ABSTRACT OF THE DOCTORAL THESIS

Androgenesis induction is an experimental procedure by which microspores are diverted from their original gametophytic pathway towards embryogenesis by applying specific stresses *in vitro*. It allows for the production of doubled haploid (DH) pure lines through anther culture or isolated microspore culture followed by chromosome doubling. DH technology is interesting for both basic research and plant breeding. In this Thesis, we studied microspore embryogenesis with two parallel approaches: (I) an applied study directed to the development of the first eggplant (*Solanum melongena*) highly embryogenic line and the improvement of the efficiency of eggplant microspore cultures; and (II) a fundamental research study focused on the relationship between microspore embryogenesis ability, intracellular Ca^{2+} levels and the dynamics of callose and cellulose deposition for cell wall formation in microspore-derived structures, using rapeseed (*Brassica napus*) as a model species.

As an applied research, we developed and evaluated an eggplant DH population from a commercial hybrid, and identified and characterized the first eggplant highly androgenic DH line (DH36), which may be used to facilitate the study of eggplant androgenesis and for both basic and applied research. In addition, we evaluated different factors involved in microspore embryogenesis induction efficiency in eggplant and optimized the regeneration protocol for DH production via microspore culture. Together, the applied research on eggplant microspore embryogenesis made in this Thesis resulted in the most efficient protocol existing to date for DH production in eggplant.

As a fundamental research, we studied the dynamics of Ca^{2+} during *in vivo* microsporogenesis and microgametogenesis, as well as during the first stages of *in vitro*-induced microspore embryogenesis, establishing a link between microspore embryogenesis and changes in Ca^{2+} levels and subcellular distribution. In addition, we studied the deposition of callose and cellulose during the first stages of microspore embryogenesis and demonstrated that the abnormally increased callose deposition and the inhibition of cellulose deposition observed in embryogenic microspores is most likely caused by a transient increase in the intracellular Ca^{2+} levels that occurs right after microspore induction. We also found that this particular dynamics of callose and cellulose deposition is related to microspore embryogenesis ability, and is essential for proper progression and success of microspore embryogenesis.

In summary, the research made in this Thesis helps to further understand the basis underlying microspore embryogenesis and cell totipotency, and to apply the powerful DH technology to an economically important crop such as eggplant.