

SFRN 2019

Security in
food,
renewable
resources,
and
natural
medicines



PROCEEDING

ISBN:978-602-51262-8-4



**3rd INTERNATIONAL CONFER-
ENCE ON SECURITY IN FOOD,
RENEWABLE RESOURCES, AND
NATURAL MEDICINES 2019
(SFRN 2019)**

Convention Hall Politeknik Pertanian Negeri Payakumbuh
INDONESIA



hosted by,
Politeknik Pertanian
Negeri Payakumbuh



co-Hosted by,
Universitas Andalas
(UNAND)

QUANTUM-LEAP OF AGRI-FOOD SYSTEM 4.0 AND DELIVERY OF SUSTAINABLE DE- VELOPMENTS GOALS (SDGS)

September 25-26, 2019



PROCEEDING
3rd INTERNATIONAL CONFERENCE ON SECURITY IN
FOOD, RENEWABLE RESOURCES, AND NATURAL
MEDICINES 2019 (SFRN 2019)

September 25-26, 2019
Convention Hall Politeknik Pertanian Negeri Payakumbuh
INDONESIA

Theme:
"QUANTUM-LEAP OF AGRI-FOOD SYSTEM 4.0 AND
DELIVERY OF SUSTAINABLE DEVELOPMENTS GOALS
(SDGS)"

Publisher
Politeknik Pertanian Negeri Payakumbuh
ISBN 978-602-51262-8-4



PROCEEDING
**3rd INTERNATIONAL CONFERENCE ON SECURITY IN FOOD, RENEWABLE
RESOURCES, AND NATURAL MEDICINES 2019 (SFRN 2019)**

Theme:
**“QUANTUM-LEAP OF AGRI-FOOD SYSTEM 4.0 AND DELIVERY OF
SUSTAINABLE DEVELOPMENTS GOALS (SDGS)”**

Steering Committee

Ir. Elvin Hasman, MP
Prof. Dr. Tafdil Husni, SE, MBA
Assoc. Prof. Dr.-Ing. Uyung Gatot S. Dinata, MT
Dr. Rusfrida, Spt, MP

Executive Chairman

Fithra Herdian, S.TP, MP

Co-Chair

Assoc. Prof. Dr. Eng. Muhammad Makky, Msi

Scientific Committee

Dr. Vasu Udompetaikul (Thailand)
Prof. Dr. B. Yogesha (India)
Dr. Darius El Pebrian (Malaysia)
Assoc. Prof. Dr. Samsuzana Binti Abd Aziz (Malaysia)
Dr. Shinichiro Kuroki (Japan)
Assoc. Prof. Dr. Eng. Muhammad Makky (Indonesia)
Dr. Fri Maulina, SP, MP (Indonesia)

Advisory Committee

Ir. Harmailis, M.Si
Ir. Edi Joniarta, M.Si
Ir. Darmansyah, MP

Reviewer

Assoc. Prof. Dr. Eng. Muhammad Makky, MSi
Assoc. Prof. Aflizar, SP, MP, P.Hd
Dr. Edi Syafry, ST, MSi

Editor

Fithra Herdian, S.TP, MP
Indra Laksmiana, S.Kom, M.Kom
M. Riza Nurtam, S.kom, M.Kom
Yuliandri, S.S.MTESOLLead
Resa Yulita, S.S., M.Pd.
Hudia, S.S., M.Pd.
Sri Nofianti, SP, M.Si
Yelfiarita, SP, MP
Nahda Kanara, SP, M.Si

Publisher

Politeknik Pertanian Negeri Payakumbuh
Jl. Raya Negara Km. 7 Tanjung Pati Kec. Harau, Kab. Limapuluh Kota, Sumatera Barat
26271, Telp: (0752) 7754192, Fax : (0752) 7750220, Email: p3m@politanipyk.ac.id



