Popular Science Article – Patrick Martin – Master's thesis

The role of auxin and cytokinin during gynoecium development in *Arabidopsis thaliana*

With today's healthy life style trend, it is no secret that eating fruits have become increasingly popular. Before producing these fruits, plants must go through a series of complex developmental processes that all starts with the establishment of a flower bud. This flower bud is initiated by environmental cues such as changes in the length of days. Once the plant has started to initiate flower development, the floral pridmordium will go through different steps starting with flower bud and ending with a fully mature flower, ready to be pollinated. After pollination, the female reproductive organ that will give birth to seeds and will develop into a fruit is called the gynoecium.

Most of these steps are controlled by hormones. These hormones will enable genes to play their role in plant development. The two main hormones in plants are auxin and cytokinin. Both of them tend to work together in plant growth and development. The way these hormones work is often based on accumulation peaks. In other words, there is a need for a high concentration of these hormones in a specific area of a developing tissues. For this process to be possible, plants have some proteins that are capable of transporting hormones to the desired location. Auxin has many different transporters that are both capable of exporting and importing auxin from/in the cell. Cytokinin transporters are not always very well understood.

Here, we wanted to see which role would play a set of auxin importers (called the AUX/LAX gene family of importers) during gynoecium development. We were also interested to discover if these transporter could be affected by other hormones such as cytokinin.
We also looked at cytokinin transporter ABCG14 and its potential role during flower development.

To see if these genes were present during gynoecium development, we used what we like to call marker lines. A marker line is a tool that enables a scientist to see if a specific gene is present in a tissues using different "coloring" methods.
It seemed that AUX/LAX and ABCG14 were both present during flower development. It also appeared that AUX/LAX showed to be less active when we treated our plants with cytokinin. Cytokinin would then negatively affect AUX/LAX genes.
However auxin is also capable of affecting cytokinin. We showed this by also using marker lines but in this case, a marker line sensitive to the presence of cyotkinin. These two experiments seem to indicate that auxin and cytokinin play together during gynoecium development.
To understand how these genes affect gynoecium development, we used mutants of AUX/LAX and ABCG14 genes. In the mutant plants, the transporter becomes inactive. By looking at how it affects development, we can try to fathom which role they would play.
AUX/LAX genes appeared to play a strong role during gynoecium development. The mutants showed odd flowers and gynoecia. The cytokinin transporter, when inactive, did not appear to strongly affect the gynoecium during its development.

We could conclude that auxin transport is essential for gynoecium development. We can also say that auxin and cytokinin act together for a correct development. There is still a lot to be done before we fully understand how these hormones and transporter act to give rise to the gynoecium that will later give us all the fruits that we know and love.

Degree project in biology, Master of science (2 years), 2015
Examensarbete i biologi 45hp till masterexamen, 2015
Biology Education Centre, Uppsala University, and Swedish University of Agricultural Science
Supervisor : Christina Joy Müller
External opponent: Prashanth Ramachandran