

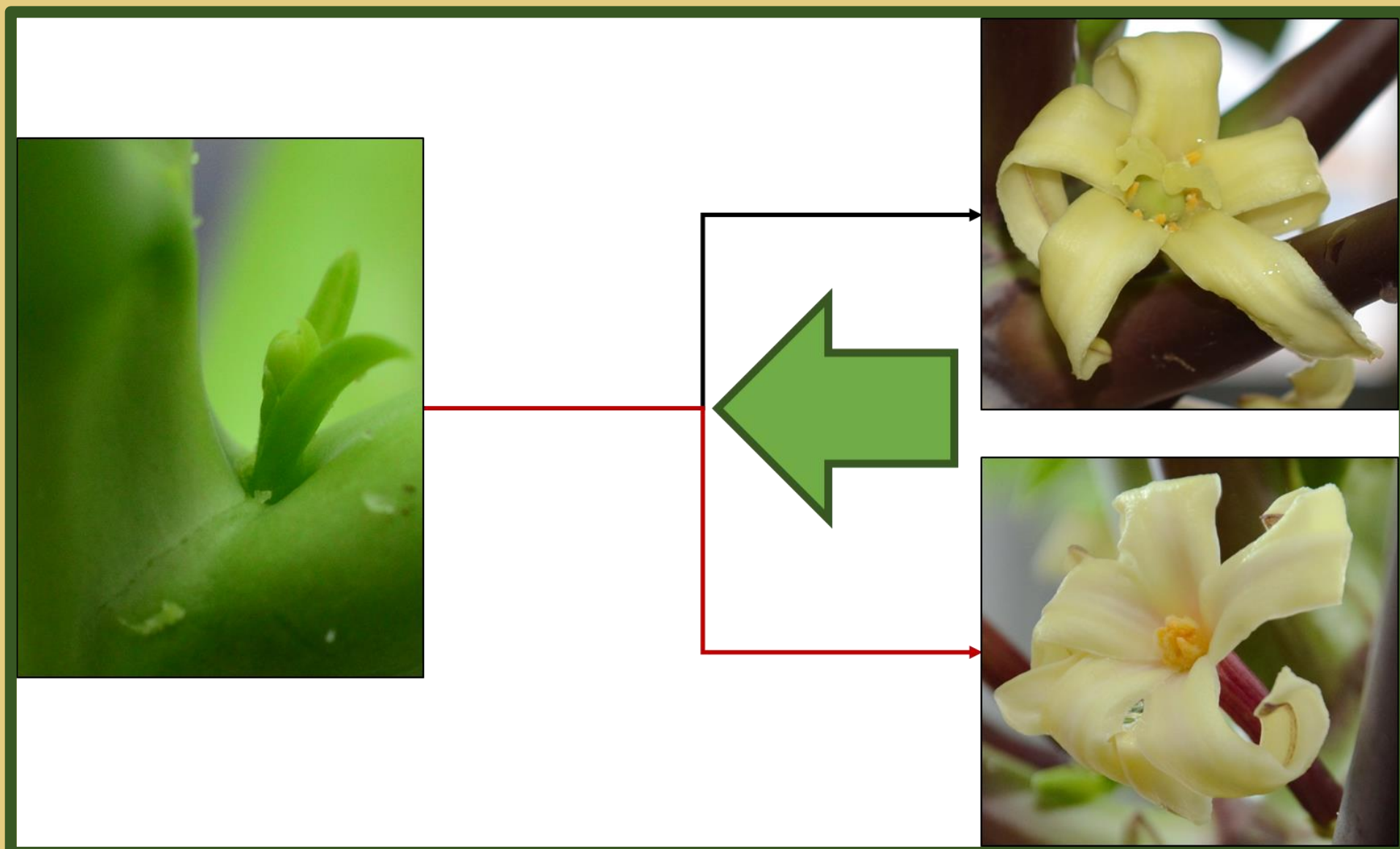
# Sex Reversal in Papaya

Tiago L. Meier<sup>1</sup>, Ueli Grossniklaus<sup>1</sup>

<sup>1</sup>Department of Plant and Microbial Biology & Zurich-Basel Plant Science Center, University of Zurich, Zollikerstrasse 107, CH-8008 Zurich, Switzerland

