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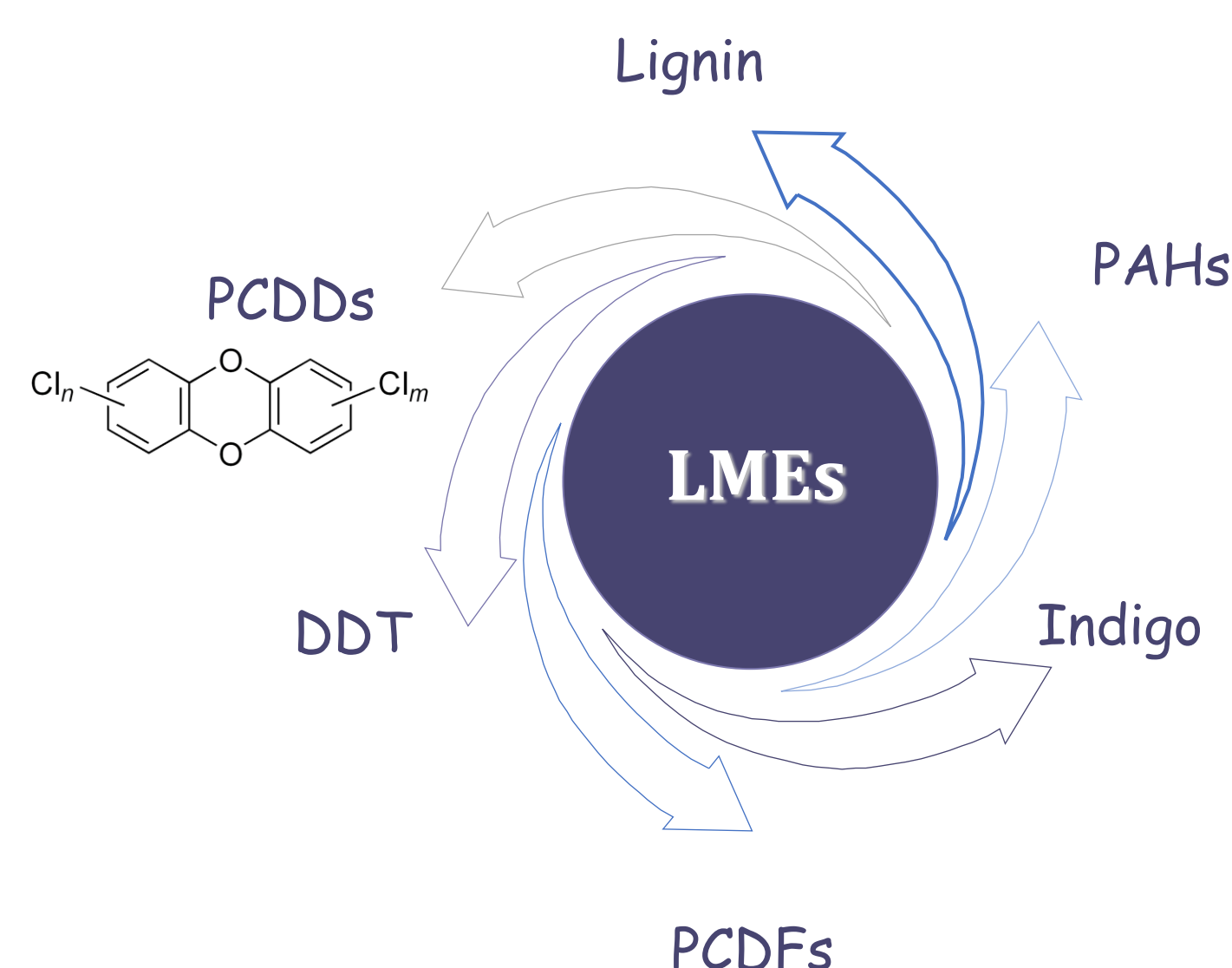
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† In memoriam

Introduction

Basidiomycete white rot fungi are known to produce lignin modifying enzymes LMEs (such as lignin peroxidase, manganese peroxidase, versatile peroxidase and laccase



