



ABSTRACT

“Turning meiosis into mitosis and other games with meiosis”

Dr Raphaël Mercier

Génétique et Amélioration des Plantes

INRA – Centre de Versailles Grignon

FRANCE

Apomixis, or asexual clonal reproduction through seeds, is of immense interest due to its potential revolutionary application in agriculture. One key element of apomixis is apomeiosis, a deregulation of meiosis which results in a mitotic-like division. Meiosis halves the chromosome number because its two divisions follow a single round of DNA replication. This process involves two cell transitions, the prophase to meiosis I transition and the unique meiosis I to meiosis II transition. We show that *OSD1* and the A-type cyclin *CYCA1;2/TAM* play a major role in both transitions in *Arabidopsis*. A series of *osd* and *tam* mutants failed to enter meiosis II and thus produced diploid spores and functional diploid gametes. These diploid spores had a recombined genotype produced through the single meiosis I division. Combining *tam* and *osd1* mutations lead to a failure in the prophase to meiosis I transition during male meiosis and to the production of tetraploid spores and gametes. This suggests that TAM and OSD1 are involved in the control of both meiotic transitions.

In addition, by combining either the *osd* or the *tam* mutation with two others affecting key meiotic processes (*spo11-1* and *rec8*), we obtained plants producing diploid gametes through a mitotic-like division, that were genetically identical to their parents. The obtained plants, called *MiMe-1* and *MiMe-2* respectively, produce functional diploid gametes that are genetically identical to their mother. Creation of the *MiMe* genotypes and apomeiosis phenotype is an important step towards understanding and engineering apomixis.