The tropical crop plant papaya is one of the rare plant species that is trioecious, meaning that papaya plants can have one of three sexes: male, female, or hermaphrodite. In papayas sex is determined genetically by sex chromosomes: as in humans female papayas have two X chromosomes, whereas male have an X and a Y chromosome, hermaphrodite have an X and slightly different Y chromosome called Y<sup>h</sup>. Papaya farmers mostly plant hermaphrodite papayas as they can self-pollinate and produce more uniform fruits and offspring. However, environmental effects, such as heat, may induce a so-called sex reversal that leads to the production of male flowers on hermaphrodite plants and can cause yield loss. Sex reversed plants stay genetic hermaphrodites and may turn back and produce again hermaphrodite flowers. This indicates a difference in gene expression causing sex reversal rather than genetic mutations. One part of my project is to find genes that are responsible for sex reversal.

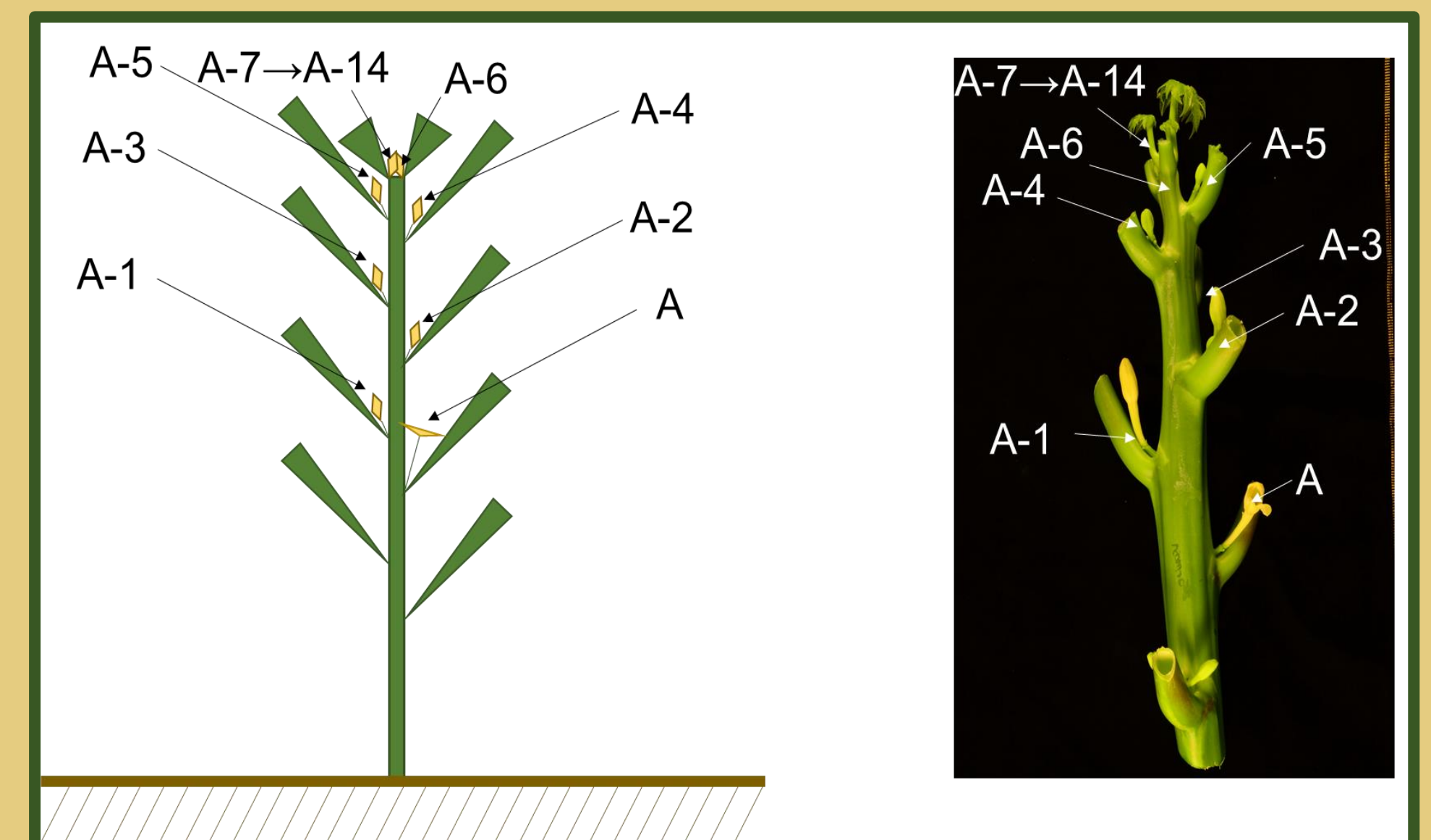
When the sex of a flower is determined?



