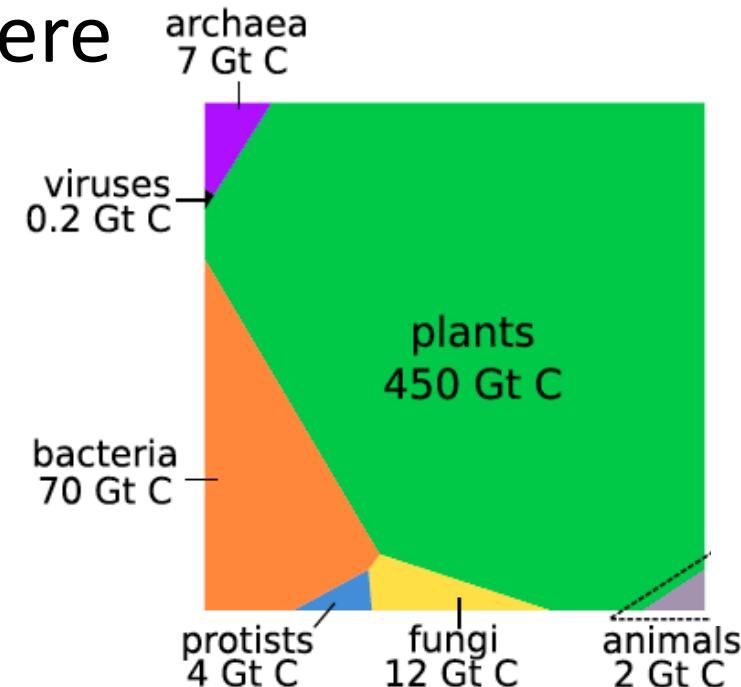
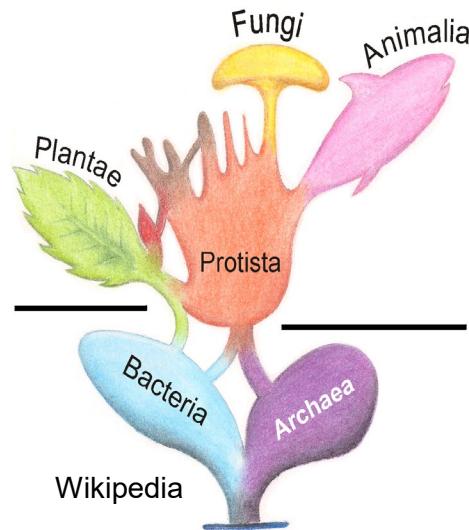


Engineering of forest feedstocks for future bioeconomy

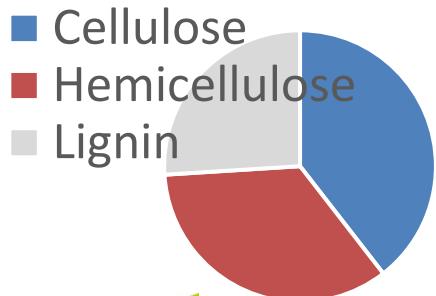
Ewa Mellerowicz,
SLU, Dept. of Forest Genetics and Plant
Physiology,
Feedstock Platform

