



Akreditasi **A**  
Universitas Mulawarman  
www.mulawarman.ac.id



# ICTAFF 2018

**International Conference  
on Tropical Agrifood, Feed, and Fuel**  
Sustainability of Food, Feed, and Fuel Tropical Resources for Quality Future

**PROCEEDING**

**Samarinda, 13-14 November 2018  
MESRA Bussines Hotel**

# **PROCEEDING**

## **INTERNATIONAL CONFERENCE ON TROPICAL AGRIFOOD, FEED, AND FUEL (ICTAFF) : SUSTAINABILITY OF FOOD, FEED, AND FUEL TROPICAL RESOURCES FOR QUALITY FUTURE**

**Samarinda, 13-14 November 2018**



**Publisher**

**Department of Agricultural Products Technology  
Agriculture Faculty, Mulawarman University  
Samarinda**

## PROCEEDING

### International Conference on Tropical Agrifood, Feed and Fuel (ICTAFF) : Sustainability of Food, Feed, and Fuel Tropical Resources for Quality Future Samarinda, 14-15 November 2018

ISBN : 9786021753019

#### Executive Committee

- Advisor : Dr. Ir. H. Rusdiansyah, M.Si.  
(Dean of Agriculture Faculty, Mulamarman University)
- Supervisors : Prof. Dr. Bernatal Saragih, M.Si.  
Nurul Puspita Palupi, SP., M.Si.  
Dr. H. Achmad Zaini, SP., M.Si.
- Board Committee : Prof. Dr.oec.troph. Ir. Krishna Purnawan Candra, MS.
- Chairman : Dr. Aswita Emmawati, S.TP.,M.Si.
- Vice Chairman : drh. Fikri Ardhani, M.Sc.
- Secretary : Marwati, S.TP., MP.
- Trasurer : Dra. Yuliani, MP.
- Academic Committee : SulistyPrabowo, S.TP., MP., M.PH., Ph. D.  
 1. Ir. Ndan Imang, MP., Ph.D  
 2. Anton Rahmadi, S.TP., M.Sc., Ph. D.  
 3. Dr. Ir.Taufan Purwokusumaning Daru, MP.  
 4. Dr.Agr.sc. Nurhasanah, SP., M.Si.  
 5. Dr. Ir. Hj. Sopiaelena, MP.
- Organizing Committee : Hj. Maulida Rachmawati, SP.,MP.  
 1. Dr. Odit Ferry Kurniadinata, SP., M.Si.  
 2. Arif ismanto S.Pt., M.Si  
 3. Mursidah SP,MM  
 4. Novi Cristiani, S.TP.
- Sponsorship : Ir. Hj. HudaidaSyahrumsyah, MP.  
 1. Ir. Hj. Rita Mariati, MP.  
 2. Tetty Wijayanti, SP., MP.  
 3. Nella Naomi Duakaju, S.TP., MP.  
 4. Rina Rusmina, SP.
- Equipment and Transportation : Dr. Hadi Pranoto, SP., MP.  
 1. Donny Donanto, SP., M.Sc.  
 2. Adi Suwito
- Public Relation : Dr.Ir. Hj. Ellok Dwi Sulichantini, MP.  
 1. Dr. Rabiatul Jannah,SP., MP.
- Secretariat : Yulian Andriyani, S.TP., M.Sc.  
 1. Muhammad Jailani, SP.  
 2. Elisa Maulidya Saputri S.TP., M.Sc

3. Yudha Agus Prayitno S.TP
4. Hairun Nisyawati S.TP
5. Ondella Widhiarto S.TP
6. Rini Rahmawati S.TP
7. Hanip S.TP

### **Streering Committee**

Prof. Dr.oec.troph. Ir. Krishna Purnawan Candra, M.S. (Mulawarman University, Indonesia)  
Prof. Dr. Bernatal Saragih, M.Si. (Mulawarman University, Indonesia)  
Prof. Dr. Ir. Juraemi, M.Si. (East Kutai Agricultural College School, Indonesia)

