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FLAX CELL TISSUE CULTURES AS PLATFORM FOR BIOACTIVE COMPOUNDS PRODUCTION

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Flax is one of the oldest crop being widely grown for its oil, fiber content and food nutrients such as high quality omega-3 fatty acids (α-linolenic acid), proteins, lignin and phenolic acids (lignans). Besides industrial and nutritional importance, flaxseeds exhibit numerous pharmacological activities due to the presence of biologically active components (lignans) that show antioxidant, cytotoxic, antifungal, antiviral and phytoestrogenic properties. Furthermore, numerous studies have demonstrated the role of these compounds in reducing the risk of certain types of cancers especially the breast, colon and prostate cancers. Therefore, due to the growing need of these medically and nutritionally important metabolites, it is crucial to find sustainable and eco-friendly alternative system for their production on large scale. *In vitro* plant cell cultures represents a promising source for rapid and enhanced production of desired plant metabolites. Indeed, the production of these metabolites can be enhanced by the use of specific elicitors that in small quantities promote the biosynthesis of secondary metabolites.

Flax comprises over 180 species taxonomically divided into 2 clades. The species belonging to the first clade are characterized by the accumulation of podophyllotoxin type lignans, which show cytotoxic activity and are successfully used as anticancer compounds. The species belonging to the second clade accumulate the justicidin B and secoisolaricilresinol (SECO) as major lignans, which show an anti-inflammatory, anti-viral and cytotoxic activity.

The aim of this research project was to exploit different flax species for improving lignans production *in vitro* cell cultures. To this purpose, we analyzed the total phenol content, the antioxidant capacity and the metabolite profile of the cell extracts in order to identify flax species that produce the highest level of metabolites. We have also evaluated the effect of the elicitor methyl-jasmonate on metabolites production, and we are now planning to apply a metabolic engineering approach to improve the flax bioactive compound production.