Plant biomass is the most important carbon store in the biosphere

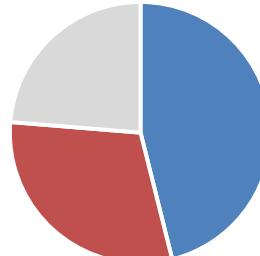


Bar-On (2018) PNAS 115: 6506-11

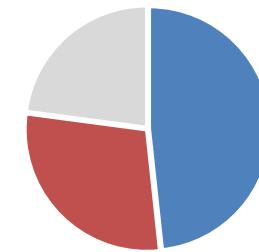
Woody biomass



Herbaceous and agricultural biomass

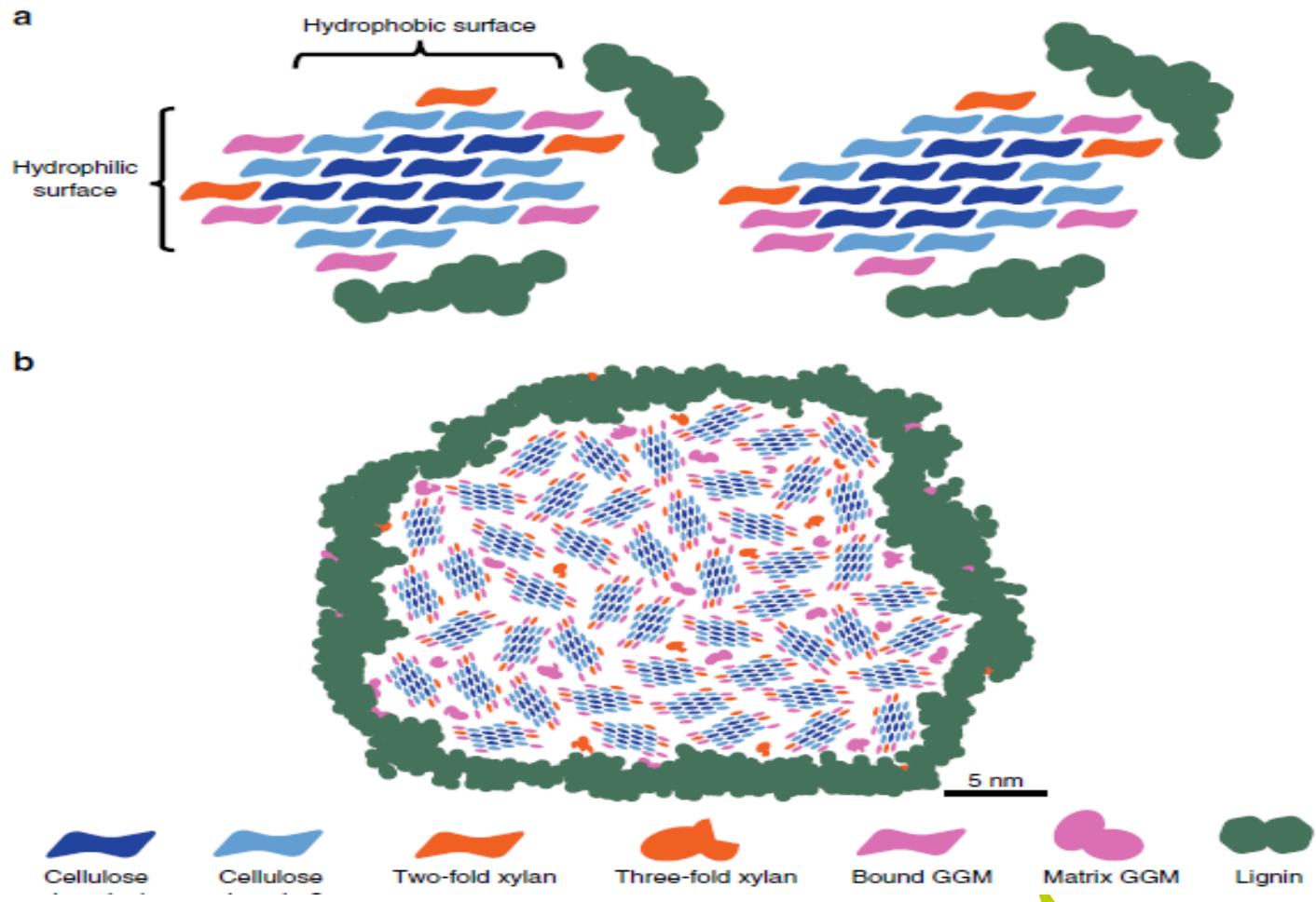


Residues (shels, husks, pits..)