### **Reviewers**

Prof. Xuming Huang, Ph.D (South China Agricultural University, China)  
Assoc. Prof. Dr. Somsak Mannepong (Walailak University, Thailand)  
Prof. Dr. Irwandi Jaswir (Internasional Islamic University, Malaysia)  
Dr. Dadan Rohdiana (Research Institute of Tea and Chincona, Indonesia)  
Dr.Agr.sc. Nurhasanah, S.P., M.Si (Mulawarman University, Indonesia)  
Dr. Ir. Hj. Sopiarena, MP (Mulawarman University, Indonesia)  
Dr. Rabiatul Jannah,SP., MP (Mulawarman University, Indonesia)  
Widi Sunaryo, S.P., M.Si., Ph.D (Mulawarman University, Indonesia)  
Dr. Aswita Emmawati, S.TP., M.Si (Mulawarman University, Indonesia)

### **Editor :**

Sulistyo Prabowo, S.TP., MP., M.PH., Ph.D.  
Maghfirotin Marta Banin, S.Pi., M.Sc.  
Elisa Maulidya Saputri, S.TP., M.Sc.

### **Cover and Layout :**

Hairun Nisyawati, S.TP.  
Ondela Widhiarto, S.TP.

### **Publisher**

Department of Agricultural Products Technology  
Agriculture Faculty, Mulawarman University  
Jl. Pasir Balengkong, Gunung Kelua Campus Mulawarman University, Samarinda.

Published: August 2019

All rights reserved.

No part of this book may be reproduced or copied in any form without written permission of the publisher.

## PREFACE

The greatest regards should be expressed only to God the Almighty, Allah SWT. We have finished the Proceeding book of International Conference on Tropical Agrifood, Feed, and Fuel (ICTAFF) after the conference which was held on 13-14 November 2018 in Mesra bussines Hotel Samarinda.

The conference takes "Sustainability of Tropical Food, Feed, and Fuel Tropical Resources for Quality Future" as the main theme. This international conference is aimed at resolving problems and bringing together scientists, researchers, professionals, and students from multidisciplinary agriculture-related fields to share the latest findings or ongoing research activities.

There are 6 sub themes emphasized in the ICTAFF 2018, including halal, safe, and healthy food, improving quality food and nutrition, security and sustainability food and agriculture, innovation in feed technology to increase animal production, sustainable and renewable fuels based on tropical resources, and empowering of agribusiness based on community.

We would like to thank all keynote speakers for their contributions to the Conference, they are Asst. Prof. Dr. Somsak Maneepong from Walailak University Thailand, Prof. Xuming Huang from South China Agricultural University, Prof. Irwandi Jaswir from International Islamic University Malaysia (IIUM), Prof. Ali Agus from Gadjah Mada University, Dr. Dadan Rohdiana from Research Institute of Tea and Cinchona Indonesia, and Widi Sunaryo, Ph.D from Mulawarman University Indonesia.

Finally, we would like to thanks all of the proceeding team who have dedicated their constant supports and countless time to bring these scratches into a book. The ICTAFF 2018 proceeding is a credit to a large group of people, and everyone should be proud of the outcome.

Editors

## Welcome Speech

### Welcome Note From ICTAFF 2018 Committee



*Assalamu'alaikum Warahmatullah Wabarakatuh*

I would like to express the greatest regard to the Almighty God, Allah Subhanallahi Wa Ta'ala, for the Successful of International Conference of Food, Feed and Fuel 2018. I also would like to welcome all the audiences to Samarinda Kota Tepian.

Food security is very important to strengthen and support sustainable development in agriculture. Food, not only from plant but also from animal, should be available for all resident of Indonesia. It is urgent to provide quality feed to support food animal development to fulfill people needs of nutrition.

We would like to report that about sixty participants are attending the conference. Researcher and lecturer from some universities and research institutions will disseminate their research in this conference. This number is beyond our expectation when we were arranging the conference.

