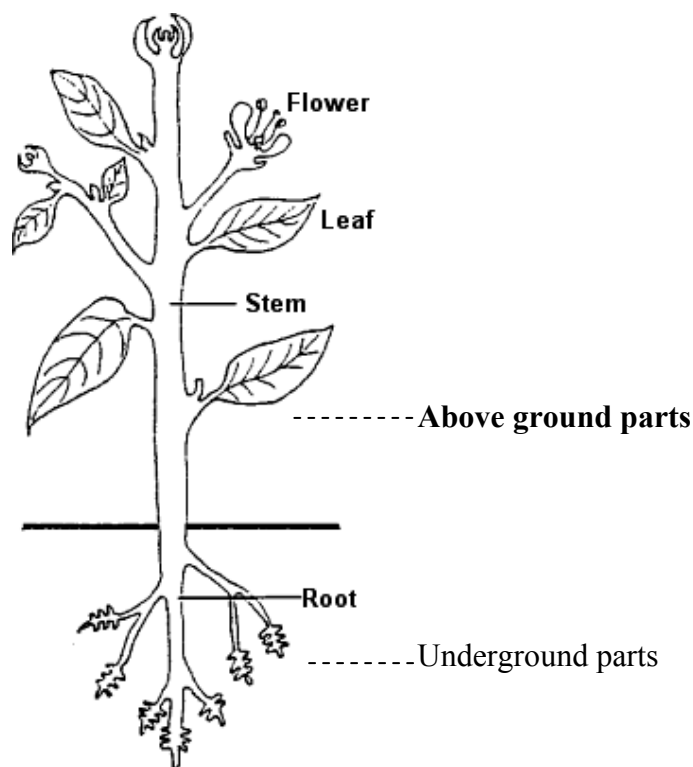


Plant Body of a Flowering Plant



ROOTS

The root is the below-surface part of the plant, meaning that part of the plant that grows towards gravity.

Roots have two main functions, first they serve to anchor the plant to the ground, and prevent it by being moved by wind, rain or water. Secondly, roots absorb water and dissolved mineral salts from the soil, which the plant needs to survive and grow.

Root types

Roots are divided into three main types, according to their origin and the order in which they develop. These types are taproots, adventitious roots and lateral roots.

Taproot or main root

The tap root, also known as the main root, develops from the radicle of the seed embryo. In dicotyledonous plants, the taproot is permanent but in monocotyledonous plants, the taproot is only temporary and dies off. It is only the dicotyledonous plants therefore which develop a taproot system. The size of the taproot system and the actual thickness of the roots themselves varies with the type of plants. The roots of many large trees rise above the ground. Known as buttressed roots, they can cause considerable damage to paved surfaces and prevent other plants from growing beneath the tree.