Vasiliev et al, 2012, Fuel

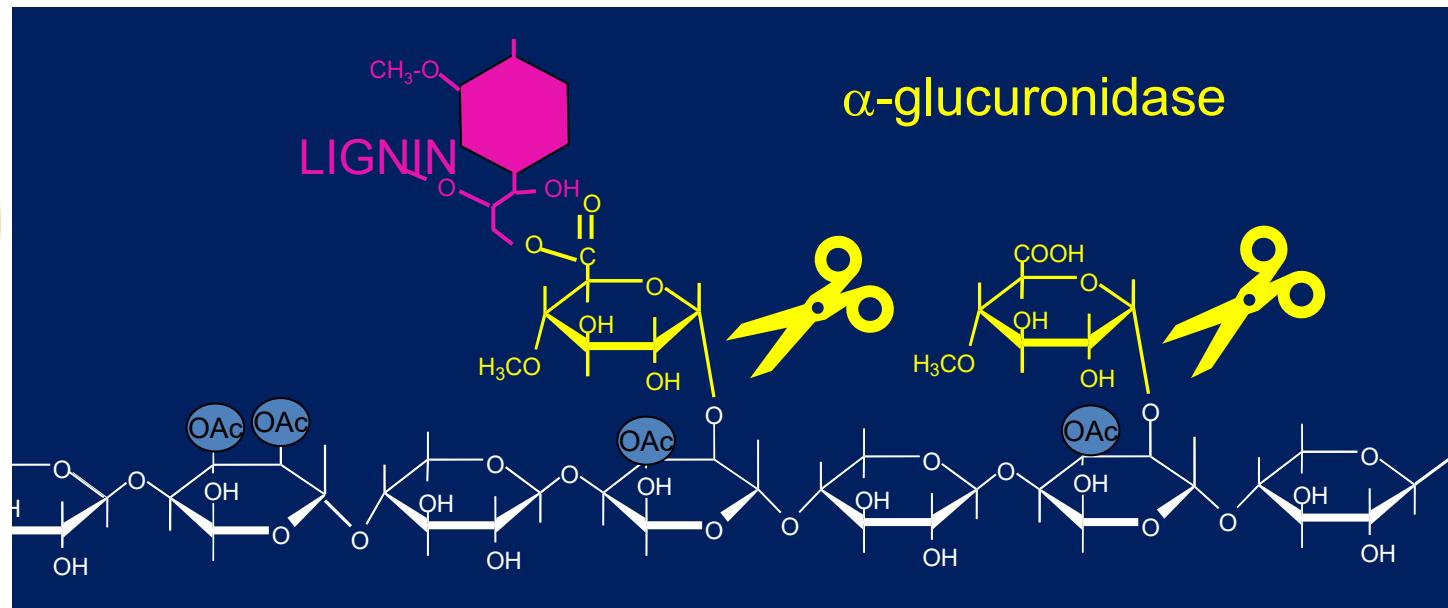
Understanding cell wall architecture



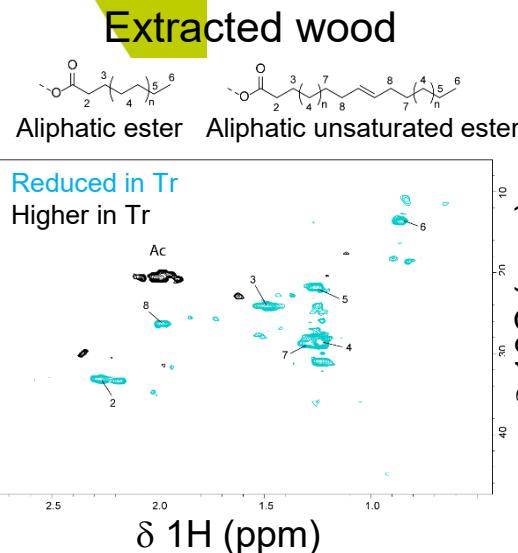
Terrett et al, *Nature Comm* (2019) 10:4978

