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Effective lactic acid production from waste paper using *Streptococcus thermophilus* at low enzyme loading assisted by *Gleditsia saponin*

Shujuan Yang<sup>1</sup>, Hailong Yu<sup>2</sup>, Yanzhi You<sup>1</sup>, Xiaoli Li<sup>1</sup>, and Jianxin Jiang<sup>1,\*</sup>

<sup>1</sup>Department of Chemistry and Chemical Engineering, MOE Engineering Research Center of Forestry Biomass Materials and Bioenergy, Beijing Forestry University, Beijing, 100083, China;

<sup>2</sup>College of Chemical Engineering, Qingdao University of Science and Technology, Qingdao 266042, China

\*Corresponding author: [jiangjx@bjfu.edu.cn](mailto:jiangjx@bjfu.edu.cn)

### Highlights

- The fermentation of waste paper using *Streptococcus thermophilus* was investigated.
- The lactic acid yield of magazine and office paper was 99.50% and 82.85%, respectively.
- *Gleditsia saponin* could significantly increase the lactic acid yield at low enzyme loading.
- The new strategy to obtain both high yield and high concentration of lactic acid was proposed.

### Abstract

Waste paper has considerable potential as a raw material for lactic acid (LA) production due to high cellulose content, abundance and low cost. In this study, four kinds of waste papers were used for LA production through simultaneous saccharification and fermentation (SSF) by *Streptococcus thermophilus*. The SSF of office paper achieved the highest LA concentration (39.71 g/L), while the highest LA yield was observed for magazine (99.56%), followed by office paper (82.85%). High LA concentration is unfavorable to total LA conversion because of product inhibition. However, the addition of *Gleditsia saponin* (GS) could obtain both high yield and high concentration of LA at a low enzyme loading, indicating that product inhibition could be moderated. A lactic acid yield of 86.30% was obtained from office paper at an enzyme loading of 9 FPU/g-cellulose with GS, which was higher than that of without GS at a higher loading of 18 FPU/g-cellulose.

### Key words:

Waste paper; Lactic acid; *Gleditsia saponin*; Enzyme loading.

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