PROCEEDINGS

2nd National and International Research Conference 2018 (NIRC II 2018)

Peer Reviewers

Professor Dr. Chamnong Adiwattanasit

Professor Dr. Kriangsak Cheronwongsak

Professor Dr. Watchara Ngamchitchareon

Professor Dr. Bunthan Dokthaisong

Professor Dr. Anant Polthanee

Professor Dr. Amnat Suwannarit

Professor Dr. Thira Runcharoen

Professor Dr. Suntud Sirianuntapiboon

Professor Dr. R. Michael Smith

Professor Dr. Paul J. Vermette

Professor Dr. Thomas J. Sheeran

Professor Dr. Andrew Lian

Professor Dr. Will Barratt

Professor Dr. Leslie Barratt

Professor Dr. Ilhan Cagirgan

Professor Dr. Bim Prasad Shrestha

Professor Dr. Jung-Ja Jsai

Professor Dr. Dato Abdul Rani Bahaman

Professor Dr. Chian-Son Yu

Professor Dr. Yi YiMyint

Professor Dr. Ni Ni Hlaing

Professor Dr. Warren Prior

Professor Dr. Ted Yu-Chung Liu

Professor Shi Yunhui

Associate Professor Dr. David Hayes

Associate Professor Dr. Lloyd Kornelsen

Associate Professor Dr. Fung King-fai

Associate Professor Dr. Arshad Abd Samad

Associate Professor Dr. Manish Pokharel

Associate Professor Dr. Xiao Feng Lin

Associate Professor Pham Thi Hong Nhung

Associate Professor Dr. Anchalee Wannaruk

Associate Professor Dr. Channarong Intaraprasert

Associate Professor Dr.Makha Khittasangka

Associate Professor Dr. Wichai Vanpetch

Associate Professor Dr. Jintanaporn Wattanathorn

Associate Professor Dr. Yupin Techamanee

Associate Professor Dr.Yothin Sawangdee

Associate Professor Dr. Kwunkamol Donkwa

Associate Professor Dr. Warapol Aengwanich

Associate Professor Dr. Poramate Banterng

Associate Professor Dr. Chalermsak Pikulsri

Associate Professor Dr. Manop Wisutipat

Associate Professor Sombat Prajonsant

Assistant Professor Dr. Rabindra Bista

Assistant Professor Dr. Kutcharin Phunikhom

Assistant Professor Dr. Kittiphoom Suppalakpanya

Assistant Professor Dr. Sornchai Mungthaisong

Assistant Professor Dr. Cholvit Jearajit

Assistant Professor Dr. Pragasit Sitthitikul

Assistant Professor Dr. Aniwat Kaewjamnong

Assistant Professor Dr. Nomjit kaewthai Angdre

Assistant Professor Dr. Patcharee Suriya

Assistant Professor Dr. Patcharin Songsri

Assistant Professor Dr. Sahalap Homvutivong

Assistant Professor Dr. Sunanta Verakultawan

Assistant Professor Dr. Chookiat Jarat

Assistant Professor Dr. Akkarapon Nuemaihom

Assistant Professor Dr. Nawamin Prachanannt

Dr. Nayan Deep S. Kanwal

Dr. Ashok R. Thorat

Dr. Ngo Thi Thanh Van

Dr. Abu Bakar Razali

Dr. Truong Bach Le

Dr. Edna Luisa A. Matienzo

Dr. Diana Freeman

Dr. Dhirawit Pinyonatthagarn

Dr. Jidapa Suwannarurk

Dr. Nisit Intamano

Message from the President of Buriram Rajabhat University

Research has become a very important tool used to contribute economic and social development of the country. Moreover, the capacity for research is a significant indicator of value and process of Thailand competition and development. Learning via practice is to propel Thai society into the wise society. The utilization or dissemination of research results to the academic circles leads to social problem solution and higher research development with the development of current trend towards Thailand 4.0. So, it is necessary for every educational institute to enhance its students, lecturers, and staffs to become entrepreneurship researchers who can develop and adapt themselves to the current change and dare to think and be creative for the bodies of new knowledge, the innovation development, and the technology transfer that can be used commercially and is beneficial to social development.

Buriram Rajabhat University has an important role in developing the locality and producing students in bachelor's degree, master's degree, and doctoral degree. Besides, one of its roles is to propel and disseminate lecturers' and students' research works for the academic achievement of the 2nd National and International Research Conference 2018 under the theme "Entrepreneurial University in the 21st Century: Development of Entrepreneurship Education and Research for Social Sustainability". This is to provide an opportunity for organizations, researchers, academicians, and general people who are interested in participating in the conference and presenting research works, productivities, products, and innovations resulting from the invention research as well as expressing their opinions on the development of the research, the invention, and the utilization. It also furthers great academic achievement to bring research results to the public. Therefore, this conference is organized by the graduate school cooperating with the various faculties and the institute of Research and Development, Buriram Rajabhat University. It is also fully appreciated in holding this conference to have local and international educational institutions' participation in supporting this mission.

On behalf of Buriram Rajabhat University, I warmly welcome experts, scholars, researchers, lecturers, students, and participants to this conference. I also would like to express my sincere thanks to keynote speaker: Associate Professor Dr. Peeradet Thong-amphai, the Director of Knowledge Network Institute and featured speakers: Professor Dr. R. Michael Smith from Niagara University, Lewiston, New York, U.S.A, Professor Dr. Hlaing from Mandalay University of Distance Education (MUDE), Myanma, Professor Dr. William Barratt and Professor Dr. Leslie Barratt from Roi Et Rajabhat University, including peer reviewers, commentators, and all working staffs who cooperate in running this conference. I wish the NIRC II every success in all objectives and highly hope that academic research presentations in this conference will be very useful to everybody.