In muro xylan modification using fungal enzymes

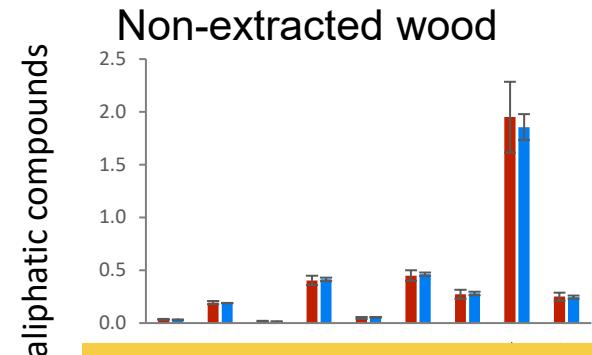
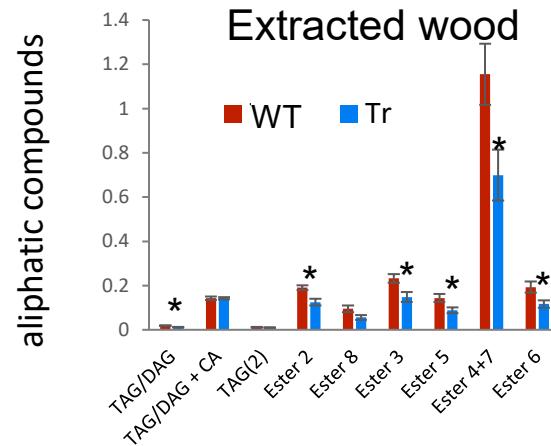
Marta Derba-Maceluch



Lipidic substances in wood cell walls are reduced in lines expressing α -glucuronidase



Wood 2D-NMR

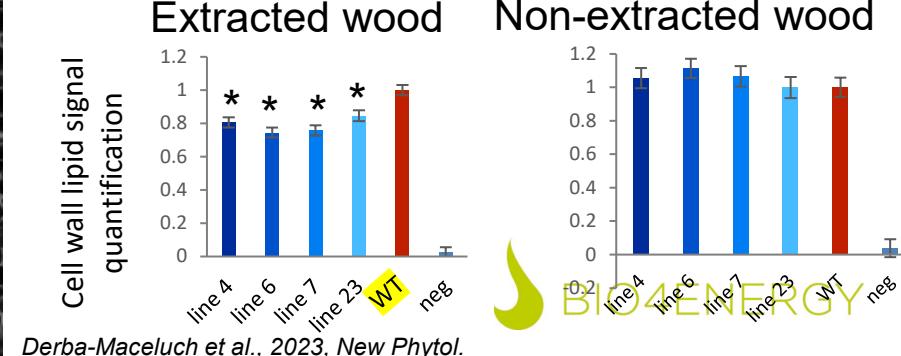
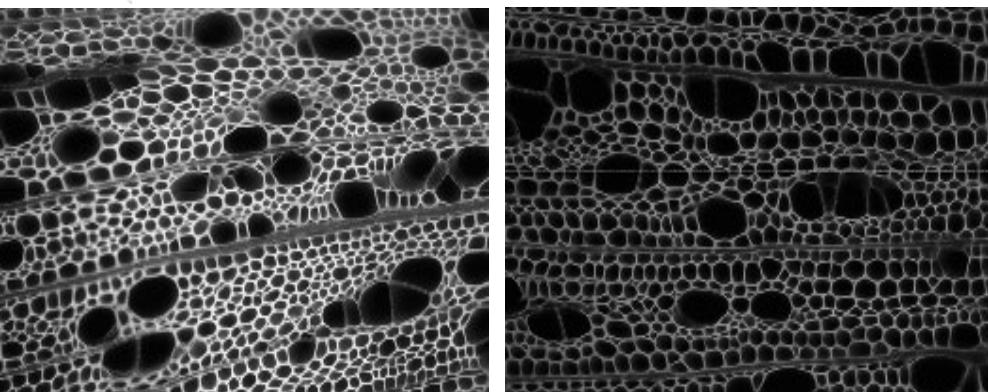