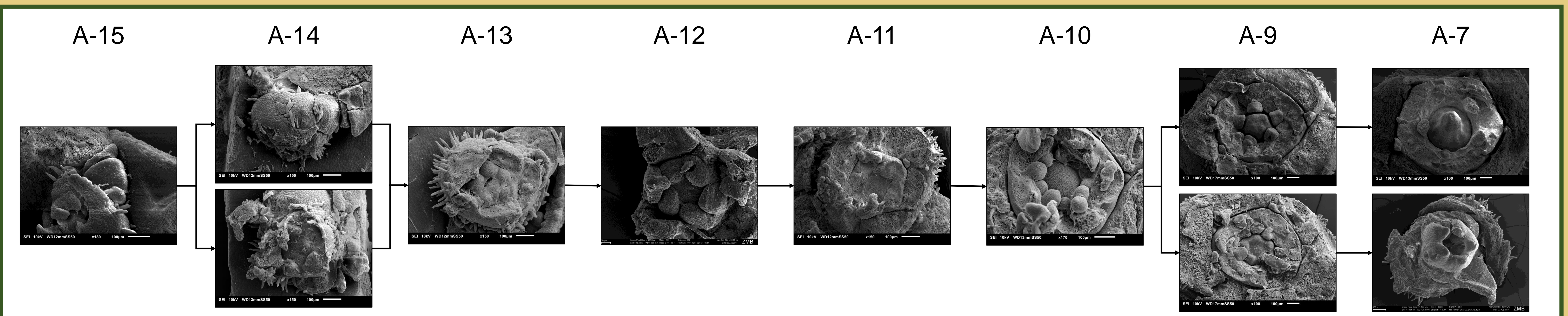
Papaya flowers grow in a gradient