Organizing Committee

Indra Laksmana, S.Kom, M.Kom
Haryadi Saputra, A.Md
Newis Yerli
Fidela Violalita, S.TP, MP
Ir. Deni Sorel, M.Si
M. Riza Nurtam, S.kom, M.Kom
Yuliandri, S.S.MTESOLLead
Resa Yulita, S.S., M.Pd.
Hudia, S.S., M.Pd.
Syarmila Devi, SP, M.ScAg
Ir. M.Syakib Sidqi, M.Si
Yulius Efendi, A.Md
Yasmardi, S.Sos
Sri Aulia Novita, S.TP, MP
Sri Nofianti, SP, M.Si
Efa Leninasfita

Annita, SP
Elita Amrina, Ph.D
Fitri Rosdianti, S.Sos
Hazanul Putra, SH
Bujang Sadad
Rita Elviza
Sufendri, SE
Lektri Marlina, SE
Gusdi Arjet
Ridwan
Yuslimar
Bismar Hendra
Dr. Eka Candra Lina
Hanalde, MSc
Amri Syahardi, MP
Hamsiah, S.Kom, M.Kom

Layout

Amrizal, S.Kom, M.Kom
Haryadi Saputra, A.Md
Annita,SP

Welcome Message
**Executive Chairman of The 3rd International Conference on Security in Food,
Renewable resources, and Natural Medicines (SFRN) 2019**



Dear Honorable ladies and gentlemen,

Good Morning and Assalamu'alaikum wr.wb

On behalf of the SFRN 2019 organizing committee, I am really honoured and delighted to welcome all of you to the 3rd International Conference on Security in Food, Renewable resources, and Natural Medicines (SFRN) 2019 at the State Polytechnic of Agriculture Payakumbuh, West Sumatra Indonesia

Our technical program is rich and varied with 8 keynote speeches and 4 invited talks and more than 170 technical papers split between 8 parallel oral sessions and 1 poster sessions. The speakers and participants came from 8 different countries, consist of Academicians, Scientists, Researchers, Practitioners, Professionals, and Government Officials in multidiscipline branch of knowledge, who gathered here today to share and discuss new findings and applications of innovations for promoting Food Security, Renewable Energy, Sustainable Resources and HealthCare Free for All, in particular for those who in needs. As the chairman of conference 2019 SFRN, I know that the success of the conference depends ultimately on the how many people who have worked in planning and organizing both the technical program and supporting social arrangements. This year, the conference is jointly organized by the Payakumbuh State Agricultural Polytechnic and Andalas University. We also thank to the steering committee for their wise and brilliant advice on organizing the technical program; and also to the the Program Committee, both from the Payakumbuh State Agricultural Polytechnic and Andalas University , for their thorough and timely reviewing of the papers and to the Director of Payakumbuh State Agricultural Polytechnic and the rector of Andalas University, and the Head of the Institute for Research and Community Service of Andalas University, and Payakumbuh State Agricultural Polytechnic. Our recognition should go to the Organizing Committee members who have all worked really hard for the details of the important aspects of the conference programs and social activities, and then we extend our gratitude to our students who bore the arduous burden for preparing this event.

We hope this event is also a good step in gaining strengthened cooperation between our universities as we know that the State Agricultural Polytechnic of Payakumbuh is part of the Andalas University previously, of course the psychological relationship between the State Agricultural Polytechnic and the Andalas University is really close.

Finally on behalf of the committee, we apologize profusely for all the shortcomings and everything that is not properly in organizing this event and hopefully AES-Network contributes significantly to the research and technology for the good of humanity.

