

PROGRAM



The 4th International Conference of Indonesian Society for Lactic Acid Bacteria (4th IC-ISLAB)

Editors

Prof. Dr. Ir. Endang S. Rahayu
Dr. Tyas Utami

Kamarijani - Soenjoto Auditorium
Faculty of Agricultural Technology
Universitas Gadjah Mada
Yogyakarta

January 25-26
2013

In collaboration with



Perhimpunan Mikrobiologi
Indonesia (PERMI)

Organized by



Indonesian Society
for Lactic Acid Bacteria
(ISLAB)



Faculty of Agricultural Technology,
Universitas Gadjah Mada,
Yogyakarta, INDONESIA

CONFERENCE

The 4th International Conference of Indonesian Society for Lactic Acid Bacteria (4th IC-ISLAB)

**January 25 – 26, 2013
Kamarijani – Soenjoto Auditorium
Faculty of Agricultural Technology, Universitas Gadjah Mada
Yogyakarta, Indonesia**

**Organized by:
Indonesian Society for Lactic Acid Bacteria (ISLAB)
Faculty of Agricultural Technology,
Universitas Gadjah Mada, Yogyakarta, Indonesia**

**In collaboration with:
Perhimpunan Mikrobiologi Indonesia (PERMI)**

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Indonesian Society for Lactic Acid Bacteria (the 4th IC-ISLAB)**

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INTRODUCTION

Indonesia as a mega-diversity country has diverse microorganisms, including lactic acid bacteria. These bacteria which have varied physiological functions have been isolated and investigated associated with the benefit of human life. The utilizations of lactic acid bacteria expand into many areas of food, health, and industries. Lactic acid bacteria play many roles in traditional Indonesian fermented foods such as *tape*, *kecap*, and *asinan*. Many species and strains of lactic acid bacteria have been suggested to have many beneficial effects on the health of the digestive tract of humans. Many strains of lactic acid bacteria have been applied into probiotic products. Administration of specific strains of lactobacilli and/or bifidobacteria was found to be effective in the treatment/prevention of rotavirus, antibiotic-associated, and pathogenic diarrhea. The ability of specific probiotics to enhance immune function in infant has also been reported.

Research has been carried to development of science and technology in microbiological area. Lactic acid bacteria could be explored for novel function, particularly to support the health benefit for human being and other life. Therefore, it is necessary to disseminate these research findings and experiences among researcher, students, industries, as well as government. Indonesian Society of Lactic Acid Bacteria (ISLAB), in its 10 years old, would like to organize again conference, named, "the 4th International Conference of Indonesian Society for Lactic Acid Bacteria". Objectives of this conference are:

1. To disseminate the research achievement among the researchers;
2. To explore novel function of lactic acid bacteria;
3. To strengthen the network among the international and national researchers, govtment, as well as industrial partner.

This conference is organized by the ISLAB and the Faculty of Agricultural Technology, Gadjah Mada University, Yogyakarta, Indonesia in cooperation with the Indonesian Society for Microbiology (PERMI) as a core of accosiation related to microorganism. It is expected that the seminar will be attended by researchers, lecturers, doctors, students, industrial society, from local and abroad.

ISLAB with more than 200 member consit of researchers from the university, research institute, government and industry is an active scientific organization. In between two years, many research have been done, and many outcome need to be shared among member.

During this conference, various "*lactic acid bacteria lover*" speakers in various field of expertise will be presenting their research findings, reviews, opinions, especially in the prospective of these lactic acid bacteria utilizations.

Wishing you all a good and fruitfull meeting.

Preface
Chairman of Organizing Committee

Welcome to Yogyakarta, Indonesia and to The 4th International Conference of Indonesian Society for Lactic Acid Bacteria (ISLAB). I am extremely happy to greet the honorable delegates, guests and participants and wish you all the best while in Yogyakarta.

The 4th International Conference of Indonesian Society for Lactic Acid Bacteria (ISLAB) is held from January 25 to 26, 2013 at the Faculty of Agricultural Technology, Universitas Gadjah Mada. The objectives of this International Conference are to disseminate the recent research in lactic acid bacteria, to explore the role and benefit of lactic acid bacteria, and to strengthen the collaboration nationally and internationally among universities, research institutes, government agencies, and industries in exploring the role and application of lactic acid bacteria.

The participants of this International Conference are come from universities, research institute, government agenciest and industries, from Indonesia and overseas. According to the participant list, the organizing committee has received 34 papers of oral presentation in technical session, 59 papers of poster presentation, and 13 papers of invited speaker presentation which will be delivered by 5 Indonesian invited speakers and 8 overseas invited speakers (Singapore, Malaysia, Thailand, Philipines, Japan, and India). We also have a small but inspiring presentation by companies (Yakult and DIPA) to enrich our knowledge. The scientific meeting will be arranged in 2 plenary lectures, 2 parralel sessions for technical oral presentations, and poster presentation during two-day conference. In conjunction to the celebration of the 50th anniversary, The Faculty of Agricultural Technology, Universitas Gadjah Mada cordially invites all of the conference participants to attend dinner in Cultural Night, which will be held tonight in this room

The Conference Committees have tried their best to make this event pleasant one. Please do not hesitate to let us know if you have any suggestions or require any assistance during the course of your short stay.

On behalf of the organizing committee, I would like to express my sincerely thanks to member of Indonesian Society for Lactic Acid Bacteria, Indonesian Microbiological Society (PERMI), and all sponsoring companies for their generous support, sponsorships. and other contributions leading to the success of the conference. I also would like to thank to all presenters, and participant for their tremendous effort and time spent in the Conference. I would like to take this opportunity to thank to all the colleagues, the steering committee and organizing committee for their never ending precious cooperation that made this even possible. Finally, highly appreciation to the Faculty of Agricultural Technology, Universitas Gadjah Mada for essential support and facilities for this conference

I wish you all a very productive and enjoyable meeting.
Chairperson of Organizing Committee

Dr. Tyas Utami

Preface
Dean of Fac. Agricultural Technology, Universitas Gadjah Mada

Distinguished Guests, Ladies and Gentlemen, Participants of The 4th International Conference of Indonesian Society for Lactic Acid Bacteria

I would like to warmly welcome all of you to The 4th International Conference of Indonesian Society for Lactic Acid Bacteria (ISLAB) entitled *Better Life with Lactic acid Bacteria: Exploring Novel Functions of Lactic Acid Bacteria*, which is held from January 25 to 26, 2013 at the Faculty of Agricultural Technology, Universitas Gadjah Mada in the city of Yogyakarta Indonesia.

The Faculty of Agricultural Technology UGM was the host when The Indonesian Society for Lactic Acid Bacteria (ISLAB) was established nearly ten years ago, on 12 March 2003. This is the third times for the Faculty of Agricultural Technology to hold the Indonesian Society for Lactic Acid Bacteria (ISLAB) Conference.

As we all know, Lactic acid bacteria play many roles in traditional Indonesian fermented foods such as *tape*, *kecap*, *asinan*, and *fermented fish*. I believed that Lactic acid bacteria are also play similar roles in the fermentations of many other country's foods, as well. Many researchers have isolated and characterized lactic acid bacteria from various sources, and found out that many strains of lactic acid bacteria have been suggested to have certain beneficial effects on food qualities as well as on human health. Therefore, it is necessary to disseminate these research findings and exchange knowledge and experience between researchers and companies, and to strengthen national and international networking among researchers, industrial partners and universities. I hope that this International meeting activity can also strengthen the competence of higher education institutions.

At this particular moment, this International Conference is very special because it is held in conjunction with the celebration of 50th Anniversary of the Faculty of Agricultural Technology Universitas Gadjah Mada. On this occasion, as the Dean of the Faculty of Agricultural Technology, I would like to invite all the distinguished guests, participants, and sponsoring companies to the Cultural Night, on Friday evening, January 25, 2013.

Finally, I would like to express my sincere thank to all participants, companies and other parties for the contributions and support to Conference.

I wish all the participants an inspiring and fulfilling conference. Have a wonderful time in Yogyakarta, Indonesia.

Faculty of Agricultural Technology,
Universitas Gadjah Mada,
Dean,

Dr. Ir. Lilik Soetiarso, M.Eng

WHERE IS ISLAB HEADING FOR?

Endang S. Rahayu and I. Nengah Sujaya
(Chairperson and Vice Chairperson of Indonesian Society for Lactic Acid Bacteria)

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The Indonesian Society for Lactic Acid Bacteria was established at Faculty of Agricultural Technology, Universitas Gadjah Mada, Yogyakarta, 12 March 2003, just few months after the establishment of Asian Federation of Society for Lactic Acid Bacteria (AFSLAB) at Tokyo, November 2002. Objective of ISLAB are: (1) Enhancement of the interaction and facilitate the communication between Indonesian scientists, industries, communities who are interested in Lactic Acid Bacteria and related subjects through scientific meeting; (2) Establishment of research-collaboration between members; (3) to promote the activity of ISLAB to international scientific community. As professional society, ISLAB has organized 4 scientific meeting including this time. The first meeting was organized at Bali in collaboration with the 3rd Asian Conference for Lactic Acid Bacteria (ACLAB) and Congress of the Indonesian Society for Microbiology (PERMI), 25-26 August 2005; after that, ISLAB conference was organized at this Faculty for every two years, and now is the 4th conference of ISLAB.

Number of paper presented, participant from university and research institute, government as well as from industry is increased in every two years conference, and this indicated that ISLAB is a professional and very active scientific organization. Participation of ISLAB member is not only in the National Level but also in the International Level. Many Indonesian Researchers presented or published their paper in the International Scientific Community.

Most research in Indonesia is basic research, related to three roles of lactic acid bacteria; (1) in fermented food; (2) as a bio-preservative; (3) as a probiotic. Most Indonesian researchers are working on isolation and identification of LAB from several sources, followed by exploration of their functionality. There are several applied researches related to the use of beneficial cultures for modified process, modified products; and new product development. However according to our understanding there is no result of research has reached to the level of pre-commercialization or industry. Though, in Indonesia, there are several big industries using lactic acid bacteria for their production, however, usually they use import strains. No local cultures have been used at industrial level, no improvement of local technology as outcome of research have been adopted. There is still gap open between research outcomes and industrial need, in the development of lactic acid bacteria food product.

Role of ISLAB, in its 10 years old, in education and research is no doubt; however, in the future ISLAB should have more roles in strengthening the partnership either with industry as well as government. ISLAB should be able to LINK-MATCH among university, research institute and industry; therefore, potential research outcome from the university and research institute could be adopted by industry. By this link and match, we hope this society could be more exist.

PROGRAM – 4th IC-ISLAB

FRIDAY, January 25 th , 2013		
07:00 – 08:15	REGISTRATION, WELCOME DRINK, AND BREAKFAST	
08:15 – 08:30	Welcome Saman Dance	
08:30 – 08:45	Opening Ceremony	
	Chairperson of Organizing Committee	
	Dean Faculty of Agricultural Technology, Universitas Gadjah Mada	
08:45 – 09:00	Chairperson of ISLAB (Where is ISLAB heading for?)	
09:00 – 09:30	1. Dr. Roy Sparringa (Probiotic Prospect and Regulation in Indonesia)	Moderator: Dr. Tyas Utami
09:30 – 10:00	2. Aliah Abdul Wahab (Overview on Global Regulations: Microbial Food Cultures)	
10:00 – 10:15	PT. YAKULT Indonesia Persada	
10:15 – 10:45	3. Prof. Dr. Lilis Nuraida (Potency of Local Acid Bacteria: Health Benefit and Product Development)	Moderator: Dr. I Nengah Sujaya
10:45 – 11:15	4. Prof. Dr. Hardinsyah (Effects of Synbiotic of <i>Lactobacillus</i> , <i>Bifidobacterium</i> , and Fructo-oligosaccharide on Imune Response of IFN- γ and sIgA)	
11:15 – 11:45	5. Prof. M. Juffrie SpAK, PhD (Role of Probiotic in Diarrhea)	
PHOTO – SESSION		
11:45 – 13:30	BREAK	
13:30 – 17:45	PARALLEL SESSION	
	Room A: Technical Session	Room B: Technical Session
17:45 – 18.30	BREAK	
18:30 – 22:00	DINNER AND CULTURAL NIGHT (Acoustic, Javanese, Balinese Dance Performances, others)	

SATURDAY, January 26th, 2013		
07:00 – 08:00	MORNING DRINK AND BREAKFAST	
08:00 – 08:30	6. Prof. Dr. Anang M. Legowo (Utilization of Lactic Acid Bacteria in The Development of Animal Products-Based Functional Foods)	Moderator: Prof. Dr. Eni Harmayani
08:30 – 09:00	7. Prof. Dr. Jyoti Prakash Tamang (Lactic Acid Bacteria in Ethnic Fermented Foods and Beverages: Functionality and Health-Promoting Benefits)	
09:00 – 09:30	8. Dr. Francisco Elegado (Bench-scale Growth Optimization of Selected Probiotic and Bacteriocinogenic LAB Using Response Surface Methodology)	
09:30 – 09:45	PT. DIPAPUSPA LABSAINS	
09:45 – 10:30	POSTER SESSION	
10:30 – 11:00	9. Ass. Prof. Anil K. Anal (Encapsulation of Probiotics to Enhance Physical Stability and for Colon Targeted Delivery)	Moderator: Dr. Yudi Pranoto
11:00 – 11:30	10. Ass. Prof. Rosfarizan (Bioprocessing Strategies for Improvement of Folate and Hyaluronan Synthesis by Lactic Acid Bacteria)	
11:30 – 12:00	11. Dr. Mahendran Ratha (Developing Vaccines for Bladder Cancer Therapy)	Moderator: Prof. Dr. Jyoti Prakash T
12:00 – 12:30	12. Dr. Kaouther Ben Amor (A New Synbiotic Mixture of scGOS/lcFOS and <i>Bifidobacterium breve</i> M-16V Improves Gut Microbiota, Gut Health, and Allergic Symptoms in Infants with Atopic Dermatitis)	
12:30 – 13:00	13. Dr. Koichi Watanabe (Asian Microbiome Project: A Pilot Study on the Diversity of Fecal Microbiota of Healthy Asian Children)	
13:00 – 13:15	BEST POSTER ANNOUNCEMENT AND DOORPRIZE SESSION	
13:15 – 13:30	Closing Ceremony Chairperson of PERMI	
	PHOTO SESSION	
13:30 – 14:00	LUNCH	

Technical Session Room A Friday at R. 102 (13.30 – 17.45)

Time and Moderator	Note	Speaker	Title
13.30 – 14.30 (Sigit Setyabudi)	A1	Rindit Pambayun	Some Constrains in Developing Probiotic Products of Indonesian Origin
	A2	Agus Wijaya	The Biodiversity of Lactic Acid Bacteria in Indonesian Indigenous Fermented Foods
	A3	Helen Joan Lawalata	Amplified Ribosomal DNA Restriction Analysis (ARDRA) for The Characterization of Lactic Acid Bacteria Producing Antimicrobial Compound from <i>Bakasang</i>
	A4	Takahiro Matsuki	Quantitative PCR Detection of Bifidobacterial Species and Viable Probiotic Strain in Human Feces
14.30 – 15.30 (Agus Wijaya)	A5	Lindayani	The Mapping of Lactic Acid Bacteria from Fermentation of Local Foods (Semarang): <i>Tempoyak</i> , <i>Mandai</i> and Yellow Bamboo Shoot Pickles
	A6	Heni Astuti	The Isolation of <i>Bifidobacterium</i> spp. from Faeces of Infant Born by Normal Birth and Its Potential Againts <i>Eschericia coli</i>
	A7	Prima Retno Wikandari	Improvement of the Quality and the Functionality as An Angiotensin Converting Enzyme Inhibitor of <i>Bekasam</i> by Using <i>Lactobacillus plantarum</i> B1765 as Starter Culture
	A8	Titiek F. Djaafar	Effect Of Indigenous Lactic Acid Bacteria Fermentation on Enrichment of Isoflavone and Antioxidant Properties In Crude Extract of <i>Kerandang</i> (<i>Canavalia virosa</i>)
15.30 – 16.30 (M.Nur Cahyanto)	A9	Tri Marwati	Amino Acid Sequence of Pediocin PaF-11 from <i>Pediococcus acidilactici</i> F-11
	A10	Lismayana Hansur	Isolation of Lactic Acid Bacteria as Biopreservative in Corn Fermented Milk
	A11	Tri Wardani Widowati	Antibacterial Activities of Lactic Acid Bacteria Isolated From <i>Tempoyak</i> During Low Temperature Fermentation Against <i>Staphylococcus aureus</i>
	A12	Arya Widinatha	Isolation and Characterization of Lactic Acid Bacteria Producing Antimicrobial Compounds from Small Intestine of Chicken

16.30 – 17.45 (Lindayani)	A13	Widodo	Studies on The Quality of Fermented Goat and Cow Milk Produced By Different Starters of Lactic Acid Bacteria
	A14	Evy Rossi	Evaluation of Fermented Beverage Made From Pumpkin with Various Concentration of Skim Milk
	A15	N. Azizah	Study of The Growth of Lactic Acid Bacteria Viability on Yogurt Drink Added by Jackfruit Extract
	A16	A.M. Jannah	The Physical and Microbiological Properties of Yogurt Drink added by Starfruit Extract
	A17	Rinawidiastuti	The Effect of Solid Part Level of Fermented Vegetable Garbage to The Number of Lactic Acid Bacteria and The Presence of Gram (+/-) Bacteria of Foodcourt Waste's Pellet

Technical Session Room B Friday at R. 102 (13.30 – 17.45)

Time and Moderator	Note	Speaker	Title
13.30 – 14.30 (Yoyok B. Pramono)	B1	Agustin Krisna Wardani	Isolation and Characterization of Bacteriophage from Chicken Intestine for Improving Food Safety
	B2	Nyoman Semadi Antara	Application of Lactic Acid Bacteria Inoculum Powder on Fermentation of <i>Urutan</i> : Study on Microbiological, Organoleptic Characteristic, and Aroma Compounds Profiles
	B3	Happy Nursyam	Physicochemical and Microbiological Evaluation of <i>Clarias catfish</i> Fermented Sausage Manufactured by <i>Pediococcus acidilactici</i> 0110<TAT-1 Starter Culture at Different Level of NaCl Concentration
	B4	Nursilawaty	Nitrite Reduction In Fermented Sausage (<i>Pepperoni</i>) By Lactic Acid Bacteria
14.30 – 15.30 (Ingrid S. Surono)	B5	Achmad Dinoto	Spray Dried Encapsulation of <i>Lactobacillus</i> spp. Cells with Coconut Milk
	B6	Widya Dwi Rukmi Putri	Application of Dried Mixed Culture (<i>Lactobacillus plantarum</i> FNCC 0027, <i>Lactobacillus fermentum</i> FNCC 0030 and <i>Sacchromyces cereviceae</i> s) in Maize and Sorghum Fermentation
	B7	Amelia Juwana	Non-Dairy Probiotic Beverage : Application of <i>Lactobacillus plantarum</i> EM1 and <i>Lactobacillus pentosus</i> EM1 Cultures as Inoculum in Fermented Legumes and Sweet Corn Milk
	B8	Usman Pato	Probiotic Properties of <i>Tempoyak</i> Lactic Acid Bacteria and Its Application for Making Probiotic Beverage from Pineapple Skin Extract
15.30 – 16.30 (Achmad Dinoto)	B9	Siti Suryaningsih	Effect of Orange Juice and Lactic Acid Bacteria Addition on the Quality of Soyghurt
	B10	Ahmad N Al-Baarri	The Effect of Selected Indonesian Fruit Extract on The Survival of Lactic Acid Bacteria
	B11	Eka Ruriani	Viability of <i>Lactobacillus acidophilus</i> NH on The Dietary Fiber Flour Made from Unripe Fruit, Corm, and Tender Core Pseudo-Stem of Banana
	B12	Yoyok B. Pramono	Probiotic Viability and Carbohydrates Compound in Selected Tropical Fruits from Indonesia

16.30 – 17.45 (Nyoman S. Antara)	B13	Indah Kuswardani	The Viability of Alginate Entrapped <i>Lactobacillus plantarum</i> 12A2 in Soy Corn Milk Ice Cream During Frozen Storage
	B14	Sri Hastuti	Characteristics of Java Plum Juice (<i>Eugenia cumini</i>) Fermented With <i>Lactobacillus acidophilus</i> IFO 13951
	B15	Febby J. Polnaya	Prebiotic Potential of Resistant Starch derived from Phosphorylated and Cross Linked Sago Starches
	B16	Nurhayati	Improving of Banana Flour Resistant Starch by Using Fermentation of <i>Lactobacillus salivarius</i> FSnh1 with Two Cycles of Autoclaving-Cooling
	B17	Prima Interpares	The Effect of Retrogradation Step on The Properties and Prebiotic Potential of Maize Starch Noodle

LIST OF POSTER - The 4th IC-ISLAB (January 25-26, 2013)

No.	Authors	Abstract	P
		ISOLATION AND IDENTIFICATION	
1	I N Sujaya , NP. Desy Aryantini, W. Nursini, Yan Ramona, KA Nocianitri, W. Redi Aryanta ⁴ , Yoshitake Orikasa, Fukuda Kenji, Tadashu Urashima, and Yuji Oda	Identification of Lactic Acid Bacteria Isolated from Bali Cattle by Partial Sequencing of The 16s rDNA and Their Putative Probiotic Properties	P-1
2	Yong Su Ting, Wan Zuhainis Saad, Sieo Chin Chin, and Ho YinWan	Molecular Identification of Potential Probiotic Bacteria Isolated from Chicken and Their Production of Lactic Acid and Acetic Acid	P-2
3	Gladys Delarosa Purnomo, Lindayani, and Laksmie Hartayanie	Isolation and Identification of Microorganism from Fermented Glutinous Rice Using Black Bamboo (<i>Gigantochloa atroviolacea</i>) and Sweet Bamboo (<i>Gigantochloa atter</i>)	P-3
4	Fifi Lia Rahardjo, Lindayani, and Laksmie Hartayanie	Isolation and Identification of Microorganism from Fermented Glutinous Rice Wrapped by Mango Leaf (<i>Mangifera indica</i>) and Cashew Leaf (<i>Anacardium occidentale</i>) Fermented with Local <i>Ragi</i> (Na Kok Liong, Gedang, and Sidojoyo)	P-4
5	Kurniawan Eka Saputra, Nanik Suhartatik, Tyas Utami, and Endang S. Rahayu	Isolation, Identification and Characterization of Lactic Acid Bacteria from Salted Egg: An Indonesian Traditional Food	P-5
		SCREENING – FUNCTIONALITY	
6	Eny Sri Lestari, Dyah Fitri Kusharyati, and P. Maria Hendrati	Isolation of <i>Bifidobacterium</i> spp. from Feces of Infant Born by Caesar Birth and Their Potential Against <i>Escherichia coli</i>	P-6
7	Amelia Wulandari, Dyah Fitri Kusharyati, and P. Maria Hendrati	Isolation of <i>Bifidobacterium</i> spp. from Feces of Infant Born by Caesar Birth and Their Potential Against <i>Salmonella typhi</i>	P-7
8	Ni Nyoman Puspawati, Ni Luh Ari Yusasrini, Komang Ayu Nocianitri, I Nengah Sujaya, and Ni Luh Putu Oggi Yulianti	Inhibition of Lactic Acid Bacteria Isolated from Bali Cattle's Milk to The Growth of Bacteria Pathogens <i>Vibrio cholerae</i> O1 El Tor Biotype	P-8
9	Afriza Yelnetty, Hari Purnomo, Purwadi, and Arie Mirah	Capability of Lactic Acid Bacteria Isolated from Milk Goat Fermentation as Candidate for Functional Food	P-9
10	S.S. Dewi and H. Anggraini	Viability of <i>Lactobacillus</i> sp. A1.1 and A2.1 Isolated From ASI on Different pH and Level Bile Salt	P-10
11	Betty Nurhayati, Marlia Singgih Wibowo, Yantyati Widayastuti, and Tutus Gusdinar	Screening of Antimicrobial Activity of <i>Lactobacillus plantarum</i> Strains	P-11
12	Desniar, Iman Rusmana, Antonius Suwanto, and Nisa Rachmania Mubarik	Characterization of Lactic Acid Bacteria Isolated from an Indonesian Fermented Fish (<i>Bekasam</i>) and Their Antimicrobial Activity Against Pathogenic Bacteria	P-12