This conference will present international speakers from Wailailak University, Associate Professor Somsak Maneepong, Prof. Irwandi Jaswir from International Islamic University of Malaysia, Prof Xuming Huang from South China Agricultural University, Prof Ali Agus from Gadjah Mada University, Dr. Dadan Rohdiana from Research Institute of Tea and Cinchona Indonesia, and last but not least, Widi Sunaryo, Ph.D from Mulawarman University.

The morning session is designed to keynote speeches and the afternoon session is for parallel sessions. The parallel sessions will be focused into six topics: Halal, safe and healthy food; Security and sustainability of food and agriculture; Innovation in feed technology to increase animal production; Sustainable and Renewable fuel based on tropical resources; and Empowering of agribusiness based on community.

Faculty of Agriculture as conference organizer would like to thank Agrivita, the Journal of Agricultural Science on an agreement for publication of the selected papers from ICTAFF participants, and special thank Dr. Haviludin for helping our communication to the agreement. I also would like to thank to STIPER Kutai Timur, especially Prof. Juraemi, for cooperation in organizing and special thanks to PT. Kaltim Prima Coal and PT. Pupuk Kaltim for strong support to this conference.

We hope you will enjoy the tropical climate as long as staying in Samarinda. Thank you

*Wassalamu'alaikum Warahmatullah Wabarakatuh*

Committee,

Aswita Emmawati  
Chairman

## CONTENTS

<b>Title Page</b> .....	i
<b>Preface</b> .....	iv
<b>Welcome Speech</b> .....	v
<b>Content</b> .....	vi
<b>DAILY CONSUMPTION OF GREEN TEA REDUCED FREE RADICALS IN MODERATE SMOKERS</b>	
Rosyanne Kushargina, Rimbawan Rimbawan and Budi Setiawan .....	1
<b>THE CALORIES AND GLYCAEMIC INDEX OF BUBUR PEDAS, TRADITIONAL FOOD OF WEST KALIMANTAN, INDONESIA</b>	
Oke Anandika Lestari and Sulvi Purwayantie .....	9
<b>EFFECTIVENESS OF TOBACCO EXTRACTS AS BIO PESTICIDES WITH VARIOUS CONCENTRATIONS IN CONTROL OF <i>Dasychira inclusa</i></b>	
Sri Ngapiyatun, Nur Hidayat and Fadli Mulyadi .....	14
<b>A PLAIN DESIGN OF ELECTROLYSIS APPARATUS TO REDUCE AMMONIA CONTENT IN EFFLUENT FROM TOFU INDUSTRY</b>	
Muflihah and Sulistyo Prabowo .....	21
<b>GLYCEMIC INDEX AND FUNCTIONAL PROPERTIES OF JELAI (<i>Coix lacryma-Jobi L</i>)</b>	
Bernatal Saragih .....	25
<b>THE ANTIOXIDANT ACTIVITY OF KARAMUNTING FRUIT AS A NATURAL DYES AND PRESERVATIVE FOODS</b>	
Elly Jumiati and Amarullah .....	30
<b>DESIGN OF SOFT JELLY CANDY WITH ADDITION OF EDIBLE BIRD NEST (<i>Collocalia Sp.</i>) AS FUNCTIONAL FOOD RICH IN SIALIC ACID</b>	
Krishna Purnawan Candra, Firza Sarwani, and Muhammad Hasan .....	35
<b>THE EFFECT OF FORMULATION OF BAUNG FISH MEAT (<i>Mystus nemurus</i>) AND WHITE OYSTER MUSHROOM (<i>Pleurotus ostreatus</i>) ON CHEMICAL AND SENSORY CHARACTERISTICS OF AMPLANG</b>	
Marwati, Yahuda Keristian, Yuliani and Hamka .....	38
<b>EFFECT OF EXTRACTION TIME ON CHARACTERISTIC OF PECTIN DERIVED FROM KAPAS BANANA (<i>Musa Sp.</i>) PEELS</b>	
Yuliani, Diah Sri Lestari, and Anton Rahmadi .....	43
<b>CHEMICAL AND SENSORY PROPERTIES OF WET NOODLES FROM FORMULATION OF WHEAT (<i>Triticum Sp.</i>) AND BARLEY (<i>Coix lacryma-Jobi</i>) FLOUR</b>	
Hudaida Syahrumsyah, Maulida Rachmawati and Yulian Andriyani .....	46

