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Conversion of lignin model compounds by *Pseudomonas putida* KT2440 and isolates from compost

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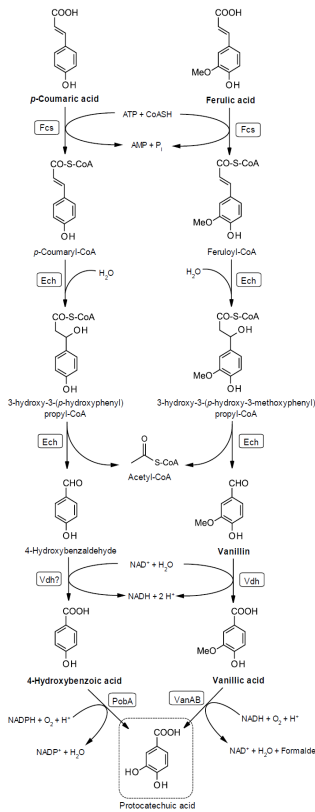
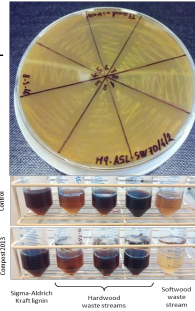
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Overview

Lignin is a heterogeneous alkyl-aromatic polymer found in the plant cell wall, which is under-utilized in the bio refining industry. The monomeric constituents of lignin are potential raw materials for further upgrading by chemical or biological means. In this present study we have isolated five bacterial strains from mature vegetal compost, selected on a lignin-rich media. There was a clear dominance of *Pseudomonas* sp. among the identified organisms. Further characterization was carried out on *P. putida* KT2440 with six selected lignin model compounds. The conversion and consumption of these model compounds through the β -ketoacid pathway was observed and the flux through the pathway was calculated.



Isolated and selected on lignin-rich media



Isolates identified by 16S rDNA sequence Species with highest score in BLAST

A-*Klebsiella variicola* At-22

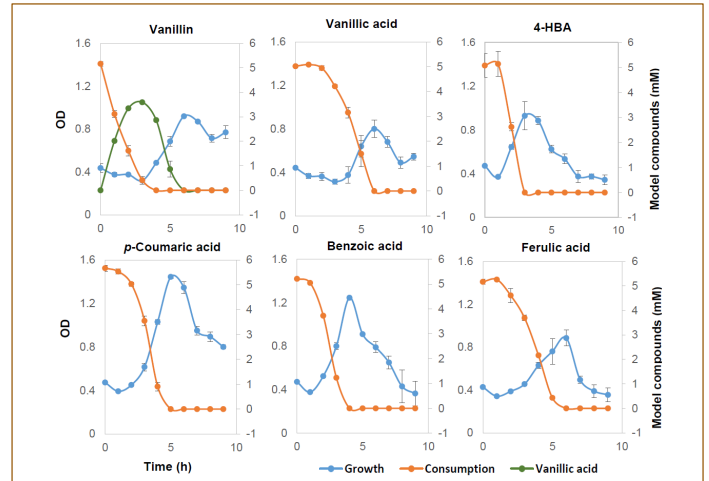
B-*Pseudomonas putida* KT2440

C-*Pseudomonas putida* KT2440

D-*Pseudomonas plecoglossicida* NBRC 103162

Sigma-*Pseudomonas chengduensis* MBR

Main upper degradation pathways of ferulic, p-coumaric and benzoic acids in *Pseudomonas putida* KT2440.
Phenylmethyl ether linkage is present in the compounds of the coniferyl branch, which is a unique linkage of lignin structure, and thus it is a critical factor determining the catabolism rate of these compounds.