Thank you

Fithra Herdian, S.TP, MP

**Message from Afro-Eurasia Scientific (AES) Network
3rdInternational Conference on Security in Food, Renewable resources, and
Natural Medicines (SFRN) 2019**



Dear Honorable and Distinguished guests,
Ladies and gentlemen,

Assalamu'alaikum Warahmatullahi Wabarakatuh and Good Morning

On behalf of the AES Network, I am honored and delighted to welcome you to the 3rdInternational Conference on Security in Food, Renewable resources, and Natural Medicines (SFRN) 2019 at the Agricultural State Poly Technique of Payakumbuh, Indonesia. I believe we have chosen a venue that guarantees a successful technical conference amid the culture, delicacy and scenery of Payakumbuh, the city of “Rendang”.

The AES-Network aims to Promote Livelihood Through Food Security, Promote Future Smart and Green Mobility by Using Renewable Energy, Promote Prosperity by Equally Managing and Distributing the Sustainable Resources and Promoting Enjoyable Long-Life by using Natural Medicines With Free Health Care For All. The AES-Network was established in 2018 and already have memberships from 12 countries. Our members consist of Academicians, Scientists, Researchers, practitioners, professionals, and government officials from multidiscipline branch of knowledge, who gathered and contributed their expertise to share and discuss new findings and applications of innovations for promoting Food Security, Renewable Energy, Sustainable Resources and Free Health Care for All. In particular, the network aims to alleviate the condition of those who in dire needs. In the future, we also expect to provide technical demonstrations, and numerous opportunities for informal networking for Promoting Food Security, Renewable Energy, Sustainable Resources and Free Health Care for All. In this opportunity, we invited you to become our members and join our efforts for a better life to all of mankind.

As a team, we acknowledge the existence of mutual interest among university and college educators, researchers, activists, business sector, entrepreneurs, policy

makers, and all society members. We must promote the need to strengthen cooperation for establishing Security in Food, Renewable Resources, and Natural Medicines in Africa, Europe, and Asia.

The AES-Network believe, a firm foundation for mutual collaboration with the spirit of equality and partnership and thereby contribute towards sustainable development in these three regions.

Therefore, through networking, friendships, and joint efforts, the capacity of our network can be enhanced to address major challenges in securing the Food, Renewable Resources, and Natural Medicines in Africa, Europa, and Asia. Our Network goals are to increase the awareness of educators, researchers, scientific community, business sector, entrepreneurs, and policy makers in Africa, Europa, and Asia, that the future of a better world, lies within their responsibilities, and to improve the networking, mobility and mutual collaboration of scientific community, business sector, entrepreneurs, and policy makers in Africa, Europe, and Asia to energize the delivery of Sustainable Development Goals.

Finally, I hope that, by registering our network, you will be provided a common platform and support the exchange of knowledge, while at the same time, we offer constructive dialogue across and within the various interest and stakeholder groups, including the intended beneficiaries, and arrived at the best solutions to our terminal goal, Promoting Food Security, Renewable Energy, Sustainable Resources and Free Health Care based on scientific evidence in Africa, Europa, and Asian region.

Thank You for Joining us!

President

Assoc. Prof. Dr. Eng. Muhammad Makky

Welcome Message
Head of Institute for Research and Community Service
Universitas Andalas



Dear Honorable and Distinguished guests,
Ladies and gentlemen,

Assalamu'alaikum Warahmatullahi Wabarakatuh and Good Morning

It is with great pleasure that I welcome the participants of the SFRN 2019 in Payakumbuh, the city of “Rendang”, the prime of Indonesian delicacy.

In this esteem event, we share the knowledges, and imparted it to the people. The quest for knowledge has been from the beginning of time but knowledge only becomes valuable when it is disseminated and applied to benefit humankind. It is hoped that this conference will become a platform to gather and disseminate the latest knowledge which can be adopted for securing the food, resources, and health for mankind, in Asian, European and African region.