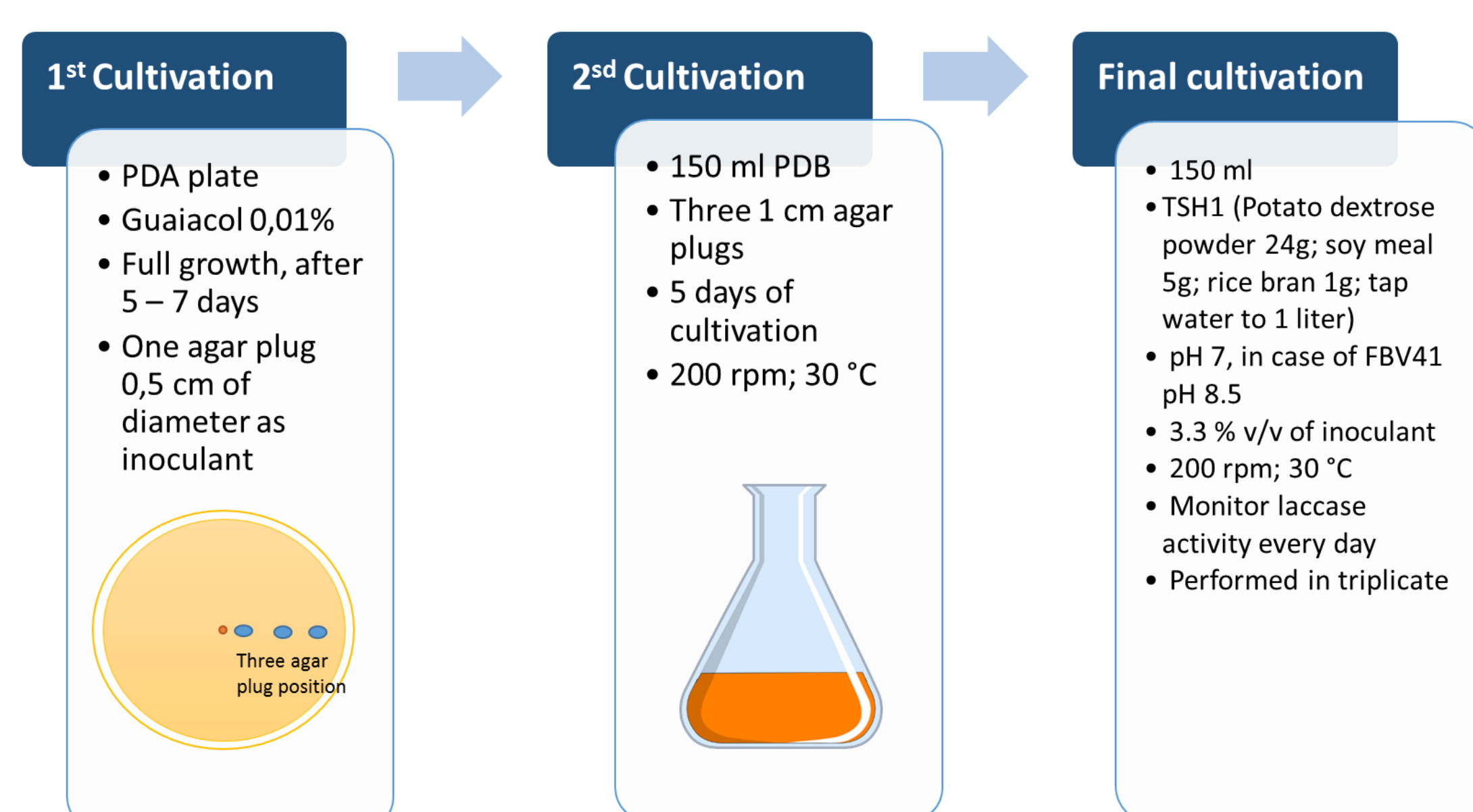
- By means of their lack of substrate specificity, which is needed for the variable polymer lignin, they can oxidize a variety of aromatic compounds.
- We aim to test their capacity of 2,3,7,8-TCDD as a measure of their strength to remove recalcitrant xenobiotics

Material and methods

In this study, we report on the degradative capacity of halogenated xenobiotics, such as 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) and halogenated pesticides, by fungal strains that were isolated from natural forests in Vietnam.

