POSTER PRESENTATION



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In search for the role of thermospermine synthase gene in poplar vascular development

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Background

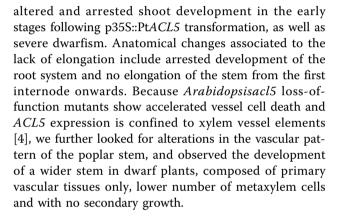
Plant polyamines are preferentially detected in actively growing tissues and have been implicated in growth and developmental processes such as embryogenesis, floral developmental, fruit ripening, senescence and stress responses [1]. Recently it has been established a link between polyamines and vascular development as it was found that, in *Arabidopsis*, the loss-of-function mutants of *ACAULIS5* (*ACL5*) gene, encoding thermospermine synthase, exhibit a severe dwarf phenotype, suggesting that thermospermine acts as a regulator of stem elongation [2,3]. However, in trees, no studies have yet been reported. Due to the relevance of vascular development in wood formation we are investigating the role of thermospermine in vascular tissues of poplar.

Materials and methods

A search for *ACL5*-like sequences in *Populus trichocarpa* genome allowed us to identify three putative *ACL5* orthologous genes. Based on the degree of sequence similarity, we have selected one of them, *PtACL5*, to generate transgenic plants bearing the constructs for overexpression and silencing of this gene in poplar.

Results

High expression levels of *PtACL5* in overexpression transgenic lines have been found to be correlated to higher thermospermine content in leaves and young stems, but not to a higher level of other polyamines, suggesting that *PtACL5* encodes a thermospermine synthase in poplar, and it is most probably an ortholog of *ACL5* in poplar. Interestingly, these plants display



Conclusions

Overall, our results suggest that thermospermine has a regulatory role in xylem differentiation/maturation in poplar. Although a feedback control of thermospermine synthesis seems to be present in *Arabidopsis*, in our transgenic poplar the high levels resulting from overexpression of thermospermine synthase gene seem to overcome any turn-over that might be occurring of the excess thermospermine being produced. Currently we are pursuing the spatial localization of the *ACL5* transcript in poplar plants through *in situ* hybridization, and by taking advantage of the generated transgenic lines we hope to understand the role of thermospermine in the vascular tissues formation in this woody species.

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References

- Kumar A, Taylor M, Altabella T, Tiburcio AF: Recent advances in polyamine research. Trends Plant Sci 1997, 2:124-130.
- Hanzawa Y, Takahashi T, Michael AJ, Burtin D, Long D, Pineiro M, Coupland G, Komeda Y: ACAULIS5, an Arabidopsis gene required for stem elongation, encodes a spermine synthase. The EMBO J 2000, 19:4248-4256.
- Knott JM, Römer P, Sumper M: Putative spermine synthases from Thalassiosira pseudonana and Arabidopsis thaliana synthesize thermospermine rather than spermine. FEBS Lett 2007, 581(16):3081-3086.
- Muñiz L, Minguet EG, Singh SK, Pesquet E, Vera-Sirera F, Moreau-Courtois CL, Carbonell J, Blázquez MA, Tuominen H: ACAULIS5 controls Arabidopsis xylem specification through the prevention of premature cell death. Development 135:2573-2582.

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