Enhanced saccharification in transgenic falcata (*Paraserianthes falcataria*) over-expressing poplar cellulase

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The rapid development of the economies and populations of Asian countries has meant we are faced with an increase in energy consumption. Biomass would be expected to be used as a renewable and carbon neutral resource in these countries, because it can fix carbon dioxide from the atmosphere through photosynthesis. This is becoming more attractive as alternative fuel resource from the perspectives of global warming mitigation and fossil resource saving. We propose that ideal carbon recycling is required for sustainable humanosphere based on sustainable biosphere, where our sustainability is dependent on sustainable forests. Towards a scenario for the sustainable utilization of biomass, technologies are required for the utilization of biomass resources today. Potential research and development to convert biomass into energy with high efficiency is necessary.

Poplar is proposed as feedstock for the production of biofuels in the world. Falcata (*Paraserianthes falcataria*) could be converted into ethanol at the same level as polar can be (Kaida et al., Journal Wood Science in press). Falcata belongs to the subfamily *Mimosoideae* of *Leguminosae*, and is native to Haiti, Indonesia, and Papua New Guinea. Like *A. mangium*, falcata thrives even in marginal lands, where it grows symbiotically with nitrogen-fixing *Rhizobium* and phosphorus-promoting mycorrhizal fungi. It should be also noted that falcata is one of the fastest growing tree species on the planet. We have succeeded in producing the transgenic falcata over-expressing poplar cellulase for the first time (Hartati et al., 2008). The overexpression further accelerates plant growth, and did not lead to a decrease of cellulose.

In this study, we examined the level of saccharification and successive ethanol production in a wood of transgenic falcata overexpressing cellulase. Compared to the wild type plant, the levels of saccharification and successive ethanol production were increased in the wood of the transgenic sengon. Since the overexpression did not decrease the cellulose content but xyloglucan content in the walls, xyloglucan intercalated into cellulose microfibrils could be one of the recalcitrance in the saccharification of lignocelluloses.

Lingocellulose represents a key sustainable source of biomass for conversion into bioethanol. However, lignocellulosic biomass is highly recalcitrant to enzymatic hydrolysis, which limits its use and prevents economically viable ethanol production. Therefore, effective pretreatment strategies are necessary, which result in the degradation of lignocelluloses. We focus on the effect of wall modification by the genetic recombination on the degradation of cellulose.

References

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