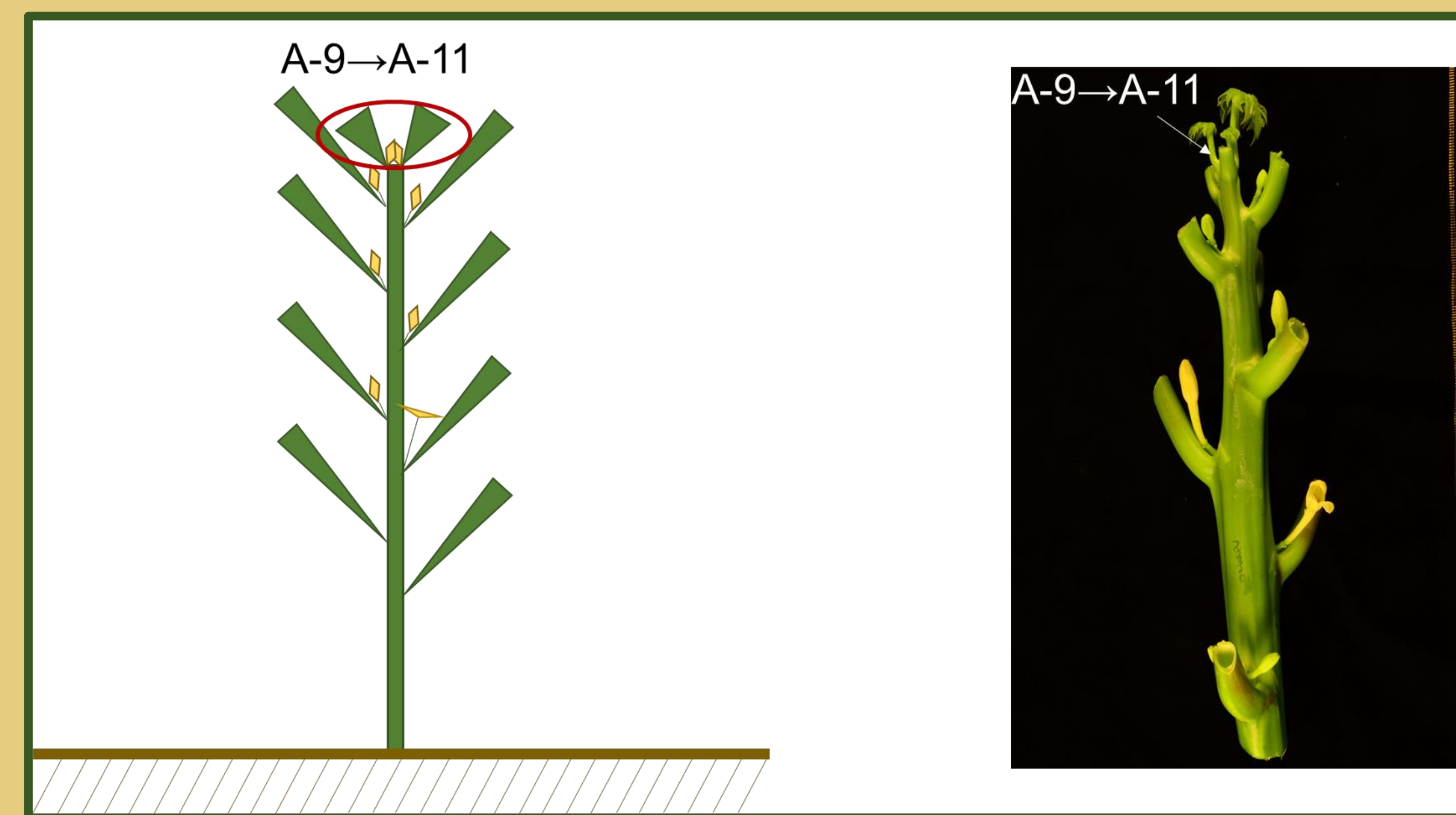
The gradient allows staging of buds



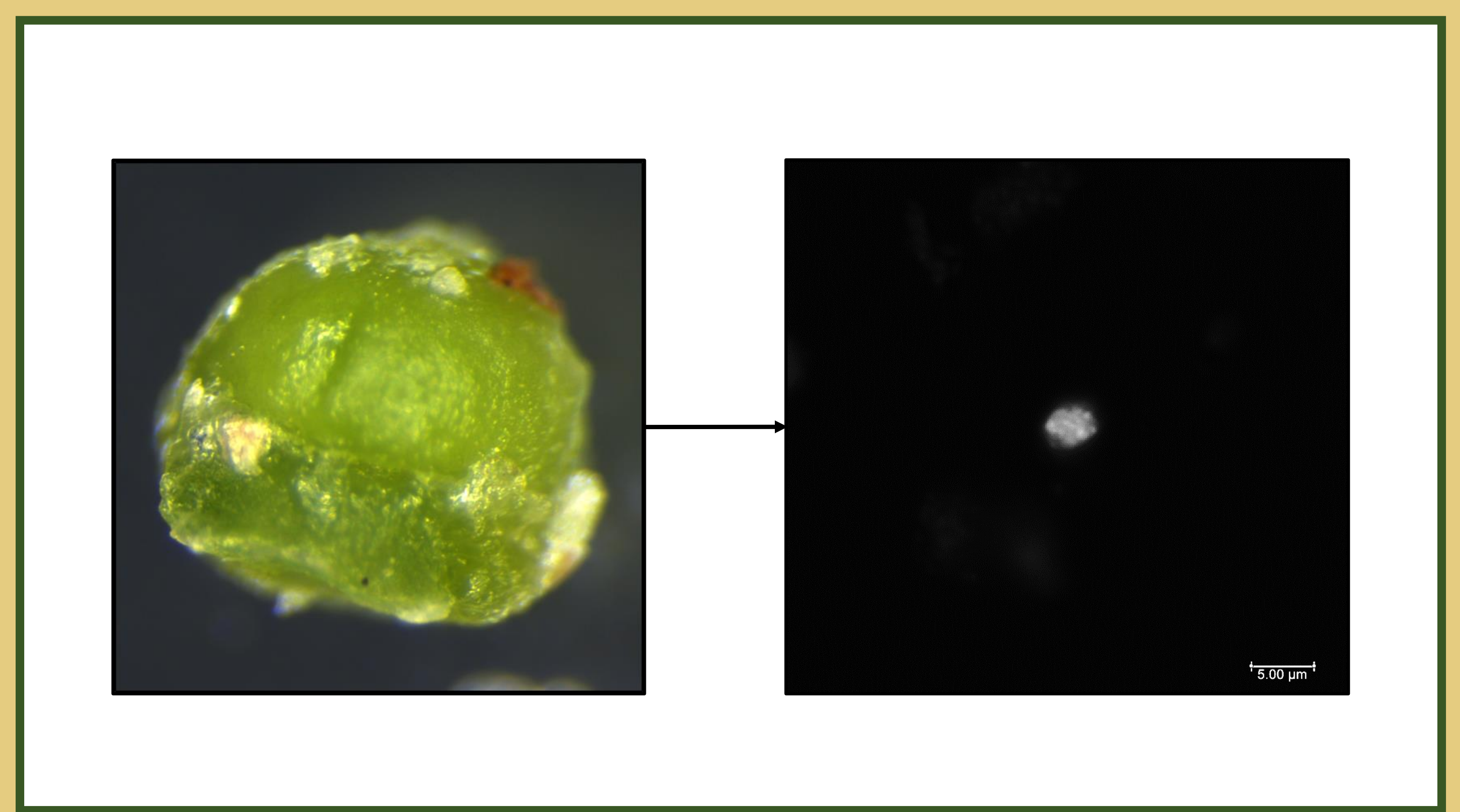
Differences between hermaphrodite and male become visible at stage A-9



