Engineering cell wall arabinoxylans towards improved ethanol production from lignocellulose biomass.

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Second-generation biofuels are derived from lignocellulosic crops. These biofuels can solve these problems and can supply a larger proportion of biofuel sustainably and affordably with greater environmental benefits. However, the production of second generation with the current state of technology is not profitable from a purely economic point of view. Lignin and the crystallinity of cellulose are two major recalcitrance factors impeding the biochemical or chemical conversion of the carbohydrates in lignocellulosic biomass to biofuels and bio-based products. The chance for the abolition of the recalcitrance lignocellulose complex can be the engineering modification of cross-links lignin-cellulose structure in order to reduce the resistance to biomass conversion without loss in biomass productivity. The arabinose side chain can be established point for cross-links and lignification. The hydrogen bond between arabinoxylan and cellulose interrupts side chains and carry an ester-linked feruloyl substituent by arabinose. For the diferuloyl cross-links and lignification, arabinose side as the point base. For the first time, we present the possibility of the modification of arabinose residues in arabinoxylan and their effects on raw ethanol production. We confirmed expression and enzymatic activity AbfB of fungal in transgenic tobacco. We studied modifications of cell wall lignin and polysaccharides at the cellular level by histochemical staining lignin patterns and immunolocalization patterns using antibodies raised against b-(1,4)-linked D-Xyl (LM11) residues. Immunochemistry antibody LM11 labeled arabinoxylan showed change in structure. However, they showed no visible effect/changes in phenotype. The results of cell wall composition suggest that the expression of AbfB causes a modification structure of the cell wall but not the contents of the composition. The transgenic plants are characterized by an increased content of free arabinose and chain long change in lignin which build hemicellulose-lignin cross-links . We performed raw ethanol production on ABfB line mature stems. The raw ethanol fermentation was significantly higher in P35Sabfb and PCCabfb lines than in control, and the amount of liberated ethanol increased by 30% and 23%, respectively, comparing to the control. We present the effect of decreased hemicellulose-lignin cross-links of the cell wall by abfB overexpression through modification of arabinoxylan and increased saccharification efficiency for production of bioethanol. Together with the developed method of genetic modification of *Miscanthus* - one of the most important energy grasses, it creates opportunities for improving the use of biomass in the production of biofuels.