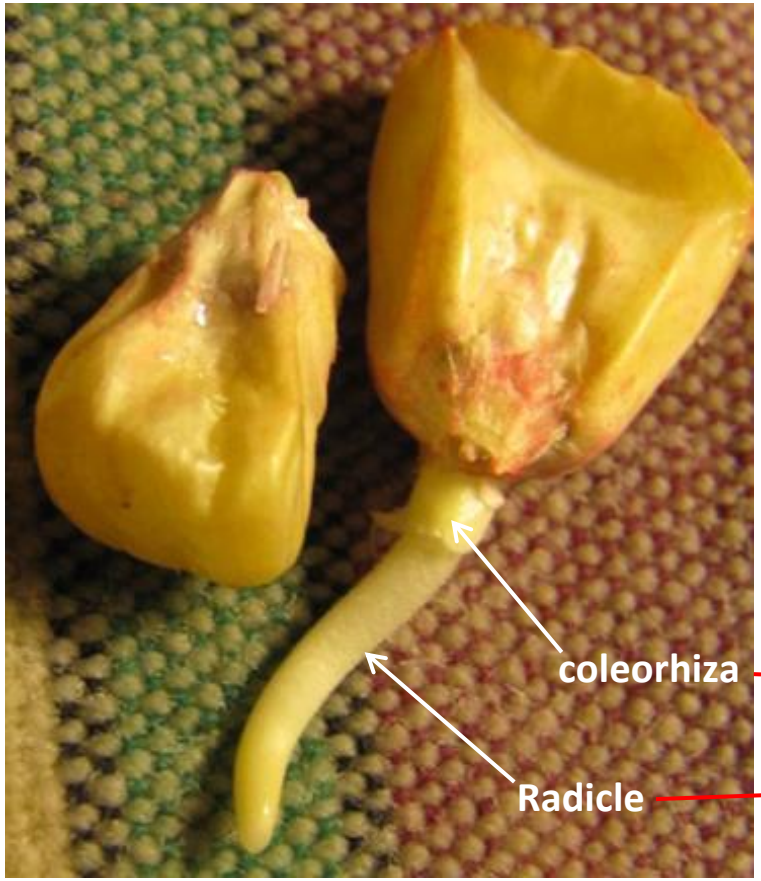
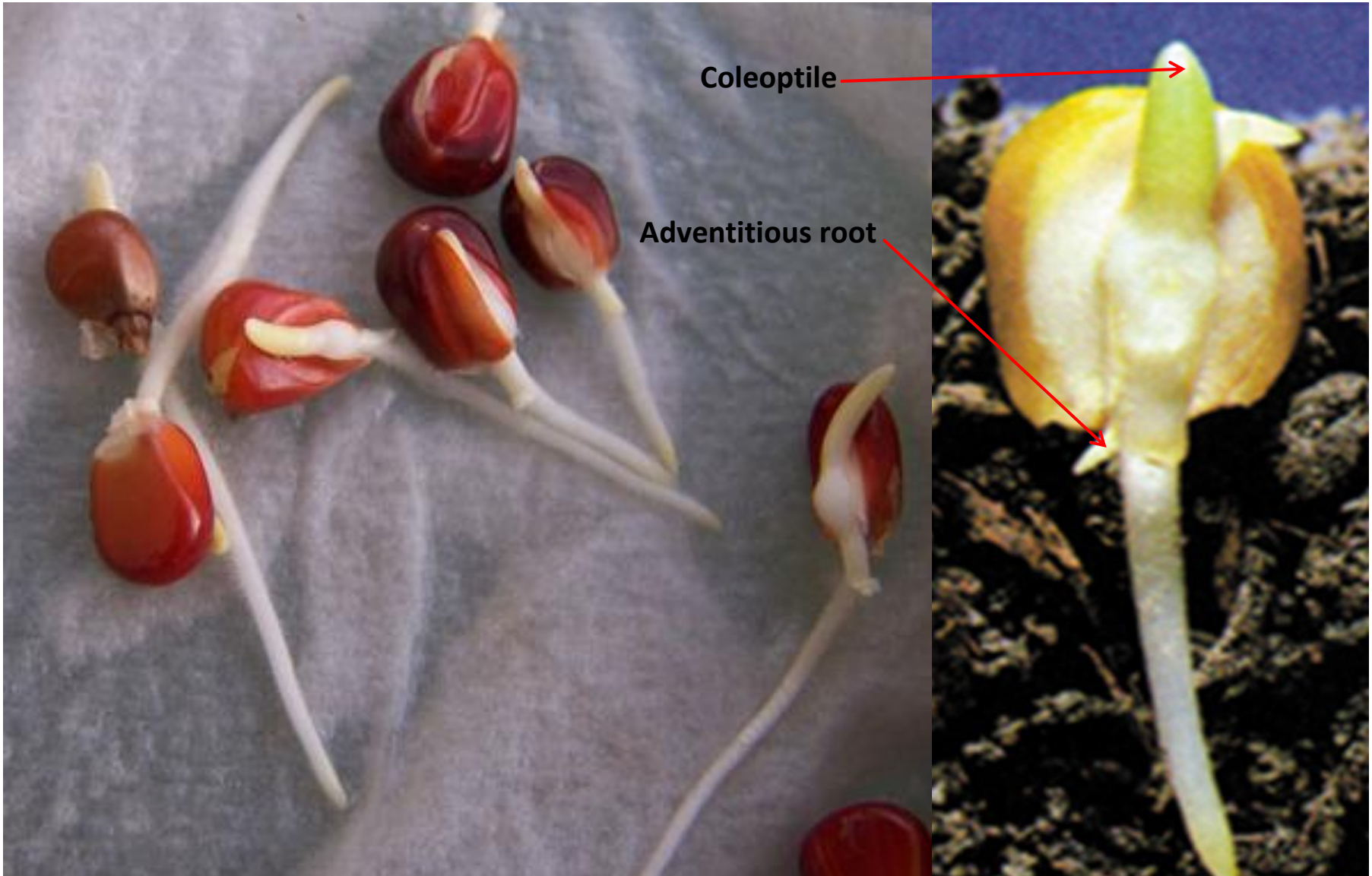