(Associate Professor Malinee Chutopama)

Acting for President of Buriram Rajabhat University

Message from the Secretaries of the Organizing Committee

The Graduate School, the Faculty of Humanities and Social Sciences, the Faculty of Education, the Faculty of Science, the Faculty of Agricultural Technology, the Faculty of Management Science, Faculty of Industrial Technology, and the Research and Development Institute have been assigned by Buriram Rajabhat University to organize the 2nd National and International Research Conference: NIRC II 2018 on 15th -16th February 2018. Moreover, there are 14 educational institutes from different countries participating in co-hosting this conference. Two purposes of the conference are: 1) to disseminate research works of researchers, academicians, lecturers, and students from both Thailand and other countries, and 2) to provide the national and international forums for exchanging knowledge of conducting research and producing academic works. In this event, there are a lot of Thai and foreign researchers, academicians, lecturers, and students who are interested in presenting research papers. Moreover, full research and academic papers read and evaluated by peer reviewers through the required criteria will be published in the proceedings and 17 academic journals from both Thailand and other countries. It is noted that the research and academic articles published in the conference proceedings and journals can be claimed for an academic title and postgraduate students' graduation.

Buriram Rajabhat University was supported to organize this conference by the Office of the Higher Education Commission and the Knowledge Network Institute of Thailand. Therefore, the organizing committee would like to give special thanks to these two institutes, and also to express sincere thanks to both Thai and foreign peer reviewers and all participants. The organizing committee highly hopes that this conference will be beneficial to the participants to apply the obtained knowledge and experience to their academic and professional works.

(Asst. Prof. Dr. Narumon Somkuna) Committee and Secretary of the Organizing Committee	(Asst. Prof. Dr. Akkarapon Nuemaihom) Committee and Secretary of the Organizing Committee

The 2nd National and International Research Conference 2018: NIRC II 2018

"Entrepreneurial University in the 21st Century: Development of Entrepreneurship Education and Research for Social Sustainability"

15th-16th February 2018

Venue: Buriram Rajabhat University

Rationale

Research has become a very important tool used to contribute economic and social development of the country. Moreover, the capacity for research is a significant indicator of value and process of Thailand competition and development. Learning via practice is to propel Thai society into the wise society. The utilization or dissemination of research results to the academic circles leads to social problem solution and higher research development with the development of current trend towards Thailand 4.0. So, it is necessary for every educational institute to enhance its students, lecturers, and staffs to become entrepreneurship researchers who can develop and adapt themselves to the current change and dare to think and be creativefor the bodies of new knowledge, the innovation development , and the technology transfer that can be used commercially and beneficial to social development. Buriram Rajabhat University is the institute established with the following main objectives: local development, intelligence empowerment of the land, learning restoration, local wisdom promotion, arts creation, and technologytransfer to the community for sustainable progress and public development, and participation in managing, preserving, maintaining, and utilizing natural resources and environment with balance and sustainability.Thus, Buriram Rajabhat University by the Graduate School is going to organize the 2nd national and international academic conference to bring the benefits to the society as a whole under the theme "Entrepreneurial University in the 21st Century: Development of Entrepreneurship Education and Research for Social Sustainability". This is to provide an opportunity for organizations, researchers, academicians, and general people who are interested in participating in the conference and presenting research works, productivities, products, and innovations resulting from the invention research as well as encouraging and supporting students, researchers in different fields of studies, and general people to provide a platform and an opportunity for organizing

academic seminars, disseminating research works , and sharing their research experiences. This conference will be taking place on 15th -16th February 2018 at Buriram Rajabhat University, Muang district, Buriram province. The objectives of this conference are as follows:

1. To provide both national and international forums for presenting research and creative innovation of Thai and foreign students, lecturers, personnel, and researchers from all Rajabhat Universities and other institutions,

2. To promote efficient research and innovation created by lecturers, personnel, and students, and researchers of Rajabhat Universities and university networks both at home and abroad,

3. To promote learning activities to improve the quality and standards of research, creative works and innovation that can be truly utilized in developing local community, society and country as a whole,

4. To provide a platform and an opportunity for lecturers, students and researchers of Rajabhat Universities and university networks both at home and abroad to present good research and to exchange their knowledge that will lead to the development of the country,

5. To be an important mechanism for linking Thai efficient research leading to the target groups of users in academic, policy, social, and community both at home and abroad.

Conference Themes and Disciplines

1. Keynote speech on "Entrepreneurial University in the 21st Century: Development of Entrepreneurship Education and Research for Social Sustainability" by Keynote Speaker: Associate Professor Dr. Peeradet Thong-amphai, Director of Knowledge Network Institute of Thailand .

2. Research paper presentations consist of an oral presentation in presentation room and a poster presentation in the exhibition area. For the poster presentation, the presenters must be at their booth to present their works and answer the questions. Here are the areas for presentations at the conference:

Call for papers at a national level:

1) Education and Culture
2) Humanities and Social Sciences
3) Science and Technology
4) Health Sciences
5) Management and Tourism
6) Creative and Innovative work

Call for papers at an international level:

1) Education and Culture

2) Humanities and Social Sciences

3) Science and Technology

4) Science

5) Business Administration

The papers will be published in the proceedings and also eight journals consis three Thai journals from Buriram Rajabhat University, six Thai journals from Rajabh University Networks, and seven international journals as the following:

1. Five academic journals of Buriram Rajabhat University: Rommayas Journal (TCI 1), Buriram Rajabhat University Academic Journal (TCI 2), Journal of I and Development Buriram Rajabhat University (TCI 2), Buriram Rajabhat University School Academic Journal, and Buriram Rajabhat University Management Science Jo

2. Six academic journals of Rajabhat University Networks: Research J Humanities and Social Sciences Phranakhon Rajabhat University (TCI 1), Research J Science and Technology Phranakhon Rajabhat University (TCI 1), Journal of Researc Development Loei Rajabhat University (TCI 2), Academic Journal Uttaradit Rajabha University (TCI 2), Golden Teak: Humanity and Social Science Journal (TCI 2), and Rajabhat University Academic Journal(TCI 2)

3. Seven international journals: International Journal of Education and (IJEC), International Journal of Social and Educational Ranking (USER), Internationa of TESOL and Learning (IJTL), Language and Communication Quarterly (LCQ), Lea and Policy Quarterly (LPQ), Asian Journal of English Studies, India, and An Internat Journal of Contemporary Issue (UGC), India

Organizers:

1. Key co-host organizers:

- Graduate school
- Faculty of Humanities and Social Sciences
- Faculty of Education
- Faculty of Science
- Faculty of Management Science
- Faculty of Agricultural Technology
- Faculty of Industrial Technology
- Research and Development Institute

2. In Association with:

- Niagara University, U.S.A.
- University of Winnipeg, Canada,
- Akdeniz University, Turkey
- Universiti Putra Malaysia, UPM Malaysia
- Hue University College of Foreign Languages, Vietnam
- Ton DucThang University, Vietnam
- Philippine State College of Aeronautics, the Philippines
- Qiannan Normal University for Nationalities, China
- Shangrao Normal University, China
- Kathmandu University, Nepal
- Royal University of Phnom Penh, Cambodia
- National Pingtung University, Taiwan
- Institute of Advanced Studies in English, India
- Savannakhet Teacher Training Collage, Laos PRD
- Mandalay University of Distance Education, Myanmar

The 2nd National and International Research Conference 2018: NIRC II 2018
"Entrepreneurial University in the 21st Century: Development of Entrepreneurship Education and Research for Social Sustainability"
Date: 15 – 16 February 2018
Venue: Buriram Rajabhat University, Thailand

.....