Academics, Scientists, Researchers and practitioners from multidiscipline branch of knowledge who gathered here today will be able to share and discuss new findings and applications of innovations for ensuring food security, in particular for those who reside in developing countries. It is envisaged that the intellectual discourse will result in future collaborations between universities, research institutions and industry both locally and internationally. In particular it is expected that focus will be given to issues on environmental and sustainability. Therefore, we urge to all participants, to establish a scientific network that will voice the needs

Researchers in the multi sectoral aspects related to the benefit of mankind have been progressing worldwide. Food is a basic right, while energy drive the world. Human need a lot of resources so the civilization can be flourished. But human is not immune, and thus, ones need to take care of their health regularly. Modern Agri-food systems is the foundations of a decent life, a sound education and the achievement of

the Sustainable Development Goals. Over the past decade, we have witnessed a chain reaction that threatens the very foundations of life for millions of the world's people. Rising energy prices drove up the cost of food and ate away the savings that people otherwise would have spent on health care or education. Unsustainable plantation management induced forest fire and posed haze hazard to the whole Sumatra island and our neighboring countries.

The human cost of the food and energy crisis has been enormous. Millions of families have been pushed into poverty and hunger. Thousands more suffering from the collateral effects. Over the past year, food insecurity led to political unrest in some 30 countries. Yet because the underlying problems persist, we will continue to experience such crises, again and again -- unless we act now. That is why we are here today.

We must make significant changes to feed ourselves, and most especially, to safeguard the poorest and most vulnerable. We must ensure safety nets for those who cannot afford food, or energy, nor even a health service. We must transform agricultural development, markets and how resources is distributed. We must do so based on a thorough understanding of the issues. That is the only possible way we can meet the Goals of Sustainable Development.

Thank You,

Assoc. Prof. Dr.-Ing. Uyung Gatot S. Dinata,MT.

**Opening Ceremony
Rector of Andalas University**



Dear Honorable and Distinguished guests,
Ladies and gentlemen,

Assalamu'alaikum Warahmatullahi Wabarakatuh and Good Morning

I welcome the opportunity to address you at this important event.

It gives me great pleasure in welcoming you to this 3rd Conference on "Security in Food, Renewable resources, and Natural Medicines (SFRN)" 2019. I am delighted that so many have accepted our invitation. I am particularly happy that we have in this room, dedicated individuals from so many stakeholder groups — including our most respected and distinguished guest “The ministry of Agriculture of the Republic of Indonesia”. We also welcome the mayor of Payakumbuh and the Regent of Lima Puluh Kota. We extend our welcome to the civil society, the private sector, international organizations; the science community; and others dedicated to help create an environment in which people can escape food insecurity. Imagine what we can do together if we make the security for all as an our top priority, and pull in the same direction. We can make a difference in the lives of millions.

Food is a basic right. Food security are the foundations of a decent life, a sound education and the achievement of the Sustainable Development Goals Access to medicines - a fundamental element of the right to health. Health is a fundamental human right, indispensable for the exercise of many other rights in particular the right to development, and necessary for living a life in dignity. Moreover, human rights principles and language are being used to support resource access claims as rights-based approaches empower individuals and groups to gain or maintain access to natural resources

Much progress has been made during the last decades but much more needs to be done. Millions of people are Insecure worldwide, meaning that they either starve or they do not know from where their next meal, health care or resources will come.

Much of the progress on security has occurred at the expense of our environment. With business as usual, we foresee that the production improvements during the next decade will be less than the last one, while the environmental degradation will continue, and health will deteriorate significantly. Without available resources to seek, mankind will become endanger species in a very short time.

Solutions to the security problems need to be designed and implemented within a new and rapidly changing environment. Globalization and sweeping technological changes offer new opportunities for solving these problems. A number driving forces or trends must be taken into account in developing appropriate action. Some of the action needed, such as appropriate technology for small farms, is not new but it must be cast in the new and changing global and national environment, taking into account new opportunities and risks. I hope that by providing a forum for knowledge exchange, this conference will help identify the action to be taken. Furthermore, this conference will help to provide constructive dialogue across and within the various interest and stakeholder groups, including the intended beneficiaries, and arrive at the best solutions.

