The study on possible mechanisms involved in gametic embryogenesis of sugar beet (*Beta vulgaris* L.)

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For breeding of new sugar beet (*Beta vulgaris* L.) lines and improving the existing ones, the doubled haploid (DH) production is of critical importance. The traditionally achieved homozygosity requires the performance of time-consuming and labor-intensive back crosses. Owing to the induced process of chromosome doubling that takes place during the early stages of haploid embryo development, fertile double haploid plants can be easily regenerated within a short period of time. Of all the haploidization techniques tested so far for sugar beet gametic embryogenesis is the only possible method. Unfertilized ovules a few days before anthesis stage are required for viable gynogenetic embryo regeneration, which originates predominantly from the egg cell. The success of haploid induction depends on the induction method, developmental stage of ovules, pre-treatment or physical factors during tissue culture. However, the influence of genotype of the donor plant on the regeneration rate should be pronounced, so the detection of genotypes with a high gynogenic response is important.

Despite a considerable advance in doubled haploid production, currently little is known about the molecular mechanisms during the induction of embryogenic pathway in particular sugar beet genotypes. From a developmental point of view, the gynogenesis is a rewarding system for understanding the process of embryo formation from single, haploid egg cell. The identification of genes that might serve as stage-specific markers of ovules embryogenesis would help in further understanding of the above mentioned process. Any progress revealing molecular determinants in gynogenesis can lead to improvements in the use of haploids and further doubled haploids during genetic studies and breeding programs. In relation to morphogenetic potential, the presence and changes in plant cell wall composition have been previously described. Especially pectins and arabinogalactan proteins (AGPs) are the major cell wall components implicated to the development and differentiation of plant cells and tissues. The above mentioned compounds are widely distributed throughout the plant kingdom and occur either in intercellular species, plasma membranes and certain cytoplasmic vesicles.

Therefore, the preliminary characterization of gametic embryogenesis at the cytological and molecular level among selected sugar beet genotypes will be discussed. A biochemical, immunocytological and molecular approaches were employed to locate and analyze the biological role of endogenic arabinogalactan proteins and to identify differences in genes expression during the regeneration of sugar beet unpollinated ovules by differential display technique. A comparison of selected breeding lines with two embryogenic potential abilities: high and low was performed. The results will broaden the knowledge about the basic events taking place during the regeneration of unpollinated ovules and will help to improve the efficiency of the above mentioned process.