Conference Program

Date/Time	Activities/Venue
15 February 2018	
12.00 am. - 12.50 pm.	Registration Venue: Graduate School Meeting Room, Building 15, Floor 9
01.00 pm.	Opening Ceremony Opening Keynote: Associate Professor Malinee Chutopama, Acting for the President of Buriram Rajabhat University Venue: Graduate School Meeting Room, Building 15, Floor 9
01.00 pm. - 05.00 pm.	Training Workshop on "Learning Motivation and Classroom Management" Keynote Speakers from Niagara University, U.S.A.: Professor Dr. R. Michael Smith, Associate Professor Dr. Patricia Briscoe, Associate Professor Dr. Lisa Kilanowski
05.30 pm. - 08.30 pm.	Dinner talk and welcome party
16 February 2018	
08.00 am. - 09.00 am.	Registration Venue: Witcha Attasart Auditorium
09.00 am. - 09.30 am.	Opening Ceremony Opening Keynote: M.L. Priyada Diskul Secretary of the Minister of Education
09.30 am. - 11.00 am.	Keynote Address: "Entrepreneurial University in the 21st Century: Development of Entrepreneurship Education and Research for Social Sustainability" Keynote Speaker: Associate Professor Dr. Peeradet Thong-amphai Director of Knowledge Network Institute of Thailand
12.00 am. - 01.00 pm.	**Lunch Break**
01.00 pm.	Ribbon Cutting Ceremony of Poster Presentations by BRU President Venue: Witcha Attasart Auditorium
01.10 pm. - 02.00 pm.	**Poster Presentations** **N.B.:** Certificate Awarding Ceremony at 02.30 pm. by Assistant Professor Dr. Siranee Chutopama Venue: Witcha Attasart Auditorium
01.00 pm. - 07.00 pm.	**National Paper Presentations: Oral Presentations**

Date/Time	Activities/Venue
	1. Room 150701 : Management and Tourism **2. Room 150703/1** : Education and Culture **3. Room 150703/2** : Creative and Innovative Work, Science and Technology, and Heath Science **4. Room 150704/1** : Creative and Innovative Work, Science and Technology, and Health Science **5. Room 150704/2** : Humanities and Social Sciences **N.B.:** Certificate Awarding Ceremony in each presentation session
01.00 pm. - 07.00 pm.	International Paper Presentations: Oral Presentations **1. Graduate School Meeting Room, Floor 9 : Education and Culture** Featured Speaker: Prof. Dr. R. Michael Smith, Niagara University, U.S.A. **2. Room 150905/1, Floor 9: Education and Culture** Featured Speaker: Assoc. Prof. Dr. Lisa Kilanowski, Niagara University, U.S.A. **3. Room 150905/2, Floor 9: Education and Culture** Featured Speaker: Prof. Dr. Ni Ni Hlaing, Mandalay University of Distance Education (MUDE), Myanmar **4. Room 150901, Floor 9: Humanities and Social Sciences** Featured Speaker: Prof. Dr. Leslie Barratt, Roi Et Rajabhat University **5. Room 150601, Floor 6: Science and Technology** Featured Speaker: Prof. Dr. Will Barratt, Roi Et Rajabhat University **6. Sueksitalai Meeting Room, Floor 8: Business Administration** Featured Speaker: Assoc. Prof. Dr. Patricia Briscoe, Niagara University, U.S.A. N.B.: Certificate Awarding Ceremony in each presentation session

Oral Presentation Schedule for NIRC II

(Parallel Session)

Date: 16th February 2018

Venue: Chaloem Phrakiat Maha Vajiralongkorn's 50th Anniversary Building (15th Building)

Buriram Rajabhat University, Thailand

Time	Title/Author	Commentator 1	Commentator 2	NB
Parallel Session I / Room: Graduate School Conference Room, Floor 9				
1	Constructivism and Entrepreneurial Education: A Global Comparison *Prof. Dr. R. Michael Smith **(Featured Speaker)**	Prof. Dr. R. Michael Smith Dr. Dhirawit Pinyonatthagarn		**Featured speaker:** Prof. Dr. R. Michael Smith
2	English Boot Camp Curriculum Proposal: A Training Course in Critical Reflection for Thai Primary Teachers Saengkae Khonghuayrob			
3	Factor Analysis of Quality Culture for School Administrators under the Offices of Secondary Educational Service Areas in the Northeast of Thailand *Thanit Punprakhon			
4	Problem Status and Guidelines for Administration of Muaythai Activities for Basic Education Schools *Pinid Nimprang			
5	The Development of the Prototype Early Children Center in the Lower Northeastern Region *Petchara Phromtuang			

6	The development on the teachers' competencies in English for communication teaching of primary school under the lower northeastern region *Thatyalak Wetchkama		
7	The Effect of Using Drama-based Activities to Improve Grade Six Students' Speaking Ability *Duangkamon Stankulov		
8	Development of Applications on Android Operating System for the Water Analysis Rice Farming and A trial on Consumptive use for farming *Phisit Pornpongtechavanich		
9	The Roles of Needs Analysis to Design ESP Courses *Somyong Som-in		
Parallel Session II / Room: 150901, Floor 9			
1	Developing Entrepreneurial Language Learners *Prof. Dr. Leslie Barratt **(Featured Speaker)**	Prof. Dr. Leslie Barratt Assoc. Prof. Dr. Anchalee Wannaruk	**Featured speaker:** Prof. Dr. Leslie Barratt
2	Buddhist Psychology for Creativity Learning Development *Sumeth Boonmaya		
3	A Study of Strategies in Translating Comedy Movie from English into Thai: a Case Study of Bridesmaids *Jutirat Srimuang		
4	An investigation on Thai Flight Attendants English Usage Needs for the Preparation of Designing the Conversation Package: English for Flight Attendant *Nitipan Leelasuwattanakul		
5	Using an Electronic Bilingualised Dictionary to Develop Vocabulary Learning for Low Proficiency Mathayom Suksa 5 Students *Apinya Kitueawiriya		

