Expression of laccase fused with cellulose-binding domain to increase saccharification efficiency of lignocellulosic materials

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Subject

- It is important and useful to increase the saccharification efficiency of lignocellulosic materials for biorefinery.
- Previous studies reported that delignification and decrystallization of biomass improve the digestibility.

In the present work, we tried to express a Laccase (Lac) from the basidiomycete (Trametes versicolor IF01030) fused with a cellulose-binding domain (CBD) in rice, Oryza sativa L., to enhance the saccharification efficiency of lignocelluloses.

1) Lac : Decrease of lignin content
2) CBD : Decrystallization of crystalline cellulose

Previous studies reported that delignification and decrystallization of biomass improve the digestibility.

Conclusion

- We revealed that the expression of Lac-CBD fusion protein in rice could improve the saccharification efficiency.
- In spite of the decrease of lignin content, further increase of the glucose elution was not observed.
- Decrystallization of crystalline cellulose influence greatly to the saccharification efficiency in the transgenic rice plants.
- In order to enhance the saccharification efficiency of rice, decrystallization of crystalline cellulose is more important than reduction of lignin content.

Expression in Arabidopsis thaliana

The saccharification efficiency and the lignin content in the Lac-CBD producing lines were about 1.3 fold higher and 0.7 fold lower than those of control line, respectively.

Expression of Lac-CBD might be a tool to improve the saccharification efficiency of various plant species.