3 step cultivation for the preparation of high laccase crude extracellular enzymes

Proxy for LME's: laccase activities were monitored with ABTS as a substrate.



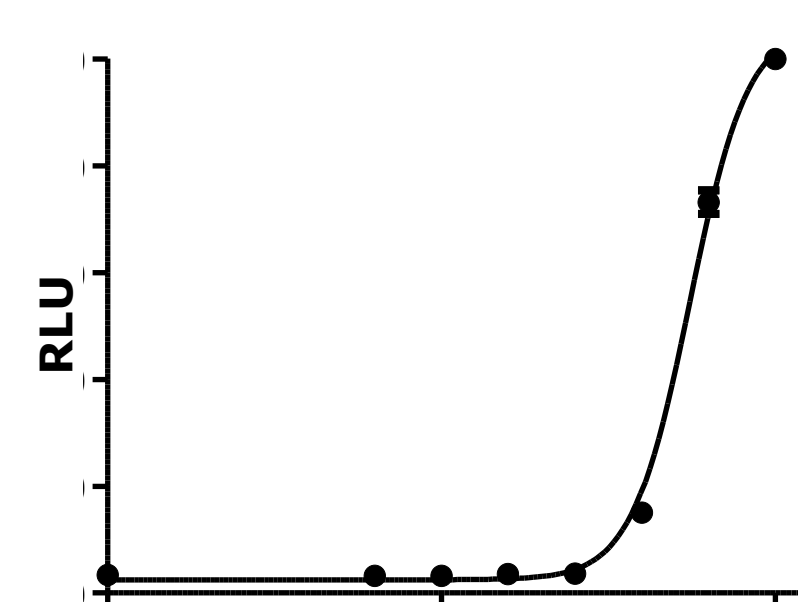
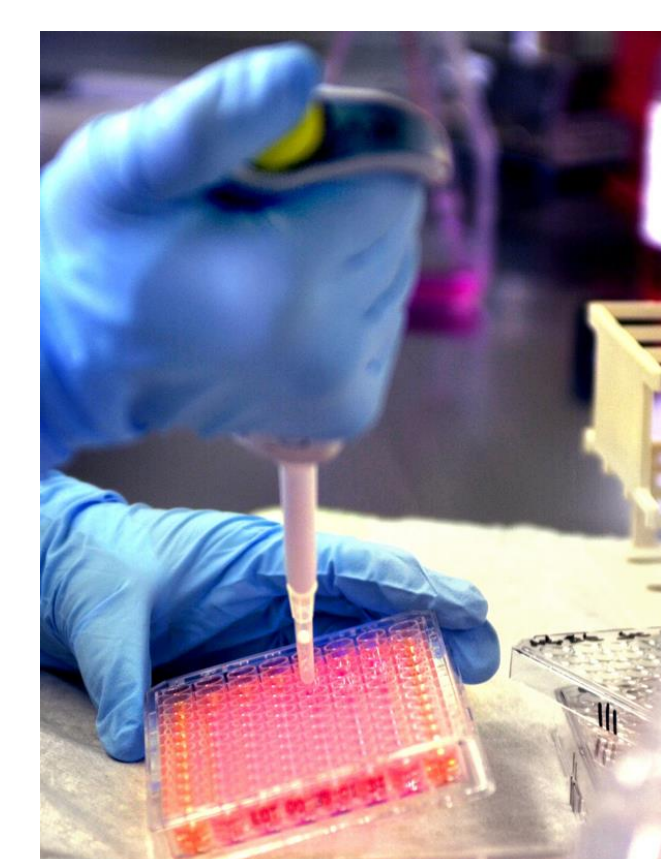
TCDD degradation in liquid condition using crude extracellular enzyme