6	The Development of Group Counseling Model in Conducting Thesis to Meet the Educational Expectations of Graduate Students *Arun Jutiphon		
7	Thai Students' Perceptions on Using Project-based Learning to Develop CEFR Vocabulary Learning *Sutthinee Chailark		
8	Strategies Used for Translating the English Bible into Thai: A Case Study of Exodus *Phichit Sukeewat		
Parallel Session III / Room: 150601, Floor 6			
1	Growing from Dependence to Independence to Interdependence for Entrepreneurship Education *Prof. Dr. Will Barratt **(Featured Speaker)**	Prof. Dr. Will Barratt Asst. Prof. Dr. Nawamin Prachanant	**Featured speaker:** Prof. Dr. Will Barratt
2	Effects of Training Skill in Basketball on Anthropometry and Physical Performance of Thai and Chinese Exchange Students at Buriram Rajabhat University *Pruchya Chumvangvapee		
3	Using Think-Aloud Strategies in Listening Comprehension *Rattiya Phumsaidorn		
4	Effect of dietary supplementation of moringa (Moringa oleifera) leaf meal and turmeric (Curcuma longa L.) on productive performance of native chickens *Narumon Somkuna		
5	Information Literacy of Fabric-Weavers to Promote Potentiality on Hand-Woven Fabric in Surin Province, Thailand *Sarapee wantrong		
6	Screening the Acute Toxicity and Antimicrobial Activity of Rhizomes of *Kaempferia glanga* L (Kungsa - ga- mon)		

	*Myint Myint Khine		
7	The study of rapidly available glucose and slowly available glucose of Kluai Hin Banana (Musa sapientum) flour for utilization of noodles *Namfon Baowthongkum		
8	The Study of Preparation and Corrosion Resistance of Ceria Film on Aluminum Alloys *Sunisa Supakanapitak		
9	Experimental Investigation on Sugar Cane Bagasse Ash and Stone dust As The Interlocking Block Material *Cheellawad Vimuttasoongviriya		
Parallel Session 4 / Room: Sueksitalai Meeting Room, Floor 8			
1	Becoming an entrepreneurial researcher: Promoting and mobilizing research based evidence to inform positive changes in practice *Assoc. Prof. Dr. Patricia Briscoe **(Featured Speaker)**	Assoc. Prof. Dr. Patricia Briscoe Asst. Prof. Dr. Chongrak Liangpanit	**Featured speaker:** Asst. Prof. Dr. Patricia Briscoe
2	Driving the knowledge of Sufficiency Economy Philosophy for Proper Practice to the Agriculturists planning the Rubber in Lahansai Sub-district, Buriram *Preecha Panoram		
3	The Community Management to Develop Local Entrepreneurs for Creating Cultural-Tourism Village: A Case Study of Naplajad Village, Huaypha District, Mua *Chutimun Sasong		
4	The Development of Community Potential in Faith-based Identities to Manage Sustainable Tourism in Pambok Village, Pai District, Mae Hong Son Province *Sanya Sasong		
5	Attitudes and Self Care among Teenage Pregnancy in Ban Na Fai, Chaiyaphum, Thailand *Sasirin Krasinhom		
6	Using Social-Network to Promote the Writing Skill		

	*Chanata Somanawattana		
7	The Development Model of Learning Leadership for Private School Administrators *Suraroj Nualmangsor		
Parallel Session 5 / Room: 150905/1, Floor 9			
1	School Psychologists' Ability to Assist LGBQ Youth *Assoc. Prof. Dr. Lisa Kilanowski **(Featured Speaker)**	Assoc. Prof. Dr. Lisa Kilanowski Asst. Prof. Dr. Prakasit Sitthitikorn	**Featured speaker:** Assoc. Prof. Dr. Lisa Kilanowski
2	A Study of Music Learning management in Secondary school in Buriram Province *Thiti Panyain		
3	Reading Strategies Employed in English Teaching of High School Teachers in Buriram Province *Mattharin Ruangram		
4	The Development of Translation Learning through Mobile Learning Package *Peraluk Ruksaprakhon		
5	Study of using behavior of smart phone mobile of science and mathematics students in education at Savannakhet Teacher Training College *Bounpone PHETBOUNHEUANG		
6	Study on Competencies in Mathematics of Lower Secondary Schools Students in Savannakhet Province, Examined with TIMSS 2011 Standards *Phailath Sythong		
7	The Development of English Writing Ability Using the Process Approach and Scaffolding Technique of the Second Year Students at Udon Thani Rajabhat University *Phuchayoung Kongcharoen		
8	The Role of Indra in King Rama I's Ramakirti *Porncharnok Chatchamni		

Parallel Session 6 / Room: 150905/2, Floor 9			
1	The Importance of Entrepreneurship Education towards Enhancing Sustainable Development in the Context of Myanmar *Prof. Dr. Ni Ni Hlaing **(Featured Speaker)**	Prof. Dr. Ni Ni Hlaing Asst. Prof. Dr. Akkarapon Nuemaihom	**Featured speaker:** Prof. Dr. Ni Ni Hlaing
2	The Study of Behavioral Relationship in Using Services at Spa in Mueang District, Nakhonratchasima Province *Wankasem Sattayanuchit		
3	The transformational Leadership of School Administrators the Group Charity School in Buddhist Temples *Ekachai Chayametee		
4	Move Structure of the Introduction Sections of PhD Theses in Myanmar *Ni Ni Hlaing		
5	Exploring the Leadership Styles of Teachers at an Ethnic Boarding School in Lao PDR *Katika Rajboutra		
6	Possibility of Alienation at University as Experienced by a Specific Group of Myanmar Youths *Khin Mar Mar		
7	Forms and Dimensions of Alienation Found in Modern American Fictions *Amy Kyaw		
8	Needs of Teacher Candidates for TOEIC Short-Course Instruction of Buriram Rajabhat University Language Center *Pallapa Lertcharoenwanich		
9	English Communication Problems Faced by English Majors at Buriram Rajabhat University Akkarapon Nuemaihom		

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont.)