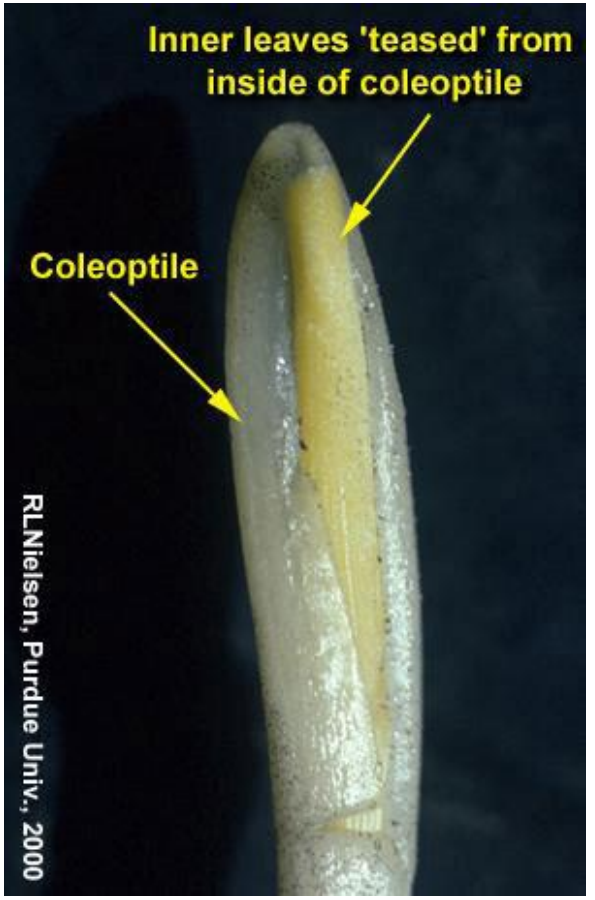

