EFFECTS OF SKIMMED MILK POWDER AND SUGAR FORMULATION ON THE CHARACTERISTICS OF PROBIOTIC YOGURT ENRICHED BY GAC (*Momordica cochinchinensis*) AND PASSION FRUIT (*Passiflora edulis*)

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FACULTY OF AGRICULTURE

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SUMMARY

NAFISAH EKA PUTERI. Effects of Skimmed Milk Powder and Sugar Formulation on the Characteristics of Probiotic Yogurt Enriched by Gac (*Momordica cochinchinensis*) and Passion Fruit (*Passiflora edulis*) (Supervised by **FILLI PRATAMA**).

The objective of this research was to analyze the physical, chemical, microbiological and sensory characteristics of gac and passion fruit enriched-yogurt which was formulated by different concentrations of skimmed milk and sugar. This research has been done at Institute of Agricultural Technology, School of Agriculture, Walailak University, Thailand from July till December 2013.

This research was designed as Complete Randomized Design (CRD) with 2 treatments, which were consisted of skimmed milk powder (4 %, 6 % and 8 %) and sugar concentration (4 %, 6 % and 8 %). Parameters were titrable acidity, pH, texture (hardness and cohesiveness), syneresis, viscosity, colour measurement, microbiological characteristics and sensory test.

The result showed that the concentration of skimmed milk powder and sugar significantly affected ($p < 0.05$) the titrable acidity, pH, syneresis, viscosity, texture (hardness and cohesiveness), colour (L^* and a^*) and yogurt bacteria counts. The yogurt formulation of 8 % skimmed milk powder with 4 %, 6 %, and 8 % sugar (A3B1, A3B2, A3B3) resuted in yogurt with good quality based on physical, chemical, and microbiological properties. Sensory test showed that the treatment of A3B2 (8 % skimmed milk powder and 6 % sugar) resulted in the most preferred

yogurt based on hedonic score with 13.23% of titrable acidity, 3.43 of pH value, 2.76 N of hardness, 0.35 of cohesiveness, 3.86 % of syneresis, 221.74 mPas of viscosity, 7.2 log CFU/g of yogurt bacteria counts and 6.6 log CFU/g of *Lactobacillus acidophilus* counts.

RINGKASAN

NAFISAH EKA PUTERI. Pengaruh Formulasi Susu Bubuk Skim dan Gula terhadap Karakteristik Yogurt Probiotik yang Diperkaya dengan *Gac* (*Momordica cochinchinensis*) dan Markisa (*Passiflora edulis*) (Dibimbing oleh **FILLI PRATAMA**).

Penelitian ini bertujuan untuk menganalisa sifat fisik, kimia, mikrobiologi dan sensoris yogurt buah *gac* dan markisa yang diformulasikan dengan susu bubuk skim dan gula dengan konsentrasi yang berbeda. Penelitian ini dilaksanakan di Jurusan Teknologi Pertanian, Fakultas Pertanian, Walailak University, Thailand pada bulan Juli hingga Desember 2013.

Penelitian ini didesain sebagai Rancangan Acak Lengkap Faktorial dengan 2 perlakuan yang terdiri atas konsentrasi susu bubuk skim (4 %, 6 % and 8 %) dan konsentrasi gula (4 %, 6 % and 8 %). Parameter yang diamati meliputi *titrable acidity*, pH, tekstur, sineresis, viskositas, warna, karakteristik mikrobiologi dan uji hedonik.

Hasil penelitian menunjukkan bahwa konsentrasi susu bubuk skim dan konsentrasi gula berpengaruh nyata ($p < 0.05$) terhadap *titrable acidity*, pH, sineresis, viskositas, tekstur, warna (L^* dan a^*) dan total bakteri pada yogurt. Formulasi antara 8 % susu bubuk skim dengan 4 %, 6 %, dan 8 % gula (A3B1, A3B2, A3B3) menghasilkan yogurt dengan kualitas yang baik berdasarkan sifat fisik, kimia dan mikrobiologi. Uji sensori menunjukkan bahwa perlakuan A3B2 (8 % susu bubuk skim dan 6 % gula) menghasilkan yogurt yang paling disukai berdasarkan skala

hedonik dengan *titrable acidity* 13.23% , pH 3.43, *hardness* 2.76 N, *cohesiveness* 0.35, sineresis 3.86 %, viskositas 221.74 mPas, total bakteri pada yogurt 7.2 log CFU/g dan total *Lactobacillus acidophilus* 6.6 log CFU/g.