The Study of Rapidly Available Glucose and Slowly Available Glucose of Kluai Hin Banana (Musa sapientum) Flour for Utilization of Noodles

Namfon Baowthongkum[1]

[1]Faculty of Education, Phetchabun Rajabhat University, 67000, Thailand
E-mail: namfon_wk@hotmail.com

Abstract

Banana (*Musa sapientum*) is a good source of dietary fructo-oligosaccharide, which are considered to be functional components of food. They were impact energy consumption, Herein, Healthy volunteers consumed unripe banana flour. Banana flour (BF) and ratio of noodle with 2.5 of BF and 3.0 of BF, the values of total sugar were 66.4, 54.4 and 73.2 µg/mL; reducing sugar glucose were 7.8, 17.3 and 19.8 µg/mL; rapidly available glucose (RAG) were 44.4±2.78, 27.2±2.97 and 29.4±2.97 g/100g flour; and slowly available glucose (SAG) were 28.1±0.66, 16.2±1.02 and 25.0±1.91 g/100g flour g/100g flour, respectively.

Keywords: banana flour, banana noodles, RAG, SAG, Total sugar, reducing sugar

1. Introduction

The noodle industry is an important industry in Thailand because noodles are the main food in the daily life of Thai people, secondary to rice. As a result, Entrepreneur of the noodle industry in large industrial plants, Medium industry and Small and medium sized enterprises (SMEs) spread across all regions of the country. From visiting the noodle factory, "Small and Medium Industry" project found problems such as contaminants from oil in fresh noodles that harm consumers which cause low quality. Rice with high amylose was the raw material for the production of noodle, and wheat allergy consumer from aboard tuned to eat rice flour from Thai rice from flour. Some food additives were used in noodles, such as benzoic acid and sorbic acid preservatives exceed the standards, especially in small lines is

harmful to health. (Innawong, 2008). At present, consumer pay more interested in health and the healthy foods or functional foods were more popular with consumers. The elderly and diabetic patients chooses to eat healthy foods. Diabetes patients had high blood glucose levels due to lack of hormone insulin to burn energy into the activities of the body. If such deficiency occurs, the body will not be able to use the blood sugar, resulting in high blood sugar. Most diets were converted to glucose in the bloodstream, so dietary regulation is one of the key ways to control blood sugar. Each carbohydrate was digested and absorbed into the body at a different rate. Glycemic index (GI) diets will increase blood glucose levels faster than GI foods. Lower GI foods will be slowed down. Glucose is released into the blood stream slowly. Blood sugar levels are also slow. The study carbohydrate digestion in rice or food into sugar using *In vitro* rapidly available glucose (RAG) which measures the amount of glucose obtained by digesting carbohydrates with enzymes rapidly in 20 minutes and then slowly available glucose (SAG) was carbohydrate residue the enzyme 100 minutes later. This test found that consistent with the human glucose index trial and showed the relationship between RAG and glycemic index (Sahaspot, Charoensiri, & Kongkachuichai, 2015). The study was to process nutritional rice noodle with malt flour. Two varieties of rice were used as ingredient for malt production as Chai-nat1 and Suphan-buri 1 that amylose content were 30.50% and 33.4% respectively. The panelists accepted the product with the formular of Chai-nat1 30%, malt flour 15%, modified starch 10%, xanthan gum 0.1%, tapioca flour 4% and prepare by 40% slurry. Nutritional quality of finished product were 57.67% moisture content, 7.42% protein, 0.44% fiber and γ-aminobutyric acid (GABA) 0.20 mg/100 g (Surakarnkul, & Unparsert, 2013). Mixing vegetables and whole grains was high in fiber and the noodles are colorful (Porntavan, 2014). The development of noodle product from germinated mung bean flour. The value of a* and b* value of noodle sheet with ratio of flour to water of 1:3 were higher than the ratio of flour to water of 1:4 while the L* value of noodle sheet with ratio of flour to water of 1:3. The result of consumer's sensory acceptance in the terms of color, flavor, chewiness, softness and overall acceptance showed no significant difference in all product ($p>0.05$) (Buranachokpaisan, 2013). Rice flour substitution with 10 percent banana flour had the highest overall acceptability, and had the lowest breaking noodle 4.13 which within the standard acceptable level.

The chemical components of 10 percent banana flour substituted sample were 55.16-68.77 percent moisture, 2.58-3.22 percent protein, 1.68-3.26 percent fat, 0.41-0.51 percent fiber, 1.98-2.28 percent ash and 24.28-35.87 percent carbohydrate. These chemical compositions was significantly different from the normal noodle in the market. Therefor the more nutrition product is obtained (Aussawasathein, & Nilnate, 2005). An unripe Hom Tong banana flour in pasta had the enzymatic resistant starch (RS) higher than of unripe Namwa and Khai banana flour. The amylose content of these flour were high, between 38.33-44.67%, however, the solubility were not significantly different ($p<0.05$) and swelling power were low (between 6.12-7.92). The chemical composition analysis showed that Hom Thong banana pasta had high fiber and ash content than those of control. All of Hom Thong banana pasta had lower glucose content (mg/ 100 g starch) from enzymatic hydrolysis than control and pasta that substituted with Hom Thong banana flour at 45% was the lowest in the glucose content. (Boonkong, Bunmee, & Ruenkeaw, 2014) Oligosaccharide is carbohydrates of a food made from all kinds of plants. Bananas had carbohydrate content and low glycemic index. Bananas also contain substances in the energy, vitamins and minerals that are beneficial to the body. Banana (*Musa sapientum*, ABB group) is one of the most popular in other parts of the world especially in tropical regions. It is a climacteric fruit, generally consumed in a ripe state; ulwent, a large amount of ripe banana are lost during commercialization. They are quickly perishable and if the processes of harvesting, and transporting are not done properly, the Bananas will soon decompose and become unwholesome. For human consumption (Moongngarm et al., 2014). The chemical of Kluai Hin starch or Green Bananas (*Musa sapientum*) starch contained ash content 0.97%, protein content 0.57%, fiber content 0.65%, carbohydrate content 34.76% and dry starch content 24.09%. The objective of the present study was *In vitro* measurement of free sugar glucose, total glucose, rapidly available glucose (RAG) and slowly available glucose (SAG) of unripe banana flour and banana noodles. And 50 consumer testing and evaluation of sensory acceptance.