13	Prima Nanda Fauziah, Jetty Nurhajati, and Chrysanti	The Effectiveness of Lactic Acid Filtrate and Bacteriocins of <i>Lactobacillus bulgaricus</i> KS1 Strain Against The Growth of <i>Klebsiella pneumoniae</i> ATCC 700603, CT1538 and S941 Strains	P-13
14	Rifa Nurhayati, Tyas Utami, and Endang S. Rahayu	Isolation of Proteolytic Lactic Acid Bacteria from Spontaneous Sorghum Flour Fermentation and Its Application for Sorghum Flour Fermentation	P-14
15	Nanik Suhartatik, Sri Raharjo, M. N. Cahyanto, Mika Miyashita, and Endang S. Rahayu	Isolation and identification of Lactic Acid Bacteria Producing β -Glucosidase from Indonesian Fermented Foods	P-15
16	Rikka Welhelmina Sir, M. Nur Cahyanto, and Tyas Utami	Screening of Phytase Producing Lactic Acid Bacteria Isolated from Fermented Sorghum Flour	P-16
17	Ahimsa Kandi Sariri	Effectiveness of <i>Lactobacillus plantarum</i> Mut7 as Fermentation Agents to Reduce <i>Trembesi</i> (<i>Albizia saman</i>) Saponins Content	P-17
18	Tezar Ramdhan and Anil K. Anal	Effects of Lactic Fermentation on Total Polyphenol Content and Antioxidant Activity of Ginger (<i>Zingiber officinale Roscoe</i>)	P-18
		APPLICATION	
19	Meidistria T. R, Langkah Sembiring, and Endang S. Rahayu	Application of <i>Lactobacillus plantarum</i> Dad 13 in Probiotic Cheese Making	P-19
20	Tyas Utami, Kasmiati, Eni Harmayani, and Endang S. Rahayu	Survival of <i>Lactobacillus plantarum</i> Dad 13 During Spray Drying and Its Application for Yoghurt Fermentation	P-20
21	Sri Hartati, A. Intan Niken Tari, Catur Budi Handayani, Eni Harmayani, and Marsono	Formulation of Guava (<i>Psidium guajava</i>) Fruit Powder Drink and Probiotic <i>Lactobacillus plantarum</i> Dad 13 Dried Cell Potentially Reducing Cholesterol	P-21
22	Asri Nursiwi, Supriyanto, Suparmo, and Endang S. Rahayu	Application of <i>Lactobacillus plantarum</i> Dad 13 in The Production of <i>Tape Ketan</i> Powder as Ingredient for Functional Drink	P-22
23	Pudji Hastuti, Tyas Utami, and Kathariana Ardhanareswari	Antioxidant Activity of Fermented Sesame Milk using <i>Lactobacillus plantarum</i> Dad 13	P-23
24	Pudji Hastuti, Tyas Utami, and Yosep Kristianto	The Changes in Some Components of Sesame Milk During Fermentation Using <i>Lactobacillus plantarum</i> Dad 13	P-24
25	K. E. D. Kumalasari, A. M. Legowo, A. N. Al-Baarri, and Y. B. Pramono	Characteristic Lactic Acid Bacteria and The pH Value of Probiotic Yogurt Drink Added by Longan Extract	P-25
26	A. Intan Niken Tari, Catur Budi Handayani, and Ahimsa Kandi Sariri	Effect of Indigenous Cultures <i>Lactobacillus</i> spp. in Making Purple Sweet Potato Yogurt: Chemical and Physical Properties	P-26
27	Netty Kusumawati, Indah Kuswardani, Ira Nugerahani, and Catherine Tanaya	Effect of Grape Extract and Sugar Type on Physicochemical, Organoleptic, and Total Lactic Acid Bacteria of Low Fat Flavoured Yogurt	P-27
28	S.N. Permadi, A.M. Legowo, Y. B. Pramono, and A. S. Mulyani	Growth of Lactic Acid Bacteria on Yogurt Drink Added by Extract <i>Salak</i> Fruits	P-28

29	Yeyen Prestyaning Wanita, Mahargono Kobarsih, N. Cahyaningrum and Titiek F. Djaafar	Physico-Chemical Properties of <i>Sawo (Achras zapota)</i> Yogurt	P-29
30	Yeyen Prestyaning Wanita, Mahargono Kobarsih, and Titiek F. Djaafar	Effect of Casein Addition and Filtration on Characteristic of <i>Sawo (Achras zapota)</i> Yogurt	P-30
31	Rezki Tiara Siwi, Rohula Utami, and Esti Widowati	Optimization of Lactic Acid Production by <i>Lactococcus lactis</i> FNCC 0086 on Cashew Apple Juice (<i>Anacardium occidentale L.</i>) Medium Using Response Surface Methodology	P-31
32	Ratna Dewi Kusumaningrum, M. N. Cahyanto, Umar Santosa, and Tyas Utami	Functional Properties of Fermented Black Soybean Milk	P-32
33	Maya M. Ludong, M. F. Sumual, G. S. S. Djarkasi, and C. D. Betah	Concentrated Jackfruit (<i>Artocarpus integra</i> , MERR) Juice as Flavor Component in Coconut Milk Yoghurt	P-33
34	R.Fajriyati, A. Rahmawati, A. M. Legowo and S. Mulyani	Total Lactic Acid Bacteria (LAB), Lactose Content and Acidity of Fermented Whey with <i>Bifidobacterium bifidum</i> in Different Incubation Period	P-34
35	Andri Frediansyah and Ingga Yonico Martatino	The Effect of Consumption of Milk Fermented by <i>Lactobacillus casei</i> Shirota (Commercial Yakult Drink) on The Decrease of Student Anxiety Level	P-35
		CASSAVA, SAGO, SHORGUM, COCOA BEAN	
36	Zulianatul Hidayah, Yudi Pranoto, and Tyas Utami	Functional Properties of Sorghum Flour Fermented by Lactic Acid Bacteria	P-36
37	Ria Endriyani, Haryadi, and M.N. Cahyanto	Effect of Retrogradation Time on The Properties and Improve of Prebiotic Activity of Sago and Tapioca Starch Noodles	P-37
38	Yudi Pranoto, Fitris Apriani Purba, and Sri Naruki	Chemical, Physical and Sensory Properties of Cookies Made from Fermented Sorghum	P-38
39	S. Mahfudhi, W. Nugroho and N. Fahmi	Microbiological Quality of Cassava Meal Chip that Enriched with Extract of Fermented Vegetable Garbage	P-39
40	Sri Luwihana	Microbiota of <i>Growol</i> Fermentation Made from Various Raw Material with Addition of Yeast	P-40
41	Sony Suwasono, Jayus, Misnawi, and Avi Widagdo	Application of Lactic Acid Bacteria on The Non-Fermented Cocoa Bean for Fungal Growth Inhibition	P-41
		FISH	
42	Anastasia Wheni Indrianingsih, Khoirun Nisa, and Hernawan	Lactic Acid Fermentation for Fish Preservation	P-42
43	Laras Rianingsih, Y.S. Darmanto, Apri Dwi Anggo, and Sumardianto	Addition of <i>Pediococcus halophilus</i> CCRC 12576 and <i>Pediococcus pentosaceus</i> IFO 12230 on The Liquefaction and Characteristic of Fish Sauce Made from <i>Rucah</i> Fish	P-43
44	Bima R.A.W., Laras Rianingsih, and Y.S Darmanto	Chemical and Microbiological Changes During Fish Sauce Fermentation with <i>Pediococcus</i> spp. as a Starter Culture	P-44
45	Murtiari Eva and Elly Yuniarti Sani	Microbiological and Organoleptic Characteristic of Fish Fermented (<i>Rastrelliger neglectus</i>) in Waste Rice Water	P-45

46	Arifah Kusmarwati, Tyas Utami, Endang Sri Heruwati, and Endang S. Rahayu	The Effect of <i>Pediococcus acidilactici</i> F-11 as Starter Culture on The Microbiological and Chemical Changes During Over Fermentation of <i>Rusip</i>	P-46
47	Sandriana J Nendissa and Endang S Rahayu	The Potential of <i>Pediococcus acidilactici</i> F11 Manufacturer Bacteriosin as A Natural Presevative Ina Sua (Stock Fish) <i>Gurame (Osphoremus gouramy)</i>	P-47
48	Kishore Krishnaa Kumaree, and Anil K. Anal	Incorporation of Isolated Probiotic from Fish Gut in Feed as Functional Additive for Healthy and Value Added Fish Production	P-48
		RAT – CHICKEN – DUCK	
49	Komang Ayu Nocianitri, W. Redi Aryanta, and I. N. Sujaya	Resistance of <i>Lactobacillus</i> sp. SKG34 in Rat Gastrointestinal Tract Detected by PCR- Random Amplified Polymorphic DNA	P-49
50	Ledy Purwandani, Eni Harmayani, and Tyas Utami	Effect if Diet Containing Yam Bean (<i>Pachyrizus erosus</i>) fiber on Selected Colonic Microbiota and SCFA of Sprague Dawley Rats	P-50
51	Iin Khusnul Khotimah and Rita Khairina	Microbiota of Mice Gut Fed by Water Lily (<i>Nymphaea pubescens</i>) Seeds	P-51
52	Ema Damayanti, Hardi Julendra, Ahmad Sofyan, and Septi Nur Hayati	Bile Salt and Acid Tolerant of Lactic Acid Bacterial Isolated from Proventriculus of Broiler Chicken	P-52
53	Rosy Alphany, Maman Suhardiman, Yul Kurniatun, Stephen Setiawan, and Fitri Fegatella	Effect of Probiotic and Synbiotic Dietary Inclusion on Growth Performance, Intestinal Microbiota, Coccidiosis Score, and H/L Ratio of Broiler Chicken	P-53
54	S. Sumarsih, C. I. Sutrisno, B. Sulistiyanto and E. S. Rahayu	Effect Of <i>Lactobacillus</i> sp. B-12 on Feed Conversion Ratio and Body Weight Gain of Duck	P-54
55	Cici Darsih, Khoirun Nisa, A.W Indrianingsih, Hernawan, and Septi Nurhayati	Antibacterial Activity of Water Soluble Carboxymethyl Chitosan (CMCh)	P-55
		REVIEW	
56	Siti N. Purwandani, Tyas Utami, and Endang S. Rahayu	Folate Production by Lactic Acid Bacteria from Fermented Dairy Product : A Review	P-56
57	Caesariana Ariyani Priatko, Margaretha Evelyne, and Lindayani	A Potential Antioxidant Activity of Probiotic Bacteria from Fermented Foods : A Review	P-57
58	Fatimah, Tyas Munaroh, Kurniawan Eka Saputra, Nanik Suhartatik, and Endang S. Rahayu	Lactic Acid Bacteria in Traditional Indonesian Foods: A Review	P-58
59	Bellina G. Sembiring, Tyas Utami, Endang S. Rahayu	Role of Probiotic in Lowering Cholesterol : A Review	P-59

PROBIOTIC PROSPECT AND REGULATION IN INDONESIA

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ABSTRACT

The aim of the presentation is to discuss aspects of probiotic prospects and its regulation in Indonesia. A central point of probiotic control is based on the definition given by FAO/WHO that probiotics are live microorganisms, which when administered in adequate amounts confer a health benefit on the host. As consequences, a probiotic must be alive when administered, must have undergone controlled evaluation to document health benefits in the target host, must be a taxonomically defined microbe or combination of microbes (genus, species and strain level), and must be safe for its intended use (FAO/WHO, 2001, 2002). It is predicted by Transparency Market Research that Global probiotics demand was worth USD 27.9 billion in 2011 and is expected to reach USD 44.9 billion in 2018, growing at a CAGR of 6.8% from 2013 to 2018, and demand from Asia-Pacific and Europe dominated the global market, especially Asia-Pacific is expected to be the most prominent market in the future. Indonesia as reported by Nielsen Indonesia is potential market for probiotics accounted for 18 percent growth as a part of liquid milk demand including health-related benefit products in line with rapid economic growth in Indonesia (Madhav, 2011). Growing public interest in probiotics calls for appropriate regulatory and policy action. NADFC welcomes academician, business, and public community to discuss regarding the development of probiotics and novel function of lactic acid bacteria in Indonesia.

The presentation includes the global research interests and safety concerns, opportunity and challenge as well as food probiotic control in Indonesia. The pre-market evaluation by the NADFC showed that the rejection or suspension of the application for registration approval are usually due to lack of scientific evidence on human study; inappropriate scientific evidence as proposed claim, e.g. the study was not carried out in the target group claim; lack of data on the assessment of safety, interaction, and efficacy of multi-strain probiotics; probiotic information of genus, species and strain is lacking; no instruction how to keep the product, and inappropriate label. The post market control demonstrated that some producers did not maintain Good Manufacturing Practices, poor handling practices during storage and retail, labels were over health claim, and labels were different with the registration approval documents. Indonesia as one of the mega biodiversity countries, rich in genetic resources and traditional fermented foods should have a great opportunity to develop probiotics through innovation. Academician and business communities should follow regulation and its guidance in early stage of development of probiotics in Indonesia to obtain premarket assessment successfully.

PS-2

OVERVIEW ON GLOBAL REGULATIONS-MICROBIAL FOOD CULTURES (MFC)

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ABSTRACT

There is a wide variety of microbial species. We have learnt about bad and good microorganism. Some good microbial species are used in food and also feed production. The awareness of use of microbial food culture (MFC) such as lactic acid bacteria in fermented milk, fermented meat and dairy cheese has becoming apparent in food industry in this region. The food authorities in many countries have also become aware of the need to regulate use of MFC in food. This presentation hopefully will give a brief overview on how various countries has set up standards for MFC.

POTENCY OF LOCAL LACTIC ACID BACTERIA: HEALTH BENEFIT AND PRODUCT DEVELOPMENT

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ABSTRACT

Lactic acid bacteria are normal flora of rich nutrient foods such as meat, milk and vegetable, and also found in human such as in mouth and intestine. Lactic acid bacteria play an important role in food fermentation. Certain species of lactic acid bacteria especially *Lactobacillus* and *Bifidobacteria* have been known to exhibit beneficial health effect and considered as probiotic microorganisms. Probiotics is defined as live microorganisms when administered in adequate amounts will confer a beneficial health effect to the host. Beside inhibiting pathogenic bacteria, other functional properties of probiotics include hypocholesterolemic activity by lowering plasma cholesterol, anti-infectious barrier to pathogens, preventing and treatment of diarrhoea and altering immune system. Technological properties and food vehicle to deliver adequate amount of live probiotic bacteria is also important area in assesing potency of health benefit of lactic acid bacteria.

Lactic acid bacteria isolated from local or traditional fermented food such as dadih and growol have been shown to be potencial as probiotics. Human breast milk has also been known as source of lactic acid bacteria with probiotic properties. Evaluation on lactic acid bacteria isolated from 28 lactating mothers in Bogor area showed that some isolates were having probiotic characteristics. The evaluation included physiological properties important to be considered as probiotic, such as resistance toward bile acid, low pH, adherence properties, and functional properties related to beneficial health effect such as potency in preventing infectious diarrhea, inducing immune system and lowering blood cholesterol. *Lactobacillus rhamnosus* R23 was the best isolates for preventing diarrhoea caused by infection of EPEC, while *Pediococcus pentosaceus* A-38 was potentials to be used as probiotic that have beneficial effect in reducing cholesterol. *L. rhamnosus* was able to be used as a single starter culture for milk fermentation. Stirred yoghurt was the best methods in preparing fermented milk containing both lactic acid bacteria.

Keywords: probiotics, breast milk, anti-diarrhea, adherence, lowering cholesterol

EFFECTS OF SYNBIOTIC OF *Lactobacillus*, *Bifidobacterium* AND FRUCTO-OLIGOSACCARIDE ON IMMUNE RESPONSE OF IFN- γ and sIgA

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ABSTRACT

Synbiotics is a supplement containing probiotics and prebiotics which has synergism health benefits. Probiotic is a good viable bacteria, such as *Lactobacillus*, *Bifidobacterium*. Probiotics help in proper digestion, avoid the adhering of pathogens to the intestinal tract, and produce shortchain fatty acids and vitamins. Limited studies also found probiotics improved the immune health. While prebiotic is an indigestible dietary component such as oligosaccharide, that feeds bacteria. Studies showed prebiotics could improved gut health and reduced infection incidence. Pulmonary tuberculosis (TB) is one of common infectious diseases in Indonesia. TB patients usually have an impaired immune response, suffered from underweight and micronutrient deficiency, especially zinc. Both synbiotic and antioxidant nutrients may improve the immune response of TB patients.

A current study in Indonesia, evaluate the efficacy of the synbiotic *Lactobacillus acidophilus*, *Bifidobacterium longum* and *Fructo-Oligosaccharides* (FOS) plus micronutrients supplement (vitamin A and zinc) on improving cellular and humoral immunological response, among pulmonary tuberculosis (TB) patients. Two groups of new case TB patients aged 20-45 year of TB Hospital of Bandung and Garut was studied by applying a double blind randomized intervention-control trial. The first group (TG) as an intervention group (47 subjects) was treated each daily with a capsule of synbiotic of *Lactobacillus acidophilus*, *Bifidobacterium longum* and fructo-oligosaccharides (FOS), plus a capsule of micronutrients of vitamin A and zinc, and milk based protein for two months. The second group (CG) as a control group (47 subjects) was given each daily a milk based protein for two months. All subjects received a standard drug treatment at both intensive phase and follow up phase. The drugs were consumed in the morning before breakfast, while the supplements were consumed in the afternoon and evening. The immune response components of IFN-gamma cytokine (IFN- γ) and secretory Ig A (sIgA) were measured at baseline and after 1,2, and 6 months of intervention. The results show that there is no different of the immune response components between TG and CG at the baseline. The level of IFN- γ of the TG after 2nd month of intervention is significantly different from the CG. The level of sIgA of the TG after 1st month of intervention is significantly different from the CG. This implies that synbiotic and micronutrient supplements had an effect on improving immunologic response – IFN- γ and sIgA.

Keywords: synbiotic, *Lactobacillus*, *Bifidobacterium*, oligosaccharide, immune response

PS-5

ROLE OF PROBIOTIC IN DIARRHEA

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UTILIZATION OF LACTIC ACID BACTERIA IN THE DEVELOPMENT OF ANIMAL PRODUCTS-BASED FUNCTIONAL FOODS

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ABSTRACT

Lactic acid bacteria (LAB) have been extensively used for centuries as starter cultures in fermented foods production. The last decades, beyond the horizon of their conventional role in acid, flavor, and texture improvement, they are being looked upon as probiotic for development of functional foods. Animal products-based functional foods, especially milk and meat products, are being seen as an opportunity to improve the image of animal products, and address consumer needs. Most of fermented milks, using cow's milk or other milks, use the lactic acid fermentation of LAB, but some also used additional alcohol fermentation due to yeasts or lactic fungi to prevent bacterial and mould contamination and improve some properties. The diversification of the diet in recent years and the image as health foods, the products not only plain fermented milk, but also fermented milk with added by all kinds of fruit juice or fruit extract, or added by specific ingredients. Although fermented meats are usually cooked before consumption, one should not expect ingestion of live probiotic grown in the products, the metabolites and end products produced by some strains of *Lactobacillus*, *Streptococcus*, and other homo- and hetero-fermentative cultures in fermented meats may have health-promoting effects such as improve gastro-intestinal functions, suppresses enteric pathogens, and modulates immune functions. There are many challenges and opportunities for development of functional foods containing probiotics, such as the exploration and characterization of indigenous LAB isolates, and the technological innovation approaches. Recently, the global market for functional foods is growing rapidly with an annual 8-16% growth rate. The idea using LAB-fermented animal products for health purposes and not merely as source of nutrients opens up a whole new field in the food industry.

LACTIC ACID BACTERIA IN ETHNIC FERMENTED FOODS AND BEVERAGES: FUNCTIONALITY AND HEALTH-PROMOTING BENEFITS

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ABSTRACT

Ethnic fermented foods and beverages symbolise the culture of a community and reflect the food habits, consumption patterns, food preference, nutritional security, community health, agriculture and livestock systems, marketing, socio-economy, ethnicity and religious taboo, and the profile of native microbial diversity. More than 5000 varieties of fermented foods and alcoholic beverages representing 5-40 % of daily intake of foods, are consumed worldwide in diverse forms of cuisines such as staple, curry, stew, side dish, fried, cooked, paste, seasoning, condiment, pickle, confectionery, salad, soup, dessert, savory, drink, candied, masticator, colorant, taste-maker, alcoholic and non-alcoholic beverages. Microorganisms ranging from mycelial fungi to enzyme and alcohol producing yeasts, and bacteria, comprising mostly lactic acid bacteria, and few bacilli, are associated with fermentation and production of ethnic foods and alcoholic drinks. Most of the foods are fermented naturally, except the alcoholic beverages which are produced by using consortia of microorganisms in the form of dry, cereal-based starter. Lactic acid bacteria (LAB) are non-sporeforming, Gram-positive, catalase-negative without cytochromes, non-aerobic or aerotolerant, fastidious, acid-tolerant, and strictly fermentative bacteria with lactic acid as the major end-product during sugar fermentation. LAB genera isolated from various fermented foods are *Lactobacillus*, *Pediococcus*, *Enterococcus*, *Lactococcus*, *Leuconostoc*, *Oenococcus*, *Streptococcus*, *Tetragenococcus*, *Carnobacterium*, *Vagococcus* and *Weissella*. *Propionibacterium* and *Bifidobacterium* species, commonly present in fermented milks, are also considered among the LAB. Diversity within the species of lactic acid bacteria has created the ethnic foods with different sensory characteristics. Functional LAB present in ethnic fermented foods have many biological functions enhancing the health-promoting benefits, bio-preservation of perishable foods, bio-enrichment of nutritional value, enrichment of diet, protective properties, therapeutic values, antioxidants, etc.

BENCH-SCALE GROWTH OPTIMIZATION OF SELECTED PROBIOTIC AND BACTERIOCIINOGENIC LACTIC ACID BACTERIA USING RESPONSE SURFACE METHODOLOGY

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ABSTRACT

Low-cost culture media for high cell density production of *Pediococcus acidilactici* 3G3 and *Lactobacillus plantarum* BS, previously selected for their probiotic properties and bacteriocin-producing abilities, were optimized using the Central Composite Design of Response Surface Methodology (Design Expert 8.0 software). The contour plot generated for *P. acidilactici* 3G3 flask trials, suggests of optimum combination of the medium components that maximized growth and produced bacteriocin, consisting of 40% (v/v) coconut paring meal extract, 60% (v/v) water of mature coconut, 0.5% (w/v) peptone, 2.5% (w/v) yeast extract and 3% (w/v) molasses. Confirmation runs using a 5-L bioreactor with the temperature, pH and agitation kept constant at 37°C, 5.5, and 50 rpm, respectively, produced a cell count of 8.44×10^{10} CFU/mL ($10.9 \log_{10}$) at 12 hours. Bacteriocin activity (200 AU/mL) was seen at the 10th hour and was observed to be constant until the 16th hour. On the other hand, results derived for growth optimization of *L. plantarum* BS, suggested statistically that skim milk interaction terms had positive effect on viable cell count whereas brown sugar had negative effect. The optimal amounts of skim milk, brown sugar and prepared liquid extract from 10% (w/v) baker's yeast suspension were found to be 5% (w/v), 1% (w/v) and 10% (v/v), respectively, that yielded the highest cell growth of $10.4 \log_{10}$ CFU/mL. All criteria settings were in range and the response (cell count) was maximized. These results shall be tested in pilot-scale production.