Corn Germination
First Foliage Leaf
Coleoptile
Coleoptile
Adventitious
Roots
Primary
Root


coleorhiza
Radicle

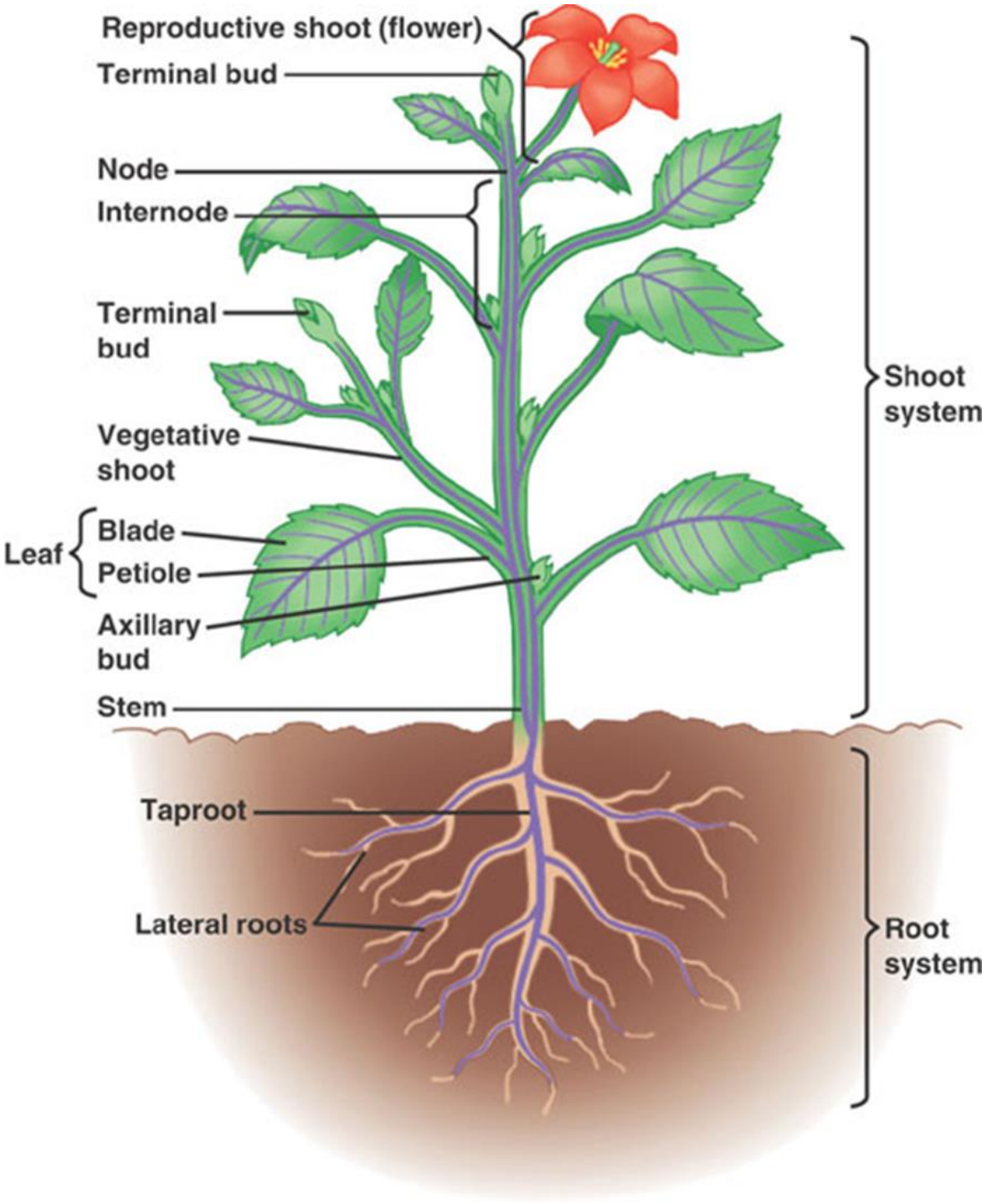

Coleoptile
Adventitious root


Inner leaves 'teased' from inside of coleoptile
Coleoptile
RLNielsen, Purdue Univ., 2000


Foliage leaf
INCHES
PICAS
L624-M

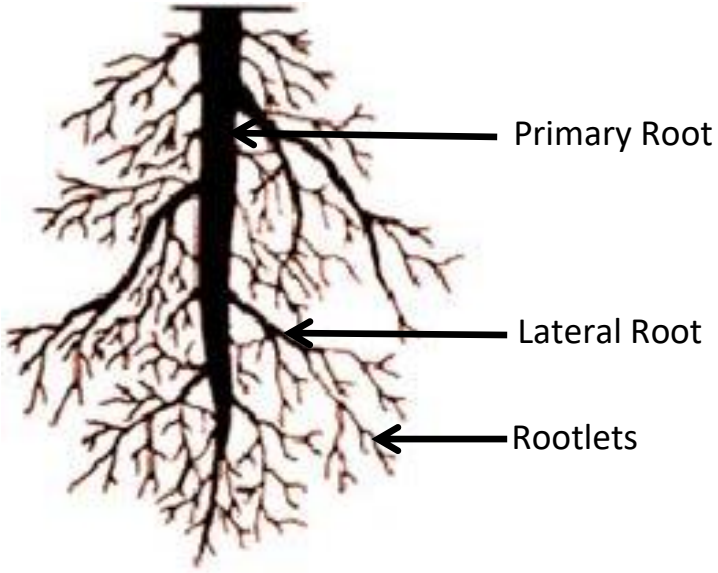
Plant Body

The plant body consists mainly of root, stem and leaves. The main axis of the plant body consists of a root normally developing below ground, and a stem normally growing above ground, and both of them bear lateral structures. The root bears branches or lateral roots which are similar to it and form the root system. The stem bears also lateral branches which in turn bear lateral appendages (leaves). The stem with leaves forms the shoot system.



Root System

The root is usually the underground portion of the main axis of the plant. It consists of a main root (primary root), from which arise lateral roots that are usually branched in turn to smaller rootlets. The whole extent of the roots of a plant is called the root system.