2. Research Objectives

1.1 measurement of total sugar and reducing sugar glucose contain in banana flour and banana noodles

1.2 measurement of rapidly available glucose (RAG) and slowly available glucose (SAG) value contain on banana flour and banana noodles

3. Materials and Methods

3.1 Source of materials

Mature green but unripe bananas (*Musa sapientum*) were from farm in Wangchompoo Maung district, Phetchabun Province of Thailand. Glucose Oxidase/Peroxidase Reagent (sigma Chemical Co. Ltd.). Alpha-Amylase from A. oryzae (sigma Chemical Co. Ltd.). Pepsin from Porcine gastric mucosa (sigma Chemical Co. Ltd.).

3.2 Preparation of banana flour

Banana flour were prepared applied by Bakare et al., (2016); Bi et al., (2017). The fruits were washed and separated into pulp and peel. To manually sliced into basin. The banana slices were placed on sieve. It was the dried in open-flow oven (Memmert E07086) at 70 ^{o}C for 18 h. The dried chips were milled to flour in a mill to pass through 60 mesh screens to obtain banana pulp flour. Flour was stored in airtight plastic packs in cold storage (4±2 ^{o}C) for further analyses.

3.3 Noodle preparation

Formulations for the noodles are show in Table 1 and noodles were prepared using the method applied by Sirilert, (2009), and Surakarnkul & Unprasert (2013). Noodles were made in triplicate and prepare in random manner. Banana flour dissolved in water and added to tapioca flour and rice flour. Materials for noodles were incorporated by mixer. The mixture was then mixed as speed 1 and the speed was raised one level per subsequent minute up till speed 3. The speed of the mixer was then slowed down level by level for every 2 min and was stopped to tally at the 10th min. The dough was removed and placed in a pot for sheeting with a steaming pot 3 min. The dried banana noodle in open-flow oven at 80 ^{o}C for 8 h. Noodle was stored in airtight plastic packs in cold storage (4±2 ^{o}C) for further analyses.

Noodles were cooked in a pot of boiling water for 10 min. Cooked noodles were left to cool at room temperature prior to analyses 50 consumer's sensory acceptance.

Table 1 Formulation ratio on Banana flour: tapioca flour: rice flour of standard and samples noodles

Ratio of Ingredients	Types of noodles		
	Standard	BF noodles 1	BF noodles 2
Banana flour	-	2.5	3.0
tapioca flour	1.0	1.0	0.5
rice flour	3.0	0.5	0.5
water	7.0	7.0	7.0

3.4 In vitro measurement of total sugar and reducing sugar glucose

Acid extracts of banana flour and banana noodles were each incubated with sodium acetate buffer pH 4-8 at 55 ^{o}C for 2 h. Fructose and glucose were measured using Phenol suplhuric acid method for total sugar (Fan, 2015). Procedure for Benedict test method for reducing sugar. Place 0.5 mL each test solution in separate test tube. Add 2 mL of Benedict's reagent to each tube. Heat for 2 min in boiling water. Remove tubes from the water with a test tube holder, place in test tube rack and allow cooling. Pipette the cooled solutions into spectrophotometer tube for measurement at 630 nm. Glucose was standard curve concentration 0 – 1,000 µg/mL.

3.5 In vitro measurement of rapidly available glucose (RAG) and slowly available glucose (SAG)

RAG and SAG measurement by Englyst et al. (1999) and Al-Mssallem, Frost, & Brown, (2014). Samples of banana flour and banana noodles were weighed to the nearest milligram into 50 mL polypropylene centrifuge tube. Internal standard solution (5 mL of 40 g arabinose/L in water with 50% saturated benzoic acid) 10 mL freshly prepared pepsin-guar gum solution (5 g pepsin/L and 5 g guar gum/L in 0.05 mol HCl/L) was added. The tubes were capped and contents were vortex mixed and place into a water bath at 37 ^{o}C for 30 min to allow hydrolysis of proteins by pepsin. Five milliliters 0.5 mol sodium acetate/L (equilibrated to 37 ^{o}C) was added to each tubes were capped and shaken gently to disperse the contents and then place in the 37 ^{o}C water bath, the glass balls function to mechanically disrupt the physical structure of the samples drying the main incubation. The guar gum standardizes viscosity, keeps the sample is suspension, and prevents its sedimentation and excessive disruption by the glass balls.

One sample tube was removed from the 37 ^{o}C water bath and 5 mL enzyme mixture added. The tube was immediately capped and the contents mixed gently by inversion before it was secured horizontally in the 37 ^{o}C shaking water bath. The shaking action of the water bath was started at this time, which was taken as time zero for the incubation and was not interrupted

until all the G_{120} portions were collected. The enzyme mixture was added to the rest of the sample tubes at 1 min intervals, to aid timing of incubations, and they were placed into the shaking water bath. Each tube was removed from the bath exactly 20 min after the enzyme mixture was added and 0.2 mL of the contents was added to 4 mL absolute ethanol and vortex mixed to stop the hydrolysis; this was the G_{20} portion. The tube was returned to the shaking water bath immediately after the sample was taken. After another 100 min (a 120 min incubation) and measured for glucose which was then used to calculate the RAG and SAG values, respectively. The released glucose from each of the samples was determined calorimetrically using Glucose Oxidase/Peroxidase Reagent (sigma Chemical Co. Ltd.) The released glucose content at different time (0, 10, 20, 30, 45, 60, 90, and 120 min) was measured using a glucose oxidase/peroxidase reagent. RAG and SAG were calculated as follows:

$$\%\text{glucose} = \frac{(A_t - A_b) \times C \times V \times D}{A_s \times w} \times 100$$

Where A_t is the absorbance of the test solution at 520 nm, A_b is the absorbance of the blank solution at 520 nm. C is the concentration of the standard solution (in g glucose/L, offered by the glucose oxidase/peroxidase reagent), V is the total volume of the test solution, D is a dilution factor, A_s is the absorbance of the standard solution at 520 nm, and w is the weight (in g) of sample taken for analysis, which may be corrected for moisture (Bi et al, 2017).

$$\text{RAG} = G_{20} \quad (1)$$

$$\text{SAG} = G_{120} \quad (2)$$

$$\text{RDS} = (G_{20} - \text{FSG}) \times 0.9 \quad (3)$$

$$\text{SDS} = (G_{120} - G_{20}) \times 0.9 \quad (4)$$

Where FSG is the free sugar glucose content (Englyst, 1999).

