

What can DNA barcoding reveal about the phylogenetic relationship of snowdrop species?

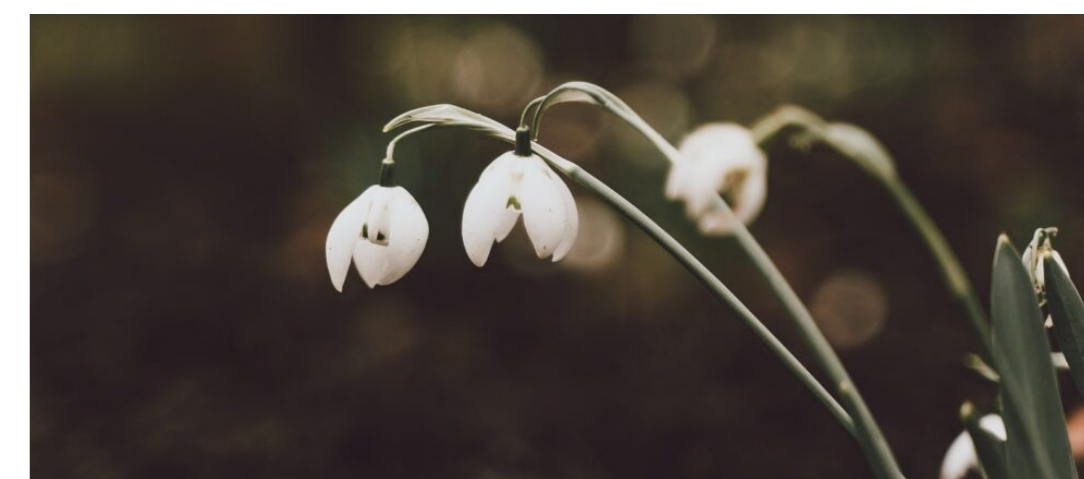
Bedford School
Rothamsted Research

Overview

We are sequencing the DNA within the chloroplasts of the 12 species of the Snowdrop (*Galanthus*) flower that are held at Anglesey Abbey. We are being trained to be able to effectively extract DNA from the chloroplasts. To isolate these chloroplasts we will be using a technique called micro pipetting. We centrifuge the substance we receive from this so that we are able to separate each different element of the chloroplasts until we are left only with the DNA. After that gel electrophoresis is used to separate DNA strands according to their size. Then using a MinION we will get the DNA sequence of the chloroplast and use it to produce a phylogenetic tree.

Aims

- Extract and sequence the genomes of 12 different varieties of Snowdrop.
- Create a phylogenetic tree containing all the 12 varieties.
- Analyse our results and determine any relationship between the varieties.
- Make all data accessible online for others to use in further scientific research.



Galanthus sp. on collection day 23rd January 2024

Background information

In 2003, the human genome was sequenced for the first time, having taken thirteen years to complete. Since then the time taken to sequence genomes has reduced to as little as half an hour, meaning this field of research is progressing faster than ever before. It is now easier than ever before to collect the genome data, and so we are able to sequence these 12 species of snowdrops for the first time. The Tree of Life is a project aiming to gather genetic information on all living things, and all information is free to the public. The chloroplast of plants contains DNA which we can use to establish the phylogenetic relationship between the snowdrops.

Methodology

Firstly we will isolate chloroplasts from leaf tissue of each species of snowdrop. We do this by first grinding the leaf in an isotonic, cold, buffered solution, with a pestle and mortar. Then we filter the solution through cheese cloth, before spinning the filtered solution in a centrifuge to separate the other organelles from the chloroplast. This involved multiple steps: first it is spun at a low speed to remove the larger organelles such as the nucleus, then we extract the supernatant (soluble debris) and re-spin it at a higher speed to isolate the chloroplast. After discarding the supernatant, we suspend the chloroplasts in a cold isotonic buffer solution. A commercial kit is then used to extract the DNA from the chloroplast and the presence of DNA checked using gel electrophoresis

Predicted results

Although we do not have our results yet we hope to be able to see the genetic differences between the species and create a phylogenetic tree to display how each variety evolved and which is the oldest/youngest and which traits are shared with different members of the genus. We expect to find that some of the members of the *Galanthus* genus to share many traits. Our results will be published, open source, for the use of the whole scientific community for their own research.



Collection of snowdrop samples 23rd January 2024

Conclusion

In conclusion, although we haven't achieved any results as of yet, we are extremely excited to be able to take part in brand new science, and work with so many scientists, such as those from Rothamsted Research and EMBL-EBI who have helped accelerate this field of research so rapidly, as well as the people from Anglesey Abbey and Hills Road Sixth Form College. We managed to collect our different species of snowdrops and their DNA will be extracted in the coming weeks, and analysed in a few months time.



Evaluation or next steps

Our next step is to make our results freely accessible online. In time, our work could benefit other researchers who might be delving into other Snowdrop species that we have not researched or indeed work on other similar species to our Snowdrop ones.

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