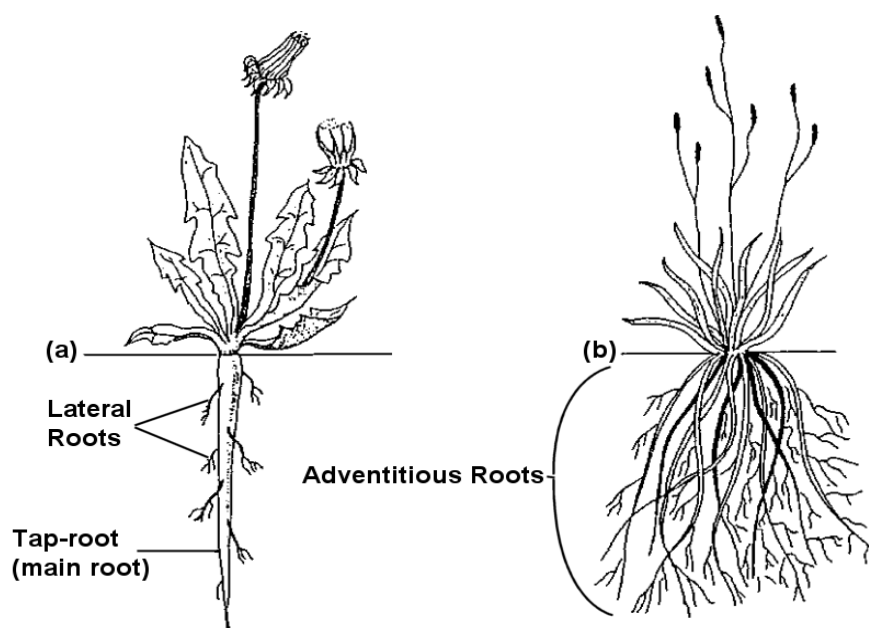
Adventitious roots

Adventitious roots develop from other parts of the plant but not from the taproot. In monocotyledonous plants, the bulk of the root system originates from the base of the stem and these plants then develop an adventitious root system. Large growing plants with an adventitious root system such as palms can develop a mass of thickly matted roots that forms a dense root ball. Note: Roots formed by stem and leaf cuttings are also adventitious roots.

Lateral roots

Also known as secondary roots, lateral roots can develop either from taproot or from adventitious roots.

a) A Taproot and b) An Adventitious Root System



Root hairs

Root hairs are minute outgrowths on the growth points of a plant's roots. It is through the root hairs that a plant can absorb soil water and mineral salts. As the roots elongate, the root hairs die off and are replaced by new ones.

Roots and water

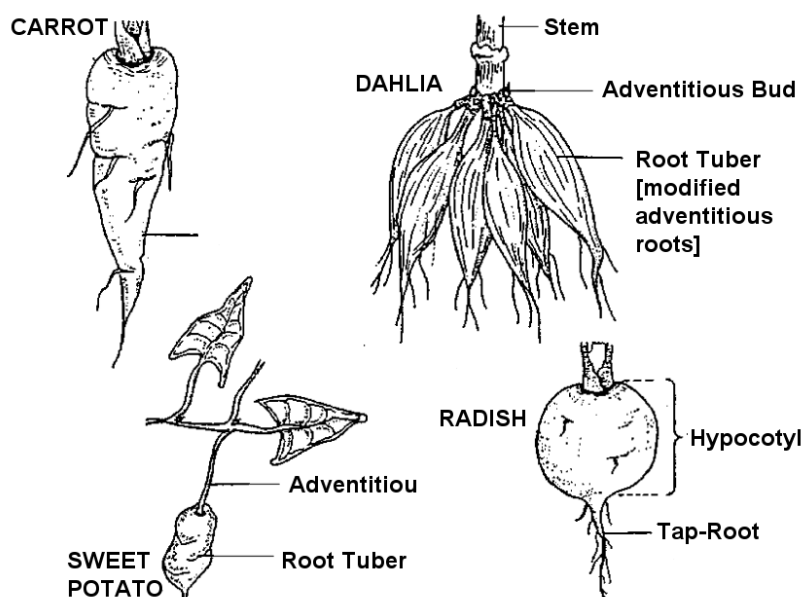
If there is a lack of water in the root area, root hairs quickly die and the whole process of root growth is inhibited. When the roots fail to develop, overall growth is stunted and continued lack of water will mean the death of the plant. Contrary to popular belief, most roots will not penetrate hard soil in an attempt to find water.

Modified roots

Roots as storage organs

Taproot and adventitious roots can store reserve foodstuffs. When this happens, the roots become fleshy and swollen. Common examples of roots as storage organs include tap-rooted plants such as carrot, turnip and radish, there both the hypocotyl [the region between the stem and the root] and the tap root itself swells up. Common examples of adventitious roots as storage organs are dahlias and sweet potatoes.