<b>NUTRITIONAL CONTENT ANALYSIS OF INSTANT DRINK FROM AVOCADO SEEDS (<i>Persea americana</i> Mill)</b>	
Ummu Aimanah, and Vandalisna.....	50
<b>EARLY MATURITY OF BLACK RICE CEMPO M4 SELECTION RESULT GAMMA IRRADIATION 200 GRAY</b>	
Eveline, Nandariyah, and Parjanto .....	55
<b>TECHNICAL EFFICIENCY ANALYSIS OF LOWLAND RICE FARMING (<i>Oryza sativa</i> L.) RICE FIELDS IN BUKIT RAYA VILLAGE TENGGARONG SEBERANG SUBDISTRICT KUTAI KARTANEGARA REGENCY</b>	
Erma Dwi Lestari, Tetty Wijayanti, and M. Erwan Suriatmaja .....	64
<b>RESPONSE OF PALM OIL SEEDLINGS (<i>Elaeis guineensis</i> Jacq.) ON THE TREATMENT OF VARIOUS TYPES OF FERTILIZATION AND TRICHODERMA COMPOST AT PRE NURSERY</b>	
Yetti Elidar .....	67
<b>THE DETERMINATION OF NITROGEN (N) STATUS IN LEAF TISSUES TO MAKE A FERTILIZER RECOMMENDATION AND PREDICT MANGOSTEEN YIELD</b>	
Odit F.Kurniadinata, Roedhy Poerwanto and Anas D. Susila.....	76
<b>THE EFFECT OF ADDITION MANGROVE FRUIT EXTRACT (<i>Sonneratia Sp</i>) ON ORGANOLEPTIC QUALITY AND ANTIOXIDANT ACTIVITY OF PASTEURIZATION COW'S MILK</b>	
Arif Ismanto and Nisa Ulkarimah .....	81
<b>POTENTIAL OF COVER CROPS AS FORAGE IN POST COAL MINING LAND</b>	
Muhammad Rizki Fadillah, Iin Susilawati and Budi Ayuningsih.....	87
<b>SEMEN AND SPERM CHARACTERISTICS OF NUNUKAN ROOSTER</b>	
Fikri Ardhani .....	95
<b>CONTRIBUTION OF HOUSEHOLD INCOME TO ACCELERATE OIL PALM REPLANTING INDEPENDENTLY AT PASER REGENCY, EAST KALIMANTAN</b>	
Mariyah, Yusman Syaikat, and Anna Fariyanti.....	101
<b>ANALYSIS OF BEEF CATTLE BUSINESS IN SWAMP LAND IN KECAMATAN KOTA BANGUN KABUPATEN KUTAI KARTANEGARA</b>	
Mursidah, Taufan Purwokusumaning Daru and Syahnur Alhusna.....	106
<b>THE LEVEL OF FARMERS GROUP MEMBER PARTICIPATION IN RDK AND RDKK PREPARATION</b>	
Midiansyah Effendi, Firda Juita, and Adi Darmanto .....	110
<b>AREA CHARACTERISTICS AND MANAGEMENT OF OIL PALM PLANTATION OF COMMUNITY IN KECAMATAN MUARA BADAK</b>	
Akhmad Sopian, Zainudin and Yusriansyah.....	118



**GENETIC QUALITY STANDARDS APPROPRIATE WITH THE  
DEVELOPMENT OF SCIENCE AND TECHNOLOGICAL IN THE  
PERSPECTIVE OF ENVIRONMENTAL LAW**

