Bacillus coagulans IPE22 was used to produce lactic acid (LA) from mixed sugar and wheat straw hydrolysates, respectively. All fermentations were conducted under non-sterilized conditions and sodium hydroxide was used as neutralizing agent to avoid the production of insoluble CaSO4. In order to eliminate the sequential utilization of mixed sugar and feedback inhibition during batch fermentation, membrane integrated repeated batch fermentation (MIRB) was used to improve LA productivity. With MIRB, a high cell density was obtained and the simultaneous fermentation of glucose, xylose and arabinose was successfully realized. The separation of LA from broth by membrane in batch fermentation also decreased feedback inhibition. MIRB was carried out using wheat straw hydrolysates (29.72g/L glucose, 24.69g/L xylose and 5.14g/L arabinose) as carbon source, LA productivity was increased significantly from 1.01g/L/h (batch 1) to 2.35g/L/h (batch 6) by the repeated batch fermentation. © 2014 Elsevier Ltd.