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By

NAFISAH EKA PUTERI

THESIS OF UNDERGRADUATE PROGRAM
in partial fulfillment of the requirements for the degree of
Bachelor of Agricultural Technology

at
PROGRAM STUDY OF AGRICULTURAL PRODUCT TECHNOLOGY
DEPARTMENT OF AGRICULTURAL TECHNOLOGY
FACULTY OF AGRICULTURE
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Thesis of Undergraduate Program

EFFECTS OF SKIMMED MILK POWDER AND SUGAR FORMULATION ON THE CHARACTERISTICS OF PROBIOTIC YOGURT ENRICHED BY GAC (*Momordica cochinchinensis*) AND PASSION FRUIT (*Passiflora edulis*)

By
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DECLARATION

I declare that this thesis of undergraduate program is the result of my own research and thoughts with the direction of my supervisor, except those being mentioned the source. This thesis of Bachelor's degree is being submitted in partial fulfilment of the requirements for the degree of Bachelor of Agricultural Technology at Sriwijaya University and has not previously been proposed for any degree. This statement is made with truth and if in the future, there is trouble found above statement, I agree to receive academic sanctions.

Indralaya, December 2013

Nafisah Eka Puteri

BIOGRAPHY

NAFISAH EKA PUTERI was born at Sleman, Yogyakarta, 31st July 1991. She is the first children of Mr. Haidinrek and Mrs. Zumrodah.

Nafisah finished primary school in 2003 at SDN 8 Tanjung Enim and junior high school in 2006 at SMP N 1 Tanjung Enim. In 2009, she finished the senior high school at SMA N 1 Muara Enim and joined the bachelor's degree program at Program Study of Agricultural Production Technology, Faculty of Agriculture, Sriwijaya University. During undergraduate program, she followed some organizations such as Badan Wakaf dan Pengkajian Islam (BWPI) in 2009/2010, Himpunan Mahasiswa Teknologi Pertanian (HIMATETA) in 2011/2012, Himpunan Mahasiswa Peduli Pangan Indonesia (HMPPI) in 2011/2013 and Perhimpunan Ahli Teknologi Pangan Indonesia (PATPI) in 2012.

Nafisah had ever done fieldwork entitled "Hygiene and Sanitation Revise of Lingga Sari Sumedang Tofu Processing at Indralaya" and KKN program entitled "Percontohan Kawasan Rumah Pangan Lestari" at Sejaro Sakti, Indralaya.

PREFACE

All praise to Allah SWT Who gave me the mercy for completion of this thesis of undergraduate program. The project in this thesis, entitled "Effects of Skimmed Milk Powder and Sugar Formulation on the Characteristics of Probiotic Yogurt Enriched by Gac (*Momordica cochinchinensis*) and Passion Fruit (*Passiflora edulis*)", was joint research between Walailak University and Sriwijaya University for assisting undergraduate student to obtain Bachelor's degree.

I must express my gratitude to my beloved parent as the main contributor in my life, who gave their love and taught many things for me. I was continually amazed by their willingness to make me great, and by the cheerfulness of my beloved sisters who prayed a lot for me.

I would like to express my gratitude to the Dean of Faculty of Agriculture, the Head and Secretary of Agricultural Technology Department, the Head of Program Study of Agricultural Product Technology and all of the staf member.