- 0.22 µm filter)
- [2,3,7,8-TCDD]=0.5 pg/µl
- 2 ml
- 30°C/37°C

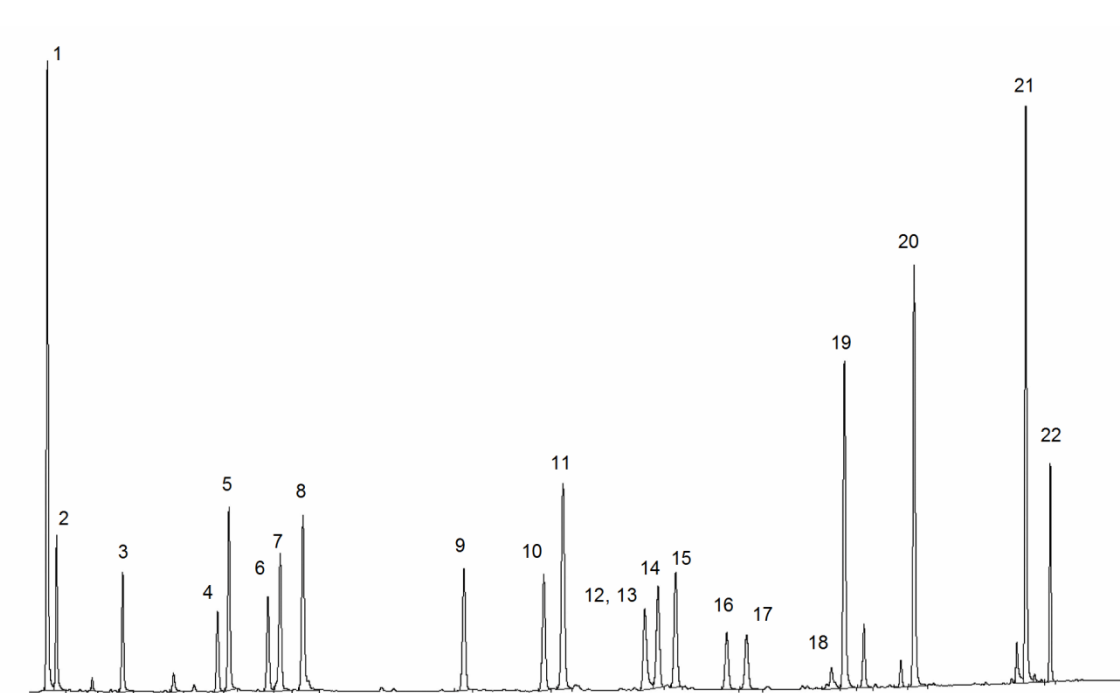
Solid-state fermentation

- 10 g LUFA 6S, 3 g of ground straw, 20 ml water (autoclaved)
- 0.5 pg /mg TCDD or pesticides mix
- 30°C
- 1 agar plug as fungal inoculant

