Te Pànui
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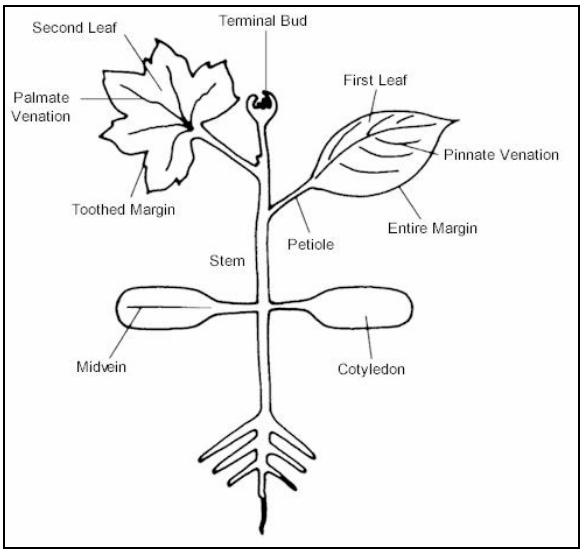
Plant parts, growth and development

There are a few specific differences between broadleaf plants and grasses. Some plant parts are arranged differently. However all plants share general characteristics of obtaining energy, growth and development and are affected by similar environmental factors.

Parts of a broadleaf plant

The picture below shows parts of a young broadleaf plant. With two different leaf types and two different cotyledons it is not a real plant! The diagram shows there are cotyledons and leaves.



http://weeds.montana.edu/images/plantparts.gif

Cotyledons are not true leaves. They are the parts of the seed that stored energy to get the new plant growing. (If you break a bean or pea seed in half the cotyledons are very obvious). The true leaves develop from the embryo that is between the cotyledons in the seed. Broadleaf plants are called dicots because they have two cotyledons.

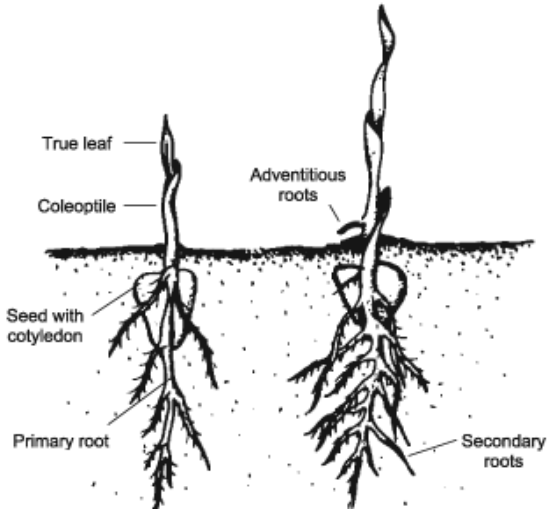
In the picture above, the true leaf on the right has pinnate venation and an entire margin. This means the veins (venation) are arranged along the main midvein like a fish skeleton (pinnate) and the leaf edge is smooth (entire). The second true leaf on the left has palmate venation and a toothed margin. This means that the veins are arranged like a palm (palmate) and the edges cut in and out (toothed).

Each leaf is attached to the stem by the petiole (the stick part you see on leaves). Where the petiole and the stem meet is a groove called the leaf axil. In the leaf axil is the axillary bud. There will be an axillary bud there even if you cannot see it. If it develops it will become a side branch. The terminal bud continues growth of the main stem. More leaves, with more axillary buds form as the terminal bud sprouts.

Remember that about half the plant is below the ground! The roots grow rather randomly compared to the regular structure of the stem, branches and leaves.

Grass parts are different

There are some differences between a grass and a broadleaf plant. Grasses grow from a seed that has only one cotyledon. As the leaves sprout they are protected by the coleoptile.



http://www.turf.uiuc.edu/teaching/NRES300/weed%20ID

The leaves are a different shape and have a different vein pattern – grass leaves are long and have veins which run parallel, compared with broadleaf plants which can have many leaf shapes and veins arranged in a network.