In conclusion, even if those responsible give high priority to achieving sustainable security for all and back it up with action, the world may not achieve the goal by 2030. But we will be much closer than with business as usual. I urge all of us to provide the strongest support for this event, to enable securing the food for all in the closest time possible. It is my sincere optimism that through the accomplishment of the objectives of this event, we will come to an important step nearer to secure the food for all.

Finally, I would like to thank the organizing committee who have spent their utmost efforts to prepare and manage this event successfully. Let me conclude my remarks by wishing our guests happiness, good luck and great success in the conference.

May I announce now the opening of the “3rd International Conference on Security in Food, Renewable resources, and Natural Medicines (SFRN) 2019” in Payakumbuh.

Thank you.

Rector,
Prof. Tafdil Husni, SE, MBA, PhD

Welcome Message
Director of Politeknik Pertanian Negeri Payakumbuh



Dear Honorable ladies and gentlemen,

Good Morning and Assalamu'alaikumwr.wb

I congratulate to all participants on the invitation and participate at our beloved campus Payakumbuh State Agricultural Polytechnic. I feel really honoured to welcome all of you at our event, the 3rd International Conference on Security in Food, Renewable Resources, and Natural Medicines (SFRN) 2019 at the Payakumbuh State Agricultural Polytechnic, Indonesia.

Food security is a very important aspect in a country's sovereignty. Food also determines the future direction of a nation. Many social and political fluctuation can also occur if food security is disrupted. Food availability that is smaller than its needs can create economic instability. This critical food condition can even endanger economic and national stability. In the current situation, there are many challenges in exteriorize food security, such as climate change, population, limited natural resources and other challenges both locally, regionally and globally.

Renewable resources are also our starting point to start sustainable development. Research on renewable resources is also very important as the solution in meeting the principles of sustainable development. As we know that Sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Sustainability is the foundation for today's leading global framework for international cooperation - the 2030 Agenda for Sustainable Development and its Sustainable Development Goals (SDGs)

The discovery of treatment based on local culture also contributes greatly to the good of humanity. Unfortunately, there are still many treatments that have not been carried out by scientific research. So, through this conference we hope it can be a trigger to increase in traditional plant-based treatments that not go through complex

chemical processes, so that the effectiveness of the pillars can be further suppressed and also contribute to the community's economy.

Finally, I would like to express my gratitude to all people who involved in organizing this event and to all of stakeholders who have helped to make this event go on successfully. Please accept my apologize for any shortage, Assalamu'alaikumwr.wb.

Thank you

Ir. Elvin Hasman, MP

Table of Content

| | |
|--|-------------|
| Committee | i |
| Welcome Message from Executive Chairman | iii |
| Welcome Message from AES-Network | v |
| Welcome Message from Head of Institute for Research and Community Service Universitas Andalas | vii |
| Welcome Message from Rector of Andalas University | ix |
| Welcome Message from Director of Politeknik Pertanian Negeri Payakumbuh | xi |
| Table of Content | xiii |

Keynote/Invited Speakers

| | |
|---|----------|
| Freshness Evaluation of Leafy Vegetables with Based on the Cell Membrane Properties <i>Graduate School of Agricultural Science, Kobe University, 1-1 Rokkodai, Nada, Kobe 6578501, Japan</i> <i>(Shinichiro Kuroki)</i> | 1 |
| Composite Materials - An Insight to a New Era <i>Malnad College of Engineering, Hassan, Karnataka, India</i> <i>(B. Yogesha)</i> | 2 |
| Precisions of Tractor Operations with Soil Sensor Implementusing Manual and Autopilot-automated Steering Systems on Oil Palm Replanting Area in Malaysia <i>Faculty of Plantation & Agrotechnology Universiti Teknologi MARA Melaka branch, Jasin campus 77300 Merlimau, Melaka, Malaysia</i> <i>(Mohammad AnasAzmi, Darius El Pebrian)</i> | 3 |
| Precision Agriculture: Digitization in Farming <i>Smart Farming Technology Research Centre Department of Biological and Agricultural Engineering Deputy Dean of Postgraduate Studies Faculty of Engineering Universiti Putra Malaysia</i> <i>(SamsuzanaAbd Aziz)</i> | 4 |
| Sustainable-Resources-Based Smart-Mobility in ASEAN: a New Concept of the Next-Generation Green-Transportation <i>ASEAN-U.S. Science and Technology Fellow (2018/2019), Association of South East Asian Nations (ASEAN) Secretariat. Dept. of Agricultural Engineering, Universitas Andalas, Padang 25163, West Sumatra, Indonesia</i> <i>(Muhammad Makky)</i> | 5 |