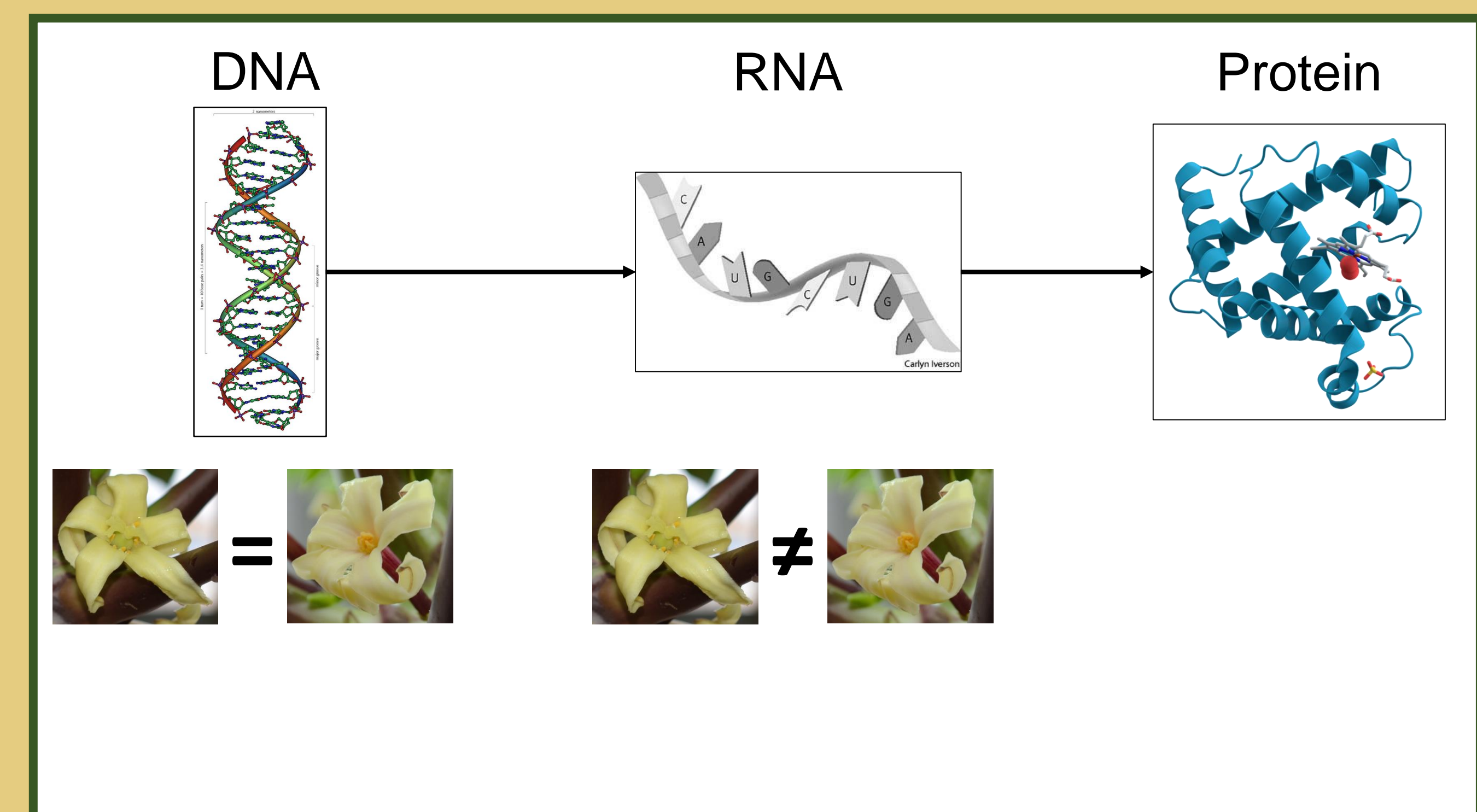
Buds of three stages will be used for further analysis



