7.30 – Flax tissue cultures as biofactory for lignan production

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Background

Lignans are the main secondary metabolites synthetized by *Linum* species as plant defense compounds. The demand for these metabolites has increased in recent years thanks to their bioactivities (from antioxidant to anticancer) for application in pharmaceutical and nutraceutical industries [1]. *Linum* species (more than 200) are specialized in the production of specific class of **lignans**: **aryltetralin-type** (**ATLs**), **arylnaphtalene-type** (**ANLs**) and **dibenzylbutyrolactone-type** (**DBBLs**). In this work were developed:

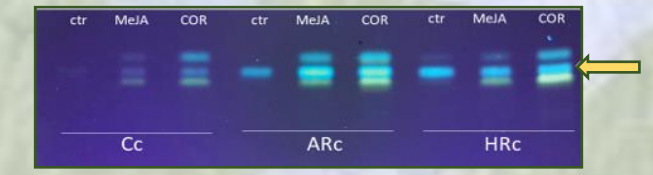
1. tissue cultures from different flax species for the production of ATLs and ANLs lignans
2. elicitation strategies to enhance lignans production: 100µM MeJA (methyljasmonate), 10µM COR (coronatine)
3. citolocalization of justicidin B
4. small-scale bioreactor for scale-up production

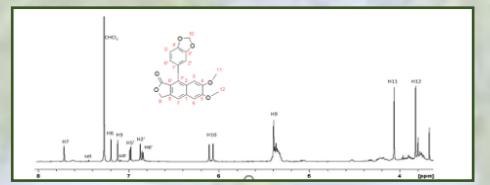
Results

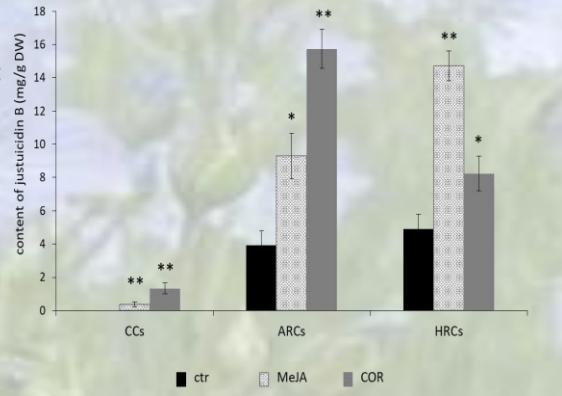
a) ANLs lignans

justicidin B production from ***Linum austriacum*** cultures: cell (CC), adventitious roots (ARC) and hairyroots (HRC). Treatments**: ctr, 100µM MeJA, 10µM COR**

Isolation and **identification** of justicidin B by TLC and NMR

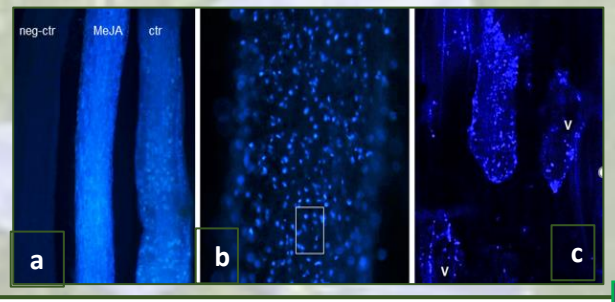






Justicidin B **localization** in ARC:

a) Autofluorescence of justidicin B
b) Picture Enlargement
c) Spots located in cell peryphery, likely in cytoplasm

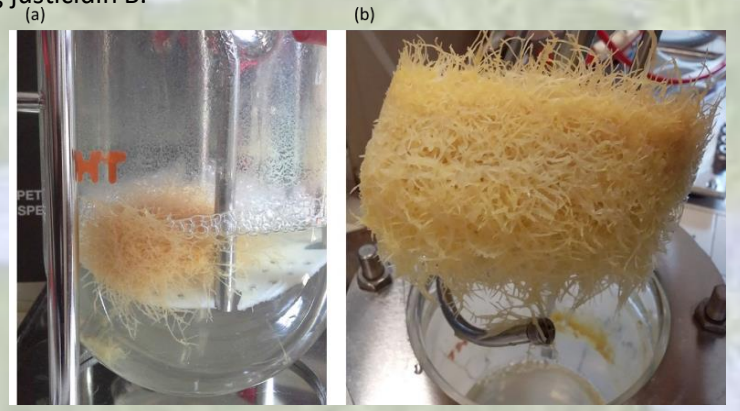


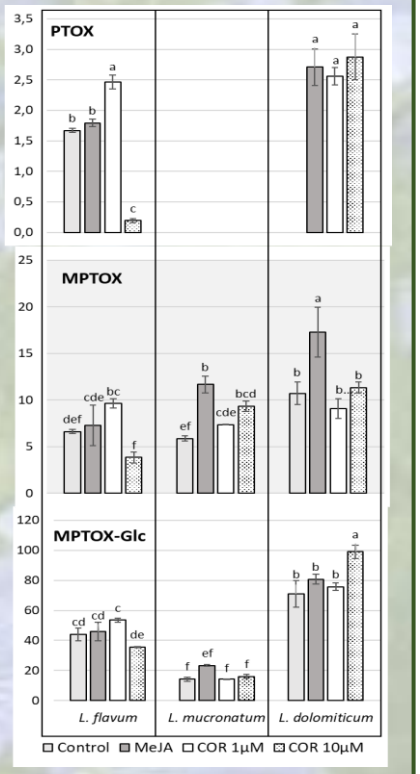
b) ATLs lignans

Production of the 3 main ATLs lignans podophyllotoxin **(PTOX)**, 6-methoxypodophyllotoxin (**MPTOX**) and 6-methoxypodophyllotoxin -7-O-β-glucoside (**MPTOX-Glc**) by elicited or not ARC from ***L. flavum***, ***L. mucronatum***, ***L. dolomiticum***.

Bioreactor:

Set-up of a Pilot bioreactor of ARC from *L. austriacum* for a scale-up of Justicidin B production. Biomass obtained after three Weeks of growth. Start: 5gr, end; 48gr (FW) with total production of 35mg justicidin B.





MATERIALS AND METHODS

See references [2] and [3]

REFERENCES

[1] De Silva et al., *Pharmaceuticals*, 2019;
[2] Mascheretti et al., *Int. J. Mol. Sci*. 2021; 22(5), 2507;
[3] Alfieri et al., *Molecules* 2022; 27(9), 2732

Conclusions

1. The production of lignans was different in different tissue cultures being **ARC** and **HRC** more productive.
2. **Elicitor treatments** triggered different effects depending on the species analyzed
3. Cellular **localization** of justicidin B in *L. austriacum* ARC is reported for the first time
4. Succesful set-up of a small scale **bioreactor** to grow ARC and HRC for secondary metabolites production.

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