

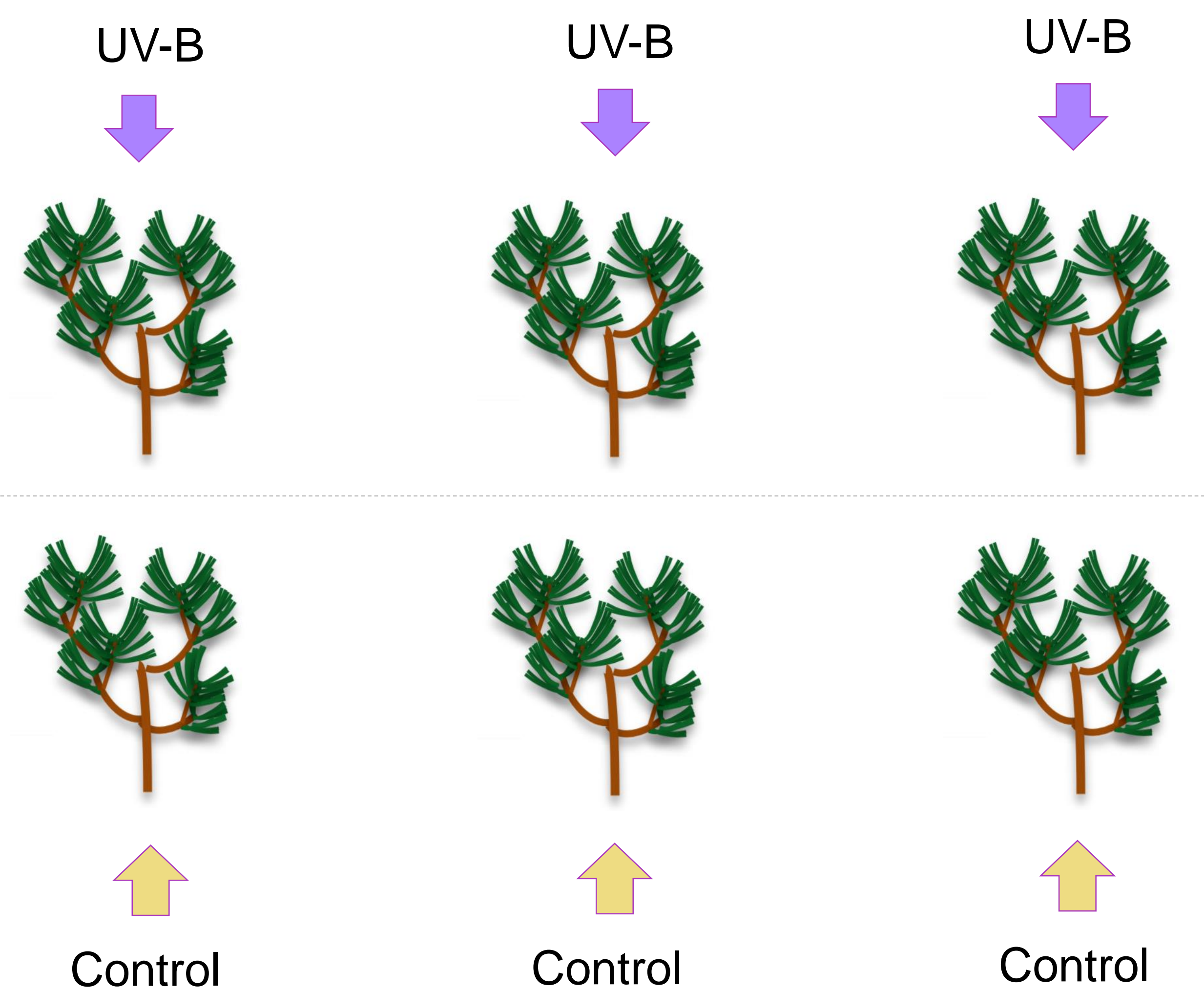
# Casting a light on malformed pollen grains and pollen tetrads