- Aspen wood contains suberin-like lipids attached to cell walls
- Xylan GlcA fastens these lipids to cell walls

Wood Fluor Yellow staining

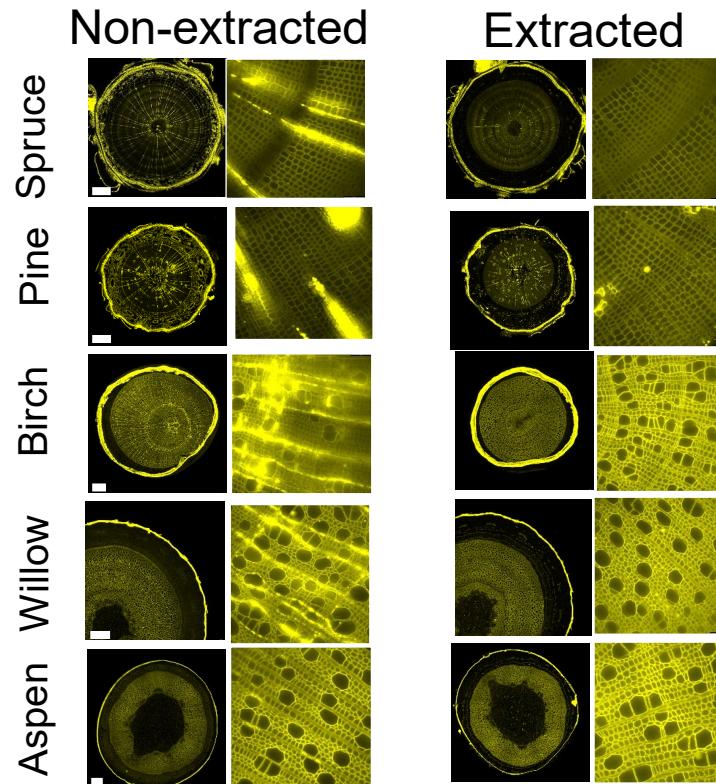
WT

Tr



Do other species contain wall-attached lipidic substances in their wood cell walls?

Fluorol Yellow staining



Derba-Maceluch et al., 2023, *New Phytol.*

- Suberin-like lipids- an overlooked wood cell wall component
- Xylan GlcA fastens these lipids to cell walls – must be involved in a covalent linkage between these lipids and lignin.



Understanding recalcitrance of woody biomass



Leif J. Jönsson



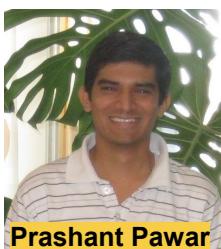
Madhavi Latha Gandla



Björn Alriksson



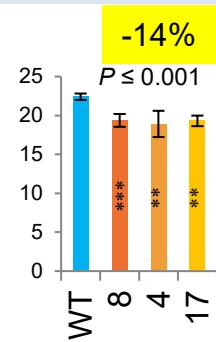
Reduction of xylan acetylation by AnAXE1