| | |
|---|---|
| Parasitoid as a Biological Control Agent of Rice Bug (<i>Leptocorisa oratorius</i> Fabricius): Effort Towards Food Security <i>Department of Food Crop, Payakumbuh State Polytechnic of Agriculture. West Sumatra. 26271. Indonesia</i> (<i>Fri Maulina</i>) | 6 |
|---|---|

| | |
|---|---|
| Intelligence Farming for Sustainability <i>Department of Agricultural Engineering King Mongkut's Institute of Technology Ladkrabang (KMITL), Thailand</i> (<i>Vasu Udompetaikul</i>) | 7 |
|---|---|

Parallel Sessions

A. Food Security

| | |
|---|-----|
| Abundance and Potential of <i>Erionata thrax</i> L (Lepidoptera; Hesperidae) as an Insect Vector <i>Ralstonia syzygii</i> subsp. <i>celebesensis</i> Cause of Bacterial Blood Disease in Barangan in Deli Serdang Regency North Sumatera Asmah Indrawaty, Suswati | A1 |
| The Study of Chemical Quality and Sensory of Egg Rendang in Payakumbuh Deni Novia, Indri Juliyarsi, Sri Mulyani..... | A7 |
| Revival of Shifting Cultivation Pattern in Subdistrict of Mapattunggul Selatan, Pasaman Regency, West Sumatera, Indonesia Juli Yusran, Yonariza, Elfindri, Mahdi, Rikardo Silaban | A18 |
| The Diversity of flower-visiting insects (<i>Musa paradisiaca</i>) and the Potential as a Spreading Agent <i>Ralstonia syzygii</i> subsp. <i>celebesensis</i> on Barangan Banana, in North Sumatera, Indonesia Suswati, Asmah Indrawaty, Rosiman, Maimunah | A31 |
| Potential of Indole Acetic Acid Producing Bacteria as Biofertilizer in Increasing Production of Corn (<i>Zea mays</i> L.) Yun Sondang, Khazy Anty, Netti Yuliarti, Ramond Siregar | A37 |
| Analysis of Inpara 3 Variety of Seed Farming Production Firdaus, Adri, Erwan | A45 |
| Growth and Results of Some Shallots Varieties in Two Ways of Planting in the Lowland Syafri Edi, Yardha..... | A53 |
| Some Perspectives on Food Security For Children: The Case of Rendang For Kids in West Sumatera Dessy Kurnia Sari, Donard Games, Atha Raihan Rusdi..... | A62 |