## 1. Will elevated levels of UV-B increase the amount of malformed pollen and pollen tetrads?

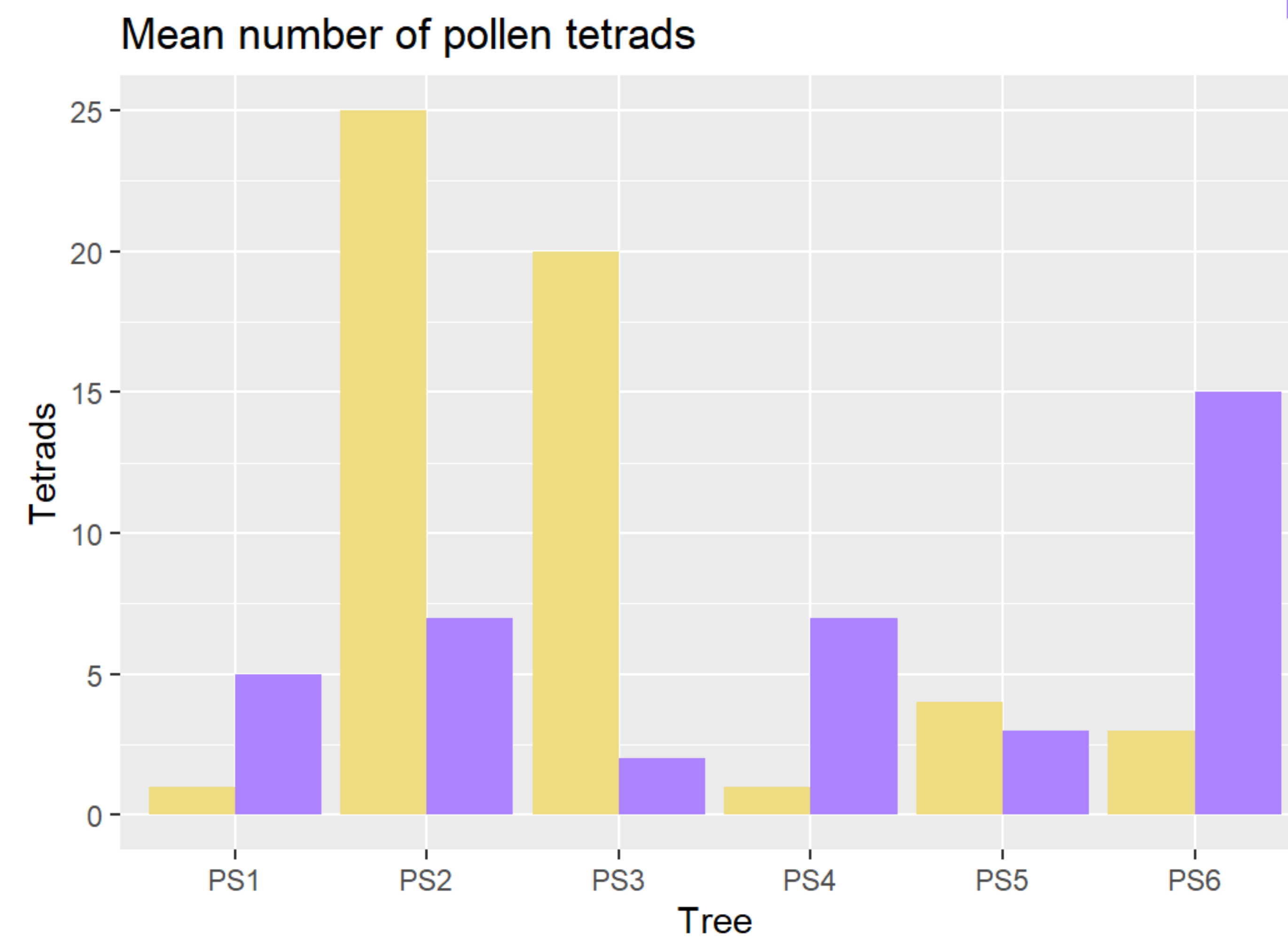
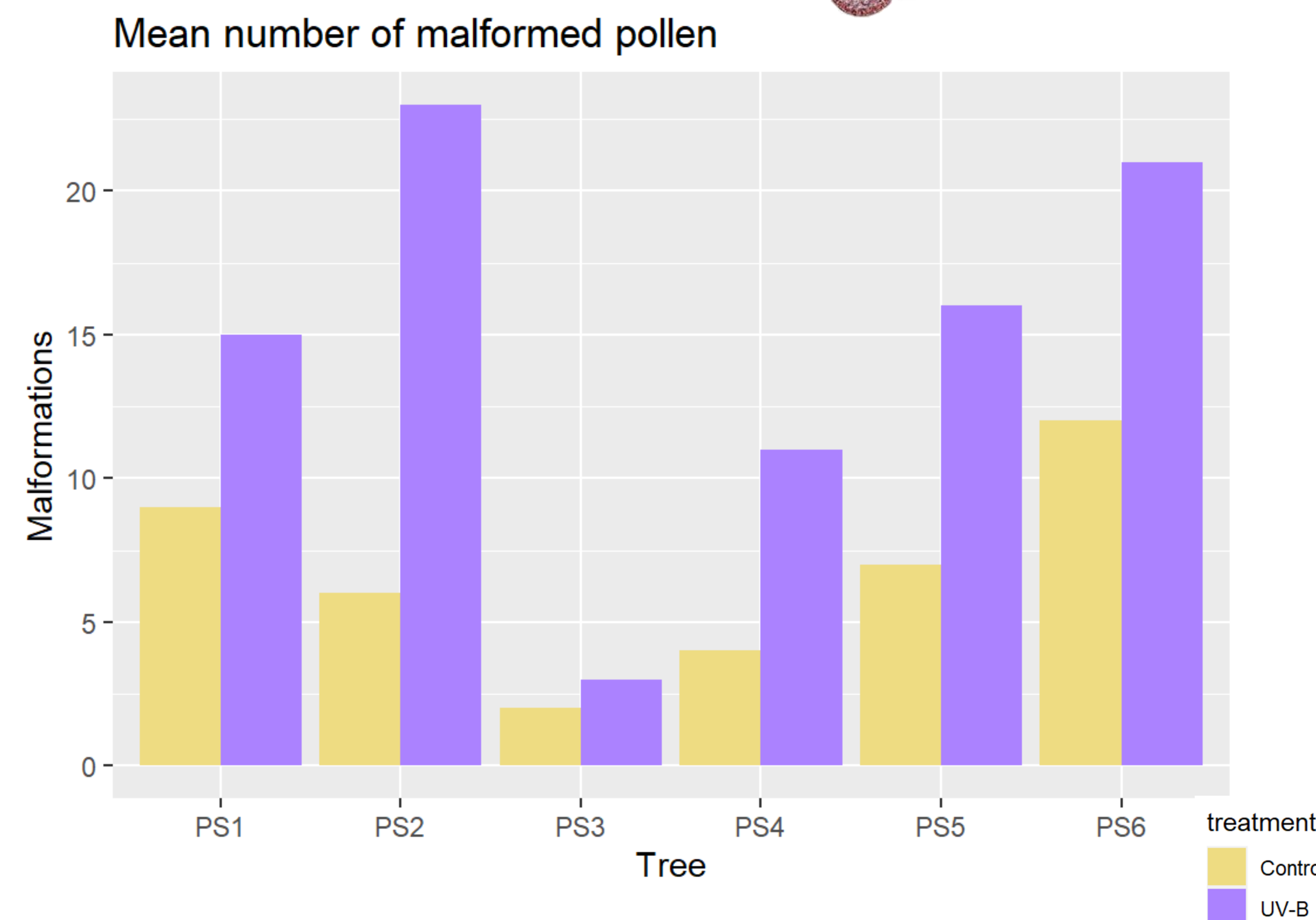
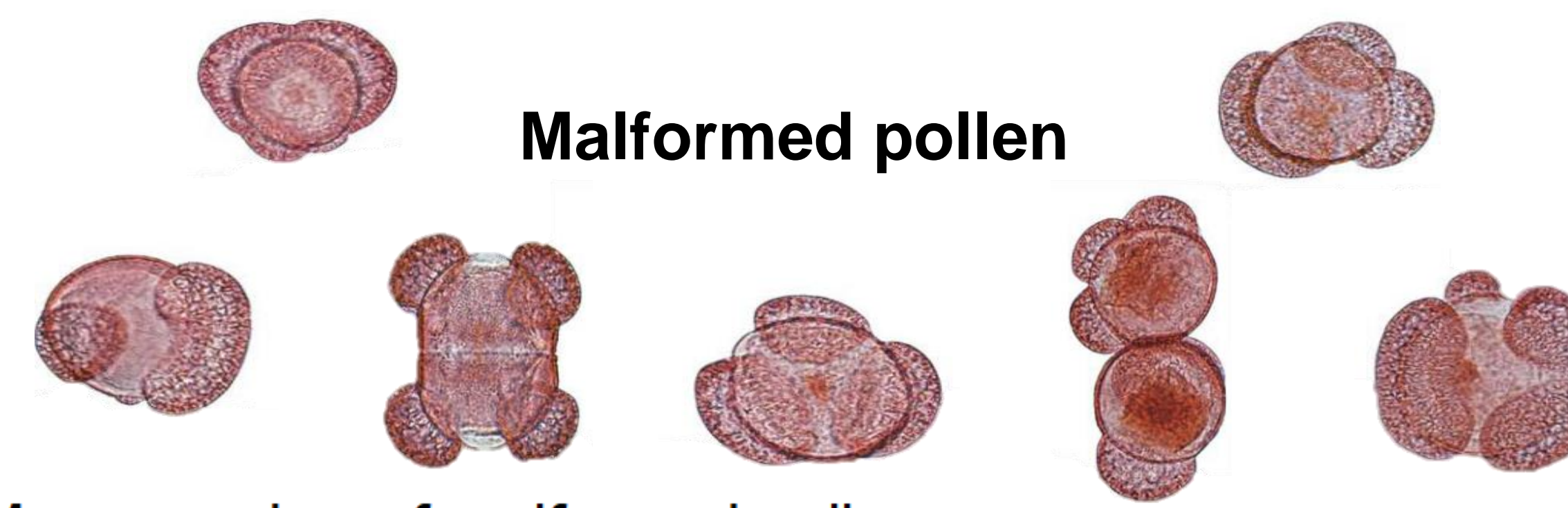
UV-B radiation causes DNA-damage, and living organisms have therefore developed repair mechanisms to combat them. However, elevated levels of UV-B has the potential to cause more damage than the organism can repair, often resulting in harmful mutations. Such elevated levels of UV-B have been suggested as a contributor to two mass extinctions based on worldwide increased rates of malformed gymnosperm pollen grains, in addition to non-gymnosperm pollen tetrads.

