OPTIMIZATION FOR SPRAY DRYING OF PROBIOTIC BACTERIA

KANOKWAN SARINYAWAT

MASTER OF SCIENCE
IN BIOTECHNOLOGY

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EXAMINING COMMITTEE

..... CHAIRPERSON
Asst. Prof. Dr. Sasitorn Wongroung

..... MEMBER
Asst. Prof. Dr. Piyanuch Niamsup

..... MEMBER
Dr. Pairote Wongputtisin

..... MEMBER
Dr. Suphawat Sinsuwongwat

THESIS ADVISOR

.....
Dr. Suphawat Sinsuwongwat

4 October 2011

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ชื่อเรื่องวิทยานิพนธ์	การหาสภาวะที่เหมาะสมสำหรับการทำแห้งแบบพ่นฝอยของแบคทีเรียโปรไบโอติก
ผู้เขียน	นางสาวกนกวรรณ ศริญญาวัจน์
ปริญญา	วิทยาศาสตรมหาบัณฑิต(เทคโนโลยีชีวภาพ)
อาจารย์ที่ปรึกษาวิทยานิพนธ์	ดร. ศุภวัฒน์ สินสุวงศ์วัฒน์

บทคัดย่อ

การหาสภาวะที่เหมาะสมในการทำแห้งแบบพ่นฝอยเชื้อแบคทีเรียโปรไบโอติก 1% (w/v) ของเชื้อ *Lactobacillus casei* sub.sp. *paracasei* F-19, *L. plantarum* V299 และ *L. fermentum* 2311M ใน 15% (w/v) สารละลายนมผงพร่องมันเนย โดยสภาวะในการทำแห้งแบบพ่นฝอยในการศึกษานี้ได้แก่ อัตราการป้อนสารละลาย 25 ml/min, แรงลมที่หัวพ่นฝอย 15 kg/cm^2 และอุณหภูมิลมออกที่ 65°C, 75°C และ 85°C พบว่าการทำแห้งแบบพ่นฝอยของเชื้อ *L. casei* sub.sp. *paracasei* F-19 มีอัตราการรอดชีวิตสูงสุดเป็น 72%, 47% และ 35% ตามลำดับ, *L. plantarum* V299 มีอัตราการรอดเป็น 55%, 49% และ 18% ตามลำดับ และ *L. fermentum* 2311M มีอัตราการรอดชีวิตต่ำสุดคือ 24%, 20% และ 10% ตามลำดับ อุณหภูมิลมออกยังส่งผลต่อความชื้นเช่นกันโดยความชื้นของผลิตภัณฑ์ที่อุณหภูมิลมออก 85°C มีค่าน้อยที่สุดคือ 3.2% ถึง 3.8% ความชื้นที่อุณหภูมิลมออก 75°C คือ 5.2% ถึง 5.6% และที่อุณหภูมิลมออก 65°C มีความชื้นมากที่สุด 7.9% ถึง 8.4% เมื่อนำผลิตภัณฑ์ที่ได้จากการทำแห้งแบบพ่นฝอยที่อุณหภูมิลมออกเท่ากับ 75°C ของจุลินทรีย์โปรไบโอติกทั้ง 3 สายพันธุ์มาเก็บรักษาไว้ที่อุณหภูมิ 4°C และอุณหภูมิห้องในถุงอะลูมิเนียม เป็นเวลา 30 วัน พบว่าเมื่อเก็บไว้ที่อุณหภูมิ 4°C ปริมาณเซลล์ที่มีชีวิตลดลงประมาณ 2 log cycle และลดลงประมาณ 4 log cycle เมื่อเก็บไว้ที่อุณหภูมิห้อง และจากการศึกษาการทำแห้งแบบพ่นฝอยโดยใช้เชื้อโปรไบโอติกผสมกับวิปปิ้งครีม โดยใช้อุณหภูมิลมออกที่ 75°C พบว่า *L. casei* sub.sp. *paracasei* F-19, *L. plantarum* V299 และ *L. fermentum* 2311M มีอัตราการรอดเป็น 22%, 21% และ 8% ตามลำดับ มีความชื้นเท่ากับ 5.5%, 5.0% และ 4.8% ตามลำดับและผงผลิตภัณฑ์ที่ได้มีความละเอียดดี ไม่จับกันเป็นก้อน

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Author Miss Kanokwan Sarinyawat
Degree Master of Science (Biotechnology)
Thesis advisor Dr. Suphawat Sinsuwongwat

ABSTRACT

Evaluation of optimum condition for spray drying of probiotic bacteria, *Lactobacillus casei* sub.sp. *paracasei* F-19, *L. plantarum* V299 and *L. fermentum* 2311M in 15% (w/v) skim milk solution. Conditions of spray drying were done with 25 ml/min of feed rate, 15 kg/cm^2 of air atomization and the air outlet temperature at 65°C, 75°C and 85 °C. Spray dry of *L. casei* sub.sp. *paracasei* F-19 had highest survival rate 72%, 47% and 35% respectively, *L. plantarum* V299 had survival rate at 55%, 49% and 18%, respectively and *L. fermentum* 2311M had lowest survival rate 24%, 20% and 10%, respectively. Moisture content of product was related with air outlet temperature too. At 85°C of air outlet temperature yielded lowest moisture content from 3.2% to 3.8%, at 75°C of air outlet temperature were 5.2% to 5.6%, moisture content is nearly standard of milk powder and the highest moisture content obtained from air outlet temperature at 65°C were 7.9% to 8.1%. The sample of probiotic with skim milk powder were stored at 4°C and at room temperature in aluminum bags for 30 days. The viable cells decreased 2 log cycle after stored at 4°C and decreased approximately 4 log cycle after stored at room temperature. Another experiment of spray drying probiotic in whipping cream at 75°C of air outlet temperature the survival rate viable of *L. casei* sub.sp. *paracasei* F-19, *L. plantarum* V299 and *L. fermentum* 2311M were 22%, 21% and 8%,respectively. Which had moisture content at 5.5%, 5.0% and 4.8%, respectively and the product particle were very fine and non-caking.

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ABBREVIATION AND SYMBOLS

cfu	colony forming units
cfu/g	colony per gram
cfu/ml	colony per milliliter
g	gram
hrs	hours
kg/cm^2	kilogram per square centimeter
min	minute
ml	milliliter
rpm	revolutions per minute
w/v	weight per volume
µm	micrometer
°C	degree Celsius
%	percent