ENCAPSULATION OF PROBIOTICS TO ENHANCE PHYSICAL STABILITY AND FOR COLON TARGETED DELIVERY

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ABSTRACT

Probiotics, defined as “living organisms which, upon ingestion in certain numbers, exert health benefits beyond inherent general nutrition”, have become increasingly popular during the last two decades. Due to their perceived health benefits, probiotic microorganisms (e.g. Lactobacilli and Bifidobacteria) have been increasingly included in yoghurts and fermented milks. A major development in functional foods pertains to foods containing Probiotics, which enhance health promoting microbial flora in the intestine. There is growing scientific evidence to support the concept that the maintenance of healthy gut microflora may protect against gastrointestinal disorders including certain infections and inflammatory bowel diseases. However, viability and activity of probiotics are considered prerequisites for optimal functionality. It has been recommended that foods containing such microorganisms should contain 10^6 CFU live microorganisms per g or ml of product at the time of consumption, in order to produce therapeutic benefits. Despite the importance of this essential prerequisite, several surveys have shown large fluctuations and poor viability of probiotics. Factors influencing probiotics’ functionality are i) strain characteristics, ii) daily dosage, iii) non-viability, iv) food matrix formulations, v) targeted prebiotics, vi) fermentation technology, vii) stability, viii) drying technologies etc. Several factors have been claimed to affect the viability of these organisms in fermented milk products, including acidity, pH, concentration of lactic and acetic acids, hydrogen peroxide, and dissolved oxygen content. Moreover, because viable and biologically active microorganisms are usually required at the target site in the host, it is essential that the probiotics be able to withstand the host’s natural barriers against ingested microorganisms. Different approaches that increase the resistance of these sensitive microorganisms against adverse conditions have been proposed, including appropriate selection of acid and bile resistant strains, use of oxygen-impermeable containers, two-step fermentation, stress adaptation, incorporation of micronutrients such as peptides and amino acids, and microencapsulation.

In order to resolve some of the above mentioned issues for a specific product, research work is carried out on the formulations, their stabilization and targeted delivery of probiotic microorganisms. Microencapsulation of probiotic bacterial cells has the potential to protect these

organisms from harsh conditions and ensure the smaller log reduction in viability of cells the products than free cells. One approach is to entrapment of the microorganisms in a polymer matrix. The polymer could be biopolymers such as alginate, chitosan, carboxy-methyl cellulose (CMC), hydroxylpropyl-methyl cellulose (HPMC), proteins, carrageenan, pectin etc. Entrapment of probiotics in biodegradable polymer matrix has a number of advantages. Once entrapped in matrix beads or in microcapsules, the cells are easier to handle than in a suspension or in slurry. The number of cells in each beads or microparticles can be quantified allowing dosage to be readily controlled. A further surface coating as the outer layer can be used to alter the aesthetic and sensory properties of the product and may also be functional, providing an extra level of protection to the cells. In addition, the coating layer can have desirable dissolution properties which permit delayed release of the cells or release upon for example, change in pH.

BIOPROCESSING STRATEGIES FOR IMPROVEMENT OF FOLATE AND HYALURONAN SYNTHESIS BY LACTIC ACID BACTERIA

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ABSTRACT

Locally isolated *Lactobacillus plantarum* UL4 and a recombinant strain *Lactococcus lactis* M4KEpSTag1 were used as folate producers and a medium optimization based on statistical approach of response surface methodology (RSM) was conducted. A 2-L stirred tank bioreactor associated with control strategies (batch and continuous cultivations) and optimum medium formulation was also used for the recombinant strain cultivation. The cultivation temperature was maintained at 30°C and the dilution rate (D) of the cultures was varied from 0.1 h⁻¹ to 0.4 h⁻¹ with a working volume of 600 ml. On the other hand, different types of impeller design (Rushton turbine and helical ribbon) was applied on hyaluronan synthesis by *Streptococcus zooepidemicus* ATCC 39920 using 2 L stirred tank bioreactor. The aim of this study was to improve the folate and hyaluronan biosynthesis by lactic acid bacteria (*L. plantarum* UL4, *L. lactis* M4KEpSTag1 and *S. zooepidemicus* ATCC 39920) via bioprocessing approaches using a stirred tank bioreactor. The biosynthesis of folate by *L. plantarum* UL4 was increased from 36.36 µg/L to 60.90 µg/L using the optimized medium formulation compared to using the MRS medium. Conditions for optimal growth of the strain as suggested by RSM were as follows; lactose 20 g/L, meat extract 16.57 g/L and para-amino benzoic acid 10 µM. The dilution rate of 0.3 h⁻¹ exhibited the highest folate biosynthesis as compared to 0.1 h⁻¹, 2 h⁻¹ and 0.4 h⁻¹ dilution rates by *L. lactis* M4KEpSTag1. The recombinant strain synthesized the highest folate biosynthesis (30.32 µg/L), with the cell efficiency to produce folate ($Y_{p/x}$) of 9.53 µg/g, and reached maximum cell growth (X_{max}) at 5.97 g/L after 12 h cultivation. Furthermore, the growth of *S. zooepidemicus* ATCC 39920 is dependent on oxygen supply and the oxygen supply is directly associated with hyaluronan productivity in an aerated and agitated conditions. The helical ribbon impeller showed efficient mixing in a non-Newtonian hyaluronan broth and it was able to improve its molecular weight from 4.36 x 10⁶ Da to 5.20 x 10⁶ Da, even though the hyaluronan concentrations obtained are almost the same at the fix impeller tip speed (0.785 m/s). The bioprocessing strategies applied were able to significantly improve the biosynthesis of biomolecules by lactic acid bacteria. This approach could be applied for other biomolecules synthesis by lactic acid bacteria using a bioreactor system.

Keywords: folate, hyaluronan, response surface methodology, lactic acid bacteria, bioreactor

DEVELOPING VACCINES FOR BLADDER CANCER THERAPY

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Introduction

Lactobacillus rhamnosus GG (LGG) are lactic acid bacteria, which were found to be better than BCG at inducing cell death in human bladder cancer cell lines. LGG was also as effective as BCG in curing mice with orthotopic bladder cancers after intravesical therapy. The discovery of bladder tumour antigens coupled with the ability of LGG secreting antigens to induce both humoral and CTL responses to the antigen in mice led to us to evaluate the potential of recombinant LGG secreting an antigen as a cancer vaccine.

Methods

MB49-PSA (murine bladder cancer cells secreting human PSA) cells secrete the human prostate antigen as a marker protein but this can also be regarded as a cancer antigen. So the human prostate specific antigen (PSA) was cloned into pLP500-slpAp vector under the control of various promoters. Constructs of IL15 and PSA were also generated. The murine IL-15 cDNA minus its termination codon was cloned upstream of the PSA protein sequence. Lactobacilli were transformed with the plasmids to generate LGG-IL15-PSA, LGG-PSA and LGG-S (pLP500-slpAp) respectively. PSA and IL15 secretion was 16-19 ng/2x10⁹ CFU/ml. Bone marrow cells were isolated from the tibia and femur of 8-10 weeks old female C57BL/6 mice. Neutrophils were isolated by positive selection with anti-Ly6G microbead kit (Miltenyi Biotech, Germany). To generate DCs, bone marrow derived cells were cultured for 9 days in media with 40ng/ml of GM-CSF (BD Bioscience) which was replaced every other day. Neutrophils and DC were exposed to the recombinant LGG for 2h (this exposure time is used clinically during BCG immunotherapy) and used to stimulate T cells to generate CTL against the murine bladder cancer cell lines expressing PSA (MB49-PSA).

Results

The best expression and secretion of the antigen and cytokine was obtained with a vector containing the S-layer promoter of *L. acidophilus*. Recombinant LGG activated neutrophils (elevated MHC class I expression) induced DC maturation (increased expression of CD86, CD80, CD40, MHC II and CD83), T cell proliferation and PSA specific cytotoxic T lymphocytes (CTL) activity. Activated DC was more efficient than activated neutrophils in inducing T cell IL2 and IFN γ production. Activated DC was able to stimulate naive T cells to generate PSA specific T cells in vitro that recognized PSA secreting MB49 cells. IL15 enhanced DC generation of CTL.

Conclusion

LGG secreting tumor antigens and cytokines could be used to activate DC in vitro for DC therapy in patients or used as intravesical therapy. Further analysis of the bladder tumour microenvironment also identified possible mechanisms of tumour induced immunosuppression and we are exploring ways to counter these strategies using LGG.

A NEW SYNBIOTIC MIXTURE OF scGOS/lcFOS AND *Bifidobacterium breve* M-16V IMPROVES GUT MICROBIOTA, GUT HEALTH AND ALLERGIC SYMPTOMS IN INFANTS WITH ATOPIC DERMATITIS

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Background: Disturbances in the intestinal microbiota composition has been shown in children with atopic dermatitis and prospective studies indicate that they precede the onset of clinical symptoms, suggesting a potential causal relationship. Although the administration of probiotics, seems to be a good strategy to restore and maintain the gut microbiota composition, previous studies have shown inconsistent outcome. Observed positive results may be improved by combining probiotics with prebiotics, i.e. synbiotics. Therefore, we investigated the effect of a specific synbiotic mixture consisting of the probiotic strain *Bifidobacterium breve* M-16V and the prebiotic mixture of short chain galacto-/long chain fructo-oligosaccharide (scGOS/lcFOS, ratio 9:1) on the gut microbiota, and also gut health and atopic dermatitis symptoms.

Methods: Ninety infants with AD (<7 months) participated in a double-blind, placebo-controlled, randomized multi-centre trial receiving either an extensively hydrolyzed formula with *Bifidobacterium breve* M-16V and scGOS/lcFOS or without synbiotics during 12 weeks. Severity of AD was assessed with the SCORAD index every 4 weeks. Faecal microbiota, pH, lactate and short chain fatty acids were assessed. Prospectively, at 1 year parents were asked via validated questionnaire about: (i) Prevalence of respiratory symptoms predictive of asthma (frequent wheezing, defined as ≥ 3 episodes after the intervention period, wheezing apart from colds) and (ii) Current use of asthma medication (beta-2 agonists, anti-cholinergics, inhaled corticosteroids).

Results: Ninety infants with a mean age of 4.9 months (SD 1.4) were included. During the intervention, the SCORAD score decreased 12.7 and 14.5 points in the synbiotic ($P < 0.001$) and the placebo group ($P < 0.001$), respectively. No statistically significant difference in SCORAD score

between the two groups was observed at any time point. However, interestingly, in the subgroup of infants with (n=50), there was a significant improvement in the subgroup of children with IgE-associated AD (high IgE level), improvement in the SCORAD score a week 12 compared with baseline was significantly greater in the synbiotic than in the placebo group (P=0.04). Furthermore, the synbiotic group showed significant higher levels of *B. breve* M16-V at week 1 and week 12 and a higher proportion of bifidobacteria (P<0.01) at week 12 when compared to the control group. A significantly lower percentage of *Clostridium lituseburense*/*Clostridium histolyticum* group (P=0.045) and *Eubacterium rectale*/*Clostridium coccoides* cluster (P<0.001) was observed in the synbiotic group. The synbiotic group had a higher proportion of acetic acid (P=0.04) and lower proportions of butyric (P=0.05), isobutyric (0.4% vs. 1.7%, P=0.02) and isovaleric acid (P=0.02). Faecal consistency was significantly softer in the synbiotic group and parents reported less constipation and diaper dermatitis (both P=0.01). The new formula was well tolerated by all infants.

Conclusion: This specific synbiotic mixture did not show a significant effect on the severity of AD in all infants; however, results of subgroup analysis revealed a beneficial effect in infants with IgE-associated AD. Additionally, the newly developed formula successfully modulated the composition and the metabolic activity of the intestinal microbiota of infants with AD, potentially explaining the additional beneficial effects observed for constipation and diaper dermatitis (1). The 1 year FU results revealed the potential preventive effect of the synbiotic mixture on asthma-like symptoms and possibly an effect on subsequent development of asthma (improvement of Allergy March) (2). A larger clinical study is ongoing to confirm these results.

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ASIAN MICROBIOME PROJECT: A PILOT STUDY ON THE DIVERSITY OF FECAL MICROBIOTA OF HEALTHY ASIAN CHILDREN

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ABSTRACT

Gastrointestinal microbes play important roles in the health and disease of the host. There is a lot of documented evidence which demonstrates that disturbance of intestinal microbiota is linked to the risk of developing infectious, inflammatory and allergic diseases. It is of great interest to characterize both composition and succession of the intestinal microbiota.

We have been conducting an Asian Microbiome Project as part of activities of the Asian Federation of Societies for Lactic Acid Bacteria (AFSLAB) since 2009 to examine the microbiota profile among healthy children in Asian cities as the pilot study to provide the background for further perspective studies of disease population and age groups. The profiling of the fecal microbiota of 300 healthy children aged 8–9 years of both sexes derived from the following 5 countries (10 cities): China (Beijing, Lanzhou), Indonesia (Yogyakarta, Bali), Japan (Tokyo, Fukuoka), Taiwan (Taipei, Taichung) and Thailand (Bangkok, Khon Kaen), was determined by quantitative PCR (qPCR), quantitative RT-PCR (RT-qPCR) and pyrosequencing.

As a result, we found that the microbial profiles of 298 children from 10 cities of 5 Asian countries indicated the presence of two distinctive enterotypes: *Bacteroides* and *Bifidobacterium* were the dominant bacterial components in children of China, Taiwan and Japan (Fukuoka), whereas *Prevotella* was the dominant component in those of Indonesia and Thailand (Khon Kaen). The difference in dietary habit among these countries may cause difference in fecal microbiota profiles.

We will introduce the brief information about the procedure and features for analyzing fecal microbiota using the rRNA gene-based qPCR, RT-qPCR and pyrosequencing methods, and will discuss the research results of this pilot study.

SOME CONSTRAINTS IN DEVELOPING PROBIOTIC PRODUCTS OF INDONESIAN ORIGIN

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ABSTRACT

Probiotics are bacterial cultures which are consumed with certain foods to replace or augment the normal colon flora, protect the host from pathogenic bacteria, and improve the overall health of the host. Probiotics must be able to survive during food processing and resistant against gastric acid, bile salt, and digesting enzymes before reaching small intestine and colon. Many Indonesian traditional fermented foods have high potentials to become probiotic product, for examples *tempoyak*, *bekasam*, *rusip* and *sayur asin*. However, almost all of these foods are consumed after cooking or heating. Consequently, all lactic acid bacteria lost their viabilities. Therefore, there are some constraints regarding development of probiotic products of Indonesian food origin. Firstly, it may contain microbial contaminants when the process condition is not hygienic and sanitary like *Enterococcus* in *tempoyak* and *Bacillus* in *rusip*. Secondly, no one can consume the fresh fermented fish (especially for *bekasam* and *rusip*), since the natural taste of fermented foods is not preferable. And thirdly, very low survival rate of probiotic lactic acid bacteria during food processing by cooking or heating. These three factors will be discussed in detail in this paper.

Keywords: probiotic product, Indonesian fermented foods

**THE BIODIVERSITY OF LACTIC ACID BACTERIA IN INDONESIAN INDIGENOUS
FERMENTED FOODS**

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ABSTRACT

Lactic acid bacteria (LAB) have been long known to be involved in the production of fermented foods. There are a wide range of food commodities fermented by LAB or LAB in combination with other microorganisms from various raw materials, including milk, meat, fish, vegetables, fruits, soybean and olives. The role of LAB in various Indonesian fermented foods will be discussed in this paper, from *tempoyak* in South Sumatera to *tempe* in Yogyakarta and from *wadi* in Banjarmasin to *peda* in Lombok. In conclusion, the genus *Lactobacillus* plays the most important role in Indonesian fermented foods, followed by *Pediococcus*, *Streptococcus*, *Leuconostoc*, *Enterococcus* and *Weissella*.

Keywords: lactic acid bacteria, Indonesian fermented foods

AMPLIFIED RIBOSOMAL DNA RESTRICTION ANALYSIS (ARDRA) FOR THE CHARACTERIZATION OF LACTIC ACID BACTERIA PRODUCING ANTIMICROBIAL ACTIVITY FROM BAKASANG

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ABSTRACT

A molecular technique based on the restriction fragment length polymorphism of the 16S ribosomal genes amplified by a polymerase chain reaction (PCR), referred to amplified 16S ribosomal DNA restriction analysis (ARDRA), was designed to identify 4 strains of lactic acid bacteria producing antimicrobial activity isolated from *bakasang*. The 16S rDNA was amplified by PCR using a pair of bacterial universal primers and restriction analysis of 16S rDNA sequences was done with *Hae*III endonuclease. Digestion patterns of 4 strains LAB (BksC24, BksJ21, BksJ43 and BksK25) by ARDRA were similar to *Pediococcus acidilactici* FNCC 0110 and was different to *P. pentosaceus* FNCC 0019 pattern. ARDRA method could prove to be valuable for molecular identification of lactic acid bacteria producing antimicrobial isolated from *bakasang*.

Keywords: *Bakasang*, ARDRA, lactic acid bacteria, *Pediococcus acidilactici*, 16S rDNA

QUANTITATIVE PCR DETECTION OF BIFIDOBACTERIAL SPECIES AND VIABLE PROBIOTIC STRAIN IN HUMAN FECES

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ABSTRACT

Members of the genus *Bifidobacterium* are some of the most common organisms in the human intestinal microbiota and considered to exert positive influences to host health. So far, many attempts have been made to increase populations of *Bifidobacterium* in the intestinal tract by supplying probiotics and prebiotics. Hence, the analyses of *Bifidobacterium* species composition in human intestinal microbiota and viable detection of probiotic strain are highly important. In this study, we developed genus- and species-specific quantitative PCR (qPCR) method with 16S rRNA-gene targeted primers. We also applied these primers to investigate the distribution of bifidobacteria in the intestinal microbiota of 46 healthy human adults, and found that *Bifidobacterium adolescentis*, the *Bifidobacterium catenulatum* group, and *Bifidobacterium longum* were the three predominant species in adult's intestinal microbiota. In addition, strain-specific primer set for probiotic *Bifidobacterium breve* strain Yakult (BbrY) was developed targeting a specific RAPD band. We also developed viable cell counting procedure by combination of the strain specific PCR and propidium monoazide (PMA), which selectively penetrates dead cells, bind to DNA under bright visible light, makes DNA insoluble, and inhibits PCR amplification. After 11 healthy subjects ingested $10.7 \log$ CFU of BbrY daily for 10 days, $6.9 \pm 1.5 \log$ CFU/g of BbrY was detected in feces by using strain-specific agar medium. Viable BbrY detected by qPCR with PMA treatment was $7.5 \pm 1.0 \log$ cells/g and the total number (viable and dead) of BbrY detected by qPCR without PMA treatment was $8.1 \pm 0.8 \log$ cells/g. The results indicate that there are BbrY which are unable to grow on an agar plate but PMA does not penetrate. Thus, the combination of strain-specific qPCR and PMA treatment is useful for evaluating viable probiotics in human feces.

Keywords : *Bifidobacterium*, qPCR, intestinal microbiota

**THE MAPPING OF LACTID ACID BACTERIA FROM FERMENTATION OF LOCAL FOODS
(SEMARANG): *TEMPOYAK*, *MANDAI* AND YELLOW BAMBOO SHOOT PICKLES**

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ABSTRACT

The aim of this research was to obtain the map of LAB derived from raw materials (local from Semarang). Mapping of LAB required as an embryo data base of LAB from fermented local food from Indonesia. Samples were collected from Semarang *i.e.*, durian (*Durio zibethinus* Murr.) from Gunung Pati, edible portion of jackfruit (*Artocarpus heterophyllus* Lamk.) var. Salak from Gunung Pati, yellow bamboo shoot *betung* (*Dendrocalamus mranggen*) from Mranggen. After fermentation, microbes from samples (*tempoyak*, *mandai*, and yellow bamboo shoot pickles) were isolated using MRS agar. The microbes identified as LAB by their positive Gram reaction, spore-forming, negative of catalase activity, morphological, physiological and biochemical characteristics. In general, it was found 17 isolates from *tempoyak* fermentation which were identified as *Enterococcus*, 15 isolates from *mandai* were identified as *Lactobacillus* and 21 isolates from yellow bamboo shoot pickles were identified as *Lactobacillus*. Based on API 20 STREP and API 50 CHL, the results represented that bacteria of each sample were performed to confirm the identification as LAB. This research concluded that the dominant microbes in *tempoyak* was *Enterococcus faecium*, in *mandai* and yellow bamboo shoot pickles were *Lactobacillus pentosus* and in yellow bamboo shoot pickles was *Lactobacillus plantarum*.

Keywords: mapping, lactic acid bacteria, *tempoyak*, *mandai*, yellow bamboo shoot pickles

THE ISOLATION OF *Bifidobacterium* spp. FROM FAECES OF INFANT BORN BY NORMAL BIRTH AND ITS POTENTIAL AGAINST *Eschericia coli*

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ABSTRACT

Bifidobacterium spp. are the dominant microorganism in infant digestive tract. The presence of this bacteria was used as indicator of the health of the gastrointestinal tract. The diversity of *Bifidobacterium* spp. one depends on the process of infant birth. The aim of our research was to determine the diversity of *Bifidobacterium* spp. isolated from faeces of infant by normal birth and the ability of their metabolites in inhibiting *Eschericia coli*. The research was conducted by survey and data obtained were analyzed by descriptive analysis. *Bifidobacterium* spp. were observed their characteristic such as morphological, biochemical and carbohydrate test. Morphological observation consist of colony and cell morphology. Biochemical tests consist of catalase, indole, Voges-Proskauer, growth pH range, and resistance to lisozym. The result indicated that the isolation of *Bifidobacterium* spp. obtained four different species and could inhibit *E. coli* with different inhibitory activity. Result from identification that strain number BNa1 and BNa2 were *B. infantis*; BNb2 was *B. dentium*; BNb3 and BNC6 were *B. mongoliense*; while *Bifidobacterium* BNb1 has not been determined its species yet.

Keywords : *Bifidobacterium* spp., *Eschericia coli*, isolation, normal birth

IMPROVEMENT OF THE QUALITY AND THE FUNCTIONALITY AS AN ANGIOTENSIN CONVERTING ENZYME INHIBITOR OF *BEKASAM* BY USING *Lactobacillus plantarum* B1765 AS STARTER CULTURE

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ABSTRACT

Research on a traditional Indonesian fermented fish *bekasam*, was carried out in order to improve its functionality. Aim of this research was to improve Angiotensin Converting Enzyme (ACE) Inhibitor which is related to the bioactive peptides produced by proteolytic lactic acid bacteria in *bekasam*. Among the 150 lactic acid bacteria strains isolated from *bekasam*, we found 56% strains have a proteolytic activity and were identified belong to species of *Lactobacillus plantarum* B1765, *L. plantarum* T2565, *L. plantarum* N2352, *L. plantarum* B1465, *Lactobacillus pentosus* B2555, and *Pediococcus pentosaseus* B1661. The highest ACE inhibitor activity (67.18%) was produced by *L. plantarum* B 1765, which correlated with the highest producing peptides in *bekasam* like product fermentation process. *L. plantarum* B1765 also showed some characteristics of starter culture due to growth well in the medium (10^9 CFU/g), tolerance at the acidic medium (pH 4), and tolerance at concentrated salt (10%). The use of *L. plantarum* B1765 as a starter culture in the *bekasam* fermentation showed increasing of the ACE inhibitor activity to 71.54%, higher than control (52.99%) which was not inoculated with this isolate. The used of starter culture was also improving the product quality of *bekasam* by increasing the total lactic acid bacteria, soluble protein, decreasing pH, and shorten the fermentation time due to the organoleptic test that showed higher score in 3 days of fermentation than spontaneous fermentation that showed the highest acceptability in 5 days of fermentation.

Keywords: *bekasam*, ACE inhibitor, *Lactobacillus plantarum*

EFFECT OF INDIGENOUS LACTIC ACID BACTERIA FERMENTATION ON ENRICHMENT OF ISOFLAVONE AND ANTIOXIDANT PROPERTIES IN CRUDE EXTRACT OF *KERANDANG* (*Canavalia virosa*)

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ABSTRACT

Five indigenous lactic acid bacteria *Lactobacillus plantarum-pentosus* T14, *Lactobacillus plantarum-pentosus* T20, *L. plantarum* T32, *L. plantarum* T33 and *L. plantarum-pentosus* T35 were tested for their capabilities of transformation isoflavone glucosides to aglycones in *kerandang* crude extract. Changes in growth, pH, titratable acidity (TA), β -glucosidase activity were investigated during fermentation at 37°C for 24 h. Isoflavone transformation were analyze using UPLC. The antioxidant properties were analyze using 1,1-diphenyl-2-picrylhydrazyl (DPPH) and ferrous ion-chelating ability. The result showed that each population of lactic acid bacteria reached 10⁹ CFU/ml. The initial pH 6.5 decreased while TA increased as fermentation proceeded. *Lactobacillus plantarum-pentosus* T14 showed highest enzyme activity that is 558 ± 9.8 mU/ml culture at 12 h fermentation. All five strains are able to transform isoflavone glucoside to aglycone. However, *L. plantarum-pentosus* T14 and *L. plantarum-pentosus* T20 has a better ability to transform, followed by *L. plantarum* T32 compared to *L. plantarum* T33 and *L. plantarum-pentosus* T35.