Siti Kotijah, Suradiyanto, and Fitryah ..... 123

**SENSORY PROFILE OF DURIAN YOGURT AS A SYMBIOTIC YOGURT  
WITH SUGAR AND SKIM MILK FORMULATION**

Aswita Emmawati, Marwati, Yuliani, and Rini Rahmawati ..... 129

## EFFECT OF EXTRACTION TIME ON CHARACTERISTIC OF PECTIN DERIVED FROM KAPAS BANANA (*Musa Sp.*) PEELS

Yuliani<sup>a\*</sup>, Diah Sri Lestari<sup>a</sup>, and Anton Rahmadi<sup>a</sup>

<sup>a</sup>Department of Agricultural Product Technology, Faculty of Agriculture, Mulawarman University, Indonesia

\*Corresponding author : yulianicandra482@gmail.com

### ABSTRACT

Kapas banana (*Musa Sp.*) is one of the local banana varieties from East Kalimantan, which are usually processed into crackers or fried banana. However, the peels of this banana are still not used. Peel banana is rich in pectin, and its characteristic depends on its sources besides its extraction method. In the food industry, pectin is used as thickening agent, stabilizer and emulsifier. This research aimed to determine the effect of extraction time (70, 80 and 90 min.) in chloric acid solution on a characteristic of pectin from Kapas banana peels. A completely randomized design was applied in this experiment, and each treatment was repeated three times. Data were analyzed by ANOVA continued by Tukey test at  $\alpha$  of 5% for treatment, which showed a significant difference. The results showed that extraction time in a chloric acid solution of pH 2.0 at 60°C affected insignificantly on water content and viscosity of the pectin. However, it affected significantly on yield, ash content, equivalent weight, methoxyl content and degree of esterification. Pectin extracted from Kapas banana peels by this method belongs to low methoxyl (3.86-6.34%), which has low esterification degree (5.14-5.87%).

*Keywords: low methoxyl pectin, low esterification degree pectin, thickening agent, emulsifier*

### INTRODUCTION

In the food industry, pectin is used as a thickening agent, stabilizer and emulsifier (May 1999). Commercial pectin is galacturonoglycans, i.e. poly ( $\beta$ -D-galactopyranosyl uronic acids), with various contents of methyl ester. Native pectins are more complex molecules found in cell walls and intercellular layers of all land plants. Commercial pectins are obtained by acid extraction of citrus peel (contain 20-30% pectin) and apple pomace (contain 10-15% pectin), both by-products of juice manufacturing. For pectin production, citrus peel is extracted with water of pH 1.5-3.0 at 60-100°C. The extract is filtered, and pectin is precipitated by addition of isopropanol. Properties of pectin vary with the source, the processes used for handling and drying of the peel, the type of extraction, and subsequent treatment (Whistler & BeMiller, 1999).

Kapas banana (*Musa Sp.*) is one of the local banana varieties from East Kalimantan, which are usually processed into crackers or fried banana. The banana peels from this process are still not used. Meanwhile, banana peels contain pectin as shown by (Yuliani, Simbolon, & Murdianto, 2017) using Mauli banana and Castillo-Israel et al. (2015) using Saba banana. They used different pectin extraction method to yield the optimum mass of pectin from each type of banana peels. This research was aimed to

determine the effective extraction method of pectin from Kapas banana peels.

### MATERIAL AND METHODS

#### Materials

A physiological ripped kapas banana fruit showed by the green color with 10 % of yellow color the peels (Srimuliyati, 2005) was used as raw material. The banana was collected from Loa Kulu sub-district, Kutai Kartanegara district, Indonesia. HCl, NaOH, Red phenol and phenolphthalein purchased from Merck (Germany), ethanol 95% from PT. Jayamas Medica Industry (Indonesia) and commercial pectin from CV Nura Jaya (Surabaya, Indonesia).

#### Experimental Design

The completely randomized design was applied in this single factor experiment (extraction time in HCl pH 2.00), with three levels of treatment (70, 80 and 90 min), each repeated for three times. Data were analyzed by ANOVA continued by Tukey test at  $\alpha$  of 5% for treatment, which showed a significant difference.