3.6 Sensory evaluation consumer

Sensory qualities of the samples were evaluated in terms of color, flavor, texture and overall acceptance. Each attribute was evaluated using a 5-point hedonic scale and evaluated by 50 students (Gender: 5 males and 45 females, Age: 20-22 years). The samples were boiled by water filter 3 min. comparison with standard noodles (standard scale). Divided sensory evaluation of scale is used for intensity rating scale is unipolar with descriptions such as 1 = none, 2 = slight, 3 = moderate, 4 = strong, and 5 = very strong in 5 score (Asif-UI-Alam, Islam, Hoque, & Monalisa, 2014). The optimal ratio of banana flour in the noodles was investigated using sensory qualities in comparison to the standard noodles standard scale.

3.7 Statistical analysis

Data was analyzed using analysis of variance (ANOVA) to determine significant difference among the various samples in triplicate.

4. Results

4.1 Color of standard and BF noodles

Banana pulp flour produced in this study was yellowish in color with visible dark sport scattering about the flour sample. The dimension of the banana noodles was designed to be flat in case of texture evaluation. Banana noodles were brown color. The standard noodles produced were white color. The color analysis indicated that banana noodles were darker (Lower L* value) than standard noodles.

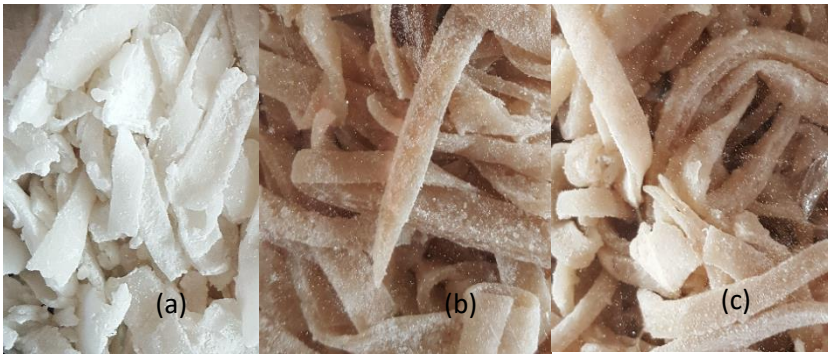

Fig 1. Image of noodles (a) standard (b) ratio 2.5 of BF noodles 1 (c) ratio 3.0 of BF noodles 2

4.2 Total sugar and reducing sugar glucose content of banana flour and noodles

The results of in vitro measurement of total sugar and reducing sugar glucose showed in Table 2. Found that banana flour total sugar content of 66.4 µg/mL, tapioca flour content of 79.3 µg/mL and rice flour content of 68.0 µg/mL. In total sugar of BF noodles recipe 1 content of 54.3 µg/mL, BF noodles recipe 2 content of 73.2 µg/mL and noodles standard content of 75.6 µg/mL, respectively. In the present study reducing sugar content bananas flour and banana noodles measurement by Benedict's method found that the reducing sugar of banana flour content of 7.8 µg/mL, tapioca flour content of 7.0 µg/mL and rice flour content of 23.0 µg/mL and BF noodles recipe 1 content of 17.3 µg/mL, BF noodles recipe 2 content of 19.8 µg/mL and noodles standard content of 10.8 µg/mL.

Table 2 Sugar composition of the test food

Types of sugar (µg/mL)	Flour			Noodles		
	Banana	tapioca	rice	Standard	BF 1	BF 2
total sugar	66.4	79.3	68.0	75.6	54.4	73.2
reducing sugar	7.8	7.0	23.3	10.8	17.3	19.8

4.3 Rapidly available glucose (RAG) and Slowly available glucose (SAG)

Data regarding the RAG and SAG content of banana flour and banana noodles are shown in Table 3. RAG values for the lowest in standard noodles were 22.8±0.19 g and highest in banana flour were 44.4±2.78 g (g/100g of standard noodles) and SAG values for the lowest in standard noodles were 11.6±0.54 g and highest in BF were 28.1±0.66 g, respectively. The SAG value in the banana flour was found higher than that the present in noodles standard. However, The SAG value in noodles standard was found lower than banana noodles and SAG value increase when value of banana flour was increase value in banana noodle. The terms rapidly available glucose (RAG) and slowly available glucose (SAG) have been devised relatively recently and are used as direct measurement of absolute CHO which is available for absorption in the human small intestine and thus likely to influence blood glucose and insulin responses. It is therefore apparent the using the RAG but also the SAG measurement of CHO contain food may be used as supplement (Al-Mssallem, 2014)

Table 3 Rapidly Available Glucose (RAG) and Slowly Available Glucose (SAG) content of banana flour and banana noodles (gram/100 gram of sample)

Determination	Flour	Noodles		
	Banana	Standard	BF 1	BF 2
RAG	44.4±2.78	22.8±0.19	27.2±2.97	29.4±2.97
SAG	28.1±0.66	11.6±0.54	16.2±1.02	25.0±1.91

4.4 Sensory evaluation

Results of the sensory qualities of the samples were evaluated in terms of color, flavor, texture and overall acceptance. Each attribute was evaluated using a 5-point hedonic scale and evaluated by 50 students (Gender: 5 males and 45 females, Age: 20-22 years) are shown in table 4. Sensory properties of the banana noodles comparison with standard noodles (standard

scale) were found to be affected significantly by the addition more banana flour in BF 2 noodles lower (Slight) than BF noodles 1 (Moderate), respectively.

