

COMPARISON OF WATER VERSUS LAND LIFE IN PLANTS

| Requirement or Condition | Plants in Water | Plants on Land |
|--------------------------|----------------------------|---------------------------------|
| Water | Absorbed from surroundings | Absorbed by roots |
| Water conservation | Not necessary | Cuticle prevents water loss |
| Minerals/Nutrients | Absorbed from water | Adsorbed by roots |
| Support | Supported by water | Strong support tissues required |
| Gamete transportation | By water | By insects, wind |
| Seed/spore dispersal | By water | By animals, wind |

DICOTS VS. MONOCOTS

| | DICOTS | MONOCOTS |
|--------------------------------------|--|-----------------------------------|
| Number of flower parts | Multiples of 4 or 5 | Multiples of 3 |
| Number of cotyledons | Two | One |
| Leaf venation | Net veined | Parallel veined |
| Typical roots | Taproot | Fibrous |
| Typical stem | Herbaceous and woody | Mainly herbaceous |
| Vascular bundles in herbaceous stems | Bundles arranged in a circle | Bundles scattered |
| Examples | Bean, oak, clover, sunflower, geranium | Lily, palm, corn, cattails, grass |

COMPARISON OF VASCULAR AND NONVASCULAR LAND PLANTS

| GROUP | VASCULAR SYSTEM | STRUCTURE | LIFE CYCLE AND REPRODUCTION | HABITATS |
|------------------|-------------------------------------|--|---|--|
| Bryophytes | None | Simple, no true roots, stems or leaves | Need water for reproduction Gametophyte dominant | Moist areas |
| Ferns | Relatively simple | True roots, stems and leaves | Need water for reproduction, Sporophyte dominant | Areas with moisture |
| Conifers | Complex Tracheids main cell type | True roots stems and leaves | Water not required for reproduction , Naked seeds, Sporophyte dominant and gametophyte greatly reduced | Wide range of land environments |
| Flowering plants | Complex Many cell types | True roots, stems and leaves | Water not required for reproduction, Covered seeds, Sporophyte dominant and gametophyte greatly reduced | Wide range of environments deserts to fresh water |

Some Evolutionary Trends in the Plant Kingdom

| Primitive | Advanced |
|-------------------------------------|-----------------------------|
| Unicellular | Multicellular |
| Little or no tissue differentiation | Much tissue differentiation |
| Nonvascular | Vascular |
| Gametophyte generation dominant | Sporophyte dominant |
| Homospory | Heterospory |
| Unprotected seeds | Protected seeds |

| | |
|--------------------------------|----------------------|
| No/little stored food in seeds | Food stored in seeds |
|--------------------------------|----------------------|

(NOTE: In an evolutionary context a primitive organism is one that shares many characteristics with its ancestors. An advanced organism is one which shares few characteristics with its ancestors. In a time context primitive conditions evolved early and advanced conditions evolved later.)

Trends in flower evolution

1. From spiral to whorled arrangement

2. Reduction in flower parts

e.g. many stamens is primitive; few is advanced

Loss of petals or both petals and sepals

3. From separate to united parts

4. From superior to inferior ovary

5. From bisexual to unisexual flowers

6. From regular(radial) to irregular(bilateral)

ARGUMENTS FOR CHLOROPHYTA AS ANCESTORS OF LAND PLANTS

(Modified from Campbell 1987:564)

There are no known fossils of the first land plants. However botanists agree that land plants evolved from the green algae. The most likely candidates for the ancestor was probably a filamentous chlorophyte that lived near the edge of the water. It is believed that bryophytes and vascular plants evolved independently from green algal lines.

1. Green algae and land plants have the same chlorophylls(a and b) and also share beta-carotene.

2. The structure of chloroplasts is similar, both have thylakoids stacked into grana.

3. The cells walls of both groups are composed of cellulose.

4. Both store reserves in the form of starch.

5. In some green algae as in land plants the cell wall formed during cell division is produced by Golgi bodies(AKA dictyosomes).

HIGHLIGHTS OF LAND PLANT REPRODUCTION

| GROUP | DOMINANT STAGE | TRANSPORT OF MALE GAMETE |
|-------------|----------------|--|
| Bryophytes | Gametophyte | Flagellated sperm swims |
| Ferns | Sporophyte | Flagellated sperm swims |
| Gymnosperms | Sporophyte | Wind blown pollen |
| Angiosperms | Sporophyte | Pollen wind blown or transported by insects or other animals |