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Assessing tree-level variation in UV protective mechanisms of pollen

Introduction:

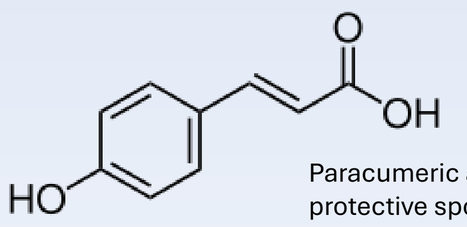
UV-B absorbing compounds **(UAC)** such as paracumeric acid (pCA) protect pollen from DNA damage, absorbing up to 80% of UV-B radiation. Increased UV-B radiation heightens UAC concentration. UAC concentration in fossil pollen can be used as a proxy for understanding UV and climate conditions in deep time.

I analysed pollen samples of *P.pinea* and *P.*mugo from a 2013 experiment where it was found that nutrient composition of pollen was affected by its location. My goal was:

1) **to find out if pCA concentration of *P.pinea* was affected by its location on the tree**. This could help in interpreting chemical variations in fossil pollen from the same tree.
2) **to compare the two species' UAC concentration over time.**



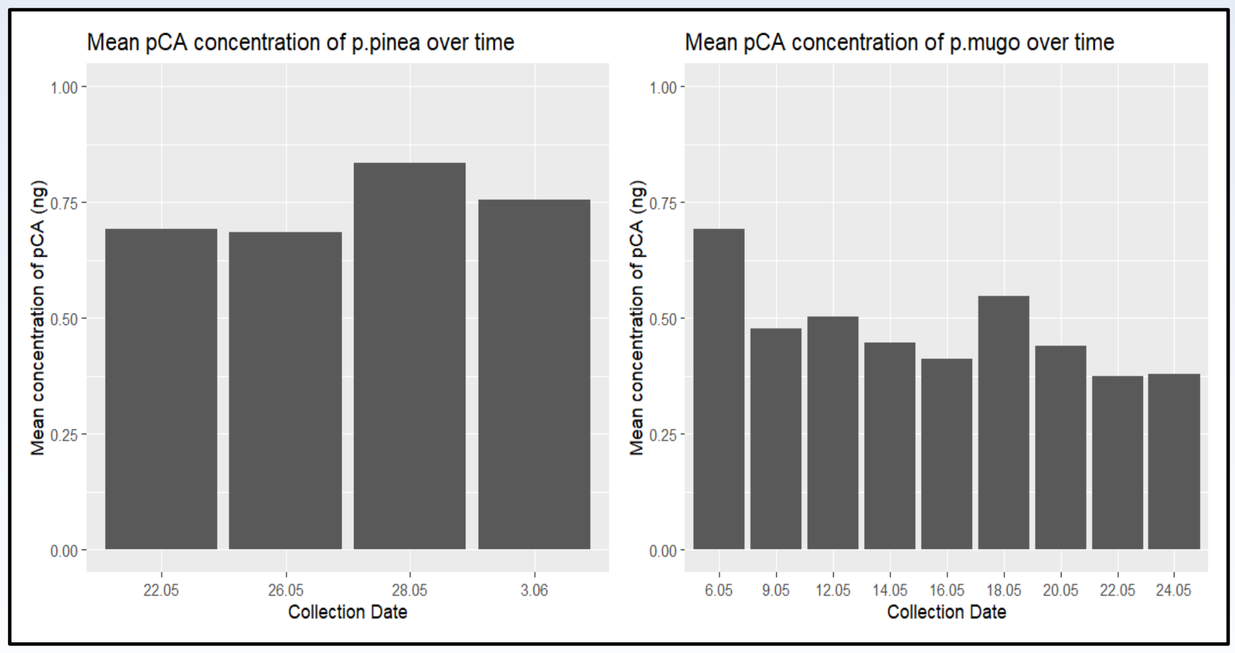




Paracumeric acid (pCA), a UAC that helps build up the protective sporopollenin layer

Method:

Using an inverted microscope and a rubber tube attached to a glass pipette, I individually picked 150 x 3 pollen grains for each sample. Then, the samples were analysed using gas chromatography methods to identify pCA concentration.

