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Title：Biosynthesis and bioengineering of grass-specific lignin components: Towards understanding lignin evolution and improving grass biomass utilization

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Related RISH mission：Mission 5（Quality of the Future Humanosphere）

Abstract：

Grasses show great potential for the sustainable production of energy, chemicals and materials due to their high biomass productivity and high processability. Lignin, a major component in plant cell walls, is long considered as a recalcitrance for the utilization of call wall polysaccharides in biorefineries, while at the same time, serves as a rich source for the sustainable production of chemicals and materials. Grass lignins are structurally and compositionally different from dicot and gymnosperm lignins. They contain tricin, which is a flavonoid generated outside the lignin biosynthetic pathway, and are decorated by *p*-coumarates (Fig. 1). However, the biosynthesis and functions of these grass-specific lignin components are not fully understood. It also remains largely unknown whether manipulating the biosynthesis of these components could improve biomass utilization properties.

Here, I summarize our recent findings on the identification of the key genes involved in the biosynthesis of tricin-lignin and lignin *p*-coumarate decoration using rice as a model of grasses. The impacts of bioengineering these grass-specific lignin components on lignin structure as well as biomass utilization properties will also be described and discussed. Overall, our works contribute to understanding lignin evolution and developing bioengineering strategies to optimize grass lignins towards improved biomass utilization.

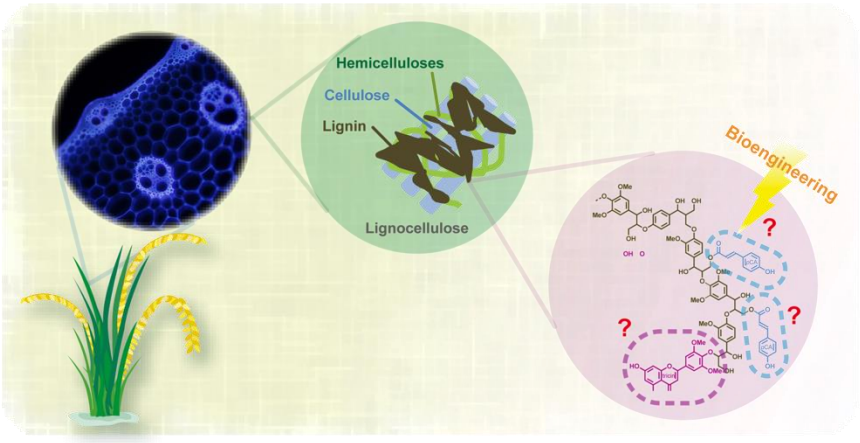

Fig. 1. Bioengineering of grass-specific lignin components in grass biomass.