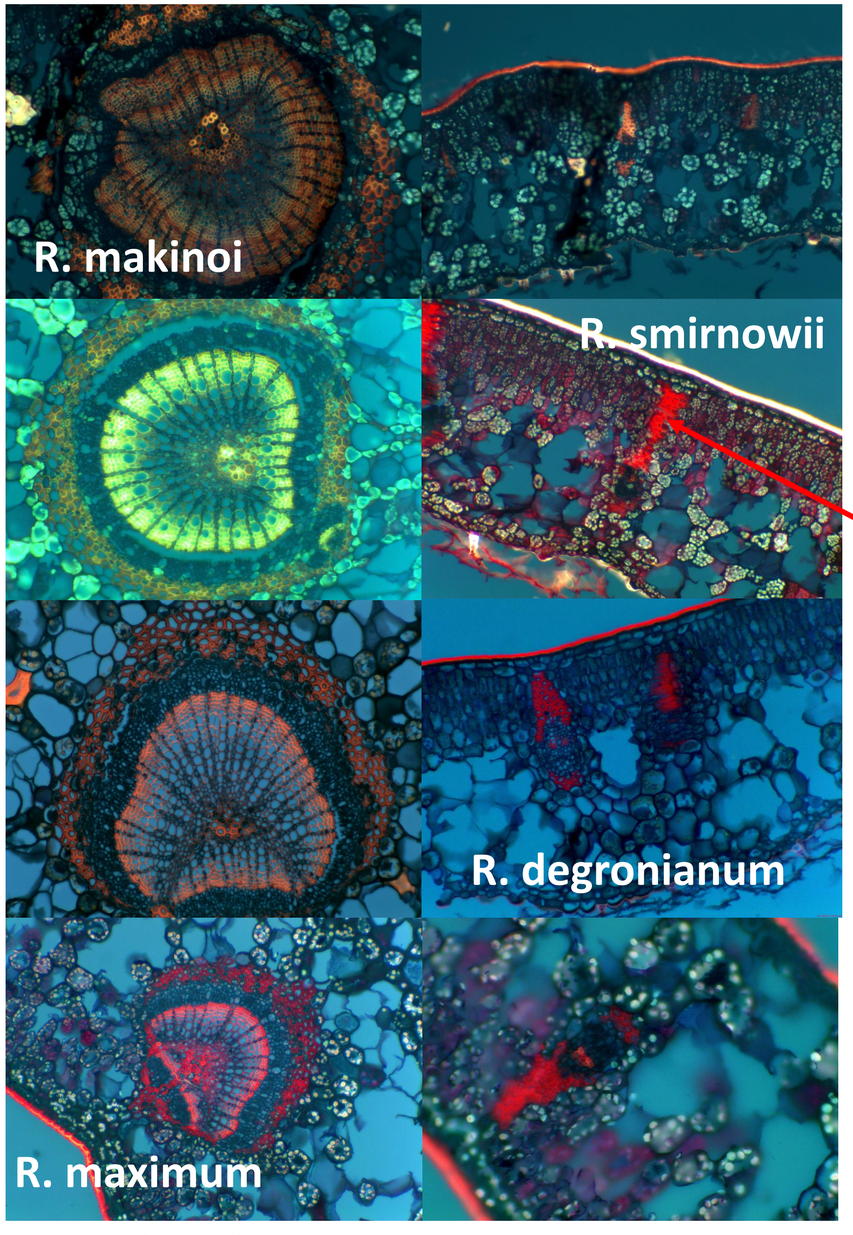
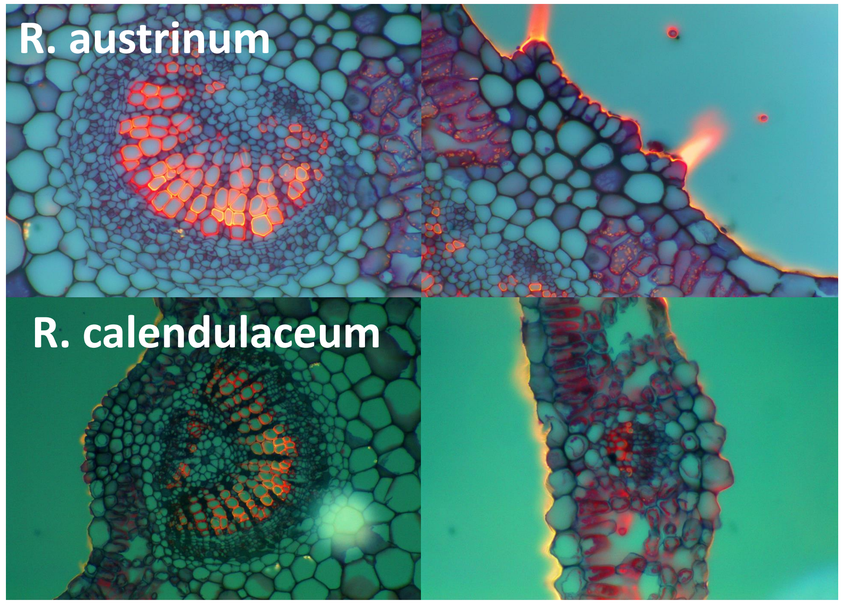
Leaf anatomical variation related to species ancestry & climate tolerance

Leaf cross sections for *Rhododendron* species from different clades and with different climate tolerance, including midrib vein (left) and leaf blade (right). Leaves take up CO2 through stomata on the leaf surface, mesophyll performs photosynthesis, and water evaporates at the same time.



