

Jurassic Fact File

Conifer

These plants are finally at a stage where they can be called true trees. They have developed a ring of woody tissue around their trunks which provides them with enough support to grow to impressive sizes; some of the largest plants in the world are conifers.

Advances in body plan

They also have very advanced xylem and phloem vessels rather than tracheids, giving them an efficient vascular/transport system to carry food and water from the roots to the leaves and vice-versa. This means they are able to have many branches covered in leaves rather than simply having leaves at the top of their trunk – and so can increase the surface area for photosynthesis easily.

Adaptations to the climate

Conifers show many adaptations to their environment such as needle-like leaves and their evergreen habit which help them conserve water and energy in cold, dry climates. This may also explain the fact that their reproduction is very advanced, but takes place very slowly; it takes three years to complete one cycle from parent plant to germinating seedling.

Reproduction over three years!

In the first year, the conifer grows a woody cone that will contain the male spores. This cone is a highly advanced version of the strobili found in cycads – the leaves have been heavily lignified to offer maximum protection to the spores inside, and are sealed to prevent water, bacteria, insects and fungi getting in – and spores getting out. The spores-producing structures are fed by vascular strands that lead from the trunk to them, until one day the spores are ready. This point is reached when the spores have actually germinated into male gametophytes and are now called pollen. They are covered in a thick cuticle to protect them from drying out, and this covering may be sculpted to help the female plants to recognise the ‘right’ pollen and reject the wrong one. At the end of year one, the pollen is shed into the wind and carried away.

Next year, the plant will produce female cones. These are bigger, stronger and very well-fed by the plant. Each woody scale is again a leaf, but the ovule (egg) sits ‘naked’ on top of it. To protect its eggs, the cone is tightly sealed until the female gametes are ready to receive pollen. The eggs continue to grow, and even start to differentiate into female gametophytes while they wait. When the time is right, the cone opens up and pollen is blown between the scales and onto the eggs. The pollen/gametophyte starts to digest its way into the heart of the ovum with a pollen tube carrying the genetic material down from the pollen grain to the egg. The nuclei meet, fuse and form a zygote. In conifers there is a ‘double fertilisation’ with some genetic material becoming a new plant, and other bits of genetic material forming a food source for the embryo (a bit like a mammalian placenta). Not only does this extra genetic material form a food source, but for the first time in the plant world, the seeds have developed special structures to help them get away from their parent plant. In the case of our conifer, the naked seed is now growing a scale-like leaf to catch the wind and carry it far away.

In the third year, the seeds are finally mature and are released from the parent. They are caught by the wind and carried much further away than any other seeds before them. Hopefully they find somewhere suitable to grow and start the long process all over again. This two-stage release of gametes does mean that there is little risk of one plant fertilising itself – this help to keep the genes of conifers nicely mixed and produce variation to keep the species alive.