Investigating mitosis by preparing a root tip squash

Transcript

Mitosis is one of the two types of cell division in eukaryotes.

It consists of four phases and results in the formation of two new daughter cells. The behaviour of the chromosomes during mitosis can be used to identify which of these phases a cell is undertaking.

Mitosis in plants happens in actively growing regions such as the tip of the roots and shoots, in regions of unspecialised tissue called meristem. This investigation involves making temporary root tip squash preparations from garlic, in order to identify meristem cells undertaking the four phases of mitosis.

A garlic clove is left to grow roots for three days.

When ready to use, the clove is rinsed thoroughly with distilled water.

It is then placed into a beaker of hydrochloric acid at 60 degrees Celcius and left for 10 minutes. The hot hydrochloric acid breaks down the pectin lamellae between cell walls.

The garlic clove is removed rinsed thoroughly with distilled water to remove all of the hydrochloric acid.

Sharp scissors are used to cut off around 5 mm from the end of a few separate roots.

2–3 mm from the very end of three root tips are cut and the rest of the material is discarded.

The root tips are placed into a watch glass, separated out so that they do not touch each other.

1 drop of toluidine blue stain is added to cover all three root tips.

The watch glass is heated to 40 degrees Celsius for 10 minutes to help the stain penetrate the tissue.

After the watch glass is removed from the hot plate, another drop of stain is added to the 3 root tips.

This time, the stain is immediately removed using a dropping pipette and replaced by a few drops of distilled water.

The water is removed and replaced by a few more drops of fresh water, which are then also removed.

This is repeated again so that there are no more obvious signs of the stain left on the watch glass.

The roots are transferred to a microscope slide so that they are about 2 and a half centimetres apart.

A small drop of glycerol is added to each root tip to keep it hydrated.

A cover slip is placed carefully on top. Care is taken to avoid introducing any air bubbles.

The microscope slide is placed onto the middle of a folded paper towel.

The paper towel is carefully folded over the slide. Then the slide and towel are rolled up so that the slide is completely covered.

A continuous downward pressure is applied to the slide using a clenched fist to squash the root tips.

This should generate a single layer of cells.

The slide is now ready for viewing under a light microscope.

At a low magnifications, it should be possible to see lots of meristem cells. They are small, with a roughly circular or square shape and a large nucleus.

Once the meristem cells have been found, the magnification is increased. 400 times magnification is the minimum required to be able to see chromosomes undergoing mitosis.

This investigation shows that cells in root meristem tissue undertaking the four phases of mitosis can be distinguished using a light microscope. It could be used to inform the basis of an investigation of a specific variable on cell division in plant roots.

The study of mitosis is of great importance to our study of how organisms grow and develop. It is also relevant to our understanding of cancer, which is caused by cells that have lost their ability to regulate their division by mitosis.