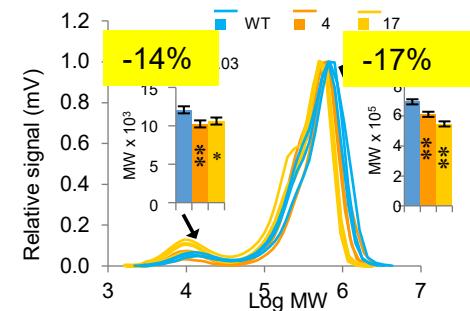
Good growth



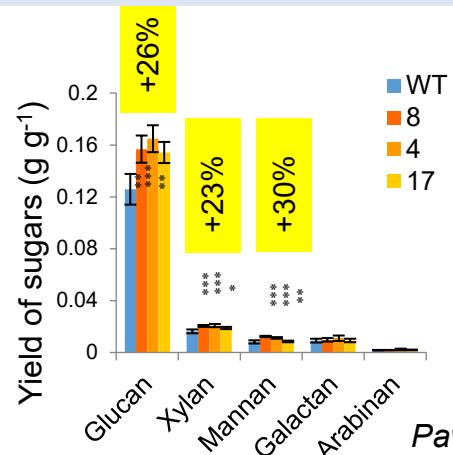
Reduced
acetyl
content



Decreased xylan
molecular weight



Improved saccharification
without pretreatment



Xylan deacetylation
improves saccharification



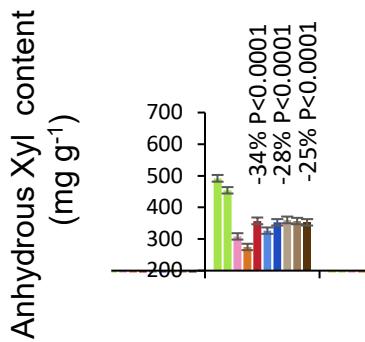
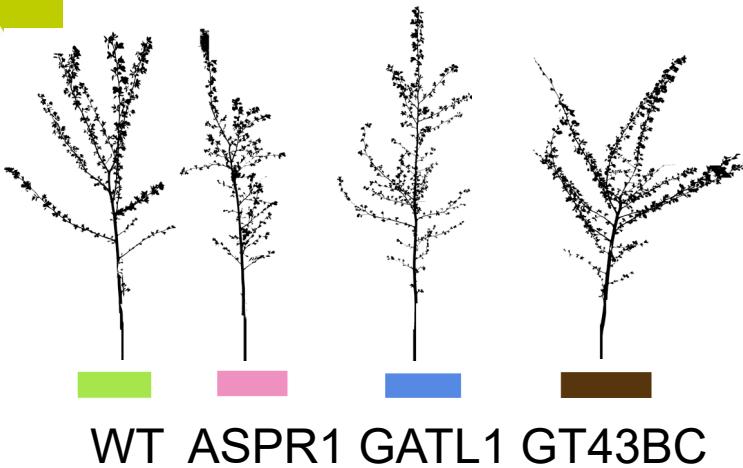
UPSC



