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Effect of nitrogen sources on the dextran production by *Leuconostoc mensenteroids* NRRL-B512F

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Abstract

The dextran prodution by *Leuconostoc mensenteroids* NRRL-B512F was studied in a synthetic medium from sucrose as a sole carbon source. Especially, effect of nitrogen source was treated and compared in this study.

In oder to maximize the cell growth and dextran produtivity through fermentation two nitrogen sources, yeast extract and tryptone, were used with various concentrations.

At the end of fermentation, when the concentration of yeast extract was 9g/L we can obtain the maximum dry cell weight(14.1g/L), dextran dry weight(25.4g/L) and productivity(1.4g/L · hr).

Introduction

Biopolymers are utilized at pharmaceutical, food, and chemical industry. They show a wide veriety of chemical compositions, and we can now begin to understand how these give rise to the wide variety of physical and biochemical property. Polysaccharides are the most abundunt biopolymers on earth.

Biopolymers are mainly synthesised by plant, animal, and microorganism. Biopolymers that are derived from microorganism are different from natural biopolymer such as derived from plant and seaweeds at physiologial properties. And mass production is available through proper strain selection and a method of cultivation.

Dextran which is synthesised by extracellullar polymerization enzyme is one of the useful microbaial polysaccharides. Dextran is cosisting of glucose monomers linked mainly (95%) by α(1-6) bonds. It has many industrial

applications due to its non-ionic character and good stability under nomal operating conditions. It is widely used as a blood volume expander in pharmaceutical industry. And it is also used in food industry as an additive for foodstuff and in chemical industry , for example chromatography media.

This paper describes effect of nitrogen sources on the dextran production sucrose as a sole carbon source by *L. mensenteroides*.

Materials and Method

Bacterial strain, medium, and growth condition

Leuconostoc mensenteroides NRRL-B512F from Korean Collection for Type Cultures(KCTC) was used in this study. The strain was stored at 4℃ in MRS agar slant. The fermentation inocula were prepared so that the final medium going into the fermenter was 8% (v/v) of the initial fermentation medium. The organnism was transfered from the stock culture to a similar medium but without agar. The inoculum was grown for 12 hours at 28℃ in shaking incubator. Fermentations were carried out in a 4.5L jar fermenter(Korea Fermenter Company, Incheon, Korea).

The fermentation medium consist sucrose(80g/L) with variable concentrations, potassium phosphate(8g/L), trace element solution(the constituents in the trace element are listed in table 1.) and nitrogen source with variable concentrations.

Table 1. Constituents in the trace elements solution

Constituents	Concentration(g/L)
$MgSO_4 \cdot 7H_2O$	40
NaCl	5
$MnSO_4 \cdot H_2O$	5
$FeSO_4 \cdot 7H_2O$	5

Analytical procedure

Cell growth was monitored by measuring the absorbance at 660nm using spectrophotometer. Cell concentration was defined as cell dry weight per liter of culture broth. Dextran was obtained from fermentation solution by ethanol precipitation. And then dextran was dried at vaccum oven(at 70℃, 15 hrs). Dextran concentration was determined by dry weight(g/L).

The concentration of sucrose is determined by HPLC equipment(μ Porasil,

3.9mm×300mm, Waters, USA) using acetonitrile : water(80:20) as mobile phase and carbohydrate analysis column.

Results and discussion

Figure 1, and Figure 2 show the concentration of dry cell weight(g/L) and dextran dry weight(g/L). When the concentration of yeast extract was 9g/L, the fermentation result of dextran dry weight was maximum value. And at the concentration of tryptone was 12g/L, the fermentation result of dextran dry weight was the maxium value. Using yeast extract as a nitrogen source dextran dry weight was more higher than using tryptone as a nitrogen source. At the end of fermentation(18hrs) 11.4g/L of the dry cell weight, and 25.4g/L of dextran.(using yeast extract). At the end of fermentation(18hrs) 11.2g/L of the dry cell weight, and 21.g/L of dextran dry cell weight(using tryptone).

Figure 3, and figure 4 show the time profile of the cell growth and dextran production rate when obtained the maximum value of dextran dry weight.
The trend of two profile were similar. But we can obtained more higher result of dry cell weight and dextran dry weight when using yeast extract as a nitrogen source.

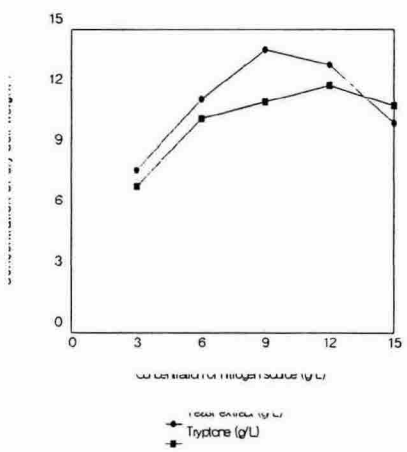

Fig. 1 Concentration of dry cell weight at two nitrogen sources and concentrations (at 28℃, pH 6.4, rpm=180, and sucrose concentration=80g/L)

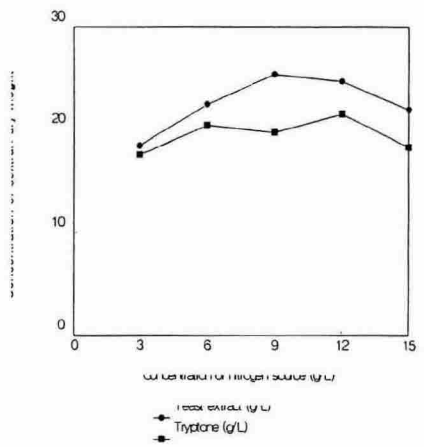

Fig.2 Concentration of dextran dry weight at two nitrogen sources and variable concentrations (at 28℃, pH=6.4, rpm=180 and sucrose concentration=80g/L)

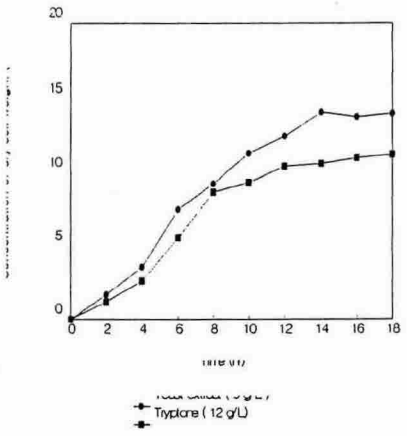

Fig 3. Effect of nitrogen sources on the cell growth of *Leuconostoc mesenteroides* NRRL-B512F (at 28℃, pH-6.4 , rpm-180, and sucrose concentration-80g/L)

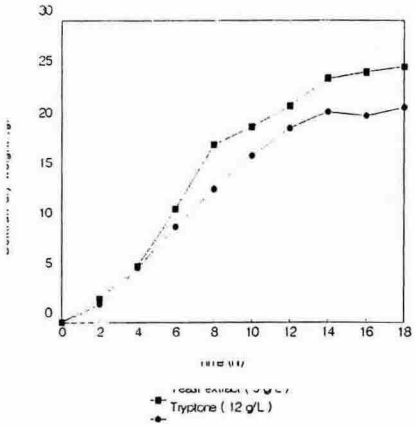

Fig 4. Effect of nitrogen sources on th dextran production (at 28℃, pH-6.4 , rpm-180, and sucrose concentration-80g/L)

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