2,3,7,8 -TCDD:DR-CALUX®

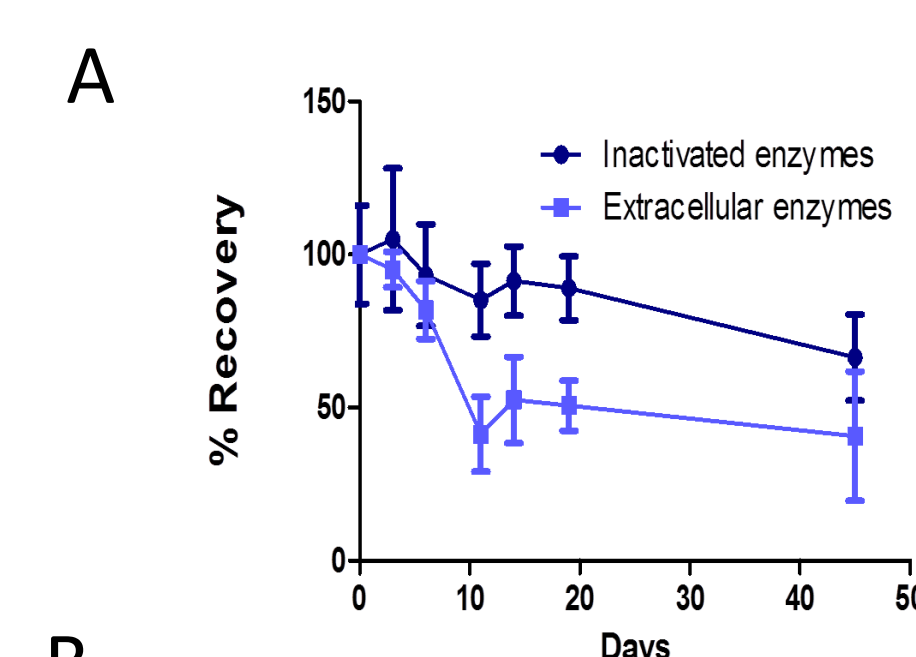
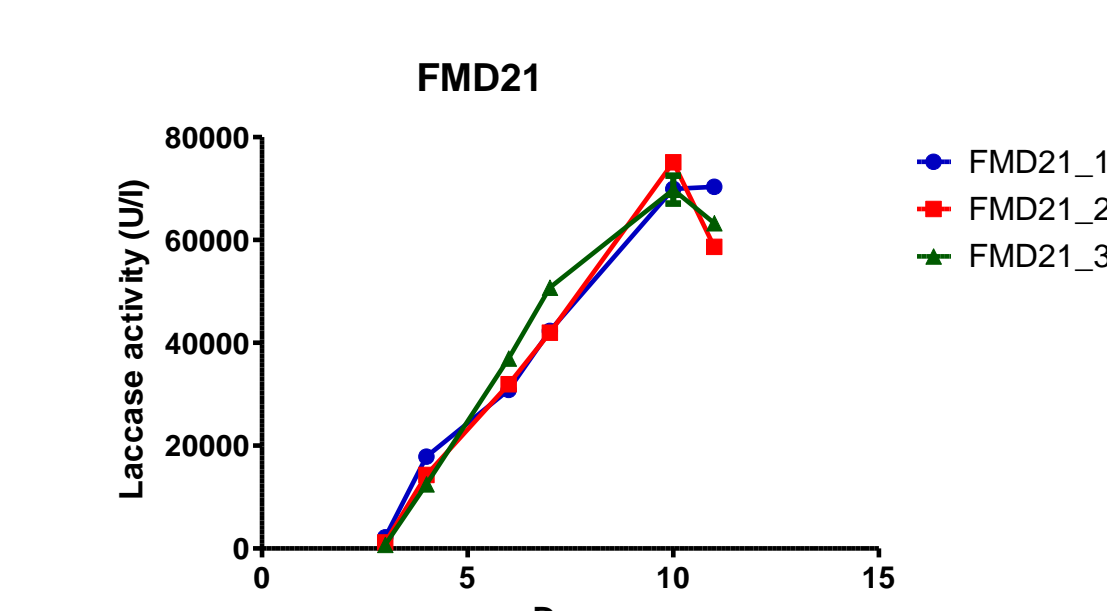