Elepidotes – Section Ponticum

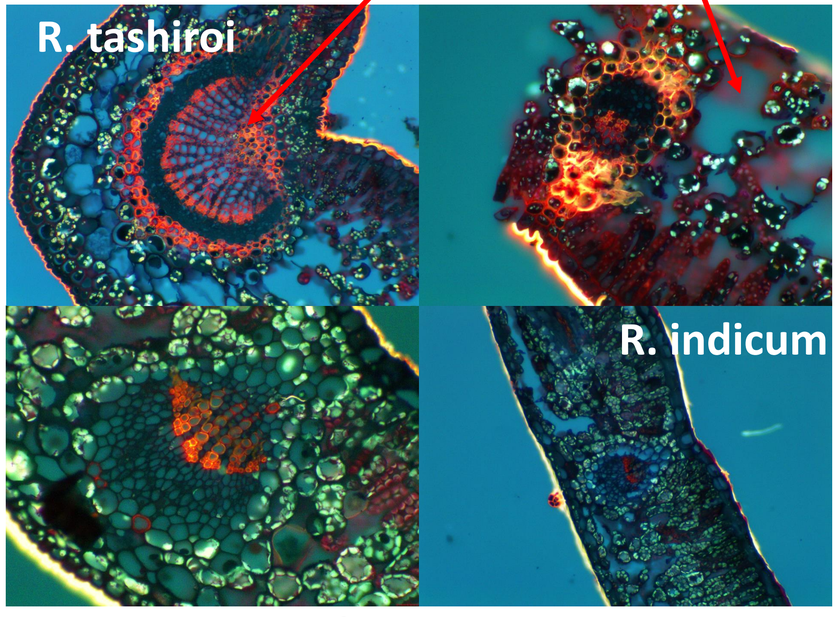


Deciduous azaleas – Section Pentanthera

Bundle sheath – circulates water around the leaf

Xylem vessels – transports water to all cells in the leaf

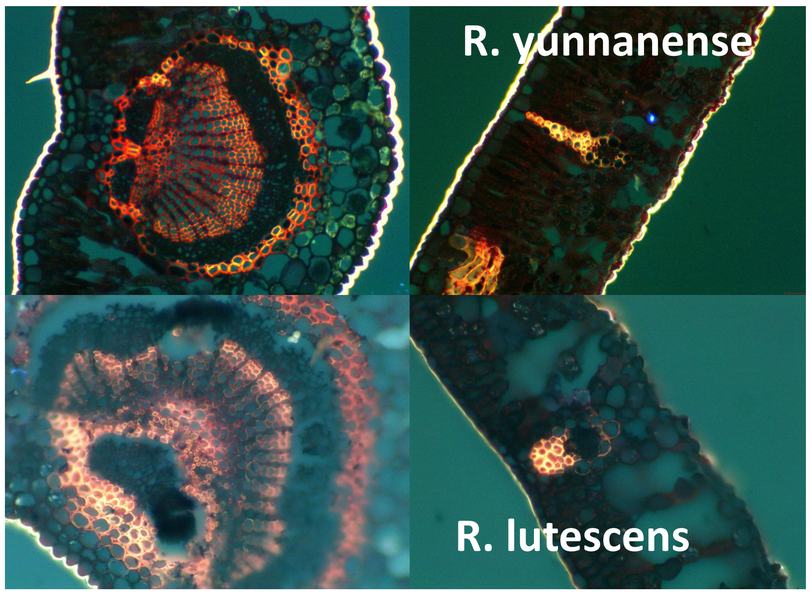
Air space – allows mixing of air to provide access to CO_2



Evergreen azaleas – Section Tsutsusi

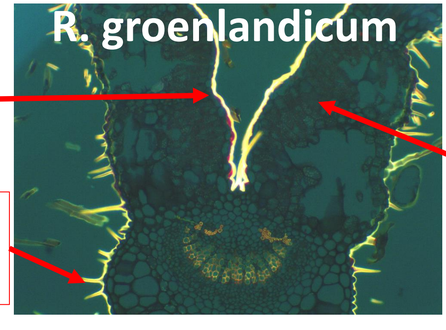
- Plants negotiate a trade-off between fast growth and stress resistance, characterized by leaf anatomical traits that either help the plant grow fast or resist damage from stress.
- Both species ancestry and climate tolerance could influence leaf anatomy: ancestry determines the kinds of traits the species can have, and which traits can be flexible, and this in turn determines the climate tolerance of the species.
- We found that leaf anatomy differs across taxonomic sections with different leaf habits and that leaf anatomy corresponds with climate where the species evolved.
- Species from the most seasonal climates had the highest trait–climate correspondence, and different aspects of leaf anatomy reflected leaf carbon uptake versus water use.
- Our study provides insight into the mechanism of whole-plant functional coordination and shows how individual leaf traits are combined.

Lepidotes – Section Rhododendron



Cuticle – waxy coating prevents dehydration

Trichomes – hairs that act like a sweater



Mesophyll – cells that conduct photosynthesis to make sugars for plant growth

Juliana S. Medeiros, Jean H. Burns, Callie Dowrey, Fiona Duong and Sarah Speroff. 2024. Leaf habit and plant architecture integrate whole-plant economics and contextualize trait–climate associations within ecologically diverse genus Rhododendron. AoB PLANTS 16: 1–14