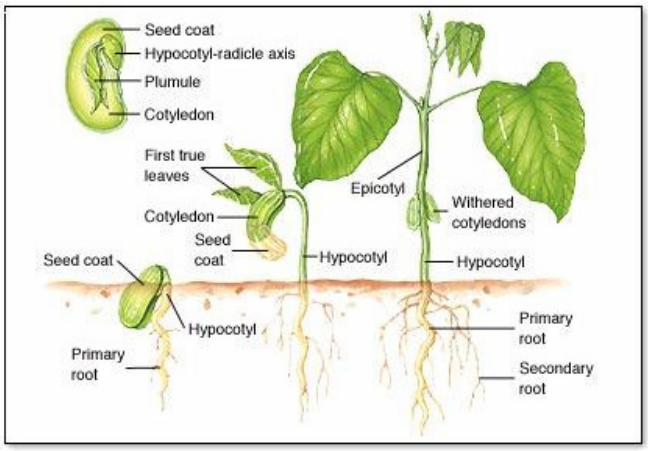
Grasses have a different root system too. They can grow roots off the stems or stolons. These are called adventitious roots.

The number of flower parts is also different. In broadleaf plants, flower parts (such as petals) are

arranged in 4s or 5s. In grasses, flower parts are in 3s. The flowers of a grass can be hard to identify – they are not what most people think of as flowers.

Germination

Five main factors affect seed germination: temperature, water, oxygen, dormancy (a long period of cold) and day length. Each plant has its own requirements for these factors, and the seed will only germinate if they are all balanced.



(http://www.mhhe.com/biosci/esp/2001_gbio

The picture above shows four different stages of germination of a broadleaf. In the top left corner, a seed is ready to unfold and grow. The outer part of the seed is called the seed coat. The plumule, hypocotyl, and cotyledon can be seen.

When a plant germinates, the cotyledon (first leaf) emerges and begins to catch sunlight for energy. Cotyledons are stored in the seed and may look very different to the "true" leaves. Some plants do not have cotyledons. For this reason, you must be very careful not to mistake a true leaf for a cotyledon.

The hypocotyl is the portion below the cotyledons connecting to the primary root of a seedling. The epicotyl is the portion above the cotyledons that forms a young stem. The plumule is the part of a seed that develops into the shoot and bears the first true leaves.

The difference with grass germination is that the cotyledon doesn't emerge from the seed, and instead the first leaf emerges protected by the coleoptile.

Photosynthesis and respiration

Plants are factories. They make the sugars they need to grow out of carbon dioxide from the air and water from the soil. To do this, the plant is powered by sunlight. This is called photosynthesis and occurs in the green parts of the plant (leaves and stems). The rate of photosynthesis depends on sunshine and the amount of light the green parts of the plant receive. If a canopy gets very thick the bottom leaves don't receive enough light and may turn yellow and drop off.

The roots are below ground where there is no light, so they can't photosynthesise. Sugars made in the green parts of the plant are transported to the roots. They use the energy in the sugars for growth. This is called respiration, the same as when people get energy from food.

Oxygen is needed for respiration. If the soil is waterlogged for too long the plant can't get oxygen and will "drown".

Vegetative growth

Plants go through a phase of vegetative growth. Vegetative growth is the production of more stems and leaves. It is also the growth of the roots.

Shoot growth begins at the apical meristem. The meristem is a mass of cells at the tip of the stem. The cells divide, then get bigger, and form the buds, shoots and leaves. What you normally see with the naked eye was made several days or weeks ago.

Flower development

Under special circumstances the apical meristem is converted into a floral meristem (flower bud). This meristem develops into a flower. Flower development can be triggered by maturity of the plant, temperature or the relative length of the day and night (photoperiod). Once a flower has formed, the shoot generally stops its vegetative growth.

Fruit development

If a flower is pollinated it will develop into a fruit, which is the part of the plant containing seeds. Not all things we eat are fruit – for example kumara and potato are swollen roots that the plants use to store reserves as sugars or starch.

'*Te Pànui Tips*' are simple fact sheets that cover topics designing organic crop production systems on the East Coast.

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