

Root hairs

Introduction:

Root hairs are easy for students to grow and observe both unaided or with a hand lens or microscope. It is virtually impossible to dig up existing plants without damage to these delicate structures so it is always best to grow seedlings especially for the purpose. They are difficult to handle and it takes practice to achieve a good slide.

Remember these facts about root hairs:

- Structure
 - root hair cells are extensions of individual root epidermal cells, they are thus very fine
 - root hairs have a very thin membrane that is easily damaged
 - root hairs are relatively short lived structures.
 - root hairs are not found at the tip of the root because this part of the root is extending into the soil. If root hairs existed here they would be rubbed off. Root hairs are found back from the zone of cell elongation
- Function
 - A root with root hairs has a much larger surface area than a root without root hairs
 - the very fine membrane readily absorbs water by osmosis
 - dissolved minerals can be absorbed by diffusion or active translocation

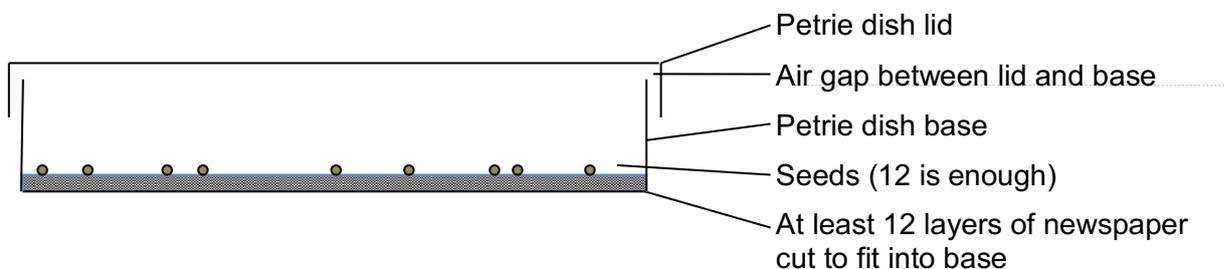
Method

The best way to grow seeds for this exercise is in a petrie dish. The lid is held up by several small ridges in the moulding on the underside of the lid. This gap allows air movement in and out of the petrie dish, but this in turn means the dish will dry out, particularly in warmer temperatures.

The method recommended here involves cutting at least 12 layers of newspaper so that they just fit inside the base. Flood this base with water and allow it to stand for 10 minutes. Water will saturate the paper and this will be enough to supply the seeds as they germinate. Less paper means less water will be stored and the seedlings will be more prone to desiccation. Check by lifting the dish and looking at the paper through the petrie dish base, it should be thoroughly damp. At this stage it is also important to pour off any excess water, if seeds are flooded they will drown (due to lack of oxygen) and not germinate.

Seeds are placed on the damp paper. Small, fast growing seeds are best. Suitable seeds include: cress, mustard, onion, lettuce etc. Slightly larger seeds such as radish work well too but because the roots are thicker they can be more difficult to mount on a microscope slide.

Do not be tempted to use too many seeds because the roots that grow will become tangled and you will damage the root hairs as you attempt to separate them.





Petrie dishes with germinated seeds:

Radish (top left)

Cress (top right)

The root hairs of radish can be seen without any magnification (left)

Microscope examination

With a sharp blade carefully cut the roots off the seedling while they are still in the petrie dish with a sharp blade. Mount on a slide with 2 drops of Iodine stain and add a cover slip. Soak up excess stain with absorbent paper.

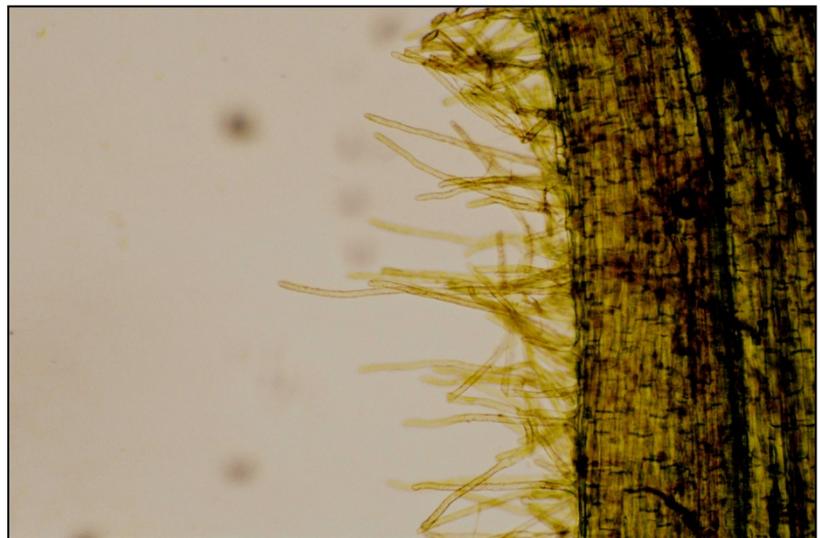
You can try to squash the root by applying pressure to the cover slip. Several layers of folded newspaper help to cushion the force and prevent breaking the cover slip.