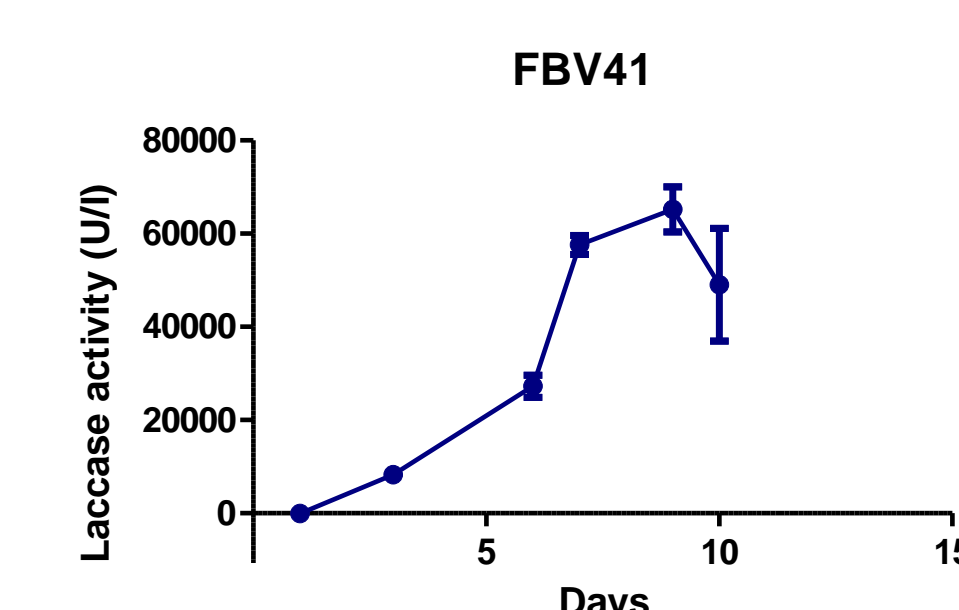
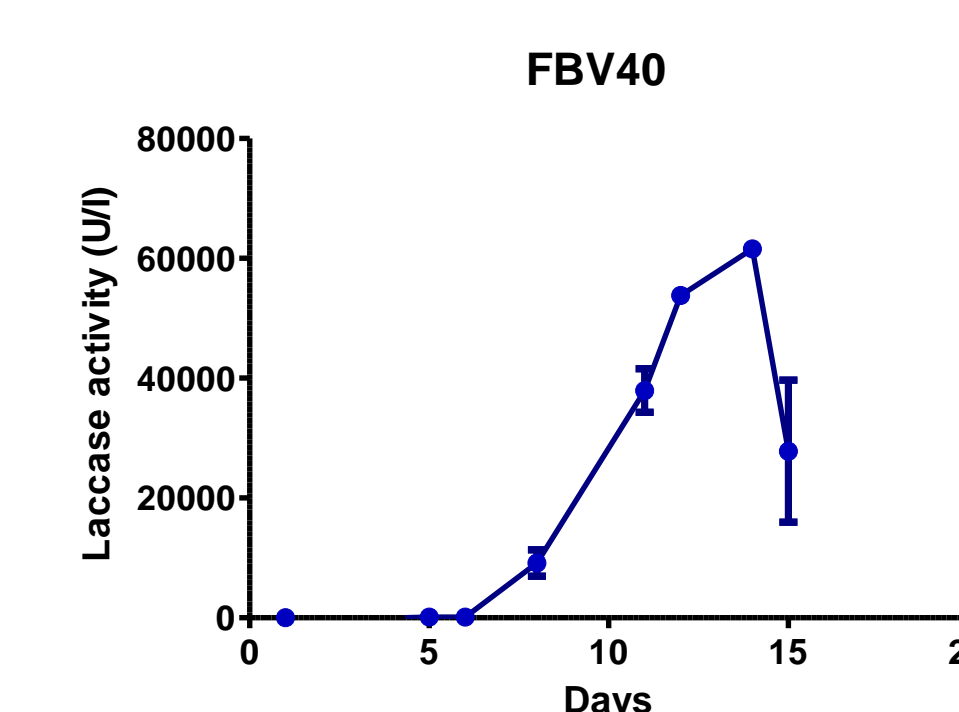