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I owe a lot to my colleagues from Walailak University who helped and supported me, Suda Lookong, Rosukon, Varangkanan Angkananon, Pam Panumas, Chitanon and Supada Songri. I am indebted to them for their help. I am pleased to thank every friend who made me feel love and enthusiastically finish this project, Dwi Maryeni, Nova Riska Ariyanti, Dessy Purnamasari, Niken Ayu Maharani, Widia Purnamasari, Dian Nurul Huda, Seftyara Wulandari, Meiyanti, Octa Andriani, Irfan Febriansyah and Anni Mardiyah. In addition, I would like to thank to the students of Agricultural Technology Department, Sriwijaya University, who supported and gave their smiles for me.

Finally, I would like to thank the Walailak University, not only for providing the funding which allowed me to undertake this research, but also for giving me the opportunity to attend many programmes and meet so many interesting people.

Author

Indralaya, December 2013

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I. INTRODUCTION

A. Background

Most people are aware of natural foods due to their benefits to health. This condition encourages the development of healthy foods such as functional foods. Functional foods are foods that are specifically processed to give physiological benefits or reduce the risk of disease (Wildman, 2007). Functional food was firstly introduced in Japan as the concept of foods for specific health used (FOSHU). Doyon and Labracque (2008) stated that functional food should include the key concepts of health benefits, the nature of the food, level of function, and consumption pattern. In other words, functional food should contain biologically active substances, probiotic organism, specific macronutrients or micronutrients.

Probiotic food which is included as functional foods, contains live and active bacteria cultures or food supplements that beneficially affect a host organism by improving its microbial balance, therefore probiotics contribute the possitive effect on gastrointestinal system (Neha *et al.*, 2012). The microorganisms in probiotic food might also produce beneficial subtances that prevent health problem in human digestive tract.

One of the product of probiotic foods is yogurt. Yogurt has long been recognized as healthy food due to its contribution to health benefit by maintaining healthy digestive system. The main ingredients in yogurt is milk. Milk is sterilized and added with probiotic yogurt starter. The starter will produce lactic acid which gives the sour taste in yogurt. Lactic acid reacts with protein in milk and results in

texture that similar to soft cooked agar in set yogurt, and creamy texture comes out when yogurt was stirred. The whole pure milk in yogurt is sometimes replaced by skimmed milk in order to reduce the fat content in the product (Edwards, 2000).

Yogurt has been modified to enhance its health effect and consumers' interests. Fruit juice or certain substance might be added into yogurt in order to enrich the vitamins and minerals in yogurt as well as its functionality. Sometimes, flavourant or colorant is added in order to enhance the flavour or color of yogurt. Petrotos *et al.* (2012) modified yogurt by adding 500 ppm of polyphenols that were extracted from olives. The polyphenols were first encapsulated in modified starch before being added into yogurt. Encapsulation could mask off the undesired color, bitterness effect, and improve the functionality.

One of fruits that is potential to be added in yogurt is gac (*Momordica cochinchinensis*). Gac aril contains substantial amount of lycopene and β-carotene (Kubola and Siriamornpun, 2011), and its addition in yogurt could increase the functionality of yogurt. Gac arils taste slightly bitter, therefore passion fruit (*Passiflora edulis*) is also added to mask off the unpleasant taste and flavour of gac. Passion fruit which has pleasant aroma and flavour is widely used to enhance the aroma in syrups and juices.

The characteristics of plain yogurt highly depend on the formulation of milk and sugar (Nifea *et al.*, 2012). The addition of gac aril and passion fruit puree in yogurt would affect the formulation of milk and sugar, and as a result, it could affect the characteristics of yogurt. This research focussed on formulating the skimmed milk, sugar, gac and passion fruit puree for yogurt making. Gac and passionfruit-

enriched yogurt was analyzed for its physical, chemical, microbiological and sensory characteristics.

B. Objective

The objective of this research was to analyze the physical, chemical, microbiological and sensory characteristics of gac and passion fruit-enriched yogurt which was formulated by different concentrations of skimmed milk and sugars.

C. Hypothesis

The different percentage of skimmed milk and sugar was significantly affect the physical, chemical, microbiological properties, and sensory profile of probiotic yogurt enriched by gac aril and passion fruit puree.

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