Charlie Moore 30th March 2005

An essay on the biological make up and properties of xerophytes,

In this essay I am going to explain the biological properties of xerophytes. Xerophytes are plants which are adapted to live in dry conditions. When there is a lot of water the rate of transpiration is about equal to the rate of transpiration of other plants. However in long droughts xerophytes can continue to photosynthesise and grow this is possible because xerophytes have several survival characteristics which enable them to live successfully in areas of low water concentration.

All cacti are xerophytes and most desert plants and trees are xerophytes.

Xerophytes have some specific structures, theses are thick cuticles with a wax coating and thick epidermal layers to try and reduce evaporation and keep water loss to a minimum. They have a reduced number of stomata which are sunk into pits to prevent wind access. The wind access would carry off vital water vapour. Xerophytes have a smaller and fewer leaves this reduces surface area and provides a small surface area to volume ratio. These small leaves have hairs or spines which trap layers of air which is rich in water vapour. This reduces the chances of wind moving the moist air layer away from the xerophyte plant. The trapped layer of air increases the thickness of the boundary layer which in turn reduces the rate at which water vapour can diffuse from the leaf into the air. This is also achieved by the stomata which have been sunk into pits or grooves or depressions in the leaf surface. The spines and hairs on the xerophytes also put off animals and humans from preying on them.

Stomata in xerophytes do not open during the day so the question of how do they photosynthesise can be asked. Xerophytes obtain carbon dioxide through a process called crassulacean acid metabolism. This is where epidermal cells combine carbon dioxide collected at night with an organic compound which is naturally occurring to form malic acid. This is stored in the vacuole and during the day large amounts of malic acid in the vacuole is released which diffuses into the chloroplasts to be used in photosynthesis.

Xerophytes are also aerodynamic in shape this lowers wind resistance along with the hairs on the xerophyte it reduces the amount of water vapour taken off the xerophyte by the wind.

Xerophytes also have a deep network of roots to draw up as much water and minerals as possible. These roots are quite wide spread with fibrous roots near the soil surface to absorb maximum water during rain or desert storms. Xerophytes also have a low growth form which reduces the loss of water from wind.

Xerophytes also store water in bulbs underground these bulbs sometimes spend a period of dormancy during drought conditions.

In conclusion xerophytes have adapted to desert conditions by having thick cuticles fewer numbers of stomata, smaller and fewer leaves, hairs and spines on the leaves to deter predators and to collect water, aerodynamic shapes to lower wind resistance, wide spread deep rooting to collect maximum water and a water reservoir in the stem or underground bulb of the xerophyte.