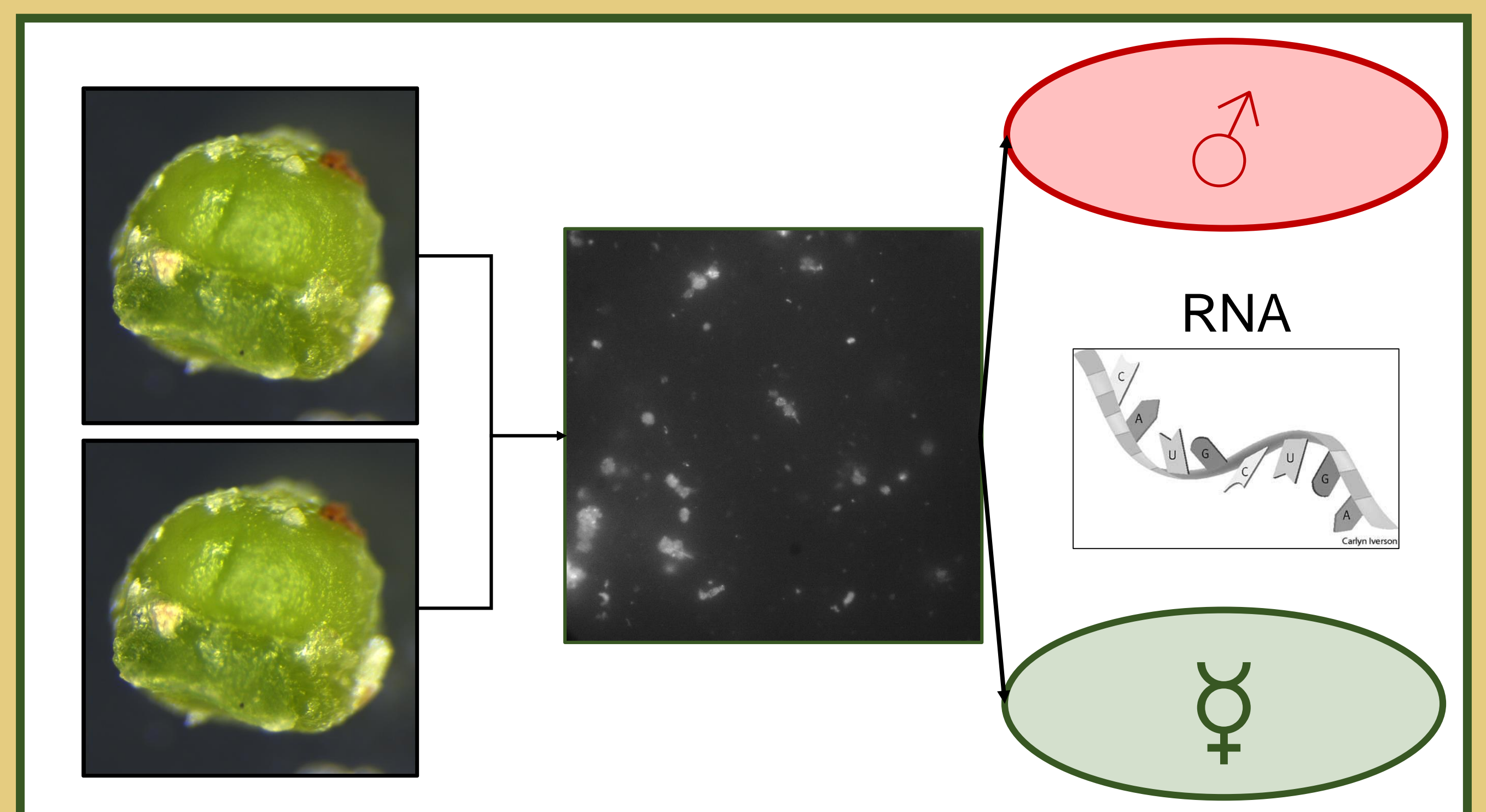
Buds of these stages will be used for nuclei extraction



The genes are the same the gene expression makes the difference



We assume that the gene expression form two clusters



Single nuclei sequencing may lead to the isolation of candidate genes that correlate with sex expression. These candidate genes can be further investigated and may be causative for sex reversal. Identification of the genes that are causing sex reversal is important for understanding sex evolution in plants. Furthermore, sex reversal in papaya could become a problem for papaya farmers in the future due to global warming and the assumed increased risk of extreme weather incidents. Therefore, a second part of the project consists of the detection and development of genetic markers that would allow breeding against sex reversal.