Molecular mechanisms driving seed development in flowering plants

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Abstract

Seed development in Angiosperms starts with a double fertilization event, whereby two paternal sperm cells fertilize the maternal gametes, the egg cell and the central cell. This leads to the formation of two fertilization products: the embryo, which will form the next generation, and the nourishing endosperm. These two structures are surrounded by the seed coat, which is purely of maternal origin. Although in the vast majority of species fertilization is necessary for seed formation, some plants can form asexual seeds. This phenomenon is called apomixis. The introduction of this mode of reproduction is highly desirable in agriculture because it would allow the fixation of hybrid vigor, and it would allow maintaining crop yields in situations where pollination is deficient, for example due to high temperatures of lack of pollinators. However, apomixis is not present in any major crop species and its introduction via classical breeding has not been successful. Therefore, understanding the molecular mechanisms driving apomictic seed development is imperative if we aim to introduce this technology into agriculture in the future. One of the components of apomictic seed development is the production of an asexual (or autonomous) endosperm. Although the mechanisms that allow apomicts to develop autonomous endosperms remain mostly undiscovered, genetic mutations in sexual species, such as *Arabidopsis thaliana*, can induce autonomous endosperm formation. This means that asexual endosperm formation is possible in sexual species but is repressed in normal conditions. Importantly, this means that those mechanisms can potentially be exploited to introduce apomictic-like endosperm formation in crops. In this seminar I will show how epigenetic and hormonal mechanisms can be manipulated to modulate endosperm development. Finally, I will discuss the evolutionary conservation of some of the mechanisms involved in endosperm formation.