Pesticides: GC-ECD

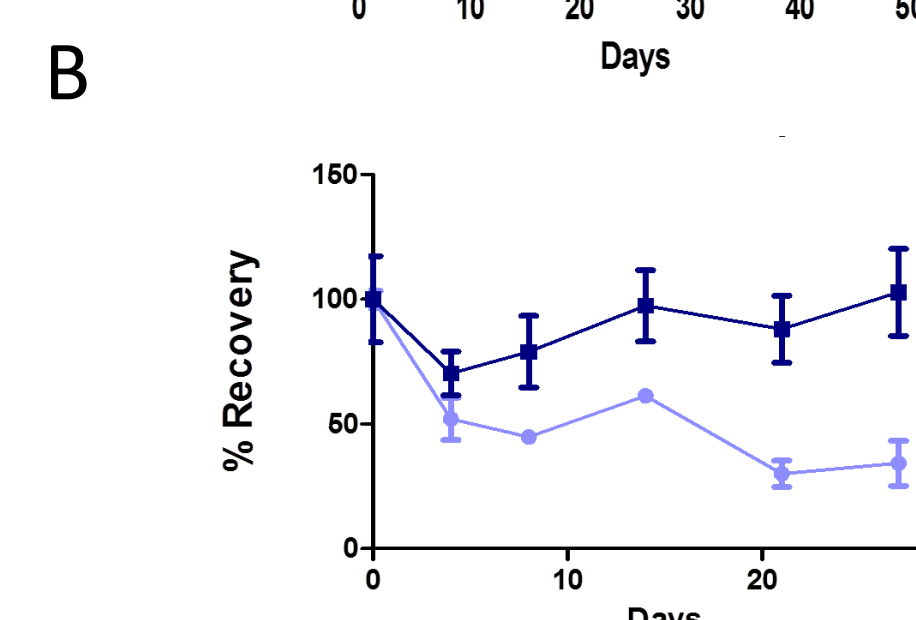


Results

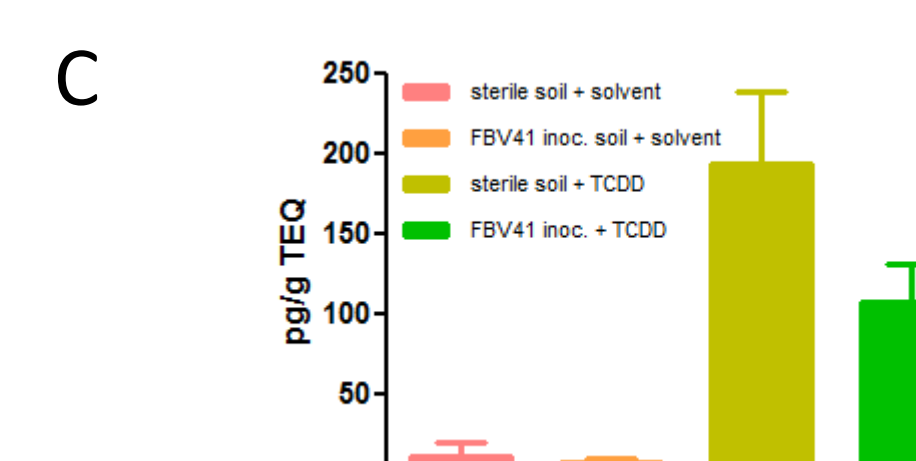
FBV40 and FBV41 from decayed wood layers from Ba Vi National Park produced laccase levels higher than 60000 U/l in an optimized liquid fermentation, whilst FMD21, derived from herbicide/dioxin contaminated forest in South of Vietnam, generated laccase activities after 10 days higher than 80000 U/l.