#### Pectin Extraction

Kapas banana peels were prepared by blanching (steaming) the banana. After 10 min. The banana was peeled following cooled at room temperature. The blanched banana peels dried by

the oven at 70°C for 12 h and powdered by blender (Phillip, Indonesia).

Pectin extraction was prepared by the method as described by (Yuliani et al., 2017) with light modification. The pH of HCl used in this research was developed by the preliminary study. Extraction at 80°C for 80 min in HCl solution of a series pH (1.00-2.00) affected insignificantly on the yield, and water content of Kapas banana peels pectin.

Fifty grams of dried banana peels were macerated in 200 mL HCl pH 2.00 solution at 60°C for 70, 80 and 90 min in water bath (Techne Cole Palmer, USA). After maceration, the filtrate was collected and added by ethanol 95% (1:1 v/v) to precipitate the raw pectin. The pectin was then washed by ethanol 95% followed by aquadest, each once. The washed pectin then was dried in an oven (Sanyo model MOV-212F, Japan) at 40°C for 10 h and powdered by blender (Phillip, Indonesia).

### Assays

The yield, water content, and viscosity were determined as described by (Cahyadi, 2008), Sudarmadji, Haryono, & Suhardi (2010), and Yazid (2007), respectively. The equivalent weight, methoxyl content and degree of esterification were determined using the method as described by (Ismail, Ramli, Hani, & Meon, 2012).

## RESULT AND DISCUSSION

Extraction time (70 to 90 min) in HCl solution pH 2.00 at 60°C affected significantly ( $p < 0.05$ ) on yield, equivalent weight, methoxyl content and degree of esterification of pectin from Kapas banana peels. However, it affects insignificantly on the water content and viscosity of the pectin (Table 1.)

**Table 1.** Effect of extraction time on yield and characteristic of pectin from Kapas banana peels.

Yield and pectin characteristics	Extraction time (min.)		
	70	80	90
Yield (%)	3.65±0.37 a	2.67±0.39 b	2.74±0.37 b
Water content (%)	15.13±0.81	14.99±0.20	14.8±1.03
Equivalent weight (mg)	854.21±1.68 a	765.30±1.78 b	695.42±3.49 c
Methoxyl content (%)	3.86±0.02 c	5.08±0.01 b	6.34±0.01 a
Degree of esterification (%)	5.14±0.02 c	5.56±0.01 b	5.87±0.01 a
Viscosity (cP)	2.28±0.18	1.85±0.31	2.07±0.17

Note: Data ( $\bar{x} \pm sd$ ) were calculated from 3 replications. Data were analysed by Anova continued by Tukey test. Data within the same row followed by a different letter are significantly different ( $p < 0.05$ ).

The pectin yield decrease along with the increasing of the extraction time. More extraction time in acid solution can increase the hydrolysis the methyl ester group (de-esterification) (El-Nawawi & Heikal, 1995). This makes the decreasing of the pectin yield and also decreasing the equivalent weight (Ismail et al., 2012).

On the other hand, the methoxyl content and degree of esterification of the pectin increase. It means that the length of extraction time increase the quality of the pectin produced even it decrease the yield. The pectin from Kapas banana peels belongs to low-methoxy (LM) pectin (BeMiller & Huber, 2008). It is suitable for dietetic and pharmaceutical products, e.g. cosmetic product, dietary fiber enrichment and emulsion stabilization (Herstreith & Fox, 2012), and some processed food like low-sugar jams, jellies and marmalades (BeMiller & Huber, 2008).

## CONCLUSIONS

Extraction time (70, 80, and 90 min.) in a chloric acid solution of pH 2.0 at 60°C affected insignificantly on water content and viscosity of the pectin. However, it affected significantly on yield, ash content, equivalent weight, methoxyl content and degree of esterification. Pectin extracted from kapas banana peels by this method belongs to low methoxyl (3.86-6.34%), which has low esterification degree (5.14 -5.87%).

