Separation and Xylitol fermentation of Xylose from hemicellulose hydrolysate

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ABSTRACT

The agricultural residual production, such as rice straw, contains a great quantity of hemicellulose. After been hydrolyzed, Xylose can be found in hydrolysate and obtain xylitol production from xylose by yeast. However, the pigment and the salt for modulating pH in hydrolysate will affect the fermentation rate of yeast. The hydrolysate has to be dealt with before fermenting. The experimentation take the hydrolysate through the ion exchange resin to separate pigment, salt and xylose; the result shows that there is a better separation when the loading volume is 1 mL, the flow rate is 3.5 mL/min, and the operating temperature is 45℃. Under the above condition, the separation is amount to 80%. The research also confers the influence of the size of rice strew pellet and the solid-liquid ratio of the straw and dilute sulfuric acid. The smaller straw powder has better xylose recovery, but its size shows a non-linear relationship with xylose recovery. The xylose recovery no longer rises when straw powder is smaller than 60 mesh. If the solid-liquid ratio is 1:4(g:mL), xylose recovery could be up to 95.6%. But the hydrolysate is more difficult to retrieve, and xylose recovery is almost 70% when the solid-liquid ratio is between 1:6 and 1:10. Although it is 30% lower, but hydrolysate and residue are easier to separate and process. Thus, the 1:6 solid-liquid ratio should be the better choice for hydrolysis. In addition, this research uses yeast Candida subtropicalis chosen by us to ferment xylose and produce xylitol. The research indicates that there is a higher xylitol yield (0.89) even though there are only Yeast Extract and Bacto Peptone in medium, and the concentration does not need be too high. However, xylitol yield would reduce once inorganic salt is added. And, when xylose concentration is 10% the xylitol yield is higher than the one when xylose concentration is more than 15%.

Keywords : hemicellulose ; hydrolysis ; xylose ; xylitol ; fermentation

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