| | |
|---|------|
| Farmer's Adoption Level for Inpara 3 and Inpari 34 Newly Rice Varieties Experiment in Swamp Land Areas, Betara District, West Tanjung Jabung, Jambi Suharyon, Lutfi Izhar | A67 |
| Palm Oil Seed Premeditated Acclaim in Jambi Lutfi Izhar, Arni Diana, Salwati..... | A76 |
| Water Resources Potency for Supporting Location-Specific Agricultural Policies and Innovations Salwati, Lutfi Izhar..... | A81 |
| Improvement of Local Bungo Cattle Calving Rate With Artificial Insemination Bustami, Zubir, E. Susilawati, Sari Yanti Hayanti | A93 |
| Performance and Productivity of Rice and Corn Intercropping in Dry Land of Jambi Province Jumakir, Adri, Rustam | A101 |
| Prospects of Superior Variety Cane "PoJ 2878 Agribun Kerinci" in Increasing Income Farmers in Kerinci District, Jambi Province Endrizal, Araz Meilin, Julistia Bobihoe..... | A110 |
| Determining Factors and the Elasticity of Demand Chicken Eggs Household Consumer in Sijunjung Regency Noni Novarista, Nofrita Sandi | A119 |
| Application of POC from Leachate Landfill on Growth and Yield of Maize (Zea mays) Hasnelly, Syafrimen Yasin, Agustian, Darmawan | A128 |

B. Natural Medicine

| | |
|---|-----|
| Utilization of Medicine Plants by Suku Anak Dalam (SAD) in Bukit Duabelas National Park Area of Sarolangun District, Jambi Province Julistia Bobihoe, Sari Yanti Hayanti Endrizal | B1 |
| The Effect of Kawa Daun Gambir (Uncaria gambir Roxb.) on the Malondialdehyde (MDA) Level of Heart Alloxan Induced Hyperglycemia Mice Husnil Kadri, Muhammad A'raaf, Julizar..... | B9 |
| Banana Extract (Musa paradisiaca) as Alternative Natural Antibacterial to Prevent Dental Caries <i>Asterina, Yustini Alioes , Ovy Prima Damara</i> | B15 |

| | |
|--|-----|
| The Difference in the Effectiveness of Propolis and Triamcinolone Acetonide in Traumatic Ulcer Healing in Mucosa of the Oral Cavity <i>Yustini Alioes, Hamdan, Elmatris,SY</i> | B21 |
|--|-----|

C. Policy, Commercialization And Innovation (PCI)

| | |
|---|-----|
| Strategies for Developing SMEs (Small and Medium Enterprises) of “Rendang” with Strengthening Regional Innovation Systems in Payakumbuh City Amna Suresti, Uyung Gatot S. Dinata, Alizar Hasan, James Hellyward, Rahmi Wati | C1 |
| Attitude Towards Technology Adoption Among Permanent Food Production Park Program Participants in Peninsular Malaysia Zulqarnain1, Norsida Man, Juwaidah Shariffudin, Salim Hassan..... | C16 |
| Nutrient Contents of Parboiled Rice as Affected by Palm Oil Addition Cesar Welya Refdi, Gita Addelia Nevara | C22 |
| Production Factors Affecting Taro Production in Sinaboi Sub-District Rokan Hilir Regency Eliza, Shorea Khaswarina, Ermi Tety | C28 |
| The Role of Various Types and Dosage of Biological Compost (Bio-Compost) on Biology and Soil Fertility in Ginger (<i>Zingiber officinale. L</i>) Misfit Putrina, Yulensri, Kresna Murti | C38 |
| Community Partnership Program in Processing Cassava Into Mocaf on Woman Farmers in Petapahan District Amelira Haris Nasution, Nirmala Purba, Salvia S..... | C45 |
| The Effect of Addition of Na₂Co₃ Solution Into the Decaffeination Process of Dry Coffee Seeds on Physicochemical Characteristics of Coffee Powder Ruri Wijayanti, Malse Anggia | C55 |
| Enhancing Innovation Performance and Commercialization in Higher Education Institutions: The Case of Andalas University Donard Games, Hanalde Andre, Amri Syahardi..... | C62 |
| Relationship Analysis of the Proportion of Food Expenditures with Food Security in Farmer Households in North Aceh Regency Riyandhi Praza, Nurasih Shamadiyah..... | C67 |