When malformed pollen grains and pollen tetrads are found at rates  $>3\%$  it is a sign of environmental stress. Pine pollen resembles ancient gymnosperms, which makes pine a relevant study object in this context. Will the rates of malformed pollen and pollen tetrads in *Pinus Sylvestris* increase when exposed to elevated levels of UV-B?

## 2. Experimental design



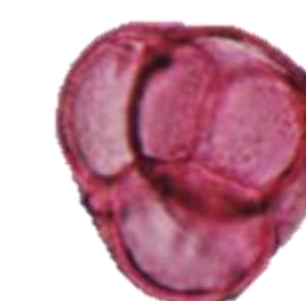
Branches were cut from eight different trees and one branch from each was put into six frames in a greenhouse. Three frames were subject to control treatment, while the other three were subject to elevated levels of UV-B



Normal pollen



Pollen tetrad



## 3. More malformed pollen and similar amounts of pollen tetrads

Pollen samples from branches exposed to the UV-B treatment was found to have significantly more malformed pollen than control branches. On the flipside, it was found that pollen samples from branches exposed to the control treatment significantly had significantly more pollen tetrads. However, if a greatly deviating branch was removed from the data, no significant difference was found between the control and UV-B treatment.

## 4. Formation of malformed pollen and pollen tetrads are likely affected by their differing origins

The effect of UV-B consequently increased the amount of malformed pollen grains, but there was much between tree variation. It is likely that these malformations are the result of DNA-damage which affects the DNA of individual pollen grains, thereby causing the grains to develop wrongly. The amount of pollen tetrads was not increased by elevated UV-B levels like the malformed pollen grains, which is likely due to the differing origins of the two. The formation of pollen tetrads is thought to be because of a failure during the separation of individual pollen grains from the pollen mother cell, which is not dependent on the proper functioning of the pollen grain itself but rather the anther of the plant.

Lastly, the one largely deviating sample suggests that there is much still unknown about what factors influences the formation of tetrads.