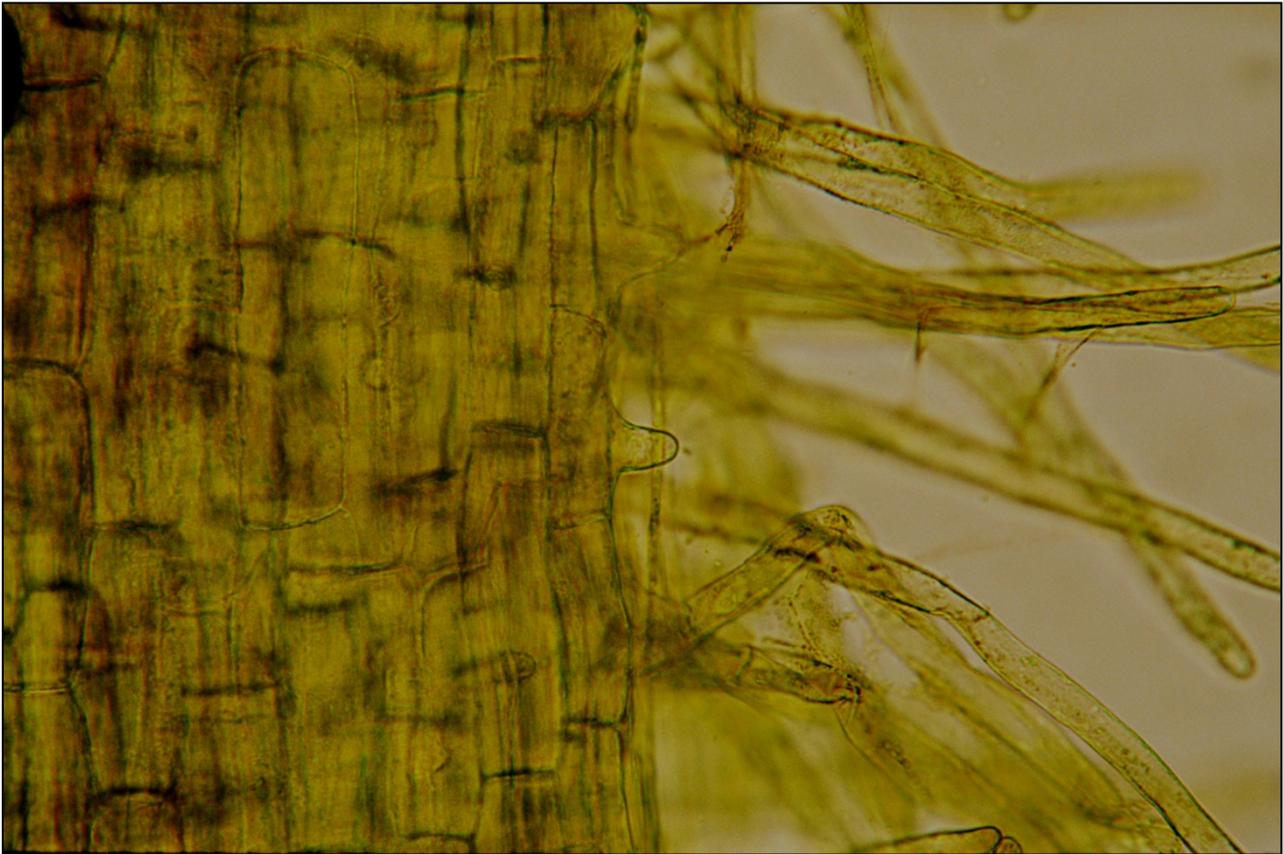
Generally, Low Power is sufficient in this exercise.

Images



Initial view at Low Power (X40) left and Medium Power (x100) below. Air bubbles can be difficult to avoid but ignore them as handling the roots too much can cause damage to the delicate root hairs.





These High Power views (x400) illustrate that root hairs are extensions of individual root epidermal cells. Their thin membrane does however provide a large surface area ideally suited to the absorption of water and dissolved minerals. All photos are of lettuce root hairs.