Table 4 Sensory property of noodles containing banana flour comparison with standard noodles

Category	Standard Noodles	Noodles	
		BF 1	BF 2
color	5	4.10±0.70	2.65±0.68
flavor	5	3.63±0.80	2.73±0.45
Texture	5	3.59±0.48	2.31±0.47
overall acceptance	5	4.08±0.72	2.63±0.49

5. Conclusion and Discussion

Banana flour and banana noodles product in this study were darker than standard noodles. The darkened appearance of banana noodles were expected since the banana flour used was initially dark in appearance. Since certain amount of yellow color develops as a result of natural pigments in banana flour, the changes in the boiling water and steaming process (Saifullah et al., 2009).

The reducing sugar compositions of banana flour and banana noodles were found lower than rice flour and standard noodles (rice flour and tapioca flour).The amount of glucose content is very important for total starch content of banana flour and when increased banana flour content in banana noodles. An increase in total dietary fiber content (Agama-Acevedo et al., 2012). RAG, and SAG value highest than standard noodles and an increased value when increased banana flour in banana noodles. Noodles with a high content of SAG contain an amount of available glucose that is likely to be absorbed more slowly (Sahaspot, Charoensiri, & Kongkachuichai, 2015). RAG and SAG measurements are solely on the hydrolysis of dietary CHOs in vitro using a mixture of enzymes resembling those present in the GI. The measurements of RAG give values for glucose that are likely to be absorbed in the human small intestine and thus likely to influence blood glucose and insulin responses. The RAG values and GI is a significant positive correlation between these values for starchy food (Al-Mssallem , Frost, & Brown, 2014). Highest of RAG content in banana noodles mean degradation of starch and carbohydrate changed to glucose in 20 min and the body can lead to energy immediately. The highest content of SAG is a reductive effect on blood glucose and insulin responses. Sensory evaluation decreased when increased banana flour in

banana noodles comparison with standard noodles. The banana noodles 2 had lower scores for appearance, texture and overall acceptance, respectively. Noodles prepared with banana flour presented important starch digestion characteristics and therefore, could be nutritional alternative for people with health problems.

6. Recommendation

6.1 The results of this research should be mixed banana flour in a variety of food products.

6.2 It is also recommended that further studies should be diversity of banana and many farming

References

Agama-Acevedo, E., Islas-Hernandez, J. J., Pacheco-Vargas, G., & Osorio-Diaz, P. (2012). Starch digestibility and glycemic index of cookies partially substituted with unripe banana flour. *LWT-Food Science and Technology*, 46, 177-182.

Al-Mssallem MQ, Frost GS & Brown JE. (2014). The metabolic effects of two meals with the same glycaemic index but different slowly available glucose parameters determined *in vitro*: a pilot study. *Annals of Nutritional Disorders & Therapy*, 1(1), 1001-05.

Asif-UI-Alam, S. M., Islam, M. Z., Hoque, M. M., & Monalisa, K. (2014). Effect of drying on the physicochemical and functional properties of green banana (Musa sapientum) flour and development of baked product. *American Journal of Food Science and Technology*, 2(4), 128-133.

Aussawasathein, C., & Nilnate, N. (2005). Rice flour substitution with banana flour in rice noodle. *The 43rd Kasetsart Annual Conference*, 1-4 February 2005, Bangkok.

Bakare, H. A., Ogunbowale D.O., Adegunwa O. M., & Olusanya O. J. (2017). Effect of pretreatment of banana (Musa AAA, Omini) on the composition, rheological properties, and baking quality of its flour and composite blends with wheat flour. *Food Science & Nutrition*, 5(2), 182-196.

Bi, Y., Zhang Y., Jiang H., Hong Y., Gu, Z., Cheng, L., Li, Z., & Li., C. (2017). Molecular structure and digestibility of bananan flour and starch. *Food Hydrocolloids*, 72, 219-227.

Boonkong, B., Bunmee, T., & Ruenkeaw, P. (2015). Application of resistant starch from unripe banana "Hom Thong" (Musa sapientum L. AAA group) in pasta. *Journal of Food Technology, Siam University*, 10(1), 19-29.

Buranachokpasisan, K. (2013). Development of noodle product from

germinated mung bean flour. *Phetchabun Rajabhat Journal*, 15(2), 9-15.

Englyst N. K., Englyst N. H., Hudson J. G., Cole J. T. & Cumning H. J. (1999). Rapidly available glucose in food: an in vitro measurement that reflects the glycemic response. *The American Journal of Clinical Nutrition*, 69, 448-454.

Fabiana A. Hoffmann Sardá a,b , Fernanda N.R. de Lima a , Nathalie T.T. Lopes a , Aline de

O. Santos a Eric de C. Tobaruela a,b , Edna T.M. Kato c , Elizabete W. Menezes (2016) Identification of carbohydrate parameters in commercial unripe banana flou. *Food Research International*, 81, 203–209

Fan, J. (2015). Phenol suplhuric acid mannose detection. Bowdish Lab, McMaster University

Innawong. (2008). Noodles: Reality requires innovation. *Quality for food*, 14(123), 102-103.

Moongngarm, A., Tiboonbun, W., Sanpong M., Sriwong, p., Phiewtong, L.,

Prakitrum R., & Huychan, N. (2014). Resistant starch and bioactive contents of unripe banana flour as influenced by harvesting periods and its application. *American Journal of Agricultural and Biological Science*, 9(3), 457-465.

Porntavan, P. (2014). Rainbow noodles on the noodle industry. *Thansettakij*, 34 (2921), 50-52.

Sahaspot, S., Charoensiri, R., & Kongkachuichai, R. (2015). Glycemic index of glutinous and non-glutinous landrace rice varieties using "In vitro Rapidly Available Glucose". *Burapha Science Journal*, 20(2), 1-7.

Saifullah, R., Abbas, F. M. A., Yeoh, S-Y. & Azhar, M. E. (2009). Utilization of green banana flour as a functional ingredient in yellow noodle. *International Food Research Journal*, 16, 373-379.

Sirilert, T. (2009). Development of rice noodle : Texture and Quick blanching time. *Journal of Food Technology, Siam University*, 5(1), 18-25.

Surakarnkul, R., & Unprasert, P. (2013). Production of Noodle with Malt flour. *Food*, 43(1), 68-78.