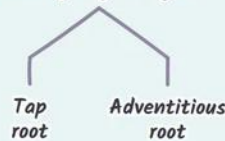


root to seed: every vegetative and reproductive part of an angiosperm, named and modified

Root: Five Regions, Tip to Base

Region	Detail
Root cap	protects the apex, secretes mucilage
Cell division	meristematic zone, about 1 mm
Elongation	cells elongate
Root hairs (piliferous zone)	absorb water; short lived, replaced every 10–15 days
Maturation	cells differentiate into tissues

Root, by origin



the one split every root question starts from: does it come from the radicle or not

the **descending axis**: positively geotropic and hydrotropic, negatively phototropic and aerotropic; non-green, cylindrical, no nodes or internodes; germinates from the embryo's radicle. in hydrophytes a **root pocket** replaces the root cap, e.g. Pistia, Eichhornia

Tap root vs Adventitious root *

Tap root

- develops from the embryo's **radicle**; primary root, then secondary, tertiary branches
- common in dicots, e.g. Pea, Bean, Sunflower

Adventitious root

- develops from any part other than the radicle: stem base, nodes, leaves
- in monocots the short lived radicle dies; equal sized roots grow from the stem base
- that cluster is the **fibrous root system**, e.g. Maize, Wheat

Euphorbia and Ipecac use adventitious roots for vegetative propagation

Tap Root Storage Shapes

Shape	Description	Example
Fusiform	swollen middle, tapers both ends (spindle shaped)	Radish (Raphanus sativus)
Conical	broad at the base, narrows to the apex	Carrot (Daucus carota)
Napiform	base highly swollen, near-spherical, narrows abruptly at the apex	Beet (Beta vulgaris)

primary root swells for storage in a definite shape; secondary roots stay thin, stem reduced and discoid. roots may also bear **lenticels**, minute pores for gaseous exchange, e.g. Rhizophora, Avicennia, Sonneratia