

Lockdown Fieldwork A biology practical that you can do at home or in your local park with no special equipment



Practical 1: Leaf Race

Level and subject: KS3 & 4 Biology and Maths

Biology Topic: Growth in plants

Maths Topic: Rate of change graph

It's spring and new leaves are bursting from leaf buds.



Question: How do they do it? How are they growing so quickly?

Biology: In the autumn, new cells were produced by mitosis in the meristematic tissue in the shoot. The new cells grew to form the new leaf, tucked up tight in a bud to protect it from predators, disease and weather.

In the spring, the leaf is already formed in the bud so when conditions are right the bud can burst and the leaves can grow very quickly to allow the plant to begin photosynthesising, making food for the plant. The young leaf cells have small vacuoles which take in water by osmosis causing the cells to elongate. This means the leaf can grow much more quickly than if each new cell had to be made by the meristematic tissue.

Question: How fast do leaves grow? Which leaves grow fastest? Why do some plants grow faster than others?

You could set up an experiment to answer these questions.

Decide which plants you would like to find out about. Does it look like some plants are competing for light? Which species will win?



Method Measure some new leaves every day or every other day, from the base to the tip, to work out how fast they grow. The plants could be in your garden, in your local park or plant some seeds and measure them as they start to grow. You could even sprout veg. Carrot tops and spring onion roots will grow if you support them over an egg cup of water using three cocktail sticks.



Holt Hall

Label your leaves so that you make sure you measure the same ones each day. You could make labels from an empty tetra-pack container, write on them with permanent pen and tie to each leaf with string.

Measure more than one leaf from each species so that you can take an average.

Fair Test Try to make it a fair test, for example if you measure some Sycamore leaves growing in a sunny area and some Beech leaves growing in a shady area will you know if any difference in leaf growth is due to the difference in species or the difference in amount of sunshine? Try to keep your variables down, so in this example, try to measure Sycamore and Beech that are both growing in sunny areas.

Results: Record your results in a table.

Data Handling: Display your results in a line graph.

The graph to use is the same as a distance-time graph. A distance-time graph displays the **rate of change** of distance with time. In this experiment the distance is the length of the leaf measured in mm and the time measured in days. You can probably fit lots of leaves onto one graph. Use a different coloured line for each leaf. The steeper the line, the faster the growth rate. When the line flattens out, the leaf will have finished growing. You can calculate the speed of growth by dividing the change in length in mm by the time in days.

Conclusions: Which leaves grew the quickest? Which leaves grew most slowly? Did you find differences between species? Did you find differences between sunny areas and shady areas?

In the example, Periwinkle 9 had the fastest growth speed at a rate of 8mm per day on its first day and an average growth speed of 5.3mm per day over 3 days. It was also the leaf that grew the most at 16mm in 3 days!

The slowest leaf growth was a draw between Hornbeam 1 and Hornbeam 3 as they both had a day where no growth was detected. Hornbeam 3 wins the slowest growth medal as it had an average growth speed of 1mm per day over 3 days. It grew a total of 3 mm.

There was a clear difference between species, with Hornbeam growing much more slowly than Sycamore or Periwinkle.

The plants in this study were all growing in the sunshine and the weather was warm and sunny every day with a slight shower on day 2.

Discussion: Why do you think you found the differences that you found?

Some plants are adapted to growing quickly. They are quick to take advantage of any available sunlight. Slower plants may not survive if the quick plants take all the light.

In the example, Sycamore and Periwinkle are quick to use the sunlight and can take over an area preventing other plants from growing.