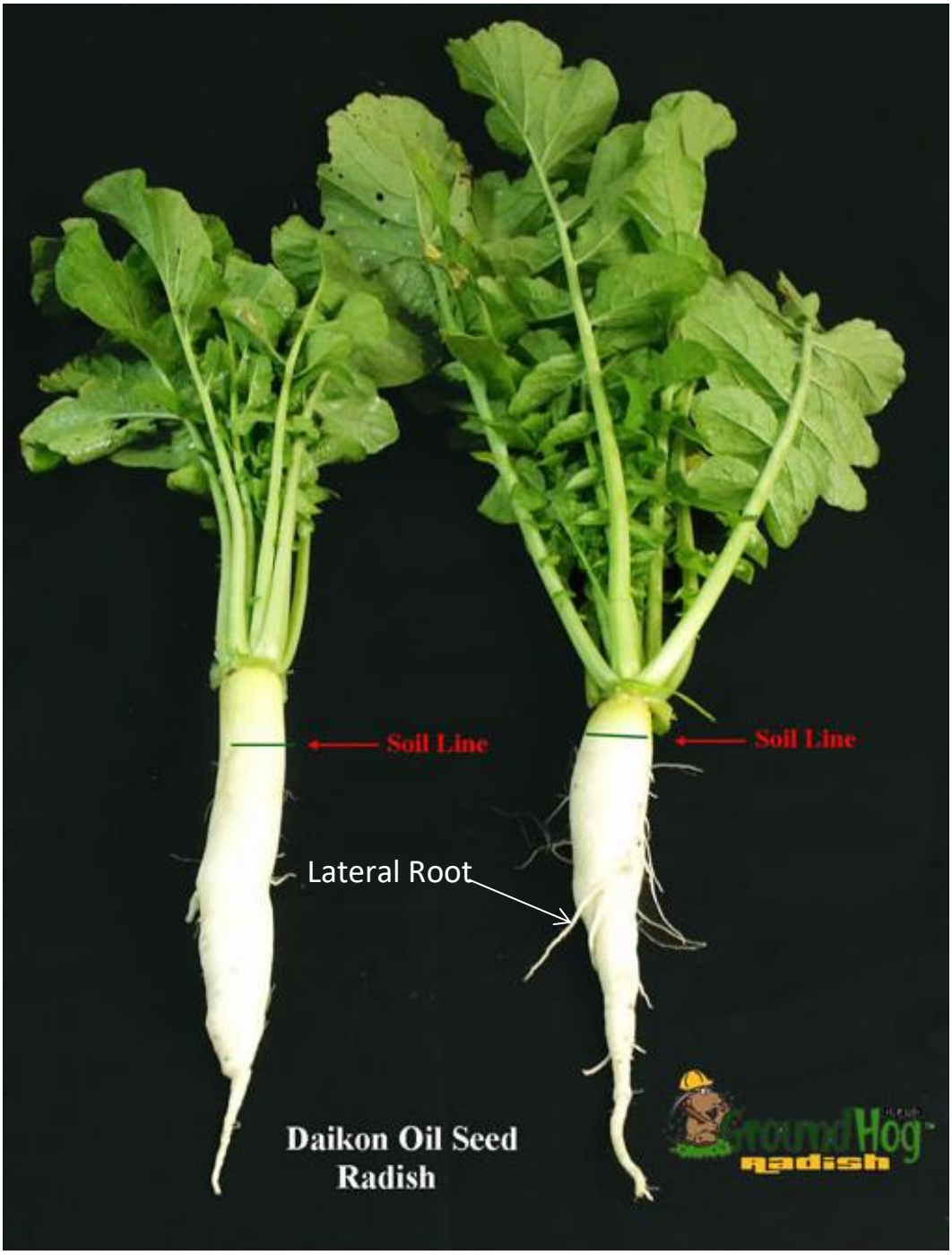
Root System

The main functions of root system are fixation of plant to soil and absorption of water and salts from soil solution. In some cases root may perform other functions like storage (eg: Carrot, radish, turnip, sweet potato……etc). Roots originating from radicle are called tap roots while those originating from any other part are called adventitious roots (eg: prop roots that originate from basal nodes).