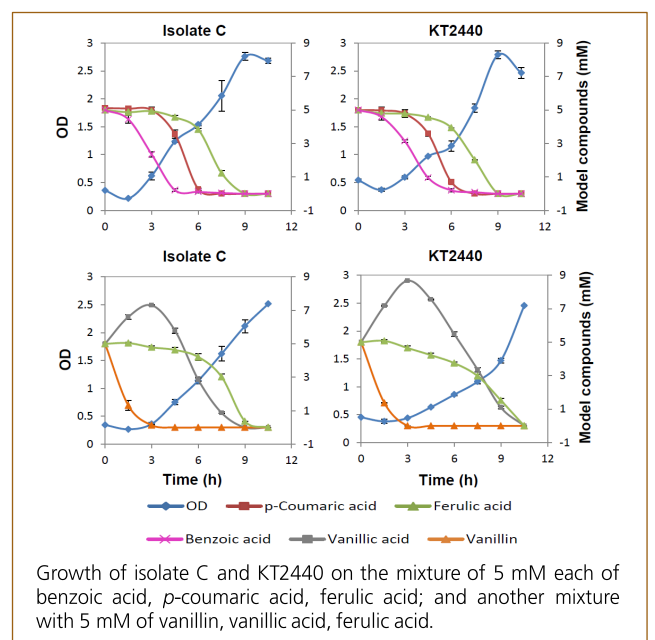
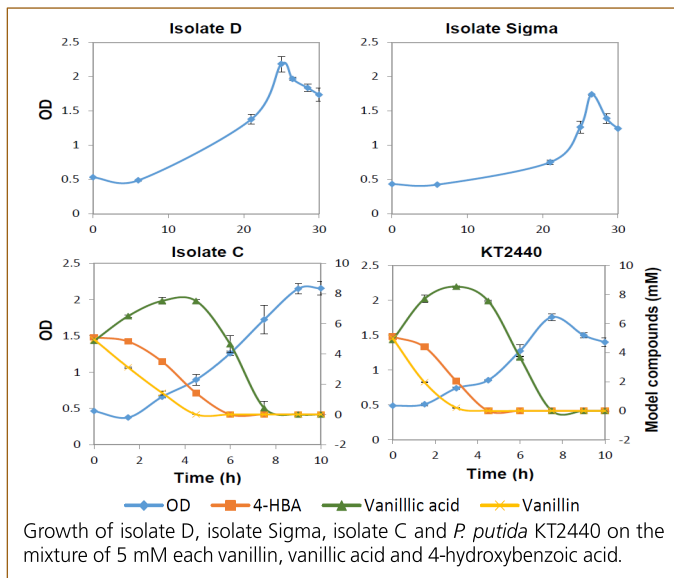


Growth of *P. putida* KT2440 on six selected lignin model compounds as the only carbon source in M9 media. There was no direct growth of *P. putida* KT2440 on vanillin; instead vanillin was rapidly converted into vanillic acid at the rate of 5.47 mmol ($g_{CDW} h$)⁻¹ and the accumulated vanillic acid was subsequently taken up.

Specific growth rates and uptake rates of model compounds by *P. putida* KT2440

Compounds	Specific growth rate (h ⁻¹)	Uptake rates [mmol ($g_{CDW} h$) ⁻¹]
Vanillin	-	5.47 ± 0.17
Vanillic acid	0.2 ± 0.06	3.08 ± 0.16
Benzoic acid	0.265 ± 0.005	3.28 ± 0.03
p-Coumaric acid	0.285 ± 0.005	3.24 ± 0.02
4-HBA	0.325 ± 0.025	3.85 ± 0.52
Ferulic acid	0.17 ± 0.2	3.05 ± 0.22

The specific growth rates and uptake rates of benzoic acid, p-coumaric acid and 4-hydroxybenzoic acid were considerably higher than those of ferulic acid and vanillic acid.



Growth of isolate C and KT2440 on the mixture of 5 mM each of benzoic acid, p-coumaric acid, ferulic acid; and another mixture with 5 mM of vanillin, vanillic acid, ferulic acid.

Acknowledgements

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