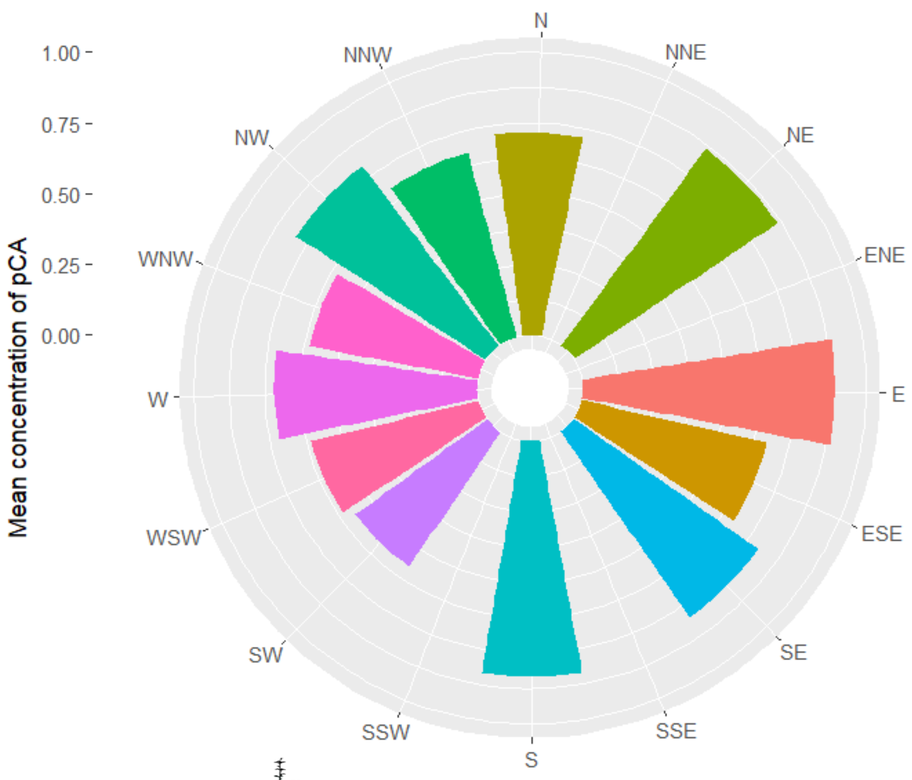


Discussion:

The 2013 analysis found a significant difference in nutrient composition between the SE and NW branches. When looking at the results for UAC concentration in these same branches, there is no significant difference.

The results may indicate that the pollens' ability to produce UAC is **independent** from its nutrient content. The Western locations express a lower pCA concentration due to the tree being shaded on this side.

When comparing a time-study of 2 species, *P.mugo* and *P.pinea* , the species native to the Mediterranian, *P.pinea*, was found to contain on average a higher concentration of UAC than *P.mugo*, the species native to mountainous regions of southwestern and southeastern Europe. There was not enough data to identify a trend over time.



Conclusion:

1) *Does the location of pollen affect its UAC concentration?*
   No. Apart from the Western side expressing lower concentration due to shading, there was **no significant correlation between location and concentration.** The results could indicate that UAC expression may be somewhat independent from nutrient content.

2) *Are there differences in UAC concentration between P.mugo and P.pinea over time?*
   Yes. The species with a native range in the Mediterranian *P.pinea* had a higher expression of UAC than the species with a native range higher in latitude, *P.mugo*.

The UAC differences between species of different climates help strengthen the reliability of fossil pollen as a proxy for determining climate. The directional findings imply that UV and climate related causes might not explain cases of huge chemical variation from different parts of a tree in the fossil record.

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