Keywords : indigenous lactic acid bacteria, *kerandang* crude extract, isoflavone, antioxidant activity

**AMINO ACID SEQUENCE OF PEDIOCIN PaF-11 FROM
Pediococcus acidilactici F-11**

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ABSTRACT

Pediocin PaF-11 produced by *Pediococcus acidilactici* F-11 has potential uses as food preservatives. The aim of this research was to sequence the amino acid of pediocin PaF-11. The strain used in this study was obtained from the Food Nutrition Culture Collection, Universitas Gadjah Mada. The *P. acidilactici* F-11 was grown to produce its pediocin PaF-11 in TGE liquid medium, pH 6.5 at 37 °C incubation for 18 hours. The pediocin PaF-11 was separated and purified according to the adsorption-desorption methods. Identification of gene encoding pediocin PaF-11 production was carried out through a Polymerase Chain Reaction (PCR) analysis. The purified PCR product was subjected to DNA sequencing. Similarity searches to the sequences obtained were performed with BLAST program (<http://www.ncbi.nlm.nih.gov>). Result showed that nucleotide of pediocin PaF-11 encoding gene was sequenced : atgaaaaaaa ttgaaaatt aactgaaaa gaaatggcca atatcattgg tggtaaatac tacggtaatg gggttacttg tggcaaacat tctgctctg ttgactgggg taaggctacc acttgcataa tcaataatgg agctatggca tgggctactg gtggacatca aggtaatcat aaatgctag. This nucleotide sequence could be used to generate the sequence of pediocin PaF-11, that is the following: **MKKIEKLTEKEMANIIGGKYYGNVTCGKHSCSVDWGKATTCIINNGAMAWATGGHQGNHKC**. The pediocin PaF-11 has the consensus sequence **YNGVXCXXXXCXVXXXXA** which indicates that pediocin PaF-11 is belong to class IIa bacteriocin. The sequence of pediocin PaF-11 has a high homology (100%) with pediocin PA-1 (from *P. acidilactici* PAC 1.0 and *P. pentosaceus* IE-3); prepediocin PA-1 (from *P. acidilactici* K10); pediocin Ach (from *P. acidilactici* H; *P. acidilactici* LB42-923; *P. parvulus* ATO77 and *P. pentosaceus* S34) and prepediocin CP2 from *P. acidilactici* MTCC 5101 and pediocin from *P. acidilactici* CFR K7 and *P. acidilactici* PED 01.

Keywords: amino acid, sequence, pediocin PaF-11, *Pediococcus acidilactici* F-11

ISOLATION OF LACTIC ACID BACTERIA AS BIOPRESERVATIVE IN CORN FERMENTED MILK

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ABSTRACT

Corn milk is one of fermented food from South Sulawesi. It still produced traditionally so that it becomes low stability of viable beneficial bacteria. The purpose of this research was to isolate and identify the lactic acid bacteria producing bacteriocin isolated from corn fermented milk. Sweet corn (*Zea mays saccharata*) removed from the cob, washed with water, crushed using mortar, added with sterile distilled water, and fermented for 24 hours at temperature 37°C. Lactic acid bacteria (LAB) was isolated from spontaneously fermented corn with 3 treatments and 2 replications. The treatments used were (i) the tube was opened and not heated (JME B), (ii) the tube was closed and heated (JME T), and (iii) the tube was closed and not heated (JMA). From these treatments 22 isolates, 7 isolates, and 5 isolates were obtained respectively. Among of them, sixteen isolates were able to agglutinate corn milk and capable in making good flavor. Screening of the isolates based on the ability to produce bacteriocin and antagonists assay against *Staphylococcus aureus*. There were 7 isolates of LAB producing bacteriocin.

Keywords: lactic acid bacteria, sweet corn, fermented milk, bacteriocin

**ANTIBACTERIAL ACTIVITIES OF LACTIC ACID BACTERIA
ISOLATED FROM *TEMPOYAK* DURING LOW TEMPERATURE FERMENTATION
AGAINST *Staphylococcus aureus***

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ABSTRACT

Isolation and identification of indigenous lactic acid bacteria from low temperature ($20\pm 2^{\circ}\text{C}$) fermented *tempoyak* were carried out in this study. Lactic acid bacteria produced some metabolites which have antimicrobial effects against other bacteria, such as lactic acid, diacetyl, peroxide and bacteriocin. *Staphylococcus aureus* has a natural habitat on the surface of the human body such as on the skin and in mucous membranes like the nose. *Staphylococcus aureus* was a risk factor in *tempoyak* fermentation, especially, during taking the durian flesh from seeds. The aim of this research was to observe antibacterial activities of lactic acid bacteria isolated from *tempoyak* during low temperature fermentation against *Staphylococcus aureus*. This growth inhibition effect was indicated by their ability to form more than 5 mm clear zone. The result indicated that eight isolates have antibacterial activities, namely, *Lactococcus* I446, *Lactococcus* I1045, *Lactococcus* C044, *Leuconostoc* C042, *Leuconostoc* C043, *Lactobacillus* I1442, *Lactobacillus* C425, and *Lactobacillus* C426. Furthermore, based on the co-culture assay, showed that generally lactic acid bacteria have bactericidal effect toward *Staphylococcus aureus*.

Keywords : lactic acid bacteria, *tempoyak*, fermentation, at $20\pm 2^{\circ}\text{C}$, antibacterial activities, *Staphylococcus aureus*

**ISOLATION AND CHARACTERIZATION OF LACTIC ACID BACTERIA PRODUCING
ANTIMICROBIAL COMPOUNDS FROM SMALL INTESTINE OF CHICKEN**

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ABSTRACT

In food industry, Lactic Acid Bacteria (LAB) have important role for food preservation because of the ability of some strains to produce antimicrobial compounds, including organic acids, hydrogen peroxide and bacteriocins. A number of studies have reported that the LAB has antagonistic properties by inhibit the growth of enteric pathogens *i.e.*, *Staphylococcus aureus*, *Escherichia coli*, *Listeria monocytogenes*, and *Salmonella*. Lactic acid bacteria are commonly found in the gastro intestinal tract of various endothermic animals and humans. The aim of this research was to isolate and to characterize lactic acid bacteria from small intestine of chickens that have antimicrobial activity against enteric-pathogenic *i.e.*, *Staphylococcus aureus* and *Escherichia coli*. Four steps in this research were LAB isolation, purification, characterization and antimicrobial activity testing using diffusion method. Nineteen strains were isolated and identified as lactic acid bacteria based on their morphology and biochemical characteristics. All isolates were Gram-positive, non-sporulating, non-motile, catalase negative, not produce gas and classified as *Lactobacillus* and *Lactococcus*. Based on the antimicrobial testing, all isolates produced antimicrobial compounds which were active against pathogenic bacteria, indicated by the formation of clear zones around the well (9-15 mm diameter zones). Isolate number 411 had the highest inhibitory zone, which produced more than 15 mm clear zone.

Keywords: Lactic Acid Bacteria, antimicrobial compound, chicken small intestine, well diffusion method

STUDIES ON THE QUALITY OF FERMENTED GOAT AND COW MILK PRODUCED BY DIFFERENT STARTERS OF LACTIC ACID BACTERIAWidodo^{1,2}, Tiyas Tono Taufiq¹, and Nosa Septiana Anindita²¹ Faculty of Animal Science, Universitas Gadjah Mada, Yogyakarta, Indonesia² Research Center for Biotechnology, Universitas Gadjah Mada, Yogyakarta, Indonesia

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ABSTRACT

Lactic acid bacteria (LAB) is widely used for the production of fermented dairy products. The aim of this experiments was to investigate the quality of fermented goat and cow milk, as well as viability of LAB during storage of the products at refrigerated temperature. Fermentation was performed on pasteurized goat or cow milk added with skim milk (total solid 18%) using three separately different starters, namely yoghurt starter (combination of *Lactobacillus bulgaricus* FNCC 0041 and *Streptococcus thermophilus* FNCC 0040), single starter of *Lactobacillus acidophilus* FNCC 0051, and *Lactobacillus casei* FNCC 0090. Parameters observed were pH and acidity, nutritional quality including protein, fat and lactose content, and product viscosity. Acidity, pH and viability of LAB were also monitored during storage of fermented products at refrigerated temperature (4°C) for 28 days. The results showed that different on LAB starters did not affect pH, acidity, lactose and protein content of the products. Differences on LAB starters affected fat content and viscosity of the fermented product. The highest score of viscosity (30.00±7.02 Pa.s) was observed on fermented product using yoghurt starters, followed by products obtained using *L. acidophilus* FNCC 0051 (17.7±11.4) and *L. casei* FNCC 0090 (8.62±0.35). Protein content, acidity and pH, as well as viscosity were not significantly different between fermented products obtained from goat and cow milk. Fat content of fermented goat milk was higher (5.03±0.62%) than fermented cow milk (3.52±0.37%), however lactose content was higher in fermented cow milk (5.16±0.40%) than in fermented goat milk (4.53±0.35%). The average of total LAB in fermented cow milk during refrigerated storage was 8.03±0.52 log₁₀ CFU/ml, while in fermented goat milk was 7.81±0.67 log₁₀ CFU/ml. There was a 10.83% decrease in LAB viability after 28 days of storage in refrigerator in fermented cow milk and 11.40% in fermented goat milk. Storage for 14 days was able to maintain the viability of LAB in the product, but after a prolonged period of storage the viability of LAB was dropped drastically.

Keywords : fermented milk, goat milk, cow milk, starter culture, viability

EVALUATION OF FERMENTED BEVERAGE MADE FROM PUMPKIN WITH VARIOUS CONCENTRATION OF SKIM MILK

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ABSTRACT

The objective of this study was to obtain the best concentration of the pumpkin and skim milk that could be used to produce fermented beverages that met requirement of the fermented beverage standard. The study was conducted using a Completely Randomized Design with factorial arrangement that consists of two main factors with three replications. The first factor was the concentration of pumpkins namely the ratio pumpkins and water, 1:2, 1:3 and 1:4 respectively and the second factor was the concentration of skim milk 0, 6, 12, and 18%. The material used were the pumpkin (*Cucurbita moschata*), lactic acid bacteria (*Lactobacillus bulgaricus* and *Streptococcus thermophilus*) obtained from the Bogor Agricultural University, skim milk, MRS agar, MRS Broth and other chemicals for analysis. The data obtained were statistically analyzed by ANOVA and followed by Tukey's test to see the differences. The results show that the concentration of the pumpkin and skim milk affected significantly ($p < 0.05$) to the total amount of lactic acid bacteria and total solids. In conclusion, the best treatment was achieved at ratio of pumpkin:water = 1:2 and 12% skim milk with a pH of 4.10, 1.05% lactic acid, lactic acid bacteria total log 11.64 CFU/ml, total solids 18.82% and 0.81% crude fiber.

Keywords: pumpkin, beverage fermentation, *Lactobacillus bulgaricus*, *Streptococcus thermophilus*

STUDY OF THE GROWTH LACTIC ACID BACTERIA ON YOGHURT DRINK ADDED BY JACKFRUIT EXTRACT

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ABSTRACT

Sugar plays important role to maintain the growth of lactic acid bacteria. Among fruits in Indonesia, jackfruit contains high component of sugar. This study analyzed the growth of lactic acid bacteria on yogurt drink added by jackfruit extract. The amount of 0%, 1%, 3%, and 5% of jackfruit extract were added to skim milk containing the combination of lactic acid bacteria i.e., *Lactobacillus bulgaricus*, *Streptococcus thermophilus*, *Lactobacillus acidophilus*, *Bifidobacterium longum* ATCC 15707. The growth of lactic acid bacteria was analyzed. The result showed that additional jackfruit extract slightly increased the population of lactic acid bacteria. Additional 0%, 1%, 3%, and 5% of jackfruit extract exhibited lactic acid bacteria population i.e., $3,0 \times 10^7$; $1,1 \times 10^8$; $1,2 \times 10^8$; $1,9 \times 10^8$ CFU/ml respectively. This study indicated that jackfruit extract could be added to yoghurt drink.

Keywords: yoghurt drink, jackfruit, LAB viability

THE PHYSICAL AND MICROBIOLOGICAL PROPERTIES OF YOGURT DRINK ADDED BY STARFRUIT EXTRACT

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ABSTRACT

The objective of this research was to analyze the physical and microbiological property of yogurt drink added by starfruit extract. The materials used in this study were skimmed milk, the mixture of lactic acid bacteria (LAB) starter cultures (*Lactobacillus bulgaricus*, *Streptococcus thermophilus*, *Lactobacillus acidophilus*, and *Bifidobacterium longum* ATCC 15707), and starfruit extract. Completely Randomized Design was used as an experimental design with four treatments and five replicates of concentration levels of starfruit extract added into yogurt drink. The addition of starfruit extract concentration were 0%, 1%, 2%, and 3%. The results showed that the pH values were 4,33; 4,11; 4,19; and 4,20 for T₀, T₁, T₂, and T₃ respectively. The total counts of lactic acid bacteria were $2,6 \times 10^8$, $4,3 \times 10^7$, $5,6 \times 10^7$, and $3,7 \times 10^8$ CFU/ml. These results indicate that the higher concentration of starfruit extract added, the higher both the pH value and the total count of lactic acid bacteria.

Keywords : yogurt drink, starfruit extract, pH, total count of LAB

THE EFFECT OF SOLID PART LEVEL OF FERMENTED VEGETABLE GARBAGE TO THE NUMBER OF LACTIC ACID BACTERIA AND THE PRESENCE OF GRAM (+/-) BACTERIA OF FOODCOURT WASTE'S PELLET

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ABSTRACT

The study was conducted to develop functional feedstuff of poultry feed from pellet of food waste from food court enriched by solid component of fermented vegetable garbage (SFVG). The experiment was conducted by completely randomized design (CRD) with 4 treatments (level of SFVG 30, 40, 50 and 60%) and 5 replications. Parameters analyzed were microbiological population, i.e., lactic acid bacteria (LAB) and the presence of Gram positive and negative bacteria (gram +/-). Results of experiment show that pellet of food waste from foodcourt that which enriched with 50% SFVG could be recommended as a potential probiotic feedstuff, because of high number of LAB and the ability to control Gram negative bacteria.

Keywords: foodcourt waste, pellets, micro-organisms

ISOLATION AND CHARACTERIZATION OF BACTERIOPHAGE FROM CHICKEN INTESTINE FOR IMPROVING FOOD SAFETY

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ABSTRACT

Food safety is an increasingly important public health issue. The number of cases of several food-borne diseases has been rising continuously in many countries. In industrialized countries, the percentage of the population suffering from food-borne diseases each year has been reported to be up to 30%. Many efforts are intensified all over the world to improve food safety. Antibiotics are generally applied to treat the illness caused by food-borne bacteria. However, there has been a rise in strains resistant to multiple antibiotics. Using phages as bio-control in controlling food-borne disease should be a promising strategy to overcome this problem. The phages should have a broad host range or they must be used in conjunction with other phages in order to be effective. In this study we attempt to isolate the broad host range phages infecting the important food-borne pathogen by including host in agar overlays inoculated with phage-containing sample. We sought to isolate phages and to examine them for properties which may be useful for bio-control purposes on food products. Bacteriophages were isolated from chicken intestine using soft agar overlays containing indicator (host) bacteria and assessed with regard to their potential to control food-borne bacteria. Isolation was performed by using agar layer (overlay) method (Carey-Smith *et al*, 2006). Base plates, poured with 25 mL of medium, used agar at a concentration of 1.5%, whereas soft agar overlays were at 0.7% (5 mL). Exponential phase host (8-10 h culture) and bacteriophages were mixed in each overlay before pouring onto dried base plates. The plate was incubated at 37°C for 6 h to examine for plaque formation. The results showed that isolated virulent bacteriophages (Φ U14) was (or isolated virulent bacteriophages (Φ U14) were) obtained from intestine. It was shown that Φ U14 with the concentration of 1×10^9 PFU/ml effectively inhibited the growth of pathogenic bacteria of *Salmonella typhimurium*, *Listeria monocytogenes* and *Bacillus cereus*. Identification by using TEM (Transmission Electron Microscopy) indicated that phages have hexagonal shape and classified as podoviridae type. In this study, the identification of host bacteria was also performed. By morphological and physiological identification, it showed that the host is Gram-negative, rod-shape, catalase-positive and confirmation with 16S rRNA showed that host is identical 99% with pathogenic bacteria, *Shigella flexneri*, suggesting that Φ U14 are potential to be candidates for bio-control of pathogenic bacteria *Shigella flexneri* as well as *Salmonella typhimurium*, *Listeria monocytogenes* and *Bacillus cereus*.

Keywords: bacteriophage, chicken intestine, pathogenic bacteria, food safety

APPLICATION OF LACTID ACID BACTERIA INOCULUM POWDER ON FERMENTATION OF URUTAN : STUDY ON MICROBIOLOGICAL, ORGANOLEPTIC CHARACTERISTIC, AND AROMA COMPOUNDS PROFILES

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ABSTRACT

The aims of this research were to find out the influences of lactic acid bacteria (LAB) inoculum powder used in *urutan* fermentation on microbiological and organoleptical characteristic of *urutan*. The profile of aroma compounds produced after fermentation and conditioning process were also determined. The production of *urutan* was done in laboratory scale using two strains of LAB, namely *Pediococcus acidilactici* U318 and *Lactobacillus plantarum* U201, as starter culture in the form of inoculums powder. The total of microbe, LAB, *Enterobacteriaceae*, and the organoleptic characteristics of the final product were determined. Profile of aroma compounds of *urutan* were analyzed by using GC-MS at the initial stage of fermentation, after fermentation, and after conditioning. The result showed that using various types of inoculum powder had significant effect on total of microbe, LAB, total *Enterobacteriaceae*, and sensory characteristics such as texture, taste, and over all acceptability. The volatile compounds aroma in fermented *urutan* was dominated by eucalyptol and caryophyllene which were specific for *urutan*. This type of compounds were detected in the conditioning phase generally exceeded the amount at the initial of fermentation and after 24h fermentation. The compounds of tetradecane, pentadecane, D-limonene, and hexadecane were produced during process of fermentation and conditioning.

Keywords: *Urutan*, *Pediococcus acidilactici* U318, *Lactobacillus plantarum* U201, inoculums powder, aroma compound

**PHYSICO-CHEMICAL AND MICROBIOLOGICAL EVALUATION OF *Clarias* CATFISH
FERMENTED SAUSAGE MANUFACTURED BY *Pediococcus acidilactici* 0110<TAT-1 STARTER
CULTURE AT DIFFERENT LEVEL OF NaCl CONCENTRATION**

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ABSTRACT

This study was aimed to obtain the best level of NaCl concentration with emphasis on the physico-chemical of *Clarias* fermented sausage. Three different *Clarias* catfish fermented sausage manufactures (1, 2, and 3% NaCl added) were used to obtain the quality along storage for 28 days. The physico-chemical characters of sausages were affected by NaCl addition, NaCl content, water activity, pH, weight loss, water content, water holding capacity; and the level of protein and fat content. While microbiology was assessed by aerobic plate count, total pathogenic bacteria, and lactic acid bacteria. Total pathogen bacteria was effectively inhibited on sausage with addition of 1% NaCl after 7 days storage, however with the addition of 2 and 3% NaCl, inhibition of pathogenic bacteria was effective before 7 days. Sensory evaluation indicated that addition of 2 % NaCl was acceptable to all parameters.

Keywords: *Clarias* catfish, fermented sausage, lactic acid bacteria, sensory evaluation, quality

**NITRITE REDUCTION IN FERMENTED SAUSAGE (*PEPPERONI*)
BY LACTIC ACID BACTERIA**

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ABSTRACT

Nitrite reduction in fermented sausage (*Pepperoni*) by lactic acid bacteria (LAB) was studied. Nitrite is famous as the most effective ingredient of curing and also indicated as raw material of carcinogens such as N-nitrosamines. However, the use of nitrite to produce cured meat properties is irreplaceable. Minimizing the level of nitrite in processing meat product is needed. One of the most feasible method to reduce nitrite in cured meat product is by using bacteria to reduce the nitrite. Hence, this study aims to select the best LAB for producing *Pepperoni* with low level of residual nitrite while maintaining the desirable cured meat characteristics. *Lactobacillus plantarum* 1167, *Lactobacillus pentosus* 3G3 and *Pediococcus acidilactici* AA5a were used as starter culture in producing *Pepperoni*. *Pc. acidilactici* AA5a showed the most promising result as a meat starter culture in producing *Pepperoni* with the lowest level of residual nitrite (from 35.40 ± 6.03 to 0.37 ± 0.19 ppm, a $98.94 \pm 0.53\%$ reduction) after 48 hr fermentation. The mean residual nitrite in *Pepperoni* obtained in this study was 0.38 ± 0.02 ppm which was much lower than the three (3) brands of commercial *Pepperoni*, that have the residual nitrite content of 5.41 to 27.44 ppm. Very strong negative correlation between per cent nitrite reduction and pH was found, which indicates that the per cent nitrite reduction increased with the decrease of pH value.

Keywords: nitrite reduction, *pepperoni*, lactic acid bacteria

SPRAY-DRIED ENCAPSULATION OF *Lactobacillus* spp. CELLS WITH COCONUT MILK

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ABSTRACT

Encapsulation technology is widely applied to improve the survivability of administered probiotic strains during storage and the transit in the gastrointestinal tract. In this study, we developed the spray-dried encapsulation of plant-origin *Lactobacillus plantarum* AP1 and human-origin *Lactobacillus fermentum* AA0014 with coconut milk as encapsulant material, and evaluated for the survivability against several environmental barriers. In prior to encapsulation by spray-drying with coconut milk, the strains were cultured in MRS-based medium. Viability assays of encapsulated cells were conducted to understand the impact of encapsulation processes, low pH culture condition, bile salts exposures, and storage. As results, the encapsulation processes reduced the viability of cells about 2-3 log, however the total cell numbers of encapsulated *L. plantarum* AP1 and *L. fermentum* AA0014 were relatively still high ($> 10^7$ CFU/g powder). Successful encapsulation was visualized by scanning electron microscopy showing that cells were encapsulated well inside the matrix of coconut milk. The results of in vitro gastrointestinal simulation showed the decreased number of uncoated cells under culture condition of pH 1.5, and as expected the encapsulation could protect cells against the acidic environment. Similar phenomenon was also found in in vitro gastrointestinal simulation of the presence of 0.3% bile salts, in which encapsulated cells showed best performance on cell protection against bile salts toxicity. In this study, we also confirmed the survivability of encapsulated cells during four weeks storage at room temperature. This study contributes on the practical aspects of the use of natural resource that is widely available in the tropical countries for development of microbial encapsulation technology.

Keywords: cell encapsulation, coconut milk, *L. plantarum*, *L. fermentum*, spray-drying

APPLICATION OF DRIED MIXED CULTURE (*Lactobacillus plantarum* FNCC 0027, *Lactobacillus fermentum* FNCC 0030 AND *Saccharomyces cereviceae*) IN MAIZE AND SORGHUM FERMENTATION

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ABSTRACT

Whole cereal-based products, i.e., maize and sorghum have a beneficial effect on health, but they also contain high level of phytate and tannin defined as anti-nutrition which could effect on protein digestibility. The quality of protein can be improved by fermentation, as natural fermentation or with pure culture. Dried culture containing lactic acid bacteria (*Lactobacillus plantarum* FNCC 0027, *Lactobacillus fermentum* FNCC 0030) and yeast (*Saccharomyces cereviceae*), has potency in cereal fermentation to decrease anti-nutrition compound and to increase protein digestibility of cereal based product. The main objective of this research was to know the effect of applying dried mixed culture of *L. plantarum* FNCC 0027, *L. fermentum* FNCC 0030, and *S. cereviceae* on maize and sorghum flour fermentation, and to determine the change of fermented maize and sorghum flour on protein digestibility, antinutrition components, and other chemical and physical characteristics. The result showed that the mixed dried culture used is effective to increase protein digestibility of fermented maize and sorghum flour, from 48,23% and 38,44% to 89,31% dan 91,00%, respectively. Phytic acid content of maize flour decrease 43,14%, and tannin content of sorghum flour decrease 74,84% as the effect of fermentation. This weaning food formulated from fermented maize and sorghum flour could release energy 160 kkal if consumed 40 g/day, and 312,5 kkal if consumed 76 g/day.

Keywords: dried mixed culture, maize fermentation, sorghum fermentation, antinutrition, protein digestibility

**NON-DAIRY PROBIOTIC BEVERAGE:
APPLICATION OF *Lactobacillus plantarum* EM1 AND *Lactobacillus pentosus* EM1 CULTURES
AS INOCULUM IN FERMENTED LEGUMES AND SWEET CORN MILK**

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ABSTRACT

Probiotic means living microorganisms when in adequate amounts confer a health benefit. Most of the probiotic foods are dairy products, so they cannot be consumed by humans who are allergic to milk proteins, have severe lactose intolerance or vegetarian way of diet. Consequently, *milk* from legumes and cereal has become a very interesting food because they have excessive nutritive value and health characteristics. This research used four fermented probiotic beverage *i.e.*, three based on legumes products (soybean, mung bean and kidney bean) and sweet corn milk. The fermented products were stored for 40 days with selected lactic acid bacteria *Lactobacillus plantarum* strain EM1 and *Lactobacillus pentosus* strain EM 1, which has been isolated from *sayur asin* (Indonesian fermented vegetables). The results showed that the total amount of lactic acid bacteria (LAB) in all samples have met the standard to be probiotic beverage according to National Standard of Indonesia (2009) and also CODEX STAN (2003). LAB viability in the storage was fairly stable, which *L. plantarum* EM1 has a higher viability (65.16%-97.52%) than *L. pentosus* EM1 (58.89-96.72%), but two types of strain were not significantly different with the *L. bulgaricus* as a control (70.75%-98.76%). Biochemical changes occurred until 40 days storage and caused the difference of the probiotic beverage characteristics. After storage for 40 days, fermented sweet corn with *L. plantarum* EM1 as inoculum contained the highest LAB 3.9×10^6 CFU/ml, the highest LAB viability 90.65%, pH 4.24, sugar content 7.53°brix, total acid 0.54% and protein content 2.75%. Based on the results, were concluded that *L. plantarum* EM1 and *L. pentosus* EM1 can be utilized as inoculum in all probiotic beverages.

Keywords: probiotic, *Lactobacillus*, legumes milk, sweet corn milk

PROBIOTIC PROPERTIES OF TEMPOYAK LACTIC ACID BACTERIA AND ITS APPLICATION FOR MAKING PROBIOTIC BEVERAGE FROM PINEAPPLE SKIN EXTRACTUsman Pato¹, Evy Rossi¹, and Ingrid S. Surono²¹Faculty of Agriculture, Riau University, Pekanbaru, Indonesia²SEAMEO TROPMED RCCN, University of Indonesia, Jakarta, Indonesia

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ABSTRACT

Tempoyak is an Indonesian traditional fermented food made from durian fruit. *Enterococcus* spp. has been isolated from *tempoyak*. Objective of this research were to study the ability of *Enterococcus* strains (UP-9, UP-11, and UP-14) in taurocholic acid deconjugation and cholesterol binding and to study the effect of addition of skim milk and sucrose as source of nutrition for the bacteria in various concentration to produce probiotic beverage. The beverage was made from pineapple skin extract that had low level concentration of essential nutrition for bacterial growth. The first experiment was carried out to study the ability of lactic acid bacteria in binding cholesterol and to deconjugate tauchoric acid. Strain selected from the first experiment was used for making probiotic beverage. Selection was based on the ability of strain to deconjugate sodium taurocholic and to bind cholesterol. In the second experiment, a complete random design using a 4 x 4 factorial arrangement with three replications was used. The first factor was concentrations of skim milk, second factor was concentrations of sucrose. Parameters observed in the second experiment were pH, total density, protein level & total lactic acid bacteria. Sensory evaluation (color, aroma, taste, and overall acceptance) was analyzed by Friedman test. Results of this study showed that *Enterococcus* sp. UP-11 had the ability to bind cholesterol, but the strain of UP-9 and UP-14 had not. In addition, *Enterococcus* sp. UP-11 can grow and deconjugate sodium taurocholic effectively. Increasing the concentration of skim milk and sucrose in medium significantly increased ($P < 0.05$) pH and total density. The interaction of skim milk and sucrose were not significantly different ($P > 0.05$) on pH and total lactic acid bacteria, but these interactions were significantly differences ($P < 0.05$) on protein and the total density level.

Keywords: probiotic, cholesterol, taurocholic acid, skim milk, sucrose

EFFECT OF ORANGE JUICE AND SKIM MILK ADDITION ON THE QUALITY OF SOYGHURT

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ABSTRACT

Soyghurt, a fermentation product of soybean milk, is produced by using *Lactobacillus bulgaricus* and *Streptococcus thermophilus* which are common bacteria used for the preparation of yoghurt. The aim of this study was to produce soyghurt which has functional values, by addition of orange juice and lactic acid bacteria. Expected functional benefits from soyghurt were come from the present of probiotic of lactic acid bacteria which help in maintaining the health of gastro intestinal tract, and antioxidant activity from orange juice. The obtained soyghurt has physical and chemical characteristics as follows: pH 3.71 - 3.92; lactic acid bacteria count $1,7 \times 10^9$ – $6,8 \times 10^9$ CFU/ml; citric acid content 4.43 - 5.36 % (v/v); fat content 1.50 - 3.52 % (w/w); and protein content 3.68 – 4.95 % (w/w).

Keywords: orange juice, lactic acid bacteria, soyghurt

THE EFFECT OF SELECTED INDONESIAN TROPICAL FRUIT EXTRACT ON THE SURVIVAL OF LACTIC ACID BACTERIA

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ABSTRACT

Tropical fruits have received widespread attention as food additive to increase the consumer preference of food product. It has been understood that this fruits contains specific compounds including saccharides. The objective of this study was to determine the survival of lactic acid bacteria in the Indonesian fruit extracts. 3% (v/v) of *L. bulgaricus*, *S. thermophilus*, and *B. bifidum* were inoculated into MRS broth supplemented with 0.05% l-cysteine-HCl (w/v) and 3% (w/v) galactose. The fruit extracts (starfruit and mangoes) were added to the medium when the incubation reached three hours. The pH was analyzed and survival of total lactic acid bacteria were counted using MRS agar plate. As results, the growth of lactic acid bacteria remarkably inhibited by selected tropical fruits. There was no notable decrease on pH value after addition of fruit extract. This result could be used for controlling the growth of lactic acid bacteria using natural compound that may also be served as food additive.

Keywords: tropical fruits, lactic acid, inhibition

VIABILITY OF *Lactobacillus acidophilus* NH ON THE DIETARY FIBER FLOUR MADE FROM UNRIPE FRUIT, CORM, AND TENDER CORE PSEUDO-STEM OF BANANA

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ABSTRACT

Dietary fiber (DF) is non-digestible in the small intestine, but fermentable in the large intestine. Some fibers can function as prebiotics and demonstrate selectivity towards the composition and/or activity of gastrointestinal bacterial microbiota, which benefits human health and well-being. This research was conducted to evaluate *Lactobacillus acidophilus* NH (probiotic) viability on the medium contain insoluble dietary fiber (IDF) of unripe fruit (UF), corm (C) and tender core pseudo-stem (TCPS) banana flour. Controlled submerged fermentation by *Brevibacillus brevis* strain and *Bacillus licheniformis* strain (1% v/w, for 24 hours at room temperature) were used to produce the IDF rich-flour. The IDF were isolated from three kinds of banana variety i.e., *agung*, *kepok* and *mas* variety by using pancreatin and amyloglucosidase enzyme. The result showed that the fermentation process decreased DF but increased the IDF content as the proportion added caused soluble DF degradation. The highest IDF content was TCPS flour. The IDF could increase *L. acidophilus* NH viability up to 6-9%. However, the IDF isolated from fermented banana corm flour decreased *L. acidophilus* NH viability. Based on the result, it can be concluded that the banana IDF were potential to be a prebiotic candidate. It is important to conduct an advanced research for prebiotic properties of the banana IDF.

Keywords: dietary fiber, *Lactobacillus acidophilus* NH, banana variety

PROBIOTIC VIABILITY AND CARBOHYDRATES COMPOUND IN SELECTED TROPICAL FRUITS FROM INDONESIA

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ABSTRACT

Aim of this study was to analyze the probiotic viability of *L. bulgaricus* and *S. thermophilus* in tropical fruit from Indonesia, as well as the carbohydrate compounds in the probiotic medium containing tropical fruits. The pH of tropical fruits was measured on the supernatant and precipitate of tropical fruits after centrifugation at 8000 x g for 20 minutes. The survivability of probiotic in the presence of tropical fruits juice was determined after incubation at 37°C for 5 hours. The carbohydrate compounds (sucrose, glucose, and fructose) were analyzed by using HPLC. The results showed the pH of tropical fruit varied in range 3,81-7,33. The viability of probiotic was enhanced by presence of some tropical fruits. The carbohydrate compounds in the tropical fruits may explain the enhancement of probiotic growth.

Keywords : tropical fruits, viability, probiotic, carbohydrate compounds

**THE VIABILITY OF ALGINATE ENTRAPPED *Lactobacillus plantarum* 12A2
IN SOY CORN MILK ICE CREAM DURING FROZEN STORAGE**

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ABSTRACT

The soy milk is popular as dairy milk substitute since it contains protein and functional compound, such as isoflavon. Its beany flavor and low sulfuric amino acid essential content restricting its acceptability. Combination of soy milk with sweet corn milk that has high sulfuric amino acid content will improve the acceptability of the non dairy ice cream. Soy-corn milk ice cream as carrier of probiotic bacteria *L. plantarum* 12A2 will give benefit for consumer. But without protection the viability of *L. plantarum* 12A2 decreased almost 2 log cycles during 21 days frozen storage. The entrapment of *L. plantarum* 12A2 in alginate gel will protect the cell from disadvantage condition and maintain the viability during freezing and storage. Alginate concentration may influence the internal structure of alginate beads that will give impact on the decrease of bacteria viability. The influence of soy milk-corn milk proportion (3:7; 5:5; and 7:3) on total solid content, overrun, melting rate, and the consumer acceptance to the texture (mouthfeel), taste and flavor of ice cream was investigated. Alginate entrapped *L. plantarum* 12A2 was added into the ice cream mix after aging during the churning. The effectiveness of calcium alginate concentration (4; 6; and 8%) for entrapping the *L. plantarum* 12A2 and maintaining viability of cells after 30 days storage of ice cream was studied. Internal structure of alginate beads was observed using Scanning Electron Microscope (SEM). The proportion of soy milk-corn milk as much as 3:7 gave the highest overrun, melting point and aroma preference score (acceptance). But both of soy milk-corn milk proportion and alginate concentration did not give any significant impact, the viability of bacteria for all treatment decreased about 5-15%.

Keywords: soy corn milk ice cream, alginate, viability of entrapped *L. plantarum* 12A2 frozen storage

**CHARACTERISTICS OF JAVA PLUM JUICE (*Eugenia cumini*) FERMENTED WITH
Lactobacillus acidophilus IFO 13951**

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ABSTRACT

The objective of this research was to determine the characteristics of Java plum juice fermented with *Lactobacillus acidophilus* IFO 13951. Fermented Java plum juice was made from the various concentration of Java plum (35%, 50%, and 100%) and various incubation time (12 h and 24 h). All samples (750 ml) were inoculated with 1 ml culture (1.9×10^8 CFU/ml) and incubated at 37°C. Bacterial count, pH, lactic acid content, sugar content, antioxidant activity and sensory quality were analyzed. The results showed that probiotic bacteria of all fermented juice reached 10^8 - 10^9 CFU/ml. The lactic acid content and the pH of fermented juice ranged from 0.07% to 0.23% and 3.52 to 3.64, respectively. The highest lactic acid content was shown by the 24 h incubation of pure Java plum juice sample. Sugar content retained from 23.33 mg/ml to 79.77 mg/ml. The 12 h incubation of pure Java plum juices sample showed the highest antioxidant activity while the other fermented juice varied from 10.53% to 94.2%. Furthermore fermented pure juice samples also revealed greater panelist acceptance level based on sensory analysis.

Keywords: Java plum, *Lactobacillus acidophilus*, probiotic, fermented juice

PREBIOTIC POTENTIAL OF RESISTANT STARCH DERIVED FROM PHOSPHORYLATED AND CROSS-LINKED SAGO STARCHES

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ABSTRACT

The objectives of this study were to find out the prebiotic index (PI) and short chain fatty acid (SCFA) level of the resistant starch (RS) type 4 determined by fermentation method. The RS were prepared by exhaustive enzymic hydrolysis of phosphorylated and cross-linked sago starches, and fermented using faecal inoculum. The production of SCFA was chromatographically characterized. The grown bacteria were identified using the selective media to enumerate bifidobacteria, lactobacilli, clostridia and bacteroides to calculate the PI. The results showed that the cross-linked RS enhanced the growth of bifidobacteria and lactobacilli, resulting in a higher PI (1.19) than the value for inulin (1.15) following incubation for 24 h. The fermentation of RS from native and phosphorylated sago starches were faster than that of RS from cross-linked sago starch. The increase in the numbers of bifidobacteria and lactobacilli during fermentation of RS gave higher SCFA production with a consequent of lower pH.

Keywords: phosphorylated sago starch, resistant starch, short chain fatty acid, prebiotic index

IMPROVING BANANA FLOUR RESISTANT STARCH BY USING FERMENTATION OF *Lactobacillus salivarius* FSNH1 WITH TWO CYCLES OF AUTOCLAVING-COOLING

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ABSTRACT

Resistant starch (RS) could be increased by combination of spontaneous fermentation with two cycles of autoclaving-cooling process, but the spontaneous fermentation could not control the fermentation process and quality of product. The research improved banana flour resistant starch by controlled fermentation using indigenous banana starter (*Lactobacillus salivarius* FSnh1) followed by two cycles of autoclaving-cooling process. Fermentation was conducted on the banana slices at room temperature for 12 and 24 h, then followed by two cycles of autoclaving (121°C, 15 min) and cooling (4°C, 24 h). The result showed that 12 h fermentation by *L. salivarius* FSnh1 (10⁶ CFU/mL) increased RS content higher than 24 h fermentation. It can be concluded that utilization of *L. salivarius* FSnh1 could reduce the time of banana fermentation up to 12 h on the production of RS-rich banana flour.

Keywords: *Lactobacillus salivarius* FSnh1, controlled fermentation, autoclaving-cooling process, resistant starch

THE EFFECT OF RETROGRADATION STEP ON THE PROPERTIES AND PREBIOTIC POTENTIAL OF MAIZE STARCH NOODLE

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ABSTRACT

Aim of this study was to obtain optimal storage time of steamed maize starch noodle that gave the desirable properties along with the prebiotic potential. Noodle was prepared by extrusion of the partially cooked maize starch, followed by steaming the strands, and keeping strands at 4°C at various time (0, 1, 2, and 3 h) to enhance retrogradation, and then drying the noodle. The resulted noodle was characterized for physicochemical properties. To evaluate the prebiotic activity, the noodle was rehydrated, and then hydrolyzed by pancreatic α -amylase and amyloglucosidase to obtain the resistant starch (RS) Type 3. The prebiotic activity of the RS was analyzed by the relative growth ratios of the probiotic bacterias, i. e., *Bifidobacterium longum* ATCC 15707 and *Lactobacillus plantarum* JCM 1551, to the enteric-bacteria (*Eschericia coli* IFO 3301) on the respective substrate containing 1% RS at the respective specified condition. A commercial RS and inulin were used for control. The results showed that the longer storage time of the cooked starch noodle strands the higher values of hardness and cooking time, but lower cooking loss and swelling index, indicating the different level of retrogradation. Prebiotic activities of the RS obtained from cooked noodle strands kept for 3 h was 0.73 based on the growth rate of the *Bifidobacterium longum*, and 0,04 based on that of the *Lactobacillus plantarum*. The score for the commercial RS I, commercial RS II and inulin were 1,06; 0,40; and 1,13 based on the growth of *Bifidobacterium longum* respectively. The prebiotic activities on *Lactobacillus plantarum* for the commercial RS I, commercial RS II and inulin were 0,06; 0,06; and 0,08 respectively.

Keywords: maize starch noodle, retrogradation, product property, prebiotic activity

IDENTIFICATION OF LACTIC ACID BACTERIA ISOLATED FROM BALI CATTLE BY PARTIAL SEQUENCING OF THE 16S rDNA AND THEIR PUTATIVE PROBIOTIC PROPERTIES

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ABSTRACT

Bali cattle is a unique indigenous-cattle found in Bali Island. Though this cattle is not for milk production it is worthy to isolate and identify the lactic acid bacteria (LAB) associated in its fresh milk. This research was aimed to identify of LAB isolated from Bali cattle fresh milk and characterized their putative probiotic properties. Identification of the isolates were performed by sequencing of the 16S rDNA, targeting to the variable region V1-V3, spanning from 1-520bp of the 16S rDNA. The probiotic properties were elucidated by screening their resistance to the gastrointestinal (GI) conditions such as low pH and bile, especially deoxy cholic acid, and inhibition ability against pathogenic bacteria. The results showed that the *Pediococcus acidilactici*, *Enterococcus gallinarum*, *Lactobacillus plantarum*, *Lactococcus garvie* and *Weissella confusa* were identified out of 62 strains studied, where *P. acidilactici* and *E. gallinarum* to be found the dominant species. Based upon their sequences homology, the strains could be grouped into 4 genetic groups for the *P. acidilactici*; 2 groups for the *E. gallinarum*, while *L. garvie* and *W. confusa* were minor species and only found in a single genetic type. Some strains were resistance to GI conditions (low pH and DCA) and inhibited pathogenic bacteria. This results indicated that LAB isolated from Bali cattle fresh milk are worthy to be further studied for probiotic application.

Keywords : Bali cattle fresh milk, lactic acid bacteria, 16S rDNA, probiotic

MOLECULAR IDENTIFICATION OF POTENTIAL PROBIOTIC BACTERIA ISOLATED FROM CHICKEN AND THEIR PRODUCTION OF LACTIC ACID AND ACETIC ACID

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ABSTRACT

Performance of animals had been improved by being fed with probiotic. LAB is the most applied probiotic bacteria in animal. Lactic acid and acetic acid are antimicrobial products produced by LAB that can inhibit the growth of pathogens such as *Listeria*, *Clostridium*, *Staphylococcus* and others. In this study, isolates which showed Gram positive and catalase negative were isolated from the gastro intestinal tract (GIT) of chicken with MRS agar. The lactic acid bacteria were identified by using molecular approach i.e. 16S rRNA gene sequence. Concentration of lactic acid and acetic acid of isolates were quantified using gas chromatography fitted with a Flame Ionisation Detector (FID). The results indicated that three bacteria were isolated from the GIT of chicken and known as isolate CCB1, CCL6 and P1. Results showed that 16S rRNA gene of the three isolates showed close similarity (99%) to 16S rRNA gene sequence of reference bacteria. Isolate CCB1, CCL6 and P1 were identified as *Lactobacillus salivarius* strain P2, *Lactobacillus agilis* strain P3 and *Enterococcus faecium* strain P1. *Lactobacillus agilis* strain P3 produced the highest concentration of lactic acid (220.04 mM), followed by *L. salivarius* strain P2 (200.17 mM) and *E. faecium* strain P1 (90.39 mM). Among the strains, only one could produce acetic acid, *L. agilis* strain P3 with 2.71 mM of acetic acid. In conclusion, *L. salivarius* strain P2, *L. agilis* strain P3 and *E. faecium* strain P1 have the potential to be used in animal feed as a probiotic bacteria. Future work need to be carried out to investigate factors that can affect the viability of microorganisms and long-term storage of probiotics in animal feed.

Keywords: lactic acid bacteria, molecular identification, acetic acid, lactic acid

ISOLATION AND IDENTIFICATION OF MICROORGANISMS FROM FERMENTED GLUTINOUS RICE USING BLACK BAMBOO (*Gigantochloa atrovioleacea*) AND SWEET BAMBOO (*Gigantochloa atter*)

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ABSTRACT

Fermented glutinous rice is a kind of traditional food from glutinous rice fermented with *ragi*. The typically containers used for fermentation glutinous rice are banana leaves, plastic bottles, etc. Some efforts to increase local knowledge or use natural resources from environment is very important, for example is the use of bamboo. Traditional Chinese food was made using bamboo to get a specific flavor, so in this research bamboo was used as a container of fermented glutinous rice. The purpose of this study was to identify the microorganisms found in fermented glutinous rice. There was a preliminary test (sensory evaluation) to determine the best *ragi* and packaging by 30 panelists. The results of sensory evaluation showed that local *ragi* tape NKL and black bamboo obtained from Ungaran were the best. The methods of this study include chemical analysis (total sugars, total acids and pH) and microbiological analysis (isolation and identification of lactic acid bacteria, molds and khamir). Identification of lactic acid bacteria were based on morphological (cell shape, Gram staining and spore formation) and physiological characteristics (catalase activity test, motility test, gas production test, growth capabilities test at various temperatures, pH and NaCl). Identification of lactic acid bacteria was done by using API 20 STREP test kit. The result showed that isolates bacteria obtained, were identified as *Aerococcus viridans* 3 and *Aerococcus viridans* 2. From mold identification, 5 isolates were belong to *Aspergillus* sp. and 2 isolate belong to *Mucor* sp. While from yeast identification using API 20 C AUX showed isolates obtained were identified as *Saccharomyces cerevisiae* 1 and *Candida utilis*.

Keyword: fermented glutinous rice, lactic acid bacteria, molds, yeast, *ragi*, bamboo

ISOLATION AND IDENTIFICATION OF MICROORGANISM FROM FERMENTED GLUTINOUS RICE WRAPPED BY MANGO LEAF (*Mangifera indica*) AND CASHEW LEAF (*Anacardium occidentale*) FERMENTED WITH LOCAL RAGI (NA KOK LIONG, GEDANG, AND SIDOJOYO)

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ABSTRACT

Fermented glutinous rice (*tape ketan*) is a traditional Indonesian food from fermentation with ragi that has a sweet-sour taste and smell of alcohol. Ragi made of rice flour and spices that contains a variety of important microorganisms that serve to accelerate the fermentation process. Commonly, fermented glutinous rice is wrapping with banana leaves. Besides banana leaves as a wrapping for fermented glutinous rice, people can also used other leaves, for example cashew leaves and mango leaves. The objective of this research was to identify microorganisms in the final fermented glutinous rice product with local ragi and determine the effect on direct used of leaves as wrapping (cashew leaves and mango leaves). Preliminary test was conducted by sensory evaluation using three kinds of local ragi that Gedang, Na Kok Liong, and Sidojoyo with 2 types of leaves (mango leaves and cashew leaves). Several tests were used in this study, as follows: the main test for identification of mold was slide culture method; for lactic acid bacteria based on morphological (cell shape, formation of spores, and Gram stain) and physiological characteristics test, such as, gas production, catalase test, motility test, and test of ability to grow at various temperatures, pH and NaCl concentration, and API 20 STREP test kit; for yeast using API 20 C AUX test. Then, these foods were analyzed for its pH, total acid, and sugar content. The result showed that mold of *Mucor* sp. and *Aspergillus* sp.; Lactic acid bacteria of *Lactococcus lactis* ssp *lactis*; and yeast of *Candida famata* and *Pichia angusta* were found in the fermented glutinous rice.

Keyword: fermented glutinous rice, cashew leaves, mango leaves, local ragi

ISOLATION, IDENTIFICATION AND CHARACTERIZATION OF LACTIC ACID BACTERIA FROM SALTED EGG: AN INDONESIAN TRADITIONAL FOOD

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ABSTRACT

Salted egg is one of the traditional foods in Indonesia. This product is made by curing duck eggs in brine solution or packing each of egg in damp salted clay. Curing is done for 2-3 weeks at room temperature. Aim of this study is to isolate and identify lactic acid bacteria in salted egg. These isolates obtained will be tested for their antibacterial activity. Method use for isolation was dilution and plating followed by streak plate. Pure cultures are kept at -40 °C mixture solution of 10% skim milk and 10% glycerol. The isolates are identified by their morphology, biochemical, physiology, fermentation type, lactic acid type, and peptidoglycan type characteristics. Antibacterial activity is determined using *Salmonella* sp., *Staphylococcus aureus* and *Escherichia coli* by measuring the zone of inhibition.

Keywords: salted egg, lactic acid bacteria, antibacterial activity

THE ISOLATION OF *Bifidobacterium* spp. FROM FAECES OF INFANT BORN BY CAESAR BIRTH AND ITS POTENTIAL AGAINST *Eschericia coli*

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ABSTRACT

Bifidobacterium is one of lactic acid bacteria which dominate in human intestine. It has some important role in digestive physiological function such as: amilase, protease and lipase enzyme. Another functions are increasing immunity of infant, reducing the risk of allergic and infection such as diarrhea by *E.coli*. The aim of this research was to determine the diversity of *Bifidobacterium* spp. isolated from faeces of infant by normal spontaneous birth and ability of their metabolites in inhibiting *E.coli*. The research was conducted by survey and data obtained was analyzed by descriptive analysis. *Bifidobacterium* spp. was observed its characters such as morphological, biochemical and carbohydrate test. The result obtained four isolates of *Bifidobacterium* spp. from caesar infant faeces. Those are *Bifidobacterium* sp. (Bca1, BCb1, BCc6), *B.thermophilum* (BCc2, BCc3, BCc4, BCc8), *B. infantis* (Bca2) and *B.longum* (BCc5). The inhibition activity to *E.coli* shown that *Bifidobacterium* spp. Metabolit was able to inhibit *E.coli* growth.

Keywords: *Bifidobacterium* spp., *E.coli*, isolation, Caesar

THE ISOLATION OF *Bifidobacterium* spp. FROM FAECES OF INFANT BORN BY CAESAR BIRTH AND ITS POTENTIAL AGAINST *Salmonella typhi*

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ABSTRACT

Bifidobacterium is a natural microflora of human intestinal tract. *Bifidobacterium* is used as a probiotic to prevent colonization of pathogenic bacteria such as *Salmonella typhi* and *E.coli*, thus the isolation and identification of *Bifidobacterium* spp. is necessary to be examined. The purposes of this research were to determine the diversity of *Bifidobacterium* spp. which was isolated from faeces of infant born by caesar birth and the ability of their metabolites in inhibiting *Salmonella typhi*. The research was conducted by survey and data obtained were analyzed by descriptive analysis. The characteristics of *Bifidobacterium* were assessed by its morphology, biochemical and carbohydrate test. Morphological characteristics were conducted on its colony and cell morphology. Biochemical tests were conducted on catalase, indole, Voges-Proskauer, growth pH range, and resistance to losozym. The result was indicated that isolate BC1a is *Bifidobacterium thermophilum* and isolates: BC1b, BC2a2, BC2b3, BC3a1, BC2b2, BC3a2, BC3b2 are *Bifidobacterium* sp., while, isolates BC2b1 and BC3b1 are *B. bifidum*.

Keywords: *Bifidobacterium* spp, isolation, caesar, *Salmonella typhi*

INHIBITION OF LACTIC ACID BACTERIA ISOLATED FROM BALI CATTLE'S MILK TO THE GROWTH OF BACTERIA PATHOGENS *Vibrio cholerae* O1 EL TOR BIOTYPE

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ABSTRACT

Potential of Lactic Acid Bacteria (LAB) isolated from Bali cattle's milk to inhibit the growth of pathogenic bacteria is unknown. The purpose of this study was to find out the LAB-producing bacteriocins isolated from Bali cattle's milk which inhibits *Vibrio cholerae* O1 El Tor causes acute diarrhea. Ninety-seven strains of LAB from Bali cattle's milk were screened for their capability in producing bacteriocin. Lactic acid bacteria isolates were inoculated in MRS broth, at 37 °C for 48 hours. The broth cultures were centrifugated at 3000 rpm for 15 minutes at room temperature to obtain cell-free supernatant. Antimicrobials activity was determined by an agar well diffusion method. Cell-free supernatant, neutralized cell-free supernatant, and neutralized cell-free supernatant with heating were tested for their capability to inhibit *V. cholerae* O1 El Tor. The bacteriocins produced by LAB isolates that showed positive results in three supernatant treatments were isolated by 80% ammonium sulphate precipitation. The result of this research showed that 8 *Pediococcus* isolates such as *Pediococcus acidilactici* BM 2.22, 33, 42, 57, 58, 66, 73, and 101 were able to produce bacteriocins that inhibited the *V. cholerae* O1 El Tor bacteria. The result showed that 8 *Pediococcus* isolates were potentially to be used in treatment of diarrhea caused by *V. cholerae* O1 El Tor.

Keywords: *V. cholerae* O1 El Tor biotype, Bali cattle's milk, lactic acid bacteria, bacteriocins

CAPABILITY OF LACTIC ACID BACTERIA ISOLATED FROM MILK GOAT FERMENTATION AS CANDIDATE FOR FUNCTIONAL FOOD

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ABSTRACT

Lactic Acid Bacteria (LAB) are widely used in food industry and commonly known to have health promoting attributes. As probiotic candidate, lactic acid bacteria should have the ability to survive in the digestion process and resistance to wards acidic pH, bile salt concentration and enteric pathogen. The purpose of this research was to compare the ability of lactic acid bacteria isolated from goat milk fermentation for their resistancy towards acidic low pH (pH 2,0), 0,3 % bile salt and their antagonistic activity againts enteric pathoegns. Probiotic isolated used in this experiment were *Lactobacillus plantarum* YN1.1, *Lactobacillus plantarum* YN 1.3 and *Lactobacillus plantarum* 1.6. Enteric pathogens used were (*Eschericia coli*, *Salmonella*, *Staphylococcus aureus* and *Bacillus cereus*). The result showed that *L.plantarum* YN 1.3 had good resistance to acidic pH and bile salt and it was significant difference among others (P >0.05). All straints showed inhibition activity against enteric pathogenic bacteria. It was concluded that *Lactobacillus plantarum* YN 1.3 and *Lactobacillus plantarum* YN 1.6 could be used as probiotic in further aplication.

Keywords : Goat milk fermentation, Lactic acid bacteria, *L.plantarum*, Probiotic

**VIABILITY OF *Lactobacillus* sp. A 1.1 AND A2.1 ISOLATED FROM ASI ON
DIFFERENT pH AND LEVEL BILE SALT**

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ABSTRACT

Lactobacillus spp. can be isolated from breastmilk (ASI) that has potency as probiotic. In this study, potency of probiotic was assayed on MRS broth adjusted to pH : 1,5; 2; 2,5; 3; 3,5; 4; 4,5; 5; 5,5 and 6 and level of bile salt: 1; 2; 3; 4 and 5%. The aim of this research was to evaluate the effect of different pH and level of bile salt on the viability of *Lactobacillus* spp. isolated from ASI. Parameter used in this study was the growth of *Lactobacillus* spp. expressed as OD (optical density) at $\lambda = 660$ nm. The data obtained were analyzed using descriptive statistics. The results showed that the growth of *Lactobacillus* spp. can reached OD>2 in the media with different pH and level of bile salt. The conclusion was *Lactobacillus* spp. (A 1.1 and A 2. 1) isolated from ASI could be use as probiotic agent.

Keywords: *Lactobacillus* sp, probiotic, ASI

SCREENING OF ANTIMICROBIAL ACTIVITY OF *Lactobacillus plantarum* STRAINS

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ABSTRACT

A study on antimicrobial activity was carried out using 30 strains of *Lactobacillus plantarum* againsts *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Streptococcus beta haemolyticus*, *Streptococcus viridans*, *Escherichia coli*, *Klebsiella pneumonia*, *Pseudomonas aeruginosa*, *Enterobacter agglomerans*, and *Candida albicans*. The method of antimicrobial sensitivity test using disk susceptibility of the Clinical Laboratory Standards Institute (CLSI) was used. *L. plantarum* was incubated at 37°C for 24-48 h. Detection of bacteriocin titer was done by microplate titration method for *C. albicans* only. The results showed that cell cultures of *L. plantarum* strains showed inhibitory zones varies between 7-16 mm. No activity of *L. plantarum* DR 1-6-2 against *Streptococcus beta-hemolitycus*. Cells-free supernatant of all *L. plantarum* strains showed inhibitory zones vary between 8-12 mm. Assay of bacteriocin activity of freeze dried netralized cells-free supernatant of *L. plantarum* strains against *C. albicans*, showed that all tested *L. plantarum* strains showed inhibitory zones varies between 7-12 mm equal to bacteriocin titer between 1 to 8. *L. plantarum* IBL-2 showed the highest inhibitory zones, 15 mm in cell cultures, 11 mm in the cells-free supernatant, 12 mm in the freezed dried netralized cell-free supernatant and bacteriocin titer was equal to 8.

Keywords: *L. plantarum*, antimicrobial, *C. albicans*, bacteriocin

CHARACTERIZATION OF LACTIC ACID BACTERIA ISOLATED FROM AN INDONESIAN FERMENTED FISH (*BEKASAM*) AND THEIR ANTIMICROBIAL ACTIVITY AGAINST PATHOGENIC BACTERIA

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ABSTRACT

Bekasam is an Indonesian fermented fish product that tastes sour and mostly contains lactic acid bacteria (LAB). The aim of this study was to obtain and characterize LAB isolates from *bekasam* and to study their potency in inhibiting the growth of pathogenic bacteria, i.e. *Escherichia coli*, *Salmonella typhimurium* ATCC 14028, *Bacillus cereus*, *Staphylococcus aureus*, and *Listeria monocytogenes*. LAB were isolated from *bekasam* using media of MRSA supplemented with CaCO₃ 0.5%. Incubation was at 37°C for 48 hours. The pure cultures were verified as LAB based on morphological and biochemical characteristics. LAB obtained was then selected based on their antimicrobial activity. Eight *bekasam* samples showed that -the total average of LAB were 1.4 x 10⁸ to 9.0 x 10⁸ CFU/mL. Seventy four isolates were successfully isolated. It was found that 62 isolates (84%) belonged to LAB, and 23 isolates of them could inhibit the growth of the five pathogenic bacteria. The highest inhibition zone was accounted for *S. aureus*. However, neutralized supernatant of the LAB culture did not inhibit the growth of the pathogenic bacteria. These results indicated that the LAB inhibition to the pathogenic bacteria was due to the organic acid, and that perhaps the main factor in the *bekasam* preservation by LAB.

Keywords: Antimicrobial, *bekasam*, characterization, fermented fish, inhibition index, lactic acid bacteria

THE EFFECTIVENESS OF LACTIC ACID FILTRATE AND BACTERIOCINS OF *Lactobacillus bulgaricus* KS1 AGAINST THE GROWTH OF *Klebsiella pneumoniae* ATCC 700603, CT1538 AND S941

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ABSTRACT

An attempt to produce a natural antibiotic, the effectiveness of lactic acid filtrate and bacteriocins of *L.bulgaricus* KS1 against the growth of *K. pneumoniae* ATCC 700603, CT1538 and S941 has been done in laboratory. This research was aimed to obtain MIC (*Minimum Inhibitory Concentration*) value and growth inhibition zones against *K. pneumoniae* strains of lactic acid filtrate and bacteriocins of *L.bulgaricus* KS1. This research consisted of two phases: first examine the MIC of lactic acid filtrate and bacteriocins of *L.bulgaricus* against *K. pneumoniae* strains. The second phase is testing the effectiveness of lactic acid filtrate and bacteriocins of *L.bulgaricus* inhibitory zones against the growth of *K. pneumoniae* strains. The research used experimental method in laboratory. The MIC test of *L.bulgaricus* filtrate against the growth of *K. pneumoniae* strains was done using agar method; whereas the effectiveness test of lactic acid filtrate and bacteriocins of *L.bulgaricus* against the growth of *K. pneumoniae* strains was used diffuse (paper dish) method. Results of the first research showed that the concentration of 30% lactic acid filtrate and 20% bacteriocins of *L.bulgaricus* could give bactericidal effect against *K. pneumoniae* strains. Result from the second phases of the research showed that lactic acid filtrate and bacteriocins of *L.bulgaricus* could increase the inhibition zones against *K. pneumoniae* strains. The greatest of inhibition zones against *K. pneumoniae* ATCC 700603 was obtained in the concentration of 90% bacteriocins filtrate amounting 16,667 mm. The inhibitory zone to the growth of *K. pneumoniae* strains depending on the concentration of *L.bulgaricus* filtrate, kind of *L.bulgaricus* filtrate and bacteria strains.

Keywords: *Klebsiella pneumoniae*, *Lactobacillus bulgaricus*, MIC, Bacteriocins, Lactic acid, effectiveness.

ISOLATION OF PROTEOLYTIC LACTIC ACID BACTERIA FROM SPONTANEOUS SORGHUM FLOUR FERMENTATION AND ITS APPLICATION FOR SORGHUM FLOUR FERMENTATION

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ABSTRACT

Proteolytic activity in the sorghum flour fermentation has been known increasing the digestibility value. The aims of this research were to isolate and select the proteolytic lactic acid bacteria from spontaneous sorghum flour fermentation, and to determine the effect of using proteolytic lactic acid bacteria as starter of the sorghum flour fermentation. There were 57 isolates of proteolytic lactic acid bacteria have been isolated. The one which formed the largest clear zone in skim milk agar was identified as *Lactobacillus plantarum* S4512. *Lactobacillus plantarum* S4512 was added to sterile sorghum flour fermentation and non sterile sorghum flour fermentation as starter culture. *Lactobacillus plantarum* S4512 grew slowly in the sterile sorghum flour medium; it showed that *Lactobacillus plantarum* S4512 required synergy with other microbes for growing. The use of *Lactobacillus plantarum* S4512 as a starter culture increased the initial amount of total bacteria, lactic acid bacteria and proteolytic bacteria; inhibited the growth of coliform; reduced the pH of the medium from 4,75 to 3,41 and increased the titrable acidity from 0,47% to 0,98% compare to spontaneous fermentation. The changes of proteolytic activity, soluble protein content and reducing sugar were detected during the fermentation.

Keywords : lactic acid bacteria, proteolytic activity, spontaneous fermentation, sorghum flour

**ISOLATION AND IDENTIFICATION OF LACTIC ACID BACTERIA PRODUCING
β-GLUCOSIDASE FROM INDONESIAN FERMENTED FOOD**

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ABSTRACT

Eight samples of Indonesian Fermented Food were collected from traditional markets and some genera of Lactic acid bacteria (LAB) possessed β glucosidase activity were isolated from these foods. Three procedures for LAB identification were performed, including phenotypic and genotypic identification from Bergey's manual methods, API 50 CHL Kits, and 16S RNA based identification procedure. Twenty one isolates were identified. Based on 16S RNA similarity of the isolates, 20 isolates were closely related to *Pediococcus acidilactici* AJ305320 and *P. Lolii* AB362985.1. Even though, based on the phenotypic character, these isolates were belonging to *P. pentosaceus*. In conclusion, the 20 isolates were identified as *Pediococcus acidilactici* and one as *Lactobacillus pentosus*.

Keywords: β glucosidase, LAB, identification

SCREENING OF PHYTASE PRODUCING LACTIC ACID BACTERIA ISOLATED FROM FERMENTED SORGHUM FLOUR

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ABSTRACT

The purpose of this research was to obtain lactic acid bacteria that produce phytase. Screening was conducted using agar medium containing sodium phytate. For qualitative assay, lactic acid bacteria was inoculated in MRS agar medium containing sodium phytate for 24 hours at 37⁰C and phytase production was demonstrated by the presence of clear zones after staining reactions using cobalt chloride and ammonium molybdate-vanadate. For quantitative assay, lactic acid bacteria was inoculated in MRS broth medium containing sodium phytate for 18 hours at 37⁰C. Supernatant from this 18 hours old culture was separated and tested its activity at various incubation temperatures. This quantitative phytase activity indicated by the increased of phosphate level. From 48 isolates were tested, 20 isolates showed positive results qualitatively. However, only four isolates showed phytase activity in the quantitative assay. Each isolate produced phytase with different temperature activity.

Keywords: lactic acid bacteria, phytase, clear zones, phytase activity

EFFECTIVENESS OF *Lactobacillus plantarum* MUT 7 AGENTS FERMENTATION TO REDUCE TREMBESI (*Albizia saman*) SAPONINS CONTENT

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ABSTRACT

Objective of this research is to assess the ability of *Lactobacillus plantarum* Mut 7 in reducing the saponin content while increasing the nutrient content in the leaves, young fruit and *trembesi* pods (*Albizia saman*). The study was conducted using a completely randomized design. The addition of *Lactobacillus plantarum* Mut 7 on the fermentation of 3 parts, namely plant leaves, young fruit and pods. Each treatment was repeated as many as four replications to obtain 12 units of the experiment. This study concluded that the fermentation using *Lactobacillus plantarum* Mut 7 reduced saponin content and increase nutrient content, especially the content of crude protein.

Keywords : fermentation, trembesi, saponin, nutrient

EFFECTS OF LACTIC FERMENTATION ON TOTAL POLYPHENOL CONTENT AND ANTIOXIDANT ACTIVITY OF GINGER (*Zingiber officinale* ROSCOE)Tezar Ramdhan¹ and Anil K. Anal²¹Agency for Assessment and Application of Agricultural Technology, Jakarta, Indonesia²Asian Institute of Technology (AIT), KlongLuang, Pathumthani, Thailand

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ABSTRACT

Until now the utilization of ginger as an ingredient of probiotic products is still lacking. This experiment was aimed to examine the effect of lactic acid bacteria fermentation on total polyphenol content and antioxidant activity of ginger extract. *L. plantarum* and *L. casei* were used as LAB fermentation starter. Prior to inoculation, 150 g of ginger was blended with 150 ml sterilized water, then, 90 ml of the juice was inoculated by 3 milliliters of subcultured starter. Then the juice was incubated at 37⁰C for 24 hours. In order to get powder of fermented samples, freeze-dryer was used (48 hours). The dried sample then was milled using a blender machine then sieved (20 mesh; 850 micrometer; 0.0331 inches). The samples were ready for further experiments. The total polyphenol content was measured using Folin-Denis method, while the antioxidant activity was estimated using the DPPH radical-scavenging activity. The result showed that *L. plantarum* was better because it could growth well in ginger juice and so it could decrease the pH lower than what *L. casei* did. As well, *L. plantarum* could raise the total polyphenol significantly higher than *L. casei*. The highest content of total polyphenol reached by ginger juice which fermented by *L. plantarum* for 12 hours, it was around 23-24 mg GAE/100 g. Those values then increased in almost two times in freeze dried fermented ginger powder. The value was 63 mg GAE/100 g. Meanwhile, the highest value of antioxidant activity was 80% in fresh ginger juice and after drying, the value were slightly decreased compared to fresh fermented spices, it was about 69.5%.

Keywords: ginger, lactic acid bacteria fermentation, total polyphenol content, antioxidant activity

APPLICATION OF *Lactobacillus plantarum* DAD 13 IN PROBIOTIC CHEESE MAKING

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ABSTRACT

Lactic acid bacteria are the most important bacteria having potential as probiotic. Probiotic are live microbial food supplements. The objectives of this study were to apply the probiotic candidate *Lactobacillus plantarum* Dad 13 in cheese making. Combination treatment of biomass production used for cheese making that is biomass production using coconut water and using MRS medium. The result showed that the viability of *L. plantarum* Dad 13 in cheese using two kind of media during production of biomass (i.e., coconut water and MRS) were almost similar during 2 month storage, that is 10^6 CFU/ml. Decreased on viability occur after 2 month storage, about 1 log cycle. The result showed that this cheese can be categorized as probiotic-cheese, since the number of its viable cells complies with the criterion of a minimum of 10^6 - 10^7 CFU/g viable cells in probiotic product.

Keywords: *Lactobacillus plantarum* Dad 13, viability, and probiotic

SURVIVAL OF *Lactobacillus plantarum* DAD 13 DURING SPRAY DRYING AND ITS APPLICATION FOR YOGHURT FERMENTATION

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ABSTRACT

The objectives of this study were to evaluate the survival of potential probiotic *Lactobacillus plantarum* Dad 13 after spray drying and its properties, and its application as a supplement for yoghurt fermentation. Yoghurt starter cultures i.e., *Lactobacillus bulgaricus* FNCC 0040 and *Streptococcus thermophilus* FNCC 0041, and *L. plantarum* Dad 13 were separately mixed with 10% w/v of rice flour solution (2:1) and spray dried. The low pH tolerance and bile salt sensitivities of spray dried *L. plantarum* Dad 13 were evaluated. Each spray dried culture (2% (w/v) was inoculated into MRS broth and incubated at 37°C for 24 h. Then 5% v/v of each 24 h culture was inoculated into low-fat milk and incubated at 42°C for 9 h. The results showed that after spray drying, the viable cells of yoghurt starter cultures and *L. plantarum* Dad 13 decreased about 1 log cycle, and the amount of viable cells for all cultures were maintained at log 10⁹ CFU/g. Spray-dried *L. plantarum* Dad13 showed little reduction of viability after incubation for 3 h in MRS broth at pH 3.0. Incubation at lower pH resulted in reduction of the viability of the culture. Its sensitivity to bile salt increase with the increase in bile salt concentration. Supplementation of *L. plantarum* Dad 13 to yoghurt starter cultures produced yoghurt with comparable microbiological and chemical characteristics of yoghurt made from freeze dried cultures. Addition of *L. plantarum* Dad 13 to yoghurt preparation decrease lactose content in yoghurt.

Keywords: Spray drying, *L. plantarum* Dad 13, lactic acid bacteria, yoghurt

**FORMULATION OF GUAVA (*Psidium guajava* sp.) FRUIT POWDER DRINK
AND PROBIOTIC *Lactobacillus plantarum* DAD 13 DRIED CELL POTENTIALLY REDUCING
CHOLESTEROL**

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ABSTRACT

This research aimed to obtain a guava fruit powder drink product that had been combined with probiotic *Lactobacillus plantarum* Dad13 dried cells. *Lactobacillus plantarum* Dad13 had been known previously potential to reduce rat blood cholesterol. The research first began with biomass and dry cell preparation, followed by guava fruit drink powder formulation using RSM (Response Surface Methodology) method. The selected formula then mixed by the probiotic *Lactobacillus* Dad13 dried cells. The combination drink then was tested its characteristics including chemical test, physical test and cell viability. The results showed that the preparation and the elected dried cell biomass were done by spray drier with maltodextrin as the filler, for the formulations, RSM method was used among guava fruit powder, sugar and citric acid. It had been resulted a formula with flavor parameters of 3.52, 23.98, and 0.24 (w/v), while by the appearance parameters, it derived formulas 4.71, 10.72 and 0.16 (w/v) respectively, and by the parameters of the overall acceptance of the product (overall), the obtained formula was 3.55, 25.37 and 0.19 b/v. The characteristics of combination drink of powder guava and dried cells of probiotic bacteria was 12.00% of moisture content (db), 0.44% (db) of the level of vitamin C, 7.28% (db) soluble fiber and 31.21 % (db) of insoluble fiber and 10⁸ CFU/g cell viability.

Keywords : *Psidium guajava* sp., probiotic, *Lactobacillus* Dad13, cell dried, RSM

APPLICATION OF *Lactobacillus plantarum* DAD 13 IN THE PRODUCTION OF TAPE KETAN POWDER AS AN INGREDIENT FOR FUNCTIONAL DRINK

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ABSTRACT

Probiotic is life microorganism which when consumed in adequate amounts confer a health benefit on the host. Probiotics need a vehicle for their specialized actions in gastrointestinal tract. The objective of this research was to produce probiotic *tape ketan* powder as an ingredient for functional drink. *Tape ketan* was made by fermentation of glutinous rice with ragi as a starter and probiotic candidate *Lactobacillus plantarum* Dad 13 (10^7 CFU/g glutinous rice) as co-starter. Incubation was done at the room temperature for three days. Powder of probiotic *tape ketan* was obtained by spray dried the *tape ketan* extract with the addition of maltodextrin at the concentration of 35% (w/v). To maintain the stability and improve the taste, pectin and sucrose were added into the powder during formulation. The results showed that viability of lactic acid bacteria and *L. plantarum* decrease after drying (0.82 and 0.90 log cycle, respectively) with viable count from 1.29×10^{10} CFU to 1.96×10^9 CFU for lactic acid bacteria and from 1.04×10^{10} CFU to 1.32×10^9 CFU for *L. plantarum* (in total of 50 g powder). Formula for prebiotic drink was composed of 20% (w/v) *tape ketan* powder, 4% (w/v) sucrose, and 0.5% (w/v) pectin. *Tape ketan* powder contains probiotic candidate *Lactobacillus plantarum* Dad 13 has a potency as an ingredient of functional drink.

