ABSTRACTS (MASTER THESIS)

Characterization of lignocellulose in fractionated stem tissues of large-sized Gramineae biomass crops

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The genus *Erianthus*, a group of large-sized Gramineae plants, belongs to the Saccharainae subtribe within tribe Andropogoneae in the Gramineae family and is part of the *Saccharum* complex. *Erianthus* has various agriculturally important traits such as a high productivity, ratooning ability, rapidity of growth, and resistance to environmental stresses, and has been considered potentially as an important genetic resource for breeding of *Saccharum*. The dry-matter yields of biomass amounts in *Erianthus* are 40-60 ton ha^{-1} $year^{-1}$ in Japan and USA [1, 2], and these yields are higher than those of miscanthus and swichgrass.

Despite of the fact that *Erianthus* is receiving much attention as potential biofuel and industrial feedstocks, there has been only limited information regarding the lignocellulosic compositions and enzymatic saccharification for producing bioethanol. Recently, Yamamura et al. characterized lignocellulose in several organs of *Erianthus arundinaceus* Type I [3, 4] in terms of lignins and enzymatic saccharification efficiencies, and found that the outer part (rind) of the internode showed a negative correlation between lignin contents and enzymatic saccharification efficiencies, whereas there was no clear correlation in the inner part (pith). The result suggests that not only lignin content but also other factors simultaneously influence the enzymatic saccharification efficiency of the pith of *E. arundinaceus* [4].

In this study, to further investigate the relationship between lignocellulose structures and enzymatic saccharification efficiency, lignocelluloses of stem tissue fractions in two *E. arundinaceus* genotypes, Type-I and IJ76-349, and *Sorghum bicolor* SE1 were characterized using various chemical analyses and 2D-NMR analysis, and obtained structural data were compared in relation to the enzymatic saccharification efficiency. Lignin content and composition as well as cell wall-bound *p*-coumarate content varied among fractionated tissues, and also among the plant species, whereas characteristics of cellulose and hemicelluloses were all similar. Correlation analysis showed that enzymatic saccharification efficiency is well correlated with both lignin content and composition in *S. bicolor*, whereas there was no or weak correlation in both the two *E. arundinaceus* genotypes, suggesting that enzymatic saccharification efficiency of *Erianthus* was negatively affected not only by lignin content but also by other factors such as supramolecular structure of lignocellulose. Our data collectively suggest that structure and assembly of cell wall lignins in large-sized Gramineae plants considerably vary among the species and substantially impact the enzymatic conversion of lignocelluloses to bioethanol.

References

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