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Mechanical fragmentation of corncob at different plant scales: Impact and mechanism on microstructure features and enzymatic hydrolysis

Guanya Ji, Chongfeng Gao, Weihua Xiao, Lujia Han

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1 **Mechanical fragmentation of corncob at different plant scales: Impact and**
2 **mechanism on microstructure features and enzymatic hydrolysis**

3 Guanya Ji, Chongfeng Gao, Weihua Xiao, Lujia Han*

4 *College of Engineering, China Agricultural University, Box 191, Beijing 100083, China*

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6 **ABSTRACT**

7 In this work, corncob samples at different scales, i.e., plant scale (> 1 mm), tissue scale
8 (500–100 μm) and cellular scale (50–30 μm), were produced to investigate the impact
9 and mechanisms of different mechanical fragmentations on microstructure features and
10 enzymatic hydrolysis. The results showed that the microstructure features and
11 enzymatic hydrolysis of corncob samples, either at a plant scale or tissue scale, did not
12 change significantly. Conversely, corncob samples at a cellular scale exhibited some
13 special properties, i.e., an increase in the special surface area with the inner mesopores
14 and macropores exposed to the surface; breakage of crystalline cellulose and linkages in
15 polysaccharides; and a higher proportion of polysaccharides on the surface, which
16 significantly enhanced enzymatic digestibility resulting in a 98.3% conversion yield of
17 cellulose to glucose which is the highest conversion ever reported. In conclusion,
18 mechanical fragmentation at the cellular scale is an effective pretreatment for corncob.

19 **Keywords:** different plant scales, mechanical fragmentation, corncob, microstructure
20 features, enzymatic hydrolysis

* Corresponding author. Tel: +86-10-6273-6313; Fax: +86-10-6273-6778. E-mail: hanlj@cau.edu.cn

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