D. Sustainable Resources

| | |
|--|-----|
| Stock and Particulate Organic Matter of Ultisols Under Selected Land Use in Wet Tropical Area, Limau Manis West Sumatra, Indonesia Yulnafatmawita,, Syafrimen Yasin, Zainal A. Haris | D1 |
| Base Analysis and Land Carrying Capacity For the Development of Buffalo in Sijunjung Regency M. Ikhsan Rias, Riza Andesca Putra, Fuad Madarisa | D10 |
| Physical and Mechanical Properties of Pinang (Areca catechu, L.) Iriwad Putri1, Putri Wladari Zainal | D18 |
| Analysis of Food Plants Intercropping on Acidic Dryland Adri, Jumakir, Rustam | D26 |
| Utilization of Organic Material Insitu to Increase the Absorption N, P, K and Soybean Results on Gold Mining Fields in Sijunjung Districts Giska Oktabrina. S., Riza Syofiani..... | D34 |
| Amelioration of the Land of Former Gold Mine By Providing Kirinyuh Weeds and Agricultural Waste to Increase Paddy Production in Sijunjung Regency Riza Syofiani..... | D41 |

Banana Extract (*Musa paradisiaca*) as Alternative Natural Antibacterial to Prevent Dental Caries

Asterina, Yustini Alioes , Ovy Prima Damara

Medical Faculty , Andalas University

Limau Manih, Padang, Indonesia

asterina@med.unand.ac.id

Abstract—Indonesia is the biggest banana producer in South East Asia, which has a production rate of 6.11 million tons in 2010. Banana contains many chemical compounds, such as vitamins A, B, C, Calcium, Iron, Fosfor Magnesium, Kalium, Natrium, Zinc, and the energy produced by bananas is much higher (136 cal/ 100 gram) compared to Apples(54 cal/100 gram). Banana also features the pharmacologic function of anti-allergic, wound-healing, antioxidant, and antibacterial activity, which helps to prevent dental caries. Dental caries is an infection caused by *Streptococcus sp.* This research aims to understand the antibacterial effect of the banana extract on by *Streptococcus sp.* This research is an experimental laboratory study with a *post-test only control group design*. Samples used were methanol-immersed bananas, which were collected as banana extract after the methanol evaporated. The extract was microbiologically tested using Agar Nutrient media and *Streptococcus sp.* acquired from a patient. They were then incubated for 24 hours in 37°C of temperature, and then the inhibition zone was measured using a caliper. The result showed that banana extract 100 % has an inhibition ability of 37 mm (more than 20 mm in diameter is categorized 'strong'). It can be concluded that banana extract can be used as an alternative natural antibacterial.

Keywords: *Banana, Post Test Only Group Design, Antibacterial, Streptococcus sp*

INTRODUCTION

Dental caries or cavity is one of the worst oral health problems worldwide. According to WHO, dental caries is a major problem in industrial countries, with approximately 60-90% of students and adults. The highest prevalence occurs in Asian and Latin American countries. Dental caries is a chronic disease, affecting a large number of populations. The carious process affects the mineralized tissues of the teeth, enamel, dentin, and cementum, and caused by the action of microorganisms on fermentable carbohydrates in the diet. The disease is often described to be progressive and if not treated, may expand in size and progress to the pulp leading to pulp inflammation, thus pain and discomfort, and the end result will be loss of vitality then the loss of the tooth (Sulafa.2012). WHO in 2000 stated that data analysis of caries based on DMF-T index (D = *Decayed* = dental caries, M = *Missing* = missing teeth, F = *filled* = teeth with dental filling, T = *teeth*) in Southeast Asia is 1.53% (Wanarfi and Erico.2012). Data from RISKESDAS in 2013 showed the national prevalence of oral and dental problems is 25.9%, of which as many as 14

provinces have a prevalence of dental problems higher than the national rate of 29.1%, namely Jakarta, West Java, 28%, 32.1% Yogyakarta, East Java, 27.2%, 36.1% in South Kalimantan, North Sulawesi 31.6%, Central Sulawesi 35.6 %, 36.2% in South Sulawesi, Southeast Sