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# INCObiFS

THE 1<sup>ST</sup> INTERNATIONAL CONFERENCE  
ON BIOTECHNOLOGY AND FOOD SCIENCE

September 11<sup>TH</sup>, 2020



**ABSTRACT BOOK**

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The 1<sup>st</sup> International Conference on Biotechnology and Food  
Science (InCoBiFS)

“BREAKTHROUGH IN FISHERIES, MARINE AND FOOD  
BIOTECHNOLOGY TO SUPPORT SUSTAINABLE DEVELOPMENT  
PROGRAMS”

Surabaya, Indonesia, September 11<sup>th</sup>, 2020

BOOK OF ABSTRACTS

FACULTY OF FISHERIES AND MARINE  
2020

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## CONFERENCE OVERVIEW

It's such a great pleasure for me to welcome all of you on behalf of the Faculty of Fisheries and Marine Universitas Airlangga, for the first International Conference on Biotechnology and Food Sciences conducted in Surabaya, Indonesia, September 11, 2020, by an online system. Due to the pandemic of COVID-19, the conference will be held online in case the physical distancing measures are still in place during the current SARS-COV2 pandemic issue. The theme of this conference is "Breakthrough in Fisheries, Marine and Food Biotechnology to Support Sustainable Development Programs".

The 1st International Conference on Biotechnology and Food Sciences (IcoBiFS) aims to communicate the results of research and innovation in basic and applied science, especially in Biotechnology in Agriculture, Fisheries and also Food Sciences. This area includes current situations, e.g. the COVID-19 pandemic, but also to predict our future, e.g. climate change effect in the agriculture and fisheries sector. Several interesting topics are:

The topics of interest for submission include, but are not limited to:

- Marine Bioprospecting and Biomedical Engineering
- Marine Biomolecular and Biochemical
- Food Process, Functional food and nutraceutical
- Marine Phyto-chemistry and Pharmacology
- Food Security and food safety
- Fisheries and Marine Product and Potential by-products development

The aims of this conference is to develop and improve the goals of Universitas Airlangga to be of the Top 500 University in the world by contributing to improving Aquaculture and Fisheries Sustainable sector especially in marine Biotechnology for food security and food safety. We also cooperate with Scopus Indexed Publisher in order to assist students, lecturers and researchers in disseminating their research findings, to publish selected papers which are expected helping societies to implement the findings in the focus on developing aquaculture and fisheries sustainable. I strongly hope that all of participants get beneficial from this conference. Hope fully for the future conference able to visit Surabaya as the second biggest city in Indonesia with competitive economic activities for the future of Fisheries and Marine development.

Once again, we are most grateful for your participation and your support. Thank you

Dr. Eng. Sapto Andriyono, S.Pi., MT

Chairman Committee of (InCoBiFS) International Conference on Biotechnology and Food Sciences

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## WELCOMING REMARKS

All distinguished fellow Faculty of Fisheries and Marine Universitas Airlangga and guests,

Assalamualaikum Wr. Wb.

Good morning

First of all, I would say regards from Universitas Airlangga's leader, including Rector and Vice-Rector, who could not join us today because of their crucial agenda.

We are delighted to welcome in our beloved Faculty of fisheries and marine, Universitas Airlangga.

This 1st International Conference on Biotechnology and Food Sciences (INCOBIFS) was eventually well-realized, and I am representing deanship of Faculty of Fisheries and Marine, Universitas Airlangga would like to deliver gratitude to Universitas Airlangga who has granted this conference through RKAT international conference 2020. The second one is distinguished Professors who become today's keynote speakers (Prof Hari Eko Irianto (KKP), Prof Kazuo Miyashita (Hokkaido University, Japan), also Dr. Woro Hastuti Satyantini (FPK Unair). We also gave appreciate to All distinguished participants and alumni of Faculty of Fisheries and Marine Universitas Airlangga, who join this scientific meeting. Thank you for Dr. Eng. Sapto Andriyono and his team, who have well organized this online conference.

In order to contribute to the achievement of UNAIR as to 500 university ranking; our Faculty annually organizes this conference starting several years ago. This conference generates proceedings which are Scopus indexed. This conference I hope can help us to bridge further cooperation with each other. This conference is attended by approximately 56 presenters from UNAIR, and several universities in Indonesia, Taiwan, Austria and France.

Let me emphasize that with the potential of Indonesia's marine waters, we are able to utilize various human needs which are expected to improve the welfare and quality of human life. This utilization can be done with the right approach of technology so that this activity which is a presentation of the results of research on biotechnology applications, can be beneficial for all of us. The support of competitive, creative and innovative human resources is needed so that the management and sustainable use of our marine resources can be carried out correctly.

I hope you can enjoy this conference activity. Greetings are always healthy.

Finally, Bismillahirrahmanirrahim, the 1st International Conference on biotechnology and food sciences is officially opened.

Wassalamualaikum wr wb.

Pror. Dr. Mirni Lamid, drh., M.Si  
Dean of Faculty of Fisheries and Marine, Universitas Airlangga

## KEYNOTE SPEAKERS



Prof Dr. Ir Hari Eko Irianto (Research Centre of Fisheries Products Processing and Biotechnology of Fisheries and Marine, Ministry of Marine Affairs and Fisheries, Indonesia).

Prof Dr. Ir Hari Eko Irianto is a Research Professor in the field of Fisheries Post-Harvest Technology. He earned his Ir. in Agricultural Products Technology (Food Science and Technology), Bogor Agricultural University, Indonesia in 1983, continued Diploma of Technology in Food Biotechnology, Massey University, Palmerston North, New Zealand in 1990 and his Ph.D in Food Technology (Food Process and Product Development), Massey University, New Zealand in 1992. He worked in Research and Development Center for Marine and Fisheries Product Processing and Biotechnology (1994 – present) as well as the lecturer in Faculty of Food Technology and Health in Jakarta Sahid University (2009 – present). He has joined several professional organization such as member of the Indonesian Food Technologist Association (PATPI) (1984 – present) and got experience as journal editor in several journal such as Editor member of Jurnal Pascapanen dan Bioteknologi Kelautan dan Perikanan and Editor member of Buletin Teknologi Hasil Perikanan (2006-present). The achievement has been published 185 papers and 8 books.



Prof. Kazuo Miyashita (Faculty of Fisheries Sciences, Hokkaido University, Japan)

Prof. Kazuo Miyashita is a Professor in Department of Bio-resources Chemistry, Faculty of Fisheries Sciences, Hokkaido University, Japan and a Project Professor in Obihiro University of Agriculture and Veterinary Medicine. He earned his B.S. in Agriculture Science from Tohoku University, Japan, in 1979, and his Ph.D. from Tohoku University in 1985. He worked for Hokkaido University as Instructor (1985-1995), Associate Professor (1995-2000), and Professor (2000-current). He has got many scientific awards such as: Japanese Oil Chemists' Society Award, The Japanese Society of Fisheries Science Award, International Society for Nutraceutical and Functional Foods (ISNFF) Award, Technology Innovation Award from the Japanese Society for Marine Biotechnology, Fellow of the American Chemical Society (Agricultural & Food Chemistry Division), and Kaufmann Memorial Lecture Award from International Society for Fat Research. His lab's work has been recognized by many scientific papers. The achievement has been published more than 200 pure reviewed papers, 3 book editions, 50 book chapters, 50 reviews, and 20 patents.



Dr. Woro Hastuti Satyantini (Faculty of Fisheries and Marine, Universitas Airlangga, Indonesia)

Dr. Woro Hastuti Satyantini is senior lecturer in Department of Fish Health Management and Aquaculture, Faculty of Fisheries and Marine, Universitas Airlangga, Surabaya, Indonesia. She earned her B.Sc in Aquaculture from Bogor Agricultural Institute in 1985, her Master in Biology Reproduction from Universitas Brawijaya in 1999 continued her doctoral in Aquaculture from Bogor Agricultural Institute in 2013. Her research area in Bioproduct, Fish Health and Algae. The achievement has been published 38 papers, 3 books and did several public services experiences.



## INVITED SPEAKERS



Dr. Ratih Pangestuti (Marine Bio Industry Lombok, Indonesia Institute of Sciences LIPI Mataram)

Dr. Ratih Pangestuti is Researcher, adviser and author with particular interest in Marine Biotechnology areas. She earned her B.Sc from Diponegoro University in 2006, her M.Sc from Satya Wacana Christian University in 2008 as well as her Ph.D from Pukyong National University in 2012. She worked as researcher in Research Centre for Oceanography LIPI (2013-2019) and Marine Bio Industry as Head of Marine Bio Industry, Indonesian Institute of Sciences (2019 – present). She did postdoctoral fellow in 2017-2018 and she got several achievement such as Productive researcher in 2018, published 14 books chapter, 19 peer reviewed, 3 popular articles, and be Editor in Indonesian Journal of Natural Pigment (2018-present), The Open Microalgae and Marine Research Indonesia (2020-present).



Dr. Ade Yaminado (Faculty of Fisheries and Marine Sciences, Universitas Brawijaya)

Dr. Ade Yamindago is an Assistant Professor in Marine Science Department, Brawijaya University. He earned his B.Sc in Marine Science, Hasanuddin University in 2007, his M.Sc in Aquaculture in Brawijaya University (2012) and Aquatic Science in Burapha University (2013) as well as his Ph.D in Applied Ocean Science in University of Science and Technology, Korea Institute of Ocean Science and Technology in 2020. The achievement has been published 5 papers, 3 patents and 2 awards for the young scientist, Korea Society of Toxicogenomics and Toxicoproteomics in 2019 and the most cited research article, Korea Institute of Ocean Science and Technology in 2020.



Dr. Laksmi Sulmartiwi, S.Pi., MP. (Faculty of Fisheries and Marine, Universitas Airlangga, Indonesia)

Dr. Laksmi Sulmartiwi is senior lecturer in Department of Marine, Faculty of Fisheries and Marine, Universitas Airlangga, Surabaya, Indonesia. She earned her B.Sc in Aquatic Resources Management in Universitas Brawijaya in 1994, her Master in Land and Water Management in Universitas Brawijaya in 2002 continued her doctoral in Mathematic and Natural Science in Universitas Airlangga in 2014. Her research area in Fish Physiology and Natural Bioactive Compound from Aquatic Sources. The achievement has been published 40 papers and did several public services experiences.



Dr. Erni Sofia Murtini, Faculty of Agriculture Technology, Universitas Brawijaya

Dr. Erni Sofia Murtini is lecturer in Faculty of Agricultural Technology, Universitas Brawijaya, Malang, Indonesia. She earned her B.Sc in Agricultural Product Technology from Universitas Brawijaya in 1995, continued her Master in Agricultural Product Technology from Universitas Brawijaya in 1999 and her Ph.D in Food Science from Oklahoma State University-Stillwater, OK, USA. She did several training concerned in food and has joined the visiting scholar with Robert M Kerr Food and Agricultural Products Center (FAPC), Oklahoma State University,

Stillwater, Oklahoma, USA in 2019. The achievement has been published 11 papers, 5 books and did several public services experiences. She is journal reviewer in several journal such as Agritech, Food Research, CRBB Current Research on Biosciences and Biotechnology, and JSAT Journal of Science and Agricultural Technology.



Ni Kadek Dita Cahyani, M.Sc. (BIONESIA Bali)

Ni Kadek Dita Cahyani is Ph.D candidate in Ecology and Evolutionary Biology (EEB) Department, University of California, Los Angeles (UCLA) Under Fulbright Presidential Scholarship program (Ph.D) starting September 2015. She earned her B.Sc in Biology Faculty, Gadjah Mada University, Jogjakarta, Indonesia (2003) and her M.Si in Master Program of Environmental Study, Post Graduate Program, Udayana University, Denpasar-Bali (2007). She did several research experiences such as Research

Scientist at Yayasan Biodiversitas Indonesia (BIONESIA) (2016-present), Co-researcher for "Delineating stock structure for tuna fish within Sulu-Sulawesi Regions" project. PEER grant (National Academy of Science, 2017-2020). The achievement has been published 20 papers, be journal reviewers in Scientific Journal of Fisheries and Marine (Jurnal Ilmiah Perikanan dan Kelautan) in Faculty of Fisheries and Marine, Universitas Airlangga; Aceh Journal of Animal Science, Faculty of Marine and Fisheries, Universitas Syiah Kuala, Banda Aceh and Journal of Tropical Biodiversity and Biotechnology. Faculty of Biology, Universitas Gadjah Mada, Jogjakarta, Indonesia.

## GENERAL PROGRAM

Day /Time	Agenda	Personal In Charge
Date : 11 September 2020		
08.30-09.00	Video Playback FPK	Sie KSK
09.00-09.05	Opening ceremony	MC (Arief Rubiana)
09.05-09.10	Sing National Anthem Indonesia Raya	MC and all participants
09.10-09.20	Opening Speech	
	Speech from Chairman	Dr. Eng. Sapto Andriyono
	Speech from the Dean	Prof. Dr. Mirni Lamid, drh.,MP.
09.20-09.30	Introduction to Moderator	MC (Arief Rubiana)
09.30-11.15	Keynote Speech	Moderator: Annur Ahadi Abdillah, M.Si
30 mins	Keynote Speaker 1 Prof. Hari Eko Irianto	
30 mins	Keynote Speaker 2 Prof. Kazuo Miyashita	
30 mins	Keynote Speaker 3 Dr. Woro Hastuti Satyantini	
15 mins	Question and Answer	
11.15-11.30	Appreciation and closing session 1 and announcement for session 2	MC (Arief Rubiana)
11.30-12.30	Break-Friday Praying	
12.30-13.00	Poster Presentation or Poster Playback/ Slideshow	KSK
Scientific Session (Room 1-4)		
13.00-16.00	Room 1 Marine Biomolecular and Biochemical Invited Speaker: Ni Kadek Dita Cahyani, M.Sc	Darmawan Setia Budi, S.Pi., M.Si
	Room 2 Food Security and Food Safety Invited Speaker: Erni Sofia Murtini, Ph.D	Nina Nurmalia Dewi, S.Pi., M.Si
	Room 3 Food Process, Functional Food and Nutraceutical ; Marine phyto chemistry and pharmacology Invited Speaker: Ade Yamindago, Ph.D; Dr. Laksmi Sulmartiwi, S.Pi., MP.	Muhammad Browijoyo Santanumurti, S.Pi., M.Sc
	Room 4 Fisheries and Marine Product and Potential by-Product Development ; Marine bioprospecting and biomedical engineering Invited Speaker: Ratih Pangestuti, Ph.D	Dr. Eng. Patmawati, S.Pi., M.Si
16.00-16.30	Closing Ceremony	MC (Arief Rubiana)
	Award session for best poster and oral presenter	MC (Arief Rubiana)
	Closing Remarks	Dean/ Representative

MARINE BIOMOLECULAR AND BIOCHEMICAL  
ROOM 1

Time	Title and Author	ID Registration
13.30-13.45	<b>Molecular identification and prevalence of endoparasite worms in silver pompano (<i>Trachinotus blochii</i>) in floating net cages of Mari-culture Center, Lampung</b> L N F Haryanto, S Subekti, H B Ardiyanti, M K Amiin, R E K Akbar, I Achmadi and M A Yudarana	O-531
13.45-14.00	<b>The identification and distribution components of polycyclic aromatic hydrocarbon contaminants at the port of paotere, Makassar, South Sulawesi</b> I Marzuki, I Pratama, H E Ismail, I Paserangi, M Kamaruddin, M Chaerul and R Ahmad	O-516

FOOD SECURITY AND FOOD SAFETY  
ROOM 2

Time	Title and Author	ID Registration
13.30-14.10	<b>Synthesis of <math>\gamma</math>-aminobutyric acid (GABA) and expression of glutamate decarboxylase by <i>Lactobacillus plantarum</i> spp strain isolated from Indonesian traditional fermented foods</b> I B A Yogeswara, T Nguyen and D Haltrich	O-482
	<b>Koi Fish (<i>Cyprinus carpio</i>) Hatchery Techniques: Its Performance in BBI Boyolali</b> M G Laksono, Sugianta and M B Santanumurti	O-518
	<b>The growth and yields of shallot (<i>Allium wakegi araki</i>) CV. Lembah palu growing under hydroponic substrate systems</b> R Yusuf, S A Lasmini, M Sandi and I Wahyudi	O-489
14.10-14.50	<b>Ice cream properties affected by carrageenan form seaweed deference type drying methods</b> I Irawan	O-524

	<b>Microbiology safety of Green mussel, Perna viridis after treated with boiling and sous vide.</b> N U Karim	O-532
	<b>Evidence of antibiotics as emerging chemicals of concern in shrimp from aquaculture</b> N V Hidayati, A D Syakti, L Asia, I Widowati, A Sabdono, P Doumenq and A Piram	O-537
	<b>Specifity analysis of mt-dna primer CO1 (Cytochrome c oxidase subunit 1) and Cyt-b (Cytochrome-b) to detect horse DNA fragment in raw meet</b> Hilda M H and J Kusnadi	O-543
14.50-15.30	<b>Evaluation of good manufacturing practices (GMPS) in fish cracker home industries in gresik, east java, indonesia</b> M A Z Fuad, F Iranawati, and H Katikaningsih	O-525
	<b>Microbial quality and diversity of Caesio cunning and Scolopsis taenioptera harvested by using trap and trawl fishing techniques.</b> Nurul Ulfah Hakim	O-554

FOOD PROCESS, FUNCTIONAL FOOD AND NUTRACEUTICAL ;  
MARINE PHYTO CHEMISTRY AND PHARMACOLOGY  
ROOM 3

Time	Title and Author	ID Registration
14.00-14.15	<b>A review of bioactive compounds in macroalgae and their application as functional beverages</b> S G Widyaswari, Metusalach, Kasmiasi and N Amir	O-485
14.15-14.30	<b>Improvement quality of sugar cane bagasse as fish feed ingredient</b> L H Suryaningrum and R Samsudin	O-488
14.30-14.45	<b>Product quality evaluation of arabica coffees produced by PT. Perkebunan nusantara xii kalifat jampit based on volatile compounds</b> Zikrina Istighfarah	O-491

14.45-15.00	<b>The application of betacyanin microcapsules as natural food colorant on beverage model</b> S R Nurbaya, W D R Putri, E S Murtini and A Khamidah	O-552
15.00-15.15	<b>Gill and skin pathology of cantang grouper (<i>E. fuscoguttatus</i> X <i>E. lanceolatus</i>) infested <i>Zeylanicobdella arugamensis</i> worms in different infestations degree</b> M Nisa, G Mahasri and L Sulmartiwi	O-499
15.15-15.30	<b>Screening acetylcholinesterase inhibitors from marine-derived actinomycetes by simple chromatography</b> M Kamaruddin, I Marzuki, R Ahmad and A Burhan	O-509
15.30-15.45	<b>Ectoparasite infestation and survival rate of pacific white shrimp (<i>Litopenaeus vannamei</i>) that immunized with crude protein <i>Zoothamnium penaei</i> in intensive ponds</b> G Mahasri, W Hastuti and A Taufik	O-519

FISHERIES AND MARINE PRODUCT AND POTENTIAL BY-PRODUCT  
DEVELOPMENT; MARINE BIOPROSPECTING AND BIOMEDICAL  
ENGINEERING  
ROOM 4

Time	Title and Author	ID Registration
13.30-13.50	<b>Administration of microencapsulated probiotic at different doses to control motile aeromonas septicemia in kelabau fish (<i>Osteochilus melanopleurus</i> Bleeker)</b> Agustina, S B Prayitno, A Sabdono and G Saptiani	O-487
	<b>Histopathological of marine fish contaminated with heavy metal (ni, fe) in the water of the obi island, indonesia.</b> M Aris, Tamrin and R Labenua	O-484
	<b>Application of glycerol on bioplastic based carrageenan waste cellulose on biodegradability and mechanical properties bioplastic</b> S N Fauziyah, A S Mubarak, and D Y Pujiastuti	O-496

13.50-14.10	<b>Application of fucoxanthin pigment extract from sargassum sp. On the physical quality of blusher preparation</b> D Nuraini, E Saputra and M A Alamsjah	O-497
	<b>Potential of fucoxanthin extract from sargassum sp. As coloring on lipstick preparation</b> A M Permata, E Saputra and M A Alamsjah	O-498
	<b>The concentration of polyethylene glycol (peg) 400 on bioplastic cellulose based carrageenan waste on biodegradability and mechanical properties bioplastic</b> D S Maulana, A S Mubarak and D Y Pujiastuti	O-506
14.10-14.30	<b>The concentration of sorbitol on bioplastic cellulose based carrageenan waste on biodegradability and mechanical properties bioplastic</b> M D Arief, A S Mubarak and D Y Pujiastuti	O-511
	<b>Study of crude extract yield and gonad maturity level of sea cucumber phylloporus dobsoni correlation</b> S Andriyono, E D Masithah and D Winarni	O-522
	<b>Techniques of additional kappaphycus alvarezii on seaweed face mask production</b> Nur Rindang P and Sapto A	O-523
14.30-14.50	<b>Identification of the <i>Euchema</i> sp. Photoprotective activity.</b> Rarasrum D K, Dian A, Rosihan Asmara, F Iranawati, A Wahyudi, Mikchaell A P, Panjaitan and Dwi Chandra P	O-512
	<b>The utilization of chitosan from comb-per shell (<i>Atrina pectinata</i>) as an emulsion stabilizer in the production of hand body cream</b> Y Supraptin, L Sulmartiwi and E Saputra	O-533
	<b>Fish oil extraction as a by-product of tilapia (<i>Oreochromis</i> sp.) fish processing with dry rendering method</b> S H Suseno, Kamini and D Listiana	O-507
14.50-15.10	<b>Biotechnology of Yellowfin Tuna (<i>Thunnus albacares</i>) Spawning in floating nets cage</b> B Bramantya, Gunawan and L Sari	O-535

	<b>Effects of deacetylation conditions on physicochemical properties of chitosan derived from shrimp shell and squid pen</b> A R Basarah, D Y Pujiastuti and Y Waiprib	O-540
	<b>Converting husbandry waste into liquid organic fertilizer using probiotic consortiums (<i>Lactobacillus</i> sp., <i>Rhodopseudomonas</i> sp., <i>Actinomycetes</i> sp., <i>Streptomyces</i> sp.)</b> S Amrullah, M Amin and M Ali	O-480
15.10-15.30	<b>Substitution of patin (<i>Pangasius pangasius</i>) flour in making sticks as an alternative of food high protein and source of calcium for autism patients</b> V Amelia, S Subekti and L Sulmartiwi	O-542
	<b>Microencapsulated fish oil powder by spray drying using combination of wall materials in kasetsart university, Bangkok</b> I Aprilia, D Y Pujiastuti and W Klaypradit	O-539
	<b>Utilization shell of green mussel (<i>Perna viridis</i>) as abrasive ingrediens in toothpaste</b> F N S Nazir, E D Masithah and E Saputra	O-553
15.30-15.50	<b>Physicochemical characteristics and organoleptic catfish sausage (<i>Clarias</i> sp.) with the addition of gelatin as binding agent</b> R F Yuzi, E Saputra and L Sulmartiwi	O-556
	<b>Analysis of fluctuating asymmetry of black strain tilapia and red strain tilapia (<i>Oreochromis niloticus</i>) at banyuwangi fish hatchery, east java</b> D Kurniawan, A H Fasya	O-558



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## The application of betacyanin microcapsules as natural food colorant on beverage model

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**240th ECS Meeting** ORLANDO, FL

Orange County Convention Center Oct 10-14, 2021



Abstract submission due: April 9

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# The application of betacyanin microcapsules as natural food colorant on beverage model

S R Nurbaya<sup>1</sup>, W D R Putri<sup>2\*</sup>, E S Murtini<sup>2</sup> and A Khamidah<sup>2</sup>

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<sup>2</sup>Agricultural Product Technology Department, Faculty of Agricultural Technology, Universitas Brawijaya, Malang City, East Java, Indonesia.

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**Abstract.** Betacyanin microcapsules were made from betacyanin extract (extracted from red dragon fruit peel) and coated with coating material, consist of maltodextrin + gum arabic. The effect of heating on the stability of betacyanin content and color in beverage model containing betacyanin were studied. Betacyanin microcapsules were applicate in water with different pasteurization temperatures (65°C, 70°C, 75°C, 80°C) and time heating (10 minutes, 20 minutes, and 30 minutes). The result showed betacyanin content was not significantly decreased after it heated for 10 minutes to 20 minutes. This indicated betacyanin microcapsules from red dragon peel was potential to be natural food colorant in beverage model.

## 1. Introduction

Colour is one quality attribute in food, because it affect consumer in the acceptance of food. Food colorant can be obtained from plant. One of source of the food colorant is red dragon fruit peel. Red dragon fruit peel usually is taken away. But it contains rich betacyanin pigment which used as natural food colorant. Betacyanin pigment stable in pH 3-7 [1]. Betacyanin pigment extracted from red dragon fruit peel using water-ethanol solvent mixture [2]. Then it can be microencapsulated with coating materials. Microencapsulation will protect the pigment from degradation process and extent the shelf life [3]. This study was evaluated the application of betacyanin microcapsules on beverage model.

## 2. Materials and methods

### 2.1. Materials

Red dragon fruit was obtained from traditional market in Malang City, Indonesia. Maltodextrin and gum Arabic (coating materials) was obtained from chemical store in Malang City, Indonesia.

### 2.2. Extraction and microencapsulation of betacyanin pigment

The extraction of betacyanin used solvent mixture with ratio of water:ethanol is 20:80 (v/v) [2]. The microencapsulation of betacyanin extract used maltodextrin + gum Arabic as coating materials. The ratio of coating materials : extract is 3:1 (w/w) [4]. The mixture then stirred for 15 min (600 rpm) and lyophilized using freeze dryer (Christ LMC-2, Martin Christ, Germany) at -41 °C in vacuum condition. The encapsulated extracts were grinded and sieved using 80 mesh sieve.



### 2.3. Effect of heating conditions on color and betacyanin stability in beverage model

The effect of heating on the stability of colour and betacyanin were observed with modification [5]. Betacyanin microcapsules (1%) was mixed with water and stirred (500 rpm, 5 min). Samples were heated at 65°C, 70°C, 75°C, and 80°C for 10 min, 20 min, and 30 min. Betacyanin content and colour were analysed before and after the heating process.

### 2.4. Colour

Colour ( $L^*$ ,  $a^*$ ,  $b^*$ ) were measurement using a colorimeter (CR-10, KONICA MINOLTA, INC., Japan) [6]. Total colour difference ( $\Delta E$ ) was calculated to study colour changes [7].

$$\Delta E = [(L_i^* - L_o^*)^2 + (a_i^* - a_o^*)^2 + (b_i^* - b_o^*)^2]^{0.5} \quad (1)$$

$L_o^*$ ,  $a_o^*$ ,  $b_o^*$ : the values of untreated sample

$L_i^*$ ,  $a_i^*$ ,  $b_i^*$ : the measured values of each sample with treatment.

### 2.5. Statistical Analysis

Data was analyzed using Minitab 16 (Minitab Inc., United States) with paired t-test.

## 3. Results and discussion

Longer time of heating process was resulted higher  $\Delta E$  (total colour difference) value of the solution. Heating process at 80°C during 30 min had the highest  $\Delta E$  value (21.61) (Table 1). High value of  $\Delta E$  indicated more colour changes during treatment [8] [9]. High value of  $\Delta E$  related to the colour parameter (lightness value increased, redness and yellowness value decreased) and betacyanin content of the solution.

Higher temperature with longer time was resulted lower betacyanin content of the solution. Betacyanin content of the solution that heated for 10 and 20 min were not significantly different with betacyanin content before the heating process. While at 30 min heating time there was a significant difference of betacyanin content (Table 4). This result indicated degradation of betacyanin may started after 30 min or more hating. Heating process will damage the redness color which caused by hydrolysis reaction [10] [11]. During the heating process, betanin compound (type of betacyanin which was found in red dragon fruit) was possibly degraded due to isomerisation and decarboxylation reactions. The isomerized betanin compound turned into an isobetanin compound and underwent a decarboxylation reaction then transformed into a 15-decarboxy-betanin (red) compound or a 17-decarboxy-betanin (orange-red) compound [11].

**Table 1.** Colour and betacyanin content in beverage model before and after heating to different time and temperature.

Treatment	Colour				Betacyanin content before and after heating	
	L	a	b	$\Delta E$	Betacyanin content (mg/L)	Sig
Before heating	62.83 ± 0.31	16.73 ± 0.12	-7.80 ± 0.17	-	1.63 ± 0.01	-
65 °C, 10 min	57.67 ± 0.49	16.17 ± 0.15	-6.03 ± 0.25	5.49 ± 0.74	1.53 ± 0.12	ns
65 °C, 20 min	63.40 ± 0.26	14.40 ± 0.44	-5.93 ± 0.35	3.06 ± 0.72	1.53 ± 0.08	ns
65 °C, 30 min	77.73 ± 0.32	10.43 ± 0.21	-3.60 ± 0.10	16.72 ± 0.19	1.32 ± 0.07	*
70 °C, 10 min	67.63 ± 0.21	13.70 ± 0.10	-5.40 ± 0.10	6.17 ± 0.26	1.25 ± 0.20	ns
70 °C, 20 min	77.47 ± 0.31	8.73 ± 0.40	-4.00 ± 0.30	17.06 ± 0.35	1.16 ± 0.04	*
70 °C, 30 min	76.43 ± 0.45	8.60 ± 0.26	-3.17 ± 0.06	16.51 ± 0.33	1.04 ± 0.22	*
75 °C, 10 min	65.57 ± 0.84	12.57 ± 0.15	-4.47 ± 0.15	6.10 ± 0.35	1.17 ± 0.22	ns
75 °C, 20 min	75.67 ± 0.31	8.43 ± 0.12	-2.23 ± 0.21	16.27 ± 0.43	1.14 ± 0.38	ns
75 °C, 30 min	77.87 ± 0.21	6.87 ± 0.15	-0.83 ± 0.23	19.29 ± 0.21	0.68 ± 0.17	*

80 °C, 10 min	76.90 ± 0.44	8.03 ± 0.15	-2.67 ± 0.21	17.32 ± 0.54	1.13 ± 0.26	ns
80 °C, 20 min	72.63 ± 1.16	4.37 ± 0.15	-3.50 ± 0.00	16.39 ± 0.64	0.99 ± 0.53	ns
80 °C, 30 min	79.20 ± 0.26	4.67 ± 0.06	-0.50 ± 0.10	21.61 ± 0.25	0.65 ± 0.39	*

The displayed value was mean ± standard deviation (n=3)

Notation in Sig column (ns and \*) was the result of paired t-test between betacyanin content in beverage model before and after heating process

ns = not significant

\* = significant

#### 4. Conclusion

Beverage model made of betacyanin microcapsules from red dragon fruit peel was stable in heating time less than 30 min but increasing the heating temperature caused decreasing of betacyanin content. This result indicated betacyanin microcapsules from red dragon fruit peel is a potential natural color to be applied on food product.

#### 5. References

- [1] Stintzing F C and Carle R 2007 Betalains –*Trends in Food Sci Tech.* **18** 514-525.
- [2] Nurbaya S R, Putri W D R, Murtini E S 2018 *JTeknologi Pertanian* **19** (3) 153-160.
- [3] Zaidel D N A, Sahat N S, Jusoh Y M M and Muhamad I I 2014 *Agriculture and Agricultural Science Procedia* **2** 82-89.
- [4] Khazaei K M, Jafari S M, Ghorbani M, and Kakhki A H 2014 *Carbohydrate Polymers* **105** 57-62.
- [5] Wong Y and Siow L 2015 *J. Food Sci Technol.* **52** 3086-3092.
- [6] Castro-Muñoz R, Barragán-Huerta B E, and Yáñez-Fernández J *Food SciTechnol.* **62** 242-248.
- [7] Obón J M, Castellar M R, Alacid M, and Fernández-López J A 2009 *J Food Engineering* **90** 471-479.
- [8] Maskan M 2006 Production of Pomegranate (*Punica granatum* L.) *J Food Engineering* **72** 218–224.
- [9] Chranioti C, Nikoloudaki A and Tzia C 2015 *Carbohydrate Polymers* **127** 252-263.
- [10] Herbach K M, Stintzing F C and Carle R 2005 *Rapid Communications in Mass Spectrometry* **19** 2603–2616.
- [11] Azeredo H M C 2009 *Int. J. Food Sci. Technol.* **44** 2365-2376.

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