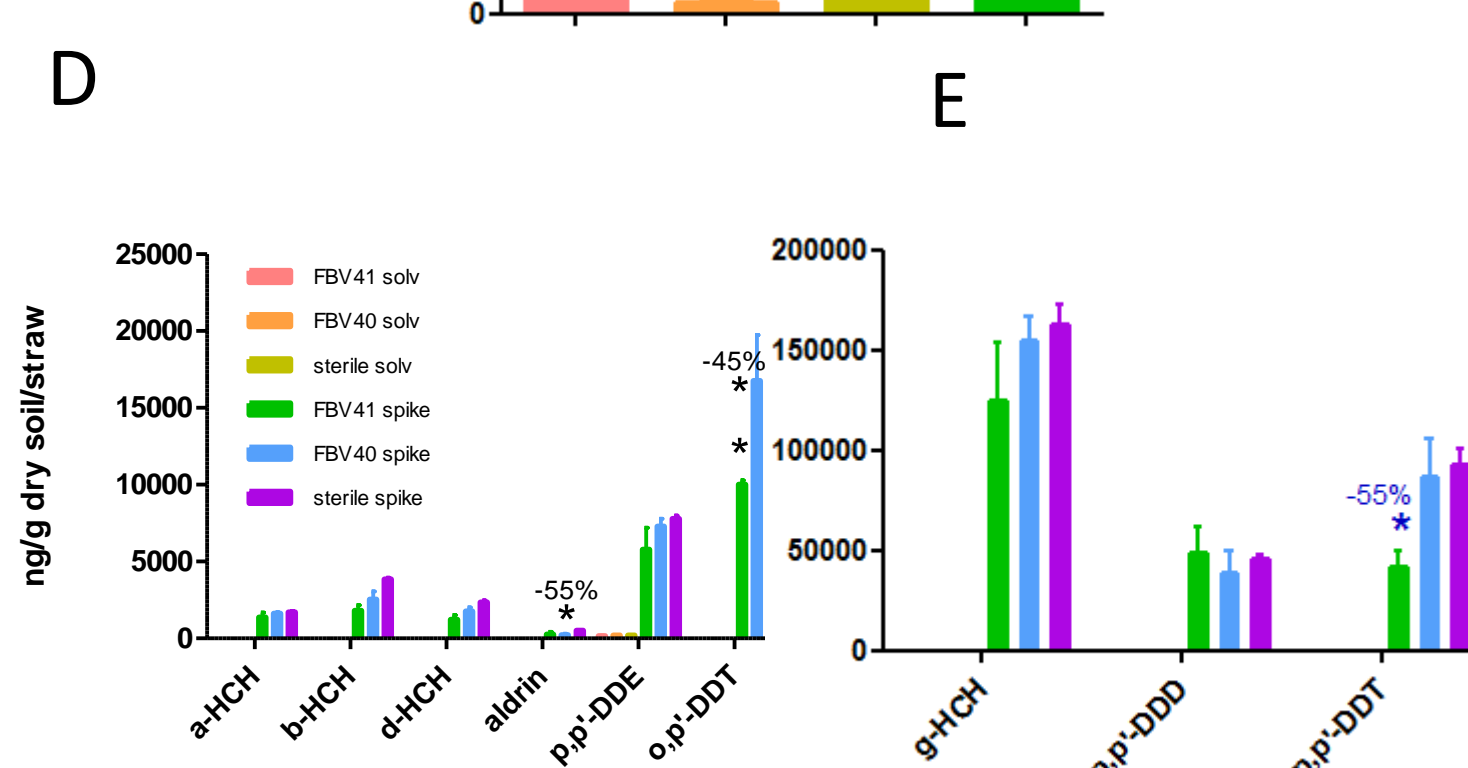
A: FBV41 crude enzymes degraded 2,3,7,8-TCDD for about 59 % within 32 days at 30 °C, violuric acid as a mediator.



B: FMD21 degraded 70 % of 2,3,7,8-TCDD after 21 days incubation at 37 °C without mediator.



C: In addition, FBV41 degraded 45% of 2,3,7,8-TCDD within 30 days on soil/straw.



D & E: FBV40 and FBV41 also showed potential to degrade pesticides, within 30 days on soil/straw (p,p'-DDT: 55 %_FBV41; o,p'-DDT: 45 %_FBV41; Aldrin: 55 %_FBV40).

Conclusion

- A selection of high laccase producing white rot fungi from Vietnamese forest has been carried out, which are able to synthesize laccase at outstanding high activities
- The biological degradation of 2,3,7,8-TCDD, the most toxic persistent compound has been rarely observed and reveals our data of extraordinary importance. Moreover, the degradation of some persistent halogenated pesticides suggest a broad range of substrates.
- Our results suggest a scope for applying these isolates for bioremediation of contaminated soils and biomass.
- Further research will focus on the mechanistic understanding by taking into account other enzymatic activities, the effect of mediators, the transcriptome and the identification of the degradation products.

Acknowledgements

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