

Leveraging the Power of Ligninolytic Enzymes to Valorize Lignin to Polyvinyl Phenol

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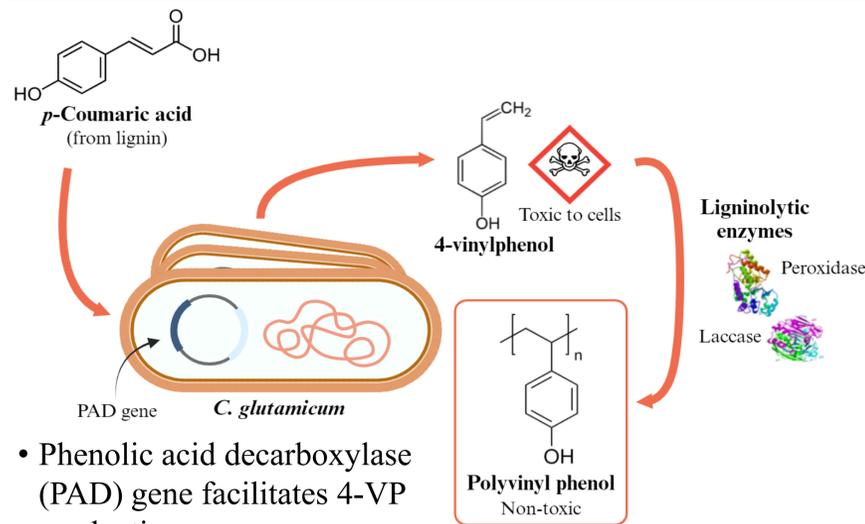


Lignin as aromatic feedstock

- Lignin is a renewable, carbon-rich resource from plants
 - Abundant in aromatic constituents, namely phenolic acids
- Complex heteropolymer requiring pretreatment
 - Products like *p*-coumaric acid can be converted into value-added chemicals

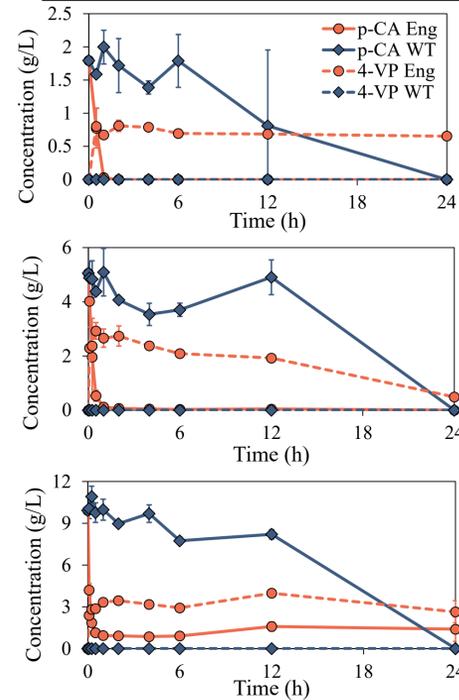


Plan for valorization of *p*-coumaric acid from lignin to polyvinyl phenol



- Phenolic acid decarboxylase (PAD) gene facilitates 4-VP production
- phdA* deletion prevents assimilation of *p*-CA

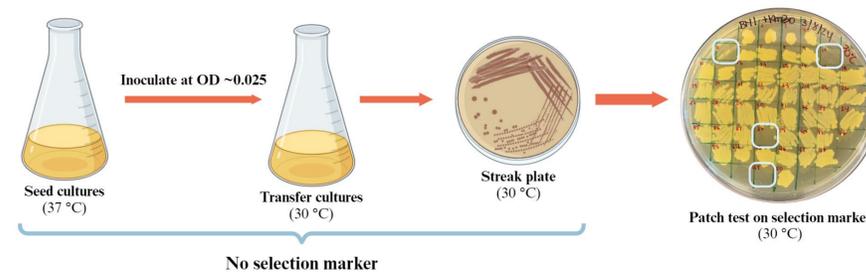
Conversion of *p*-coumaric acid to 4-vinylphenol



- Engineered (Eng) strain achieves ~30-40% yield of 4-vinylphenol
- Wild-type (WT) strain unable to produce 4-vinylphenol

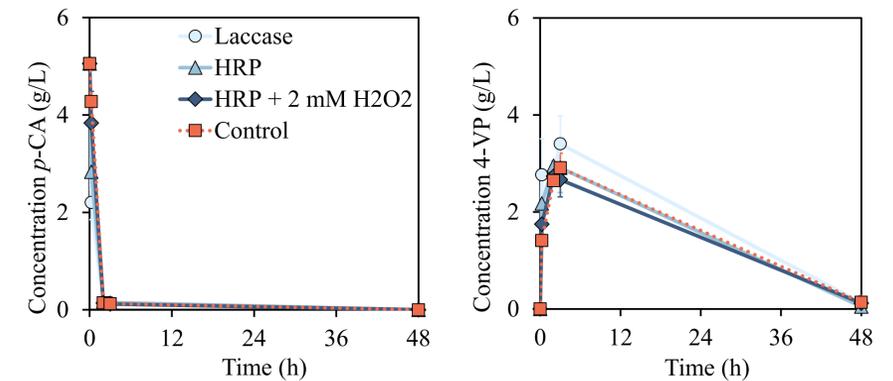
Initial <i>p</i> -CA conc.	Final 4-VP yield
2 g/L	36.5%
5 g/L	9.7%
10 g/L	30.9%

Plasmid curing of *C. glutamicum* for future work in ¹³C pathway analysis

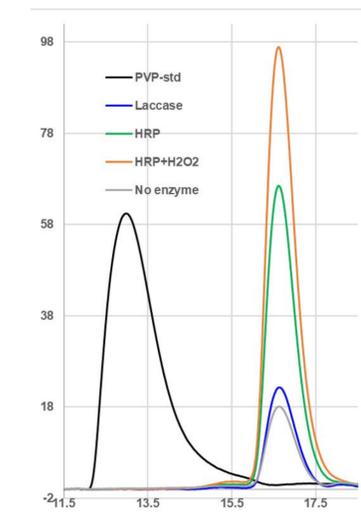


- Cells subject to thermal stresses had ability to be cured
- Overall 8% fidelity (4/50 colonies cured)
- Future work in ¹³C pathway analysis to determine carbon utilization within the cell

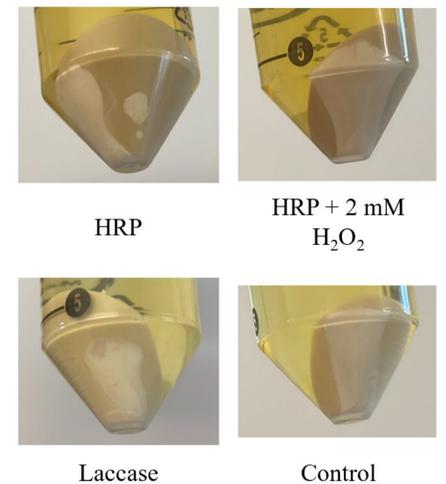
In situ polymerization of 4-vinylphenol using ligninolytic enzymes



4-vinylphenol completely depleted by 48 hours



Cell & polymer pellet, 48 h



- PVP not detected in test samples (MW <500)
- Natural laccase in *C. glutamicum* may react with 4-VP

Acknowledgements



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