Pramod Sivan



Evgeniy Donev



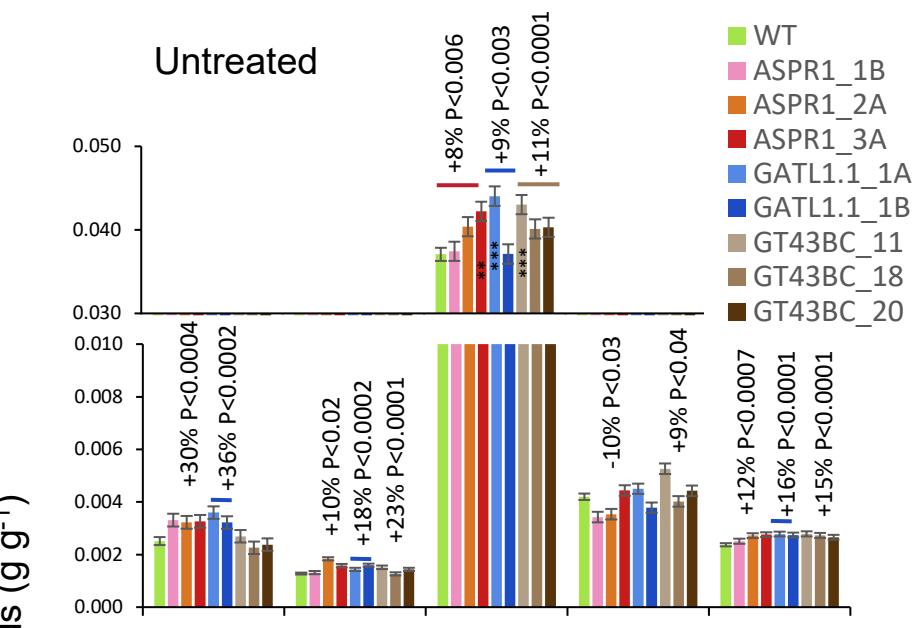
Marta Derba-Maceluch



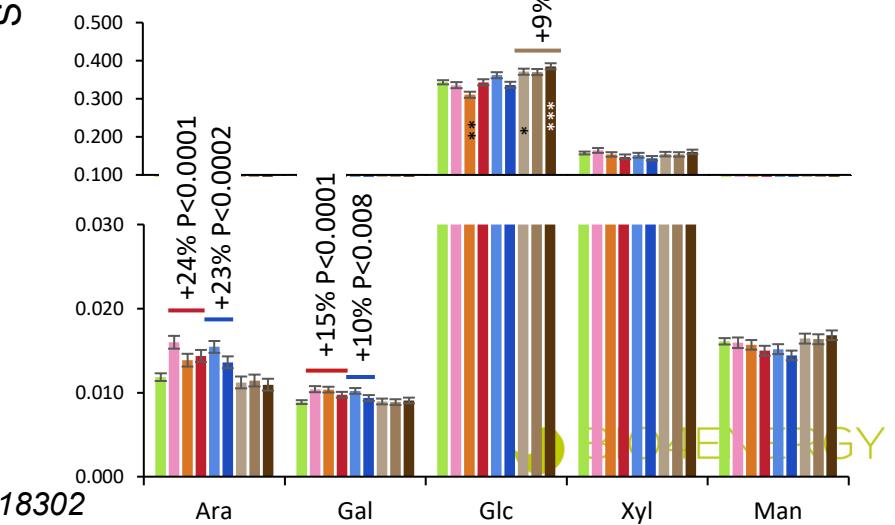
Derba Maceluch et al., 2023, *Front. Plant Sci.* 14:1218302

Xylan-modified lines in the field?

