ABSTRACT
Curdlan is an extracellular microbial insoluble polysaccharide composed entirely of 1,3-β-D-glucosidic linkages and synthesized mostly by Agrobacterium species and Alcaligenes faecalis under nitrogen-limited conditions. Curdlan is an alkali-soluble β-1,3-glucan polysaccharide and curdlan aqueous is heating an aqueous slurry to about 55℃ and letting it cool to form a thermo-reversible gel or by heating the slurry to >70℃ to form a thermo-irreversible gel. Therefore, curdlan was applied to food industry as food additives. Moreover, in a clinical trial, researchers used curdlan sulfate as an antiviral agent for the inhibition of human immunodeficiency virus (HIV)-1 infection. Because curdlan could use extensively, therefore, the dosage of curdlan would increased in the future. Consequently, it places important on decreasing the production costs of curdlan. The main aim of the research was to determine the effects of aeration and agitation on the production of curdlan by Agrobacterium species in the fermentor. In addition, effect of different extract methods for curdlan and the rheological properties of curdlan solution were studied. Finaly, we identify structure of purified sample from the fermentation liquid. The description of this is divided into four sections.

In the first section, we culture Agrobacterium sp. strain in the batch culture in the 5-L jar fermentor, study the effect of the different aeration rate and stirred rate on the curdlan production. The operation condition of aeration rate for fermentor was 0.0 vvm、0.5 vvm、1.0 vvm and 1.5 vvm; the stirred rate condition for fermentor was 150 rpm、300 rpm and 600 rpm. As aeration rate or stirred rate were increased (aeration rate from 0.0 vvm to 1.5 vv and stirred rate form 150 rpm to 600 rpm), both cell concentration and curdlan production increased, indicating that higher oxygen transfer efficiency is required for a higher production of curdlan.

The second section is focused on the effect of different methods for curdlan extract. It is found that concentration of alkali solution is a factors in the curdlan purified. The highest curdlan concentration was produced by the NaOH solution concentration (from 0.2 N to 2 N) increased and high volume rate (alkali solution/fermentation broth). Additional, the different acid solution also could influence the curdlan product. However, the reaction time with the NaOH solution didn't influence the extract of curdlan.

The third section is focused on the rheological properties of different concentration of curdlan solutions (1~6%) using a rotational viscometer at several temperatures (10-50℃) and rotational speed (22-40 rpm). The modified of power law model were found to be the good agreement with the rheological properties of purified curdlan solutions. Activation energy was determined using the Arrhenius equation and it was found that the activation energy of curdlan increased with the addition of curdlan.

The fourth section is focused on the structure of purified sample from the fermentation liquid. The purified sample was characterized by fourier transform infrared (FTIR) spectroscopy and nuclear magnetic chromatography (NMR). The results show that the purified sample from the fermentation liquid was curdlan.

Keywords : glucan、Agrobacterium sp.、jar fermentor、purification、rheologist
2.1.2 胞外多醣體的種類
2.1.3 胞外多醣體之應用範圍
2.2 卡德蘭膠簡介
2.3 卡德蘭膠的生產與合成
2.3.1 生產卡德蘭膠的菌株
2.3.2 卡德蘭膠之生化合成
2.3.3 卡德蘭膠生產條件
2.3.3.1 不同的碳源影響
2.3.3.2 氮源限制條件
2.3.3.3 溶氧量
2.4 卡德蘭膠流變學
2.4.1 牛頓流體
2.4.2 非牛頓流體
2.5 卡德蘭膠之應用
2.5.1 食品應用
2.5.2 免疫活性
2.5.3 硫酸化卡德蘭膠之免疫活性
2.5.3.1 β-D-glucan之抗腫瘤機制
2.5.4 以卡德蘭膠做為固定化酵素的擔體
3. 材料與方法
3.1 實驗材料
3.1.1 菌株
3.1.2 藥品
3.1.3 儀器設備
3.2 菌株培養
3.2.1 菌株保存與更新
3.2.1.1 固態平板培養
3.2.2 菌株活化
3.3 SEM觀察
3.4 生產培養基中之分析
3.4.1 微生物之生長分析
3.4.2 氨氮之分析
3.4.3 碳源之分析
3.5 卡德蘭膠發酵槽生產培養
3.6 純化探討
3.6.1 NaOH濃度對無菌發酵液與菌體表面萃取卡德蘭膠產量之影響
3.6.2 藉由鹽酸與醋酸調整pH後對卡德蘭膠產影響的比較
3.6.3 藉由不同濃度的NaOH溶液和反應時間對卡德蘭膠產量影響的比較
3.6.4 藉由不同體積的NaOH溶液與反應時間對卡德蘭膠產量影響的比較
3.7 純化卡德蘭膠流變學分析
3.8 純化卡德蘭膠結構分析
4. 結果與討論
4.1 攪拌式發酵槽
4.1.1 曝氣量對菌體生長速率的影響
4.1.2 攪拌速率對菌體生長速率的影響
4.2 卡德蘭膠之純化條件探討

4.2.1 NaOH濃度對無菌發酵液與菌體表面萃取卡德蘭膠產量之影響

4.2.2 利用不同酸種類調整pH後對萃取卡德蘭膠產量之影響

4.2.3 利用不同濃度NaOH溶液及其反應時間對萃取卡德蘭膠產量之影響

4.2.4 藉由不同體積的NaOH溶液與反應時間對卡德蘭膠產量影響的比較

4.3 流變學動力學解析

4.3.1 溫度和對不同濃度之卡德蘭膠溶液黏度的影響

4.4 純化卡德蘭膠之結構分析

4.4.1 純化卡德蘭膠之元素分析（Elemental Analysis, EA）

4.4.2 純化卡德蘭膠之FT-IR分析

4.4.3 純化卡德蘭膠之NMR分析

5. 結論

參考文獻