Normal Tap Root

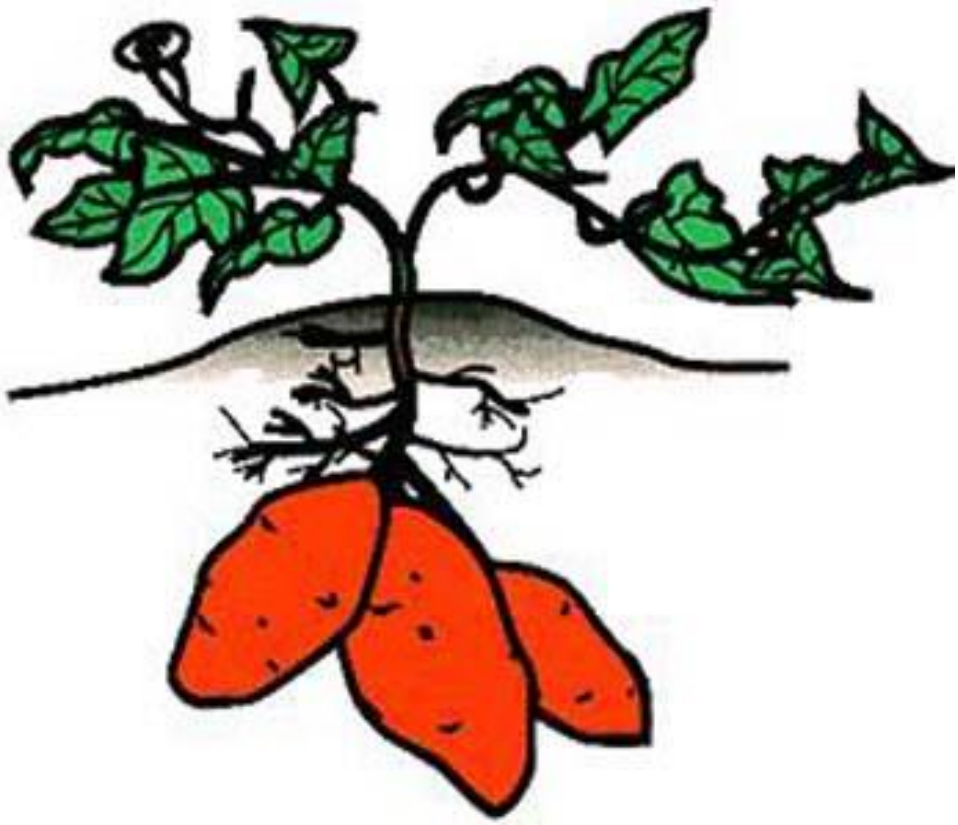
Storage Tap Root

Storage Tap Root

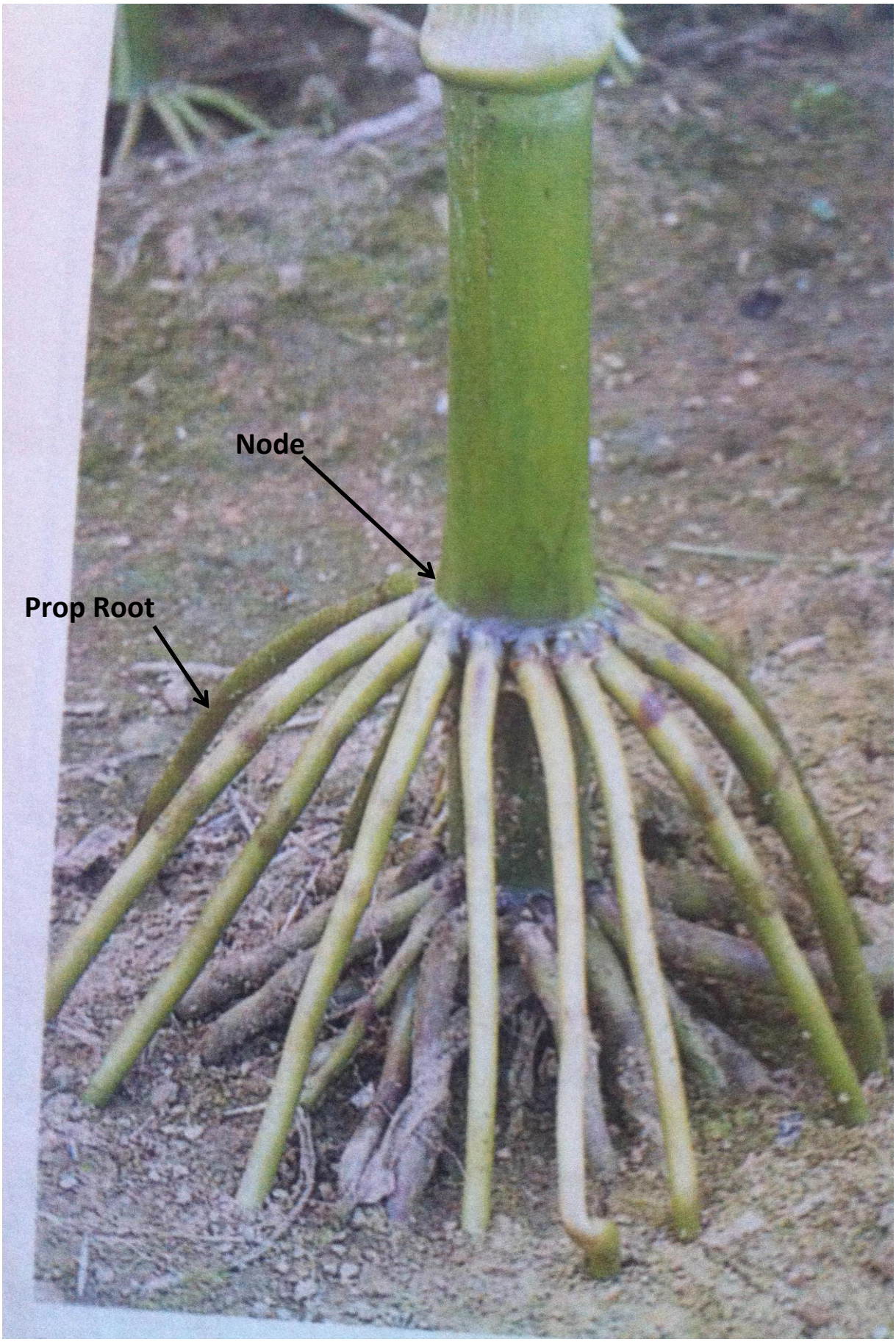


Storage Tap Root

Storage Adventitious Root

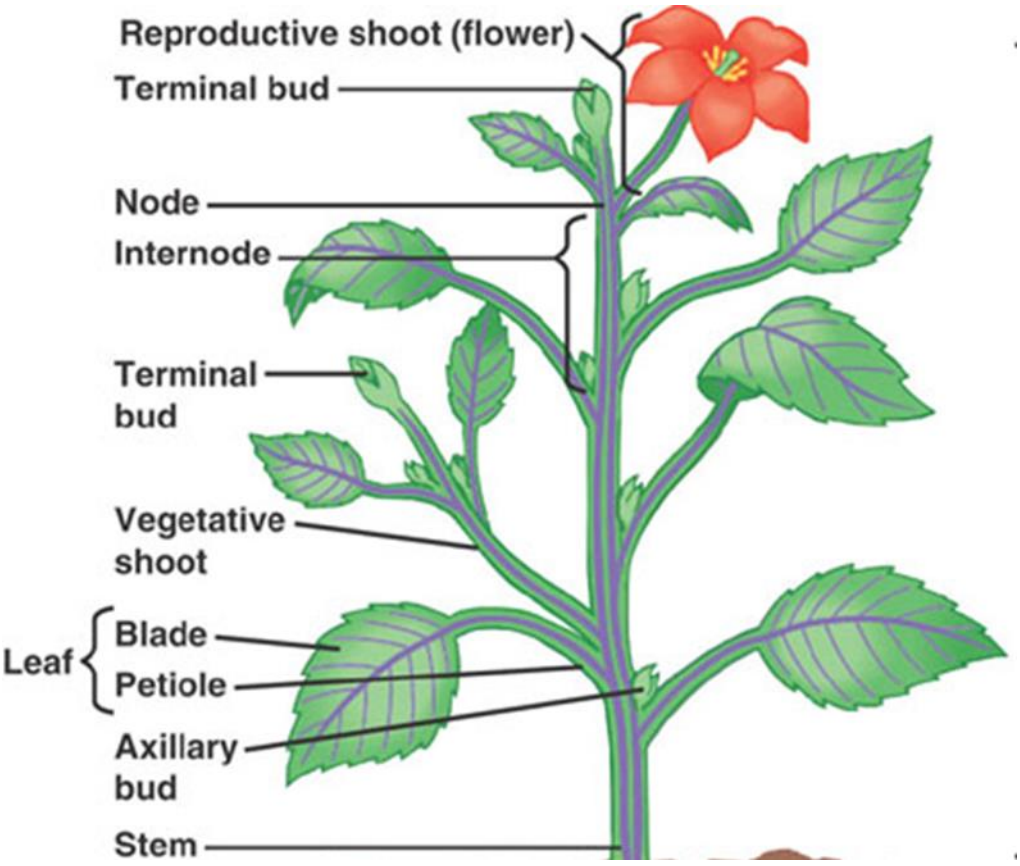


Adventitious Prop Roots

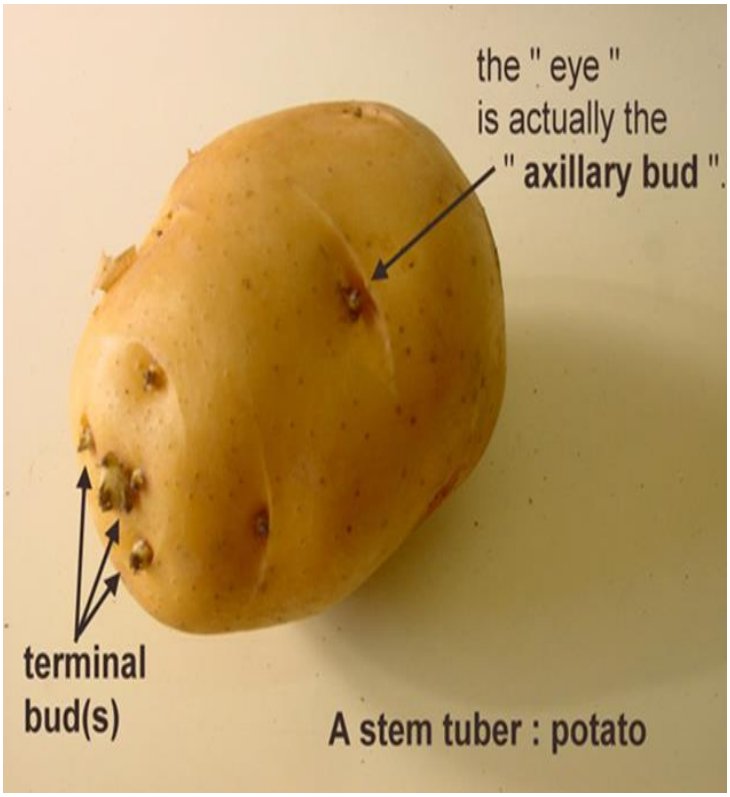


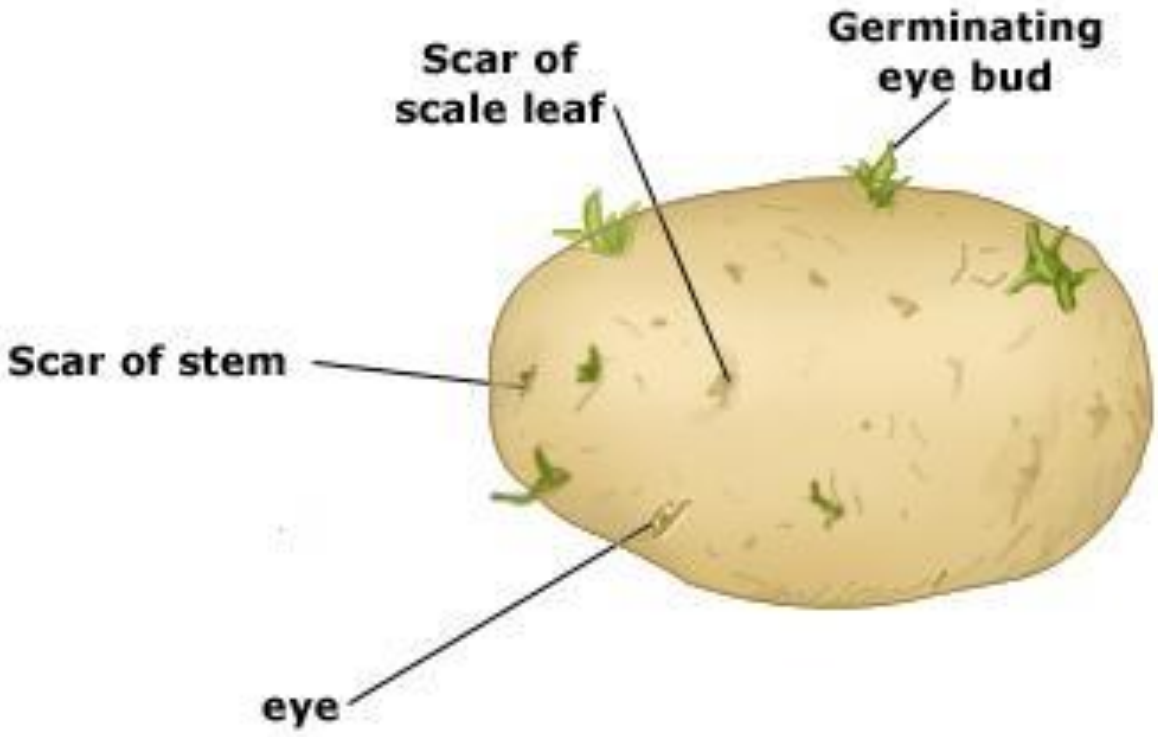
