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Saccharification of poplar biomass by using lignocellulases from *Pholiota adiposa*

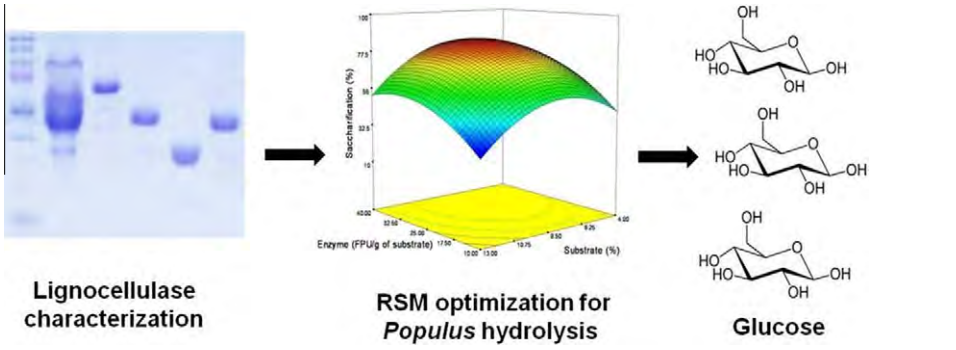
Sujit Sadashiv Jagtap [a], Saurabh Sudha Dhiman [a,b], Marimuthu Jeya [a,b], Yun Chan Kang [a], Joon-Ho Choi [c,*], Jung-Kul Lee [a,b,*]

[a] Department of Chemical Engineering, Konkuk University, Seoul 143-701, Republic of Korea
[b] Institute of SK-KU Biomaterials, Konkuk University, Seoul 143-701, Republic of Korea
[c] Department of Food Science and Biotechnology, Wonkwang University, Iksan-city, JeonBuk 570-749, Republic of Korea

HIGHLIGHTS

- It reports saccharification of woody biomasses using lignocellulase from *Pholiota adiposa*.
- Among the biomasses tested, *Populus* biomass produces maximum reducing sugar.
- Response surface methodology is used to optimize the hydrolysis of *Populus* biomass.
- *P. adiposa* can be a good choice for the production of reducing sugars from cellulosic biomasses.

GRAPHICAL ABSTRACT



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ABSTRACT

A basidiomycetous fungus, identified as *Pholiota adiposa* SKU0714 on the basis of morphological and phylogenetic analyses, was found to secrete efficient lignocellulose degrading enzymes. The strain showed maximum endoglucanase, cellobiohydrolase and β-glucosidase activities of 26, 32 and 39 U/mL, respectively and also secreted xylanase, laccase, mannanase, and lignin peroxidase with activities of 1680, 0.12, 65 and 0.41 U/mL, respectively when grown with rice straw as a carbon source. Among the various plant biomasses tested for saccharification, poplar biomass produced the maximum amount of reducing sugar. Response surface methodology was used to optimize hydrolysis parameters. A maximum saccharification yield of 83.4% (667 mg/g-substrate), the highest yield from any plant biomass, was obtained with *Populus* biomass after 24 h of hydrolysis. *P. adiposa* was proven to be a good choice for the production of reducing sugars from cellulosic biomass.

1. Introduction

Lignocellulosic materials are the most abundant and low cost biomass available to the world (Sassner et al., 2008). Poplar trees are characterized as fast-growing, moisture-loving, and shade-intolerant medium to large trees with a short life span. The genus *Populus* includes trees that are commonly called "poplar". *Populus* includes various species such as trembling aspen (*Populus tremuloides*), bigtooth aspen (*Populus grandidentata*), black poplar (*Populus nigra*), balsam poplar (*Populus balsamifera*), eastern cottonwood (*Populus deltoides*), and black cottonwood (*Populus trichocarpa*). The chemical composition of poplar wood is characterized by its high polysaccharide content (approximately 80% holocellulose, made up of 50% cellulose and 30% hemicelluloses) and low lignin content (about 20% or less), making it an attractive biomass for fermentable sugar production (Balatinecz and Kretschmann, 2001).

In lignocellulose, the linear cellulose polymers are highly crystalline and are usually surrounded by lignin, which reduces their accessibility to hydrolytic enzymes. Several pretreatment

* Corresponding authors at: Department of Chemical Engineering, Konkuk University, Seoul 143-701, Republic of Korea (J.-K. Lee). Tel.: +82 2 450 3505; fax: +82 2 458 3504.
E-mail address: jkrhee@konkuk.ac.kr (J.-K. Lee).

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