Keywords: *Tape ketan* powder; probiotic; *Lactobacillus plantarum* Dad 13

**ANTIOXIDANT ACTIVITY OF FERMENTED SESAME MILK USING
Lactobacillus plantarum DAD 13**

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ABSTRACT

The influence of fermentation of sesame milk by *Lactobacillus plantarum* Dad 13 on antioxidant activity (AOA) and total phenolic compounds (TPC) were evaluated in this study. Sesame milk (1:15 w/v) was inoculated with *Lactobacillus plantarum* Dad 13 and was incubated at 37°C for 18 hours with and without sucrose addition, followed by cold storage for 3 weeks at 4°C. The AOA assessed using 2,2-diphenyl-1-picrylhydrazyl (DPPH) scavenging capacity and the TPC determined by the Folin-Ciocalteu method and compared with those of unfermented and after cold storage ones. The TPC and the AOA values found to increase upon fermentation. However, storage at 4°C for 3 weeks the TPC and AOA values did not change significantly. The fermentation of sesame milk by this bacteria is importance to enhance the level of antioxidant activity, thus this fermentation offer a method to further develop a potential healthy beverage of sesame products.

Keywords: Sesame milk, fermentation, *Lactobacillus plantarum* Dad 13, antioxidant activity, total phenolic compounds.

**THE CHANGES IN SESAME MILK DURING FERMENTATION USING
Lactobacillus plantarum DAD 13**

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ABSTRACT

The fermentation of sesame (*Sesamum indicum*) milk using *Lactobacillus pantarum* Dad 13 had been carried out in order to study the effect of sucrose addition 4 and 8% on the changes of titratable acidity, pH, sugars and acids during 18 hours fermentation at 37⁰C and 21 days storage at 4⁰C. The pH decreased during fermentation significantly during fermentation, but only slightly decreased during storage. The titratable acidity increased significantly during fermentation and continued until ten days storage. The addition of sucrose could inhance either the decrease of the pH values and the increase of the titratable acidities during fermentation. Sucrose and raffinose content decreased during fermentation and continued during cold storage of fermented sesame milk. The lactic acid content in fermented sesame milk found to be higher than that of acetic acid.

Keywords: sesame milk, fermentation, *Lactobacillus plantarum* Dad 13, sugars, lactic acid

CHARACTERISTICS OF LACTIC ACID BACTERIA (LAB) AND THE pH VALUE OF PROBIOTIC YOGURT DRINK ADDED BY LONGAN EXTRACT

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ABSTRACT

The goal of the research was to determine total lactic acid bacteria (LAB) and pH value of probiotic yogurt drink added by longan extract. In this study the mixture of 4 types of LAB (*Lactobacillus bulgaricus*, *Streptococcus thermophilus*, *Lactobacillus acidophilus* and *Bifidobacterium longum* ATCC 15707) were used. Skimmed milk was inoculated with 3% (v/v) of *L. bulgaricus*, *S. thermophilus*, *L. acidophilus* and 1% (v/v) of *B. longum* ATCC 15707. In the skimmed milk containing these probiotic, 0%, 1%, 3% and 5% (v/v) of longan extract (T₀, T₁, T₂ and T₃ respectively) were added. The result showed that the saccharide content of longan extract were 6,86% sucrose; 1,15% glucose, and 9,63% fructose. The total LAB for T₀, T₁, T₂, and T₃ were $3,0 \times 10^7$; $3,2 \times 10^7$; $5,6 \times 10^7$ and $3,2 \times 10^8$ CFU/ml respectively. The pH value were 4,33; 4,19; 4,14; and 4,11 for T₀, T₁, T₂, and T₃ respectively. The research concluded that increasing the amount of longan extract increased the total LAB, and decreased the pH value.

Keywords: Yogurt drink, longan extract, total LAB, pH

EFFECT OF INDIGENOUS CULTURES *Lactobacillus SPP.* IN MAKING PURPLE SWEET POTATO YOGURT: CHEMICAL AND PHYSICAL PROPERTIES

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ABSTRACT

The objective of this research was to determine the influence of indigenous cultures of *Lactobacillus plantarum* in producing purple sweet potato yogurt on chemical and physical properties. Experimental design used in this research was one-way completely randomized design with 3 kinds of Lactic Acid Bacteria cultures as starter for producing purple sweet potato yogurt. Treatment 1 was a mixed culture of *Streptococcus thermophilus* FNCC 0040 and *Lactobacillus bulgaricus* FNCC 0041 as a control, treatment 2 was a mixed culture of *Streptococcus thermophilus* FNCC 0040 and indigenous culture of *Lactobacillus plantarum* Dad 13, treatment 3 was a mixed culture of *Streptococcus thermophyllus* FNCC 0040 and indigenous culture of *Lactobacillus plantarum* Mut 7. Each treatment was repeated 3 times, so there were 9 treatments. Parameter observed were chemical properties of purple sweet potato yogurt. i.e., moisture (thermo-gravimetric method), acidity (titration method), reducing sugar level (Nelson-Somogyi method) and physical properties of purple sweet potato yogurt i.e., the degree of acidity (pH), total solid (gravimetric method) and chromatic colour (calorimeter hunter method). The selected result of purple sweet potato yogurt study was mixed culture of *Streptococcus thermophilus* and *Lactobacillus plantarum* Mut 7 as culture of indigenous, which has the chemical properties. i.e., moisture 86,406 %, acidity 11.956 mgrek/100 g product, reducing sugar level 2.823 %, and physical properties : i.e., pH 4.378, total solid 13.593 % and chromatic colour 10.133

Keywords: purple sweet potato yogurt, chemical properties, physical properties, indigenous *Lactobacillus sp*

EFFECT OF GRAPE EXTRACT AND SUGAR TYPE ON PHYSICOCHEMICAL, ORGANOLEPTIC AND TOTAL LACTIC ACID BACTERIA OF LOW FAT FLAVOURED YOGURT

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ABSTRACT

Low fat flavoured yogurt was made from reconstituted skim milk, sugar and added with *Probolinggo Biru* grape extract as natural coloring. The aim of this research were to study the effect of fruit extract concentration (10%, 15%, 20%) and type of sugars i.e. sucrose and isomalt on physicochemical, organoleptic and total lactic acid bacteria of yogurt. The different level of grape extract concentration significantly ($\alpha = 0,05$) affect on yogurt acidity, syneresis, total lactic acid bacteria and color preference score. The higher the concentration of grape extract, the higher the acidity, syneresis, total lactic acid bacteria and the color preference score of yogurt. The type of sugars affected on the taste preference score of yogurt. Yogurt added with sucrose significantly ($\alpha = 0,05$) preferred by the panelists than yogurt added with isomalt.

Key words: low calory yogurt, grape extract, sucrose, isomalt

**GROWTH OF LACTIC ACID BACTERIA ON YOGURT DRINK ADDED
BY EXTRACT SALAK FRUITS**

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ABSTRACT

Lactic acid bacteria (LAB) are a group of Gram-positive bacteria that do not form spores and can ferment carbohydrates to produce lactic acid. Lactose is a sugar found in milk. Lactic acid bacteria are able to ferment lactose into lactic acid. *Salak* is sugar containing fruit that may provide carbon source for the growth of lactic acid bacteria. The objective of this study was to evaluate the growth of lactic acid bacteria in the yogurt drink containing *salak*. This study observed the growth of lactic acid bacteria in the yogurt drink containing *salak*. Material used in this experiments were skimmed milk, *salak*, and lactic acid bacteria (*Lactobacillus bulgaricus*, *Streptococcus thermophilus*, *Lactobacillus acidophilus*, *Bifidobacterium longum* ATCC 15 707). To the fresh sterilized skim milk the amount of 0%, 1%, 2% and 3% of *salak* extract were added. The result showed that the growth of lactic acid bacteria was remarkable increased by the addition of *salak* extract. This can imply the utilization of *salak* extract to the manufacturer of yogurt drink.

Keywords : yogurt drink, *salak*, LAB viability

PHYSICO-CHEMICAL PROPERTIES OF SAWO (*Achras zapota*) YOGURT

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ABSTRACT

Sawo (*Achras zapota*) yogurt is one diversification product to increase the functional value of *Sawo*. The objective of this research was to know the physico-chemical properties of *sawo* yogurt. *Sawo* fruit were obtained from Tepus subdistrict, Gunungkidul regency, Yogyakarta. Completely randomized design was use with two factors and four replications. The first factor is filtration process (with and without filtration), and the second factor is casein addition (5%, 10%, and 15%). Caspian sea yogurt starter was use in yogurt making. Physico-chemical properties including viscosity, water, ash, fat and protein content were analysis. The results show that the yogurt viscosity is 167.97 mpoise – 429.99 mpoise. *Sawo* yogurt have water content is 80% - 86.37%; ash content is 0.44% - 0.97%; fat content is 0.09% - 0.17% and protein content is 1.55% - 3.40%.

Keywords : Physico-chemical properties, diversification, Sawo yogurt

**EFFECT OF CASEIN ADDITION AND FILTRATION ON CHARACTERISTIC OF
SAWO (*Achras zapota*) YOGURT**

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ABSTRACT

Sawo (Achras zapota) yogurt has been done using Caspian sea yogurt starter. Research was conducted in Post Harvest Laboratory, Assessment Institute for Agricultural Technology (AIAT) Yogyakarta on April-November 2012. Completely randomized design was use with two factors and four replications. The first factor is filtration process (with and without filtration), and the second factor is casein addition (5%, 10%, and 15%). Total bacteria number, total lactic acid, pH, and organoleptic were analysis. The results were indicated that the total bacteria number ranged from 2.75×10^7 CFU/g to 3.75×10^7 CFU/g. The total acid were expressed as lactic acid ranged from 0.77% to 1.34%, correlated with increase of total acid, the pH were also decrease from 7 to 4. The flavor and taste yogurt are kind. Overall, panelists were like the yogurt of 10% casein addition and filtration treatment. Diversification product of sawo is support the development of local resources.

Keywords: *Sawo (Achras zapota)* yoghurt, filtration, casein addition, total bacteria number, total acid, organoleptic

OPTIMIZATION OF LACTIC ACID PRODUCTION BY *Lactococcus lactis* FNCC 0086 ON CASHEW APPLE JUICE (*Anacardium occidentale* L.) MEDIUM USING RESPONSE SURFACE METHODOLOGY

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ABSTRACT

The aim of the research was to investigate the optimum condition to produce lactic acid on cashew apple juice medium as a low cost substrate by *Lactococcus lactis* FNCC 0086. The experimental design was conducted by Box-Behnken design consist of 3 factors and 3 levels. The factors and levels were cashew apple juice concentration (50%, 75%, 100% b/v), mungbean sprout extract concentration (5%, 10%, 15% v/v), and fermentation temperature (30°C, 33°C, 36°C). The data were analyzed with Response Surface Methodology (RSM). The result showed that the optimum processing conditions were 57.79% (b/v) of cashew apple juice concentration, 10.46% (v/v) of mungbean sprout extract concentration, and fermentation temperature at 35.15 °C. At the optimum conditions, lactic acid concentration was 0.1579 %.

Keywords: cashew apple, lactic acid, lactic acid bacteria, mungbean sprout, response surface methodology

FUNCTIONAL PROPERTIES OF FERMENTED BLACK SOYBEAN MILK

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ABSTRACT

Black soybean (*Glycine max* L. Merr) is a kind of nutritionally rich food which contains isoflavone, anthocyanin, vitamin E, and other biological compounds that promoting human health. In this study, black soybean milk was fermented into yoghurt using *caspian sea yogurt* culture. Antioxidant activity, microbiological, and chemical characteristics were monitored during fermentation. Black soybean milk was prepared by extracting whole soybean seeds with distilled water (1:5). Black soybean milk was then inoculated with 5% *caspian sea yogurt* culture and incubated at 30°C for 18 h. The results showed that fermentation process increase total viable cells up to 2-log cycle, reached 10⁸ CFU/g for lactic acid and acetic acid bacteria. pH value declined from 6.24 to 4.03 and titratable acidity increased from 0.19% to 0.52%. Fermented black soybean milk exhibited higher radical scavenging activity with value of 74.13%; compared to pasteurized milk yogurt used as control which only had 17.04%. Total phenolic and anthocyanin content of fermented black soybean milk were 38.80 g GAE/kg yogurt and 7.49 mg/kg yogurt. These values were also higher than pasteurized milk yogurt. Thus, fermented black soybean milk can be used as a good alternative source of functional foods rich in antioxidant.

Keywords : functional properties, black soybean, caspian sea yoghurt.

CONCENTRATED JACKFRUIT (*Artocarpus integra*, MERR) JUICE AS FLAVOR COMPONENT IN COCONUT MILK YOGHURT

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ABSTRACT

The aim of this research was to determine level of jack fruit juice concentrate added into coconut milk yoghurt based on the sensory preference and yoghurt quality standard (total lactic acid and viscosity). The significance of this research was to elucidate a reference on the development of jack fruit flavored coconut milk yoghurt. Concentrated jack fruit juice was added to coconut milk yoghurt (10%, 15% and 20% v/v). Complete Randomized Design was used in statistical analysis of sensory evaluation. The sensory evaluation revealed that the most favorable product was coconut milk yoghurt mixed with 20% concentrated jack fruit juice. This yoghurt was scored 6.02 (like) for colour, 5.21 (sweet) for sweetness, 5.38 (acid) for acidity, and 5.05 (strong) for jack fruit flavor, and 5.07 (like) for overall flavor. A 10% concentrated jack fruit juice in coconut milk yoghurt resulted in a flavored coconut milk yoghurt with total lactic acid 1.320%, pH 4.21 and viscosity 1.9 Poise. Concentrated jack fruit juice 15% resulted in a product of flavored coconut milk yoghurt with total lactic acid 1.217%, pH 4.23, and viscosity 1.5 Poise. Concentrated jack fruit juice 20% resulted in coconut milk yoghurt with total lactic acid 1.135%, pH 4.25, and viscosity 1.33 Poise.

Keywords: jackfruit juice, coconut milk, coconut milk yoghurt

TOTAL LACTIC ACID BACTERIA (LAB), LACTOSE CONTENT AND ACIDITY OF FERMENTED WHEY WITH *Bifidobacterium bifidum* IN DIFFERENT INCUBATION PERIOD

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ABSTRACT

This study examined the effect of incubation time on characteristics of fermented whey. The characteristics were considered from total of lactic acid bacteria, acidity and lactose content during incubation of 6, 12, 18 and 24 hours. Randomized Completely Block Design was used as an experimental design with four treatments and five replicates. The findings showed that the longer the incubation time, the higher the total lactic acid bacteria and the acidity, and the lower the lactose content. Best fermented whey was produced using incubation at 37°C during 18 hours. The amount of lactic acid bacteria in 12, 18 and 24 hours reached to $>10^7$ CFU/ml, so fermented whey with *Bifidobacterium bifidum* can be used as probiotic carrier.

Keyword : fermented whey, incubation time, lactic acid bacteria

THE EFFECT OF CONSUMPTION OF MILK FERMENTED BY *Lactobacillus casei* SHIROTA (COMMERCIAL YAKULT DRINK) ON THE DECREASE OF STUDENT ANXIETY LEVELAndri Frediansyah¹⁾ and Ingga Yonico Martatino²⁾³⁾¹⁾Indonesian Institute of Science (UPT BPPTK LIPI), Yogyakarta²⁾Sunan Kalijaga Islamic State University, Yogyakarta³⁾Gadjah Mada University, Yogyakarta

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ABSTRACT

National Exam (UN) is one of the government programs to improve the education quality in Indonesia. Students should be able to achieve the standard set value to get graduate degree. On the other hand, many students anxious about the possibility of did not pass and was not able to achieve the standard. Anxiety is unpleasant emotion that most people feel at some time when they are faced with challenges. Medication such as antidepressant, beta blockers, and benzodiazepines combined with psychotherapy has shown to be the most used treatment for anxiety. Recent studies showed that some probiotic have ability to reduce anxiety related gamma aminobutyric acid (GABA). Yakult that contain *Lactobacillus casei* Shirota is the most commercial probiotic drink. The objective of this research was to determine the effect of drinking commercial Yakult drink containing *L. casei* Shirota on the decrease of student anxiety level. The research determined by the non-probably sampling technique based on the willingness of subject to perform pretest first (n=50) then selected a sample that has the highest value of anxiety (n=10) and will be subject. This selection was conducted on senior high school student in Yogyakarta. Further testing hypotheses obtained (can be seen in the table) is the result of the Wilcoxon analysis (SPSS 16) with a value of $t = 0.018$, which means $p < 0.05$, where the results showed that the data were significant or hypothesis milk to decrease anxiety level of student that facing UN. The research subject was accepted.

Keywords: Anxiety, *Lactobacillus casei* Shirota, Yakult, GABA

FUNCTIONAL PROPERTIES OF SORGHUM FERMENTED WITH LACTIC ACID BACTERIA

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ABSTRACT

The effect of fermentation of sorghum with lactic acid bacteria on the functional properties of sorghum flour was studied. Sorghum flour fermentations were carried out at 37°C for 24 h using a starter culture of *Sreptococcus thermophilus* FNCC 0040 and *Lactobacillus acidophilus* FNCC 0050 respectively, and natural fermentation as a control. The gelatinisation temperature and viscosity of sorghum flour before and after fermentation were evaluated. Sorghum fermentation with *S. thermophilus* FNCC 0040 and *L. acidophilus* FNCC 0050 decreased the gelatinisation temperature from 80.5°C to 72.6°C and from 82.5°C to 72.6°C respectively, and increased the viscosity from 716 cP to 1280 cP, and from 550 cP to 787 cP respectively. Natural fermentation of sorghum without addition of starter culture only slightly decreased the gelatinisation temperature from 87.6°C to 86.2°C and increased the viscosity from 716 cP to 761 cP.

Keywords: sorghum flour, fermentation, lactic acid bacteria, functional properties

EFFECT OF RETROGRADATION TIME ON THE PROPERTIES AND PREBIOTIC ACTIVITY OF SAGO AND TAPIOCA STARCH NOODLES

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ABSTRACT

The purpose of this research was to determine the length of retrogradation time in the sago and tapioca starch noodle to improve the physical properties and potential prebiotic activity (PA) of the resistant starch (RS) derived from the noodles. Starch noodles were prepared from sago and tapioca starches by extruding the dough followed by steaming, and then kept at 4°C for 1, 2, and 3 h before being finally dried. The RS was prepared by hydrolysis of the predetermined starch noodles using a mixture of pancreatic- α -amylase and amyloglucosidase. The RS was incorporated in the specified selective media to grow probiotic bacteria (*Bifidobacterium longum* ATCC 15707 and *Lactobacillus plantarum* JCM 1551), and enteric bacteria (*Escherichia coli* IFO 3301). The RS from a commercial starch noodle sample and inulin were also included in the separate media for control. The PA was determined by comparing the change in the growth of probiotics and enteric counts at 0 and 24 hours at the same growing conditions. The results showed that retrogradation for 3 h gave the starch noodle with similar characteristics to the commercial product. PA value of the resulted RS from sago starch noodle was 0.10 when calculated on the basis of the growth of *L. plantarum* as well as that of *B. longum*; while the values for tapioca starch noodle were 0.04 and 0.72, respectively.

Keywords: starch noodles, retrogradation, resistant starch, prebiotic activity

CHEMICAL, PHYSICAL AND SENSORY PROPERTIES OF COOKIES MADE FROM FERMENTED SORGHUM

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ABSTRACT

Sorghum is one of potential cereal foodstuff to be made into various products, such as noodle, paste and baked products. An intermediate processed sorghum is in the flour form. One problem of sorghum flour is due to the low digestibility. In addition, it needs a study to know the acceptable limit of sorghum substitution in certain products. Therefore, process development in sorghum is urgently needed to improve digestibility value of processed products and consumer's acceptance. Natural fermentation is known to be potential method to improve sorghum digestibility and sensory acceptance. The study was aimed to investigate chemical, physical and sensory properties of cookies product made from natural and fermented sorghum flour. Natural fermentation of sorghum flour was carried out by incubating sorghum flour at 37°C for 28 h. Native and fermented sorghum flour were substituted into wheat flour to make cookies at various levels of 0% (control), 25%, 50%, 75% and 100%. The cookies products were evaluated for chemical, physical and sensory properties. Results indicated that substitution of fermented sorghum flour improved protein digestibility of cookies. Texture of cookies made from fermented sorghum was stronger than that of made from native sorghum. Acceptable substitutions of native and fermented sorghum flour were at level of 75% and 50%, respectively. Cookies made by sorghum substitution resulted in product with yellowish-brownies, crispy, a bit sandy, sorghum aroma and taste. Moreover, cookies made from fermented sorghum had detectable sour taste. Further study is required to reduce sour taste in fermented sorghum flour before made into products.

Keywords: Sorghum flour, protein digestibility, natural fermentation, cookies

MICROBIOLOGICAL QUALITY OF CASSAVA MEAL CHIP THAT ENRICHED WITH EXTRACT OF FERMENTED VEGETABLE GARBAGE

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ABSTRACT

Cassava meal (*onggok*) is a common local feedstuff that potential as a source of carbohydrates for the poultry feed. It could be improved to be functional feed even if it is enriched with functional bacteria such as lactic acid bacteria (LAB). Aim of this study is to evaluate the microbiological quality of cassava chips made from cassava meal enriched with extract of fermented vegetable wastes (EFVW). Microbiological parameters used in this were total of LAB and the total of Gram +/- bacteria, *Coliform*, as well as *Salmonella*. The material used in this study was cassava meal (*onggok*), EFVW. The experiment was conducted by completely randomized design (CRD) with 3 treatments and 5 replications. The treatment applied were the difference level of EFVW by means 0% (T0), 40% (T1), 60% (T2). The results showed that the addition of EFVW in making chips significant affected the total number of LABs of chips ($P < 0.05$), however, there was not significant effect provided to the existence of Gram +/- bacteria. Among the treatments (T0, T1 and T2), total LAB were 1.2×10^2 ; 1.0×10^3 and 2.3×10^4 , respectively. While regarded to the score of the presence of Gram +/- bacteria, among the treatments are 1.00; 1.70 and 1.90 respectively. It could be considered that the product of chip had enough amounts of the Gram positive LAB, even though the Gram negative bacteria was still found. The results showed no *Salmonella* in all treatments, while the presence of *Coliform* in the treatment (T0, T1 and T2) were 2.5×10^2 ; 5.2×10^2 ; 5.0×10^2 CFU/g, respectively. It was concluded that the bacteria Gram positive and LAB can be maintained in the cassava chips, however to suppress the presence of *Coliform*, other treatments were needed.

Keywords : cassava meal, EFVW, LABs, Gram bacteria

**MICROBIOTA OF *GROWOL* FERMENTATION
MADE FROM VARIOUS RAW MATERIAL WITH THE ADDITION OF YEAST**

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ABSTRACT

Traditionally, fermentation of *growol* was made from cassava, however currently, research indication that *growol* can also be produced from several kind of tubers, such as sweet potato and taro, with the addition of yeast. For making *growol*, tubers were selected, cleaned, chop carefully, and each sample were soaked in water at ratio 1:4 (w/v), added 1% (w/w) baker's yeast and fermented at ambient temperature for 5 days long. The initial number of yeast was 7.95×10^6 CFU/mL. The results showed that there was no mold growth for all fermentation, but yeast population was increase 1 cycle log for all tubers at day 1 and stable on taro , but yeast population of cassava and sweet potato fermentation were decrease at day 3 and day 5 fermentation. The population of Lactic Acid Bacteria was stable on sweet potato (10^7 CFU/mL), but decrease on cassava and taro at day 5. Finally, the Lactic Acid Bacteria growth was slower on Taro than the other tubers.