## REFERENCES

- BeMiller, J. N., & Huber, K. C. (2008). Carbohydrates. In S. Damodaran, K. L. Parkin, & O. R. Fennema (Eds.), *Fennema's Food Chemistry* (Fourth Ed., pp. 83–154). Boca Raton, FL: CRC Press.
- Cahyadi, W. (2008). *Analisa dan Aspek Kesehatan Bahan Tambahan Pangan*. Jakarta: Bumi Aksara.

- Castillo-Israel, K. A. T., Baguio, S. F., Diasanta, M. D. B., Lizardo, R. C. M., Dizon, E. I., & Mejico, M. I. F. (2015). Extraction and characterization of pectin from Saba banana [*Musa 'saba'*(*Musa acuminata* x *Musa balbisiana*)] peel wastes: A preliminary study. *International Food Research Journal*, 22(1), 202–207. <https://doi.org/10.4172/2157-7048.1000337>
- El-Nawawi, S. A., & Heikal, Y. A. (1995). Production of a low ester pectin by de-esterification of high ester citrus pectin. *Carbohydrate Polymers*, 27(3), 191–195. [https://doi.org/10.1016/0144-8617\(95\)00051-8](https://doi.org/10.1016/0144-8617(95)00051-8)
- Herstreith&Fox. (2012). *The Specialist for Pectin*. Neuenbürg/Württ, Germany: Herbreith & Fox KG Pektin-Fabriken. Retrieved from <http://www.herbreith-fox.de>
- Ismail, N. S. M., Ramli, N., Hani, N. M., & Meon, Z. (2012). Extraction and characterization of pectin from dragon fruit (*Hylocereus polyrhizus*) using various extraction conditions. (Pengekstrakan dan pencirian pektin daripada buah naga (*hylocereus polyrhizus*) menggunakan pelbagai keadaan pengekstrakan). *Sains Malaysiana*, 41 (1), 41–45. <https://doi.org/10.3303/CET1756135>
- May, C. D. (1999). Pectins. In A. Imeson (Ed.), *Thickening and Gelling Agents for Food* (Second Edi, pp. 230–260). Gaithersburg, Maryland: Aspen Publishers, Inc.
- Srimuliyati. (2005). *Tekno Pangan Aneka Olahan Pisang* (First Edit). Surabaya, Indonesia: Trubus Agrisarana.
- Sudarmadji, S., Haryono, B., & Suhardi. (2010). *Prosedur Analisis Bahan Makanan dan Pertanian*. Yogyakarta: Liberty.
- Whistler, R. L., & BeMiller, J. N. (1999). *Carbohydrate Chemistry for Food Analysis* (Second Edi). St.Paul, Minnesota: Eagan Press.
- Yazid, E. (2007). *Kimia Fisika untuk Paramedis* (First Edit). Yogyakarta: CV Andi Offset.
- Yuliani, Simbolon, J. H., & Murdianto, W. (2017). Pengaruh pH larutan Pengekstrak Terhadap Rendemen dan Karakteristik Pektin dari Kulit Pisang Mauli (*Musa sp.*) Peel. In Seminar Nasional ke-1 Tahun 2017 Hasil Riset dan Pengembangan Industri “Peran Riset dan Inovasi Teknologi dalam Rangka Meningkatkan Daya Saing Industri Berbasis Sumber Daya Alam Berwawasan Lingkungan” (pp. 25–29). Samarinda: Kemenperin, Badan Penelitian dan Pengembangan Industri, Balai Riset dan Standardisasi Industri Samarinda. Retrieved from <http://www.kemenperin.go.id/artikel/17861/Seminar-Nasional-ke-1-Tahun-2017-Baristand-Industri-Samarinda>

Supported by :



**SECRETARIAT FOR ICTAFF 2018  
DEPARTMENT OF AGRICULTURAL PRODUCT TECHNOLOGY  
AGRICULTURE FACULTY MULAWARMAN UNIVERSITY**

**Jln. Pasir Balengkong Gunung Kelua Campus Mulawarman University  
Samarinda**

Email : [ictaff2018@gmail.com](mailto:ictaff2018@gmail.com)

ISBN 978-602-17530-1-9



9 786021 753019