Shoot System

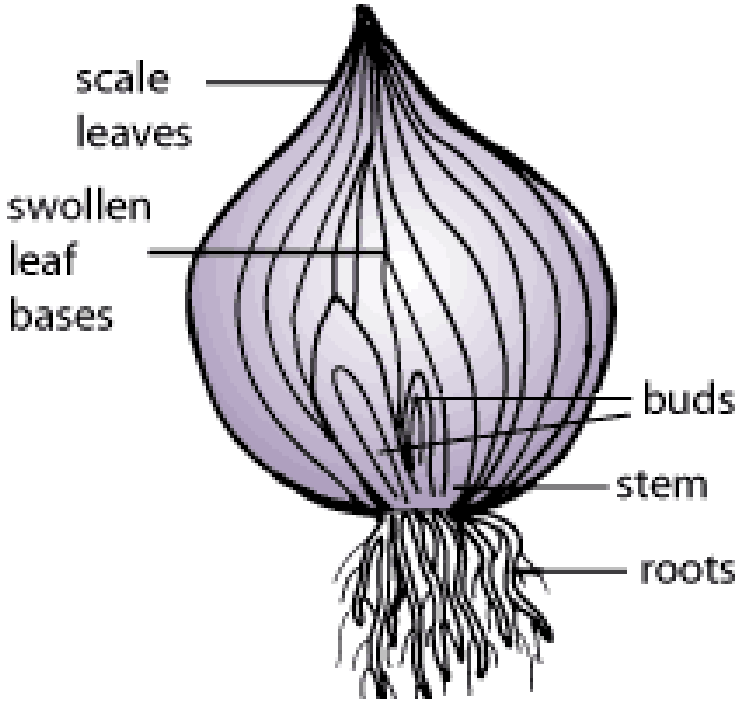
The shoot system consists of the stem and all its branches, leaves and flowers. The main stem (and its branches) consists of nodes and internodes and terminates with terminal bud that adds to the stem length. Each node carries one or more leaves. The distance between two successive nodes is called Internode. Internodes may become reduced in their length to form a discoid stem (eg: carrot and radish). One or more axillary bud is present in the axile of each leaf. The leaf consists of blade and petiole, although leaves of some species are sessile (without petiole).