Untreated



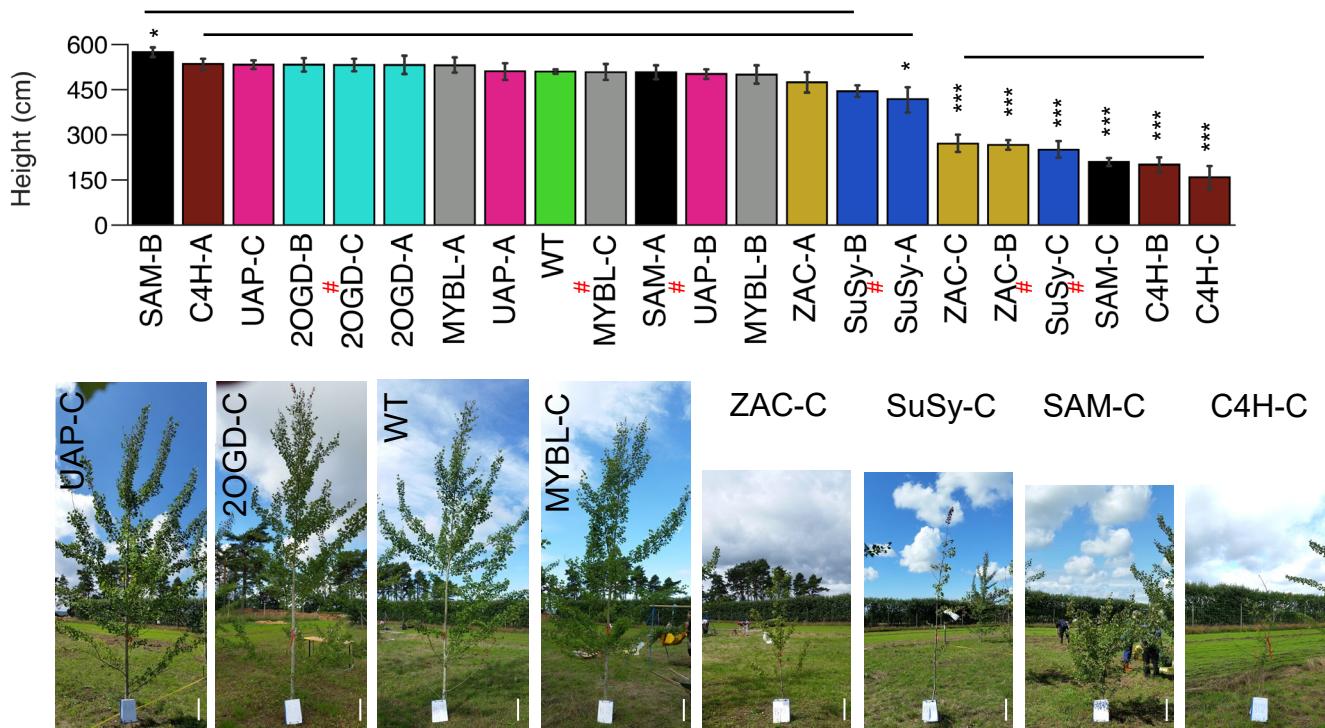
Pretreated



BIO ENERGY



Unknown function genes tested in the field?

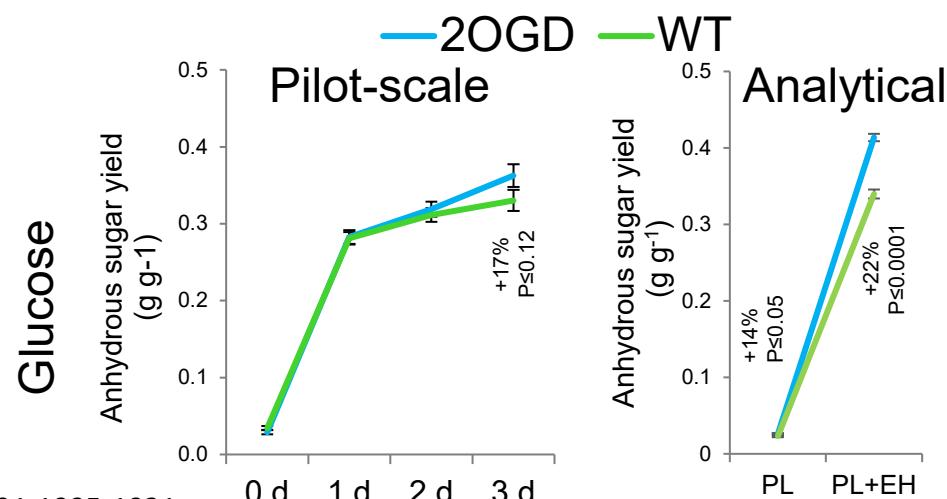


Evgeniy Donev

Marta Derba-Maceluch



Donev et al., 2023. Plant Biotechnol J. 21:1005-1021



Concluding remarks

1. Transgenic trees provide great tool to study:
 1. Cell wall architecture
 2. Determinants of recalcitrance
2. Field testing of transgenic trees
 1. Is essential for evaluation of transgenic effects
 2. Can lead to unexpected outcomes

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Collaborators

Amiens: Laurent Gutierrez

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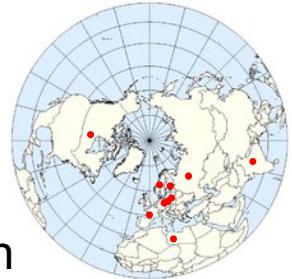
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Marta Derba-Maceluch



Pramod Sivan



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