MASTERBIOSCIENCES
ECOLE NORMALE SUPERIEURE DE LYON

Mechanisms underlying endosperm persistence in Angiosperms

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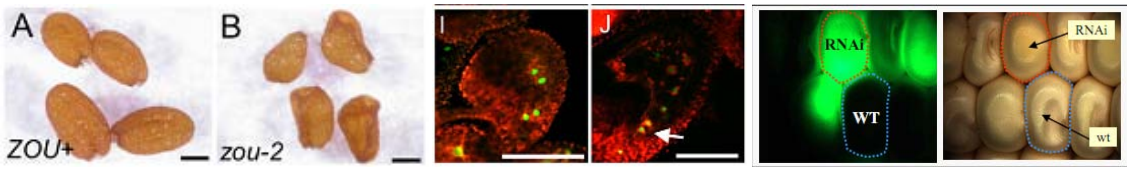
Introduction, contexte scientifique:

The endosperm, a nourishing tissue of the developing embryo, is considered to be one of the key innovations explaining the explosive radiation of the angiosperms after their appearance 200 million years ago. The endosperm is the product of fertilization of female gametophyte cells by a sperm nucleus, and its proliferation and development is dependent upon this fertilization event, contrary to the proliferation of the female gametophyte in gymnosperms. Consequently angiosperms don't "waste" nutrients if fertilization does not occur.

In addition to selective advantages however, the sexualization of the female gametophyte also caused problems. For example, the concurrent development of the embryo and endosperm imposed a need for scrupulous regulation of space allocation within the seed. This regulation is strikingly different between angiosperm groups. In cereals, for example, a large body of persistent endosperm remains at seed maturity, whereas in oilseeds, or legumes, the endosperm is almost entirely consumed during seed development. Recent results within the host laboratory have shown that in Arabidopsis (an oilseed), space allocation is regulated by the activity of the transcription factor ZHOUPI (ZOU), which, together with a recently identified ZOU INTERACTING PROTEIN (ZIP1), regulates endosperm breakdown and permits normal embryo growth. Transcriptional targets of ZOU/ZIP1 have been identified.



Description du sujet de stage/project description:

ZOU is highly conserved in cereals, including maize. Maize also contains 3 potential *ZIP1* orthologues, and preliminary experiments in maize suggest that the ZOU-ZIP1 interaction is conserved. The naturally persistant endosperm of maize has led us to ask the intriguing question of whether variations in endosperm persistence within angiosperms could be attributed to altered regulation of ZOU-ZIP1 dimer expression or activity. This project therefore aims to study the function and regulation of ZOU and ZIP1 in both Arabidopsis and in maize in more detail using a variety of genetic and biochemical approaches.

You will test which maize ZIP1 proteins interact with maize ZOU, and you will study the expression and function of these interacting proteins. You will also be involved in characterizing the biochemical pathways acting downstream of ZOU and ZIP1 in both Arabidopsis and maize using genetic and biochemical tools. Finally, you will be involved in experiments designed to test whether that activity of ZOU/ZIP1 in maize can be used to manipulate commercially important endosperm traits in cereal crops.

Techniques utilisées/Methods:

Genetic analysis; Gene expression analysis (Q-PCR, in situ hybridization); Immunolocalization and histochemical analysis of developing seeds; basic molecular biology; light and confocal microscopy.

Références:

Yang S, Johnson N, Talideh E, Mitchell S, Jeffree C, Goodrich G and Ingram G (2008) Development 135:3501-3509.
Xing, Q, Creff, A., Waters, A., Tanaka, H., Goodrich, J. and Ingram, G. C. (2013) Development 140(4): 770-9.