Stem may become modified to carry out certain functions like storage. Storage stems assume different forms including tubers eg: potato tuber and bulbs eg: onion bulb.

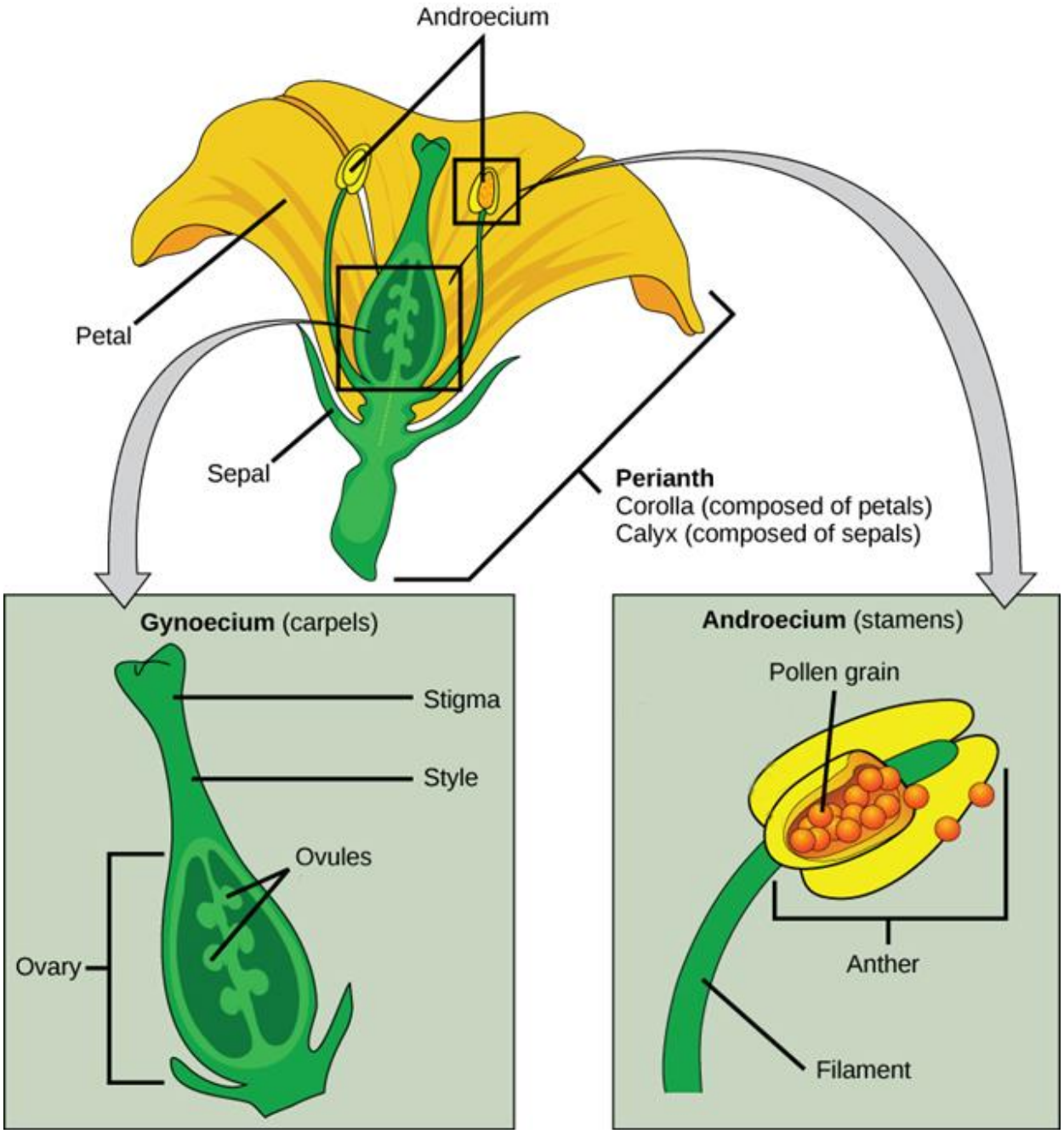





scale
leaves
swollen
leaf
bases
buds
stem
roots

The Flower

Flowers are the reproductive unit in angiosperms. Simply, a flower consists of sex organs (male and/or female) surrounded with perianth. Male sex organ (androecium) consists of units called stamens. Each stamen consists of filament and anther containing pollen grains (male gametes). Female sex organ (Gynoecium) consists of carpels each composed of stigma, style and ovary containing ovules (female gametes). Perianth also is composed of units that may be similar (called tepals) in monocot flowers or differentiated into outer calyx (consists of units called sepals) and inner corolla (consists of units called petals) in dicot flowers.


Androecium
Petal
Sepal
Perianth
Corolla (composed of petals)
Calyx (composed of sepals)
Gynoecium (carpels)
Stigma
Style
Ovules
Ovary
Androecium (stamens)
Pollen grain
Anther
Filament


tepal
tepal


stigma
anther
style
filament
ovary
receptacle
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Petal
Sepal