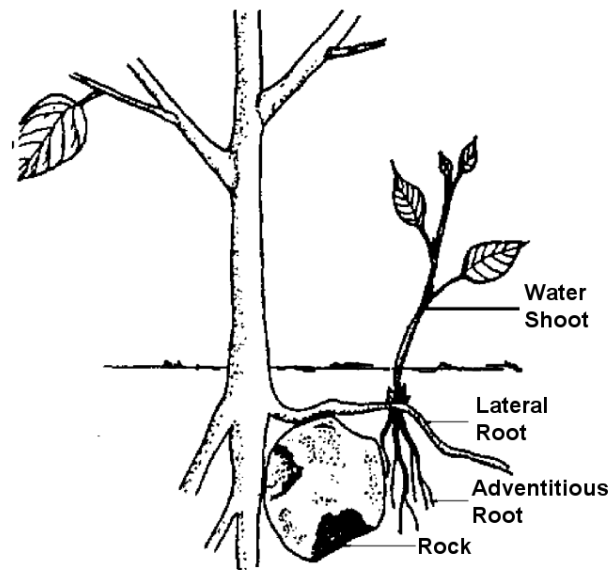
Roots as Storage Organs



Roots as vegetative reproductive organs

New plants can develop from the lateral roots of certain plants when adventitious buds form. The shoots that develop from these buds are called suckers. Plants that often form suckers are poplars, pears and willows. The swollen root tubers of plants such as dahlias and sweet potatoes also form adventitious buds that will develop into new plants.

Roots as Vegetative Reproductive Organs



A Pear Tree with a Water Shoot

Roots as support organs

When adventitious roots develop above the ground from the plant's stem, they will grow down into the soil and help support the stem. In plants such as maize they are known as prop roots, while support roots on a screw-palm are known as brace roots.

Some plants such as the wild fig grow as epiphytes on other trees. They form long support roots that twist around the host plant and grown down into the soil.

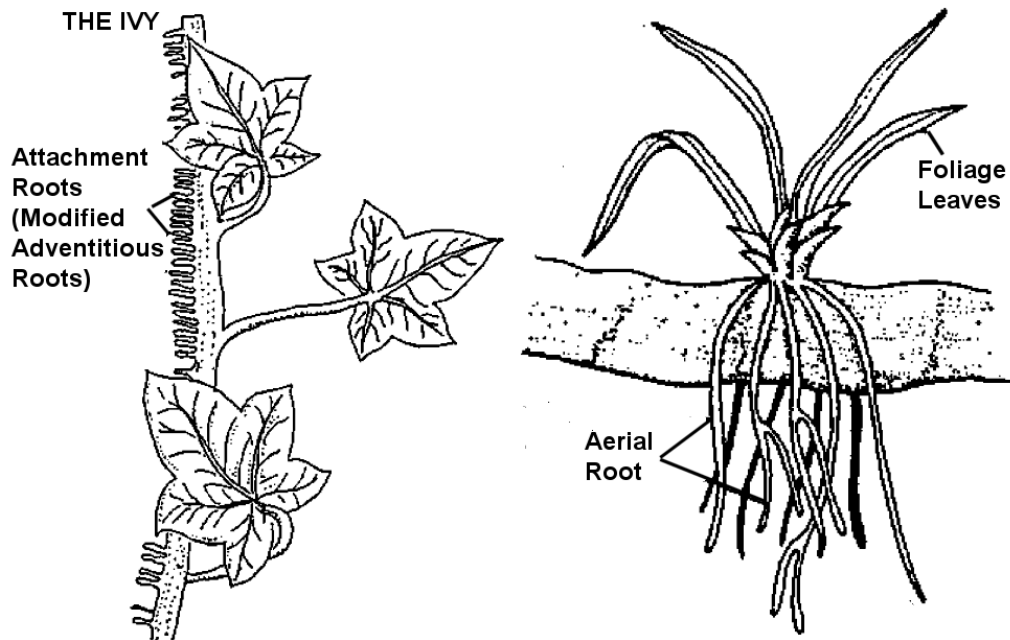
Roots as attachment organs

Attachment roots or crampons form on certain climbing plants, i.e. ivy. The short crampons develop along the side of the stem where it contacts a hard surface and then grow into any cracks and crevices, firmly anchoring the plant to its support, i.e. a wall or the trunk of a tree.

Aerial roots

Epiphytes, especially many types of orchids, develop roots that hang in the air and do not need soil in which to function. These aerial roots are surrounded by a special kind of tissue known as the root sheath or velamen. The tissue can absorb water rather like blotting paper and can even absorb substances which settle on the velamen as a source of plant nutrition.

Attachment Organs Tropical Orchid on a Tree Branch



STEMS

The main structure of the plant that is above the ground is its stem. The stem serves two main functions, first to provide support to the parts of the plant which are above ground, so that they are best exposed to air and light for photosynthesis, respiration, pollination and seed dispersal.

Secondly the stem serves as a link organ between the root system and the rest of the plant to transport water and minerals through the various cell structures.