Keywords: Microbiota, *growol* fermentation, taro, *beras miskin*

APPLICATION OF LACTIC ACID BACTERIA ON THE NON-FERMENTED COCOA BEAN FOR FUNGAL GROWTH INHIBITION

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ABSTRACT

The safety and the quality of non fermented cocoa bean from smallholder cocoa plantation are still low due to the contamination of fungus from the genus *Aspergillus* and *Penicillium* mainly available after drying process. These two fungus which are predominantly available in cocoa bean produce mycotoxin which is carcinogenic. On cocoa trading, the availability of fungus and mycotoxins indicate that the quality of cocoa is low and it brings about the low volume of trading, low price, and also the cause of automatic detention of cocoa bean in Europe and America. The effort of reducing the number of fungus and mycotoxin from cocoa bean is conducted by applying lactic acid bacteria from cocoa bean fermentation. This research aims to isolate lactic acid bacteria originated from cocoa bean fermentation potential in producing antifungal activities. The research was carried out by observing the characteristics of cocoa bean fermentation and the microorganisms involving in fermentation, identifying lactic acid bacteria during fermentation, determining antifungal activity of lactic acid bacteria, and applying the lactic acid bacteria on the non fermented cocoa bean. The results showed that some lactic acid bacteria isolated from cocoa bean fermentation in Kotta Blater Plantation PTPN 12 Jember were initially identified as *Leuconostoc mesenteroides* (KL11, KL28, KB32, KB34, KB04), *Lactobacillus plantarum* (KB03, KB05), and *Leuconostoc dextranicum* (KL21). These isolates have antifungal activities against *Aspergillus flavus* found from inferior dried cocoa bean. When the suspension of lactic acid bacteria was sprayed on the non fermented cocoa beans bulk, the growth of *A. flavus* was inhibited by *Leuconostoc mesenteroides* (KB32, KB34, KB04), *Lactobacillus plantarum* (KB03, KB05) and *Leuconostoc dextranicum* (KL21). While *Leuconostoc mesenteroides* (KL28, KL11) showed less inhibition to *A. flavus*.

Keywords : antifungal, lactic acid bacteria, cocoa bean, *Aspergillus*

LACTIC ACID FERMENTATION FOR FISH PRESERVATION

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ABSTRACT

Indonesia as a maritime country is very potential with marine resources, especially fish. A variety of marine fish were produced in Indonesia. Unfortunately, fish consumption in Indonesia is still low compared to other countries such as Maldives, Japan and Iceland. One of the problems of marine fish industry in Indonesia, is the use chemical such as formaldehyde to prolong the shelf-life of fish. The chemical very harmful and that condition makes Indonesian society must be careful in choosing the fish to consume. As it has been already known, lactic acid bacteria are potentially used as a food preservative. The objectives of this paper were to describe the use of lactic acid bacteria in fish preservation versus chemical preservation, to compare the use of lactic acid bacteria in Indonesia in the field of fish preservation to overseas, to describe the advantage and disadvantages of using lactic acid bacteria as fish preservative and to examine the types of bacteria that can be isolated from fish. For conclusion, the fish spoilage results from basic mechanism such as microbial growth, autolysis and oxidation. Chemical techniques and low temperature storage are the most common in the fish preservation industry today. Preservation of fish using lactic acid bacteria is a promising technique, however more efforts are required to understand the role of bacteria and their interaction in order to optimize the shelf-life of fish.

Keywords: Fish preservation, lactic acid bacteria, biological fermentation, chemical fermentation

ADDITION OF *Pediococcus halophilus* CCRC 12576 AND *Pediococcus pentosaceus* IFO 12230 ON THE LIQUEFACTION AND CHARACTERISTIC OF FISH SAUCE MADE FROM *RUCAH* FISH

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ABSTRACT

To accelerate the process and to increase functionality of the product, two *Pediococcus* species were used as starter cultures in the manufacture of fish sauce. *Pediococcus pentosaceus* IFO 12230 and *Pediococcus halophilus* CCRC 12576 and mix of both species were inoculated on fish sauce process using raw material *rucah* fish in 30 days fermentation. Observations were made on days of 10, 20 and 30 with 3 replications. The result showed that fish sauce produced by inoculation of *Pediococcus*: with longer fermentation, yield, TMA and total titratable acid obtained from the three treatments is increasing. Addition of *P. halophilus* starter resulted the lowest TMA content compared to the other starter. The lowest total titratable acid at the end of fermentation acids was obtained by the addition of *P. pentosaceus*. Sensory test of the final product produced by the addition of starter *P. halophilus* was accepted while the combination of soy sauce with the addition of *P. pentosaceus* was not accepted by the panelists.

Keyword : Fish sauce, *Pediococcus* , Fermentation, Liquefaction, *Rucah* Fish

**CHEMICAL AND MICROBIOLOGICAL CHANGES DURING FISH SAUCE FERMENTATION
WITH *Pediococcus* spp. AS STARTER CULTURES**

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ABSTRACT

The purpose of this study was to determine the effect of adding starter (*Pediococcus* spp.) to the changes chemical and microbiological changes during the 30-day fermentation period of fish sauce. Treatment performed is the addition of starter *P. halophilus*, *P. pentosaceus* and a combination of both (*P. pentosaceus* and *P. halophilus*). Observations were made on days 10, 20 and 30 with 3 replications. The results showed that during fish sauce fermentation the salt content were 28.2% - 24.7%. The longer of fermentation time the lower the pH values (5.79 to 5.2) and the higher the TVB value (61.33% - 94mgN%). Total Plate Count (TPC) and Lactic Acid Bacteria (LAB) were (1.25×10^5 - 9×10^4 CFU/ml and 2×10^4 - 1.1×10^5 CFU/ml) respectively.

Keyword: fish sauce, *Pediococcus Sp.*, Fermentation, Chemical and Microbiological Changes, Rucah Fish

**MICROBIOLOGICAL AND ORGANOLEPTIC CHARACTERISTIC OF FISH FERMENTED
(*Rastrelliger neglectus*) IN WASTE RICE WATER**

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ABSTRACT

The aim of this study was to evaluate the effect of three days soaking in waste rice water with the addition of various saline concentrations during processing of fermented fish on microbiological and organoleptic characteristics. Experimental design used in this study was completely randomized design (CRD) one factor, four replications. Salt concentrations were 15%, 17.5%, 20%, 22.5%, 25%. Total bacteria & lactic acid bacteria (LAB) were analyzed. Based on the result, total microbial and total LAB showed a decline with the increasing levels of salt added. Analysis salt concentration showed salinity increased with increasing salinity treatment. Organoleptic test resulted that fish fermented with 15% and 20% salinity were more preferable.

Keywords : Fermented fish , waste rice water

THE EFFECT OF *Pediococcus acidilactici* F11 AS STARTER CULTURE ON THE MICROBIOLOGICAL AND CHEMICAL CHANGES DURING OVER FERMENTATION OF *RUSIP*

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ABSTRACT

This research was conducted to evaluate the effect of addition of *Pediococcus acidilactici* F-11 as starter culture on the quality of rusip through over fermentation process. Rusip was processed by fermentation either with or without *Pediococcus acidilactici* F-11 with the addition of 10, 15 and 20% (w/w) salt and 10% (w/w) brown sugar which was incubated at room temperature for 12 days. Observation was conducted including microbiological analysis (total plate count, total lactic acid bacteria (LAB) and total Coliform), chemical analysis (pH, titratable acidity and TVB). The result showed that *Pediococcus acidilactici* F11 addition could produced better quality of rusip, especially on the high salt treatment. The rusip had total plate count (TPC) 4,78 log, total LAB count 3,25 log, total coliform was not detected, pH 5,15 and titratable acidity 1,61%.

Keywords : *Rusip*, fermentation, lactic acid bacteria, *Pediococcus acidilactici* F-11

THE POTENTIAL OF *Pediococcus acidilactici* F11 PRODUCING BACTERIOCIN AS A NATURAL PRESERVATIVE *INA SUA* (STOCK FISH) *GURAME* (*Osphoremus gouramy*)

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ABSTRACT

Bacteriocin from lactic acid bacteria has the potential used as a biopreservative agent in processed products and also has the antagonism against pathogenic bacteria. One of the bacteriocin is *Pediococcus acidilactici* F11 that have been applied in fermentation products, like in sausage that can prevent the growth of pathogenic bacteria, and also in pasteurized milk and *plasom*. The objective of this research was to preserve the quality of *Ina Sua* (Stock Fish) *Gurame* with two factorial i.e., salt concentration 15 %, 20%, and 23 % and with or without addition of 30 ml culture of *Pediococcus acidilactici* F11, and fermentation was done for 12 weeks. The result showed that *Ina Sua Gurame* by addition culture of *Pediococcus acidilactici* F11 with 20% salt concentration in week 6 showed the best result. This condition could prevent the growth of bacteria and coliform with the total 10^3 CFU/g and 10^3 CFU, respectively; while total of lactic acid bacteria was increase, that is 10^5 CFU/g. Fermented fish product has moisture content of 56,28%, protein content of 66,78%, fat content 7,25%, salinity 7,28%, acidity 1,96%, and pH 4,23.

Keywords : *Pedicoccus acidilactici* F11, bacteriocin, *Ina Sua* (Stock Fish)

INCORPORATION OF ISOLATED PROBIOTIC FROM FISH GUT IN FEED AS FUNCTIONAL ADDITIVE FOR HEALTHY AND VALUE ADDED FISH PRODUCTION

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ABSTRACT

A detail study was conducted to explore the gut microflora of two fish species (catfish and mackerel). The isolated bacteria were divided in two groups (Probiotic and Pathogenic) according to its capabilities. The samples were collected from the local fish market. Forty colonies from the gut of both cat-fish and mackerel were randomly screened for its probiotic and pathogenic capabilities. Out of all 40 colonies only one was found of probiotic characteristics and three were found belonging to pathogenic flora. The isolated probiotic bacteria were found with highly antibacterial properties against the pathogenic bacteria. The species was identified by API-50 kit and was confirmed as *Lactobacillus plantarum*. While the pathogenic bacteria flora was identified by gram staining and biochemical test. All the pathogenic bacteria were found belonging to the family of Enterobacteriaceae. One pathogenic bacteria with poly-unsaturated fatty acids (PUFAs) production capability was identified with the help of 16s rDNA Polymerase Chain Reaction (PCR). The identified organism was *Klebsiella pneumoniae ozaenae*, while the remaining were *Klebsiella pneumoniae pneumonia*, and *Vibrio parahaemolyticus*. The isolated probiotic was encapsulated in calcium alginate-gelatin systems to ensure the high viability during fish feed pellets processing (high temperature) and in the fish gut (various pH and enzymes).

Keywords: Probiotics, PCR, API-50 kit, PUFA, Encapsulation, Extrusion

RESISTANCY OF *Lactobacillus* sp. SKG34 IN RAT GASTROINTESTINAL TRACT DETECTED BY PCR-RANDOM AMPLIFIED POLYMORPHIC DNA

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ABSTRACT

This research was aimed to elucidate the resistance of *Lactobacillus* sp. SKG34 in rats gastrointestinal tract. The *Lactobacillus* sp. SKG34 was a promising probiotic strain isolated from Sumbawa mare milk. The strain was administered to rats (about 10^8 cells) for 30 days by oral gavage. The persistancy of *Lactobacillus* sp. SKG34 was monitored by PCR-RAPD using M13F primer, while the activities of *Lactobacillus* sp. SKG34 in the rat gastrointesinal tract were monitored by measuring the pH of ceccal content. The results showed that administration of *Lactobacillus* sp. SKG34 enhanced the population of LAB in ceccal content; 3.06×10^9 CFU/g and 1.25×10^{10} CFU/g in control and probiotic treatment, respectively. Detection using RAPD of the colonies isolated from agar plates showed that the *Lactobacillus* sp. SKG34 was encountered in ceccal content of about 25,16% out of total LAB population. The growth of LAB in the rats GI slightly lowered the pH of ceccal content 6,63 and 6,58 in the control and probiotic treatment, respectively. This result indicated the *Lactobacillus* sp. SKG34 resisted and multiflied in the rats GI.

Keywords: *Lactobacillus*, RAPD, probiotic

EFFECT OF DIET CONTAINING YAM BEAN (*Pachyrhizuserosus*) FIBER ON SELECTED COLONIC MICROBIOTA AND SHORT CHAIN FATTY ACID OF *SPRAGUE DAWLEY* RATS

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ABSTRACT

Yam bean is a vine which belongs to the genus of *Pachyrhizus* family. It is cultivated mainly for its tuberous root. The root is rich in dietary fiber and potentially used as a source of prebiotic. The aim of this research was to determine the effect of diet containing yam bean fiber on selected colonic microbiota and short chain fatty acid (SCFA) of *Sprague Dawley* rats. Twenty four rats were used in this study. The rats were divided into three groups. Each group received AIN 93 diets containing (50g/1000g) yam bean fiber, inulin and carboxymethylcellulose (control) as source of fiber, respectively. The diets were given *ad libitum* for 14 days. After the experimental period the rats were anaesthetized and the cecal contents were removed and analyzed for weight, pH, moisture, microbiota (*Bifidobacteria*, *Lactobacilli* and *Escherichia coli*), and SCFA (acetate, propionate, and butyrate). The results showed that consumption of diet containing yam bean fiber significantly decreased *E. coli* population, increased water content, total short chain fatty acid (SCFA), molar proportion of butyrate and reduced the pH of digesta. Population of *Bifidobacteria* and *Lactobacilli* were similar for all groups ($p > 0.05$). Yam bean fiber diet also gave bulky effect in the stool. The study showed that yam bean fiber may be used as functional food ingredient and consumption of yam bean fiber potentially improve colon health.

Keyword: Yam bean fiber, Colonic microbiota, Short chain fatty acid, *Sprague Dawley* rats

P-51

MICROBIOTA IN MICE THAT CONSUMED WITH TAPE WATER LILY SEEDS

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ABSTRACT

This research aims to determine the microflora in mice fed with *tape* of water lily seeds. There are two groups of mice being studied, first group was fed with standard diet, and second group was given oral standart diet with *tape* of water lily seeds. Mice weight, total microbes, total LAB and *E. coli* (during 7, 14, and 28 days) were analyzed. This research was conducted using randomized complete design for 3 replication. The results show that *tape* water lily seeds consumption did not affect the microflora (total bacteria, LAB and *E. coli*) of mice during 28 days maintenance of the experiment, but the mice lose weight by 2.13%.

Keywords: *Tape* water lily seeds, weight of rats, microbiota

BILE SALT AND ACID TOLERANT OF LACTIC ACID BACTERIAL ISOLATED FROM PROVENTRICULUS OF BROILER CHICKEN

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ABSTRACT

The aim of this research was to study the characteristic of lactic acid bacteria isolated from proventriculus of broiler chicken. MRS media with 0.2% CaCO₃ addition were used for the isolation. Four selected isolates which have characteristics as lactic acid bacteria were obtained in this study. The extracellular metabolites of LAB isolates have antibacterial activities against *Escherichia coli*, *Pseudomonas aeruginosa* and *Salmonella pullorum* using disc paper diffusion method. The identification procedure using API 50 CHL kit showed that the two isolates were identified as *Leuconostoc lactis* R01 and *Pediococcus pentosaceus* R02 whereas in molecular identification using 16S rRNA sequence analysis showed that R01 and R02 as *Pediococcus acidilactici*. The two isolates were tested by acid pH (i.e. pH 1, 2 and 3), gastric juice pH 2, and bile salt condition. The result showed that R01 and R02 had the high viability percentages in acid pH condition (95.45, 99.49, 104.01 and 67.17, 120.74, 103.4 %, respectively) and 1 – 2 hours on bile salt simulation (100.35 – 102.71 and 100.02 – 102.65 %, respectively), but 1 – 2 hours on gastric juice simulation, the *P. acidilactici* R01 has higher viability than *P. acidilactici* R02 (59.69 – 76.53 versus 43.57 – 40.69 %, respectively). In the antibiotic sensitivity test for three antibiotics (i.e. Erythromycin 15µg, Penicillin G 10µg and Streptomycin 10µg), the *P. acidilactici* R01 showed resistance on Streptomycin and Penicillin. It was concluded that *P. acidilactici* R01 and *P. acidilactici* R02 which were isolated from proventriculus of broiler chicken were potential as probiotic candidates for chickens.

Keywords : lactic acid bacteria, proventriculus, probiotic, broiler chicken

EFFECT OF PROBIOTIC AND SYNBIOTIC DIETARY INCLUSION ON GROWTH PERFORMANCE, INTESTINAL MICROBIOTA, COCCIDIOSIS SCORE, AND H/L RATIO OF BROILER CHICKEN

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ABSTRACT

A feeding study was conducted to observe the effect of Lactic acid bacterial-based Probiotic (LP) and Lactic acid bacterial-based Synbiotic (LS) on broiler growth performances, intestinal microbiota, coccidiosis score, and H/L ratio. The dietary treatments for this study were 1) basal diet, 2) basal diet supplemented with LP (1 kg/ton of feed), and 3) basal diet supplemented with LS (3 kg/ton of feed). Nine hundreds of 1 day-old Ross 308 chicken were randomly assigned to each dietary treatment and reared in a semi-closed house system for 4 weeks prior to sampling. Dietary supplementation of LP and LS significantly ($p < 0.05$) improved the body weight (BW), average daily gain (ADG), and feed conversion ratio (FCR). A decrease in enterobacteria count followed by an increase in lactic acid bacteria count in caecum was observed with dietary inclusion of LP and LS. The result may indicate there was a shift in intestinal microbiota balance toward healthier condition. Moreover, a decrease in coccidiosis score from 13.9% of control treatment to 6.94% and 11.10% were observed after treatment with LP and LS, respectively. Dietary inclusion of LP and LS decreased the H/L ratio from 0.53 to 0.43 and 0.37, respectively. These results could signify an improvement on stress status of broiler chicken after fed with LP and LS. From this study, both LP and LS products showed promising effects to improve overall performances of broiler chicken.

Keywords: Lactic acid bacteria (LAB), Probiotic, Synbiotic, Broiler Performances

**EFFECT OF *Lactobacillus* sp B12 ON FEED CONVERSION RATIO
AND BODY WEIGHT GAIN OF DUCK**

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ABSTRACT

The aim of the research was to evaluate the effect of *Lactobacillus* sp. B12 on feed conversion ratio and body weight gain of duck. The completely randomized design was used on this research with 3 treatments and 5 replications. The treatments were R0 (feed with 0% *Lactobacillus* sp.), R1 (feed with antibiotic growth promoters) and R2 (feed with *Lactobacillus* sp). Feed composed of iso crude protein (18%) and energy (2800 kkal/kg). The parameters were feed conversion ratio and body weight gain of duck. The results showed that the *Lactobacillus* sp. significantly ($p < 0,05$) increasing body weight gain and decreasing feed conversion ratio as compared to control (R0), but not different with R1. The conclusion was *Lactobacillus* sp. can be used to replace antibiotic growth promoters on duck

Keywords : *Lactobacillus* sp., antibiotic growth promoters, duck

**ANTIBACTERIAL ACTIVITY OF WATER SOLUBLE
CARBOXYMETHYL CHITOSAN (CMCh)**

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ABSTRACT

One of chitosan derivative is carboxymethyl chitosan (CMCh). Carboxymethyl chitosan has the properties of water-soluble, non-toxic, biodegradable, biocompatible, and has a lot of potent to be applied in the manufacture of pharmaceuticals, cosmetics, and health. In this study, we extracted carboxymethyl chitosan from chitosan of shrimp shell industry waste. The CMCh was characterized using Fourier Transform Infrared (FTIR), Atomic Absorption Spectrophotometer (AAS), and Thermo Gravimetric/Differential Thermal Analyzer (TG/DTA). Further, in vitro antimicrobial activities of CMCh were evaluated against *Escherichia coli* and *Staphylococcus aureus*.

Keywords: carboxymethyl chitosan, antimicrobial, water soluble, *Escherichia coli*, *Staphylococcus aureus*

FOLATE PRODUCTION BY LACTIC ACID BACTERIA ISOLATED FROM FERMENTED DAIRY PRODUCT

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ABSTRACT

Folate deficiency has been implicated in a wide variety of disorders from Alzheimer's to coronary heart diseases; osteoporosis, increased risk of breast and colorectal cancer, poor cognitive performance, hearing loss, and of course, neural tube defects. The recommended daily intake (RDI) of folate in an adult is 200-400 µg, and for pregnant women, 400-600 µg is recommended. Mammalian cells cannot synthesize folate; therefore, an exogenous supply of this vitamin is necessary to prevent nutritional deficiency. Folate is present in most foods such as legumes (beans, nuts, peas), leafy greens (spinach), citrus, some fruit (grapefruits, pineapple), vegetables (broccoli, cauliflower), liver and fermented dairy product. A variety of lactic acid bacteria have ability to produce folate intracellularly and/or extracellularly. Lactobacilli isolated from dairy product in Iran have ability to produce folate 2.8-66.6 µg/l. *Streptococcus thermophilus* strains (RD102 and RD104) isolated from Indian fermented milk were produced folate 48 and 44 µg/l, respectively. When grown in chemically defined folate-free medium *L. plantarum* has the ability to produce folate 45 µg/l, *L. helveticus* 2-89 µg/l, *L. bulgaricus* 54 µg/l. This review will focus on folate production by lactic acid bacteria and the folate level production, and suggest that lactic acid bacteria folate producer can be isolated from Indonesian traditional fermented milk.

Keywords: folate, fermented dairy product, lactic acid bacteria

**A POTENTIAL ANTIOXIDANT ACTIVITY OF PROBIOTIC BACTERIA
FROM FERMENTED FOODS : A REVIEW**

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ABSTRACT

Nowadays fermented foods became popular around the world, not only because of its taste, but also because of its functionality. Fermentation process not only increases the digestibility value, shelf life, and sensories properties, but also provides probiotic bacteria at the end product. Most of fermented foods was fermented by lactic acid bacteria (LAB) groups. Many researches about lactic acid bacteria had shown that most of lactic acid bacteria which found in fermented foods had probiotic properties and also had antimicrobial activity agains some pathogenic bacteria. Now, the research was developed to observed about the capability of lactic acid bacteria to produce antioxidant, so the fermented foods not only provided probiotic bacteria and antimicrobial activity, but also had a potential antioxidant activity for human's health.

Keywords: fermented foods, probiotic bacteria, antioxidant activity

LACTIC ACID BACTERIA IN TRADITIONAL INDONESIAN FOODS : A REVIEW

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ABSTRACT

Indonesia as an archipelago country has many cultures with their traditional food. Previous studies reported that these traditional foods contain lactic acid bacteria. In this review article, will be explained the types and character of lactic acid bacteria in traditional food, such as marine-based product, cereal-based product, vegetable-based product and tuber-based product. The beneficial roles of lactic acid bacteria and the reasons for their common presence are also discussed.

Keywords: traditional food, lactic acid bacteria, beneficial roles

ROLE OF PROBIOTIC IN LOWERING CHOLESTEROL: A REVIEW

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ABSTRACT

This paper reviews the role of lactic acid bacteria (LAB) as probiotic in lowering cholesterol concentration in various experimental methods, ranging from laboratory medium to experimental animals, such as mice, rats, and pigs. Strains of LAB have been recognized to have capability of lowering cholesterol concentration. There are several mechanisms which have been proposed by researchers, namely i) in vitro assimilation, ii) binding to bacterial cell wall, iii) transformation to coprostanol, iv) enzymatic deconjugation of bile salt, and v) physiological action of the end products of short chain fatty acid fermentation especially propionate. However, the exact mechanism of lowering cholesterol by LAB strains remains unclear. Based on the review of several studies on LAB strain showed that a wide diversity of LAB strain were found to have ability of lowering cholesterol concentration, such as strain members of genera *Lactobacillus* (*L. acidophilus*, *L. casei*, and *L. delbrueckii*), *Streptococcus*, and *Bifidobacterium* (*B. longum*). The LAB strains were isolated from habitats, such as fermented dairy products such as yogurt and *dadih* (buffalo fermented milk), human intestine, human fecal, as well as pig fecal. Capacity of LAB strains to lower cholesterol in experimental animal was found to be the highest (39,8% in animal fed without cholesterol and 13,4% in animal fed with high cholesterol) by *Lactobacillus* sp. Dad 13 isolated from *dadih*. However, *L. delbrueckii* B3 isolated from yogurt was able to reduce 31% cholesterol in medium. It was interesting that the capacity to reduce cholesterol was positively correlated with its capacity to produce exopolysaccharide, indicating that the mechanism of reduction possibly by binding to bacterial cell wall (EPS). Most of another LAB strains in other studies were reported to reduce cholesterol in medium and experimental animals with mechanism of reduction remained uncertain. On the basis of the review it could be concluded that various strains of LAB are very potential to be used as probiotic for lowering cholesterol concentration, although the mechanism remained to be elucidated in further studies.

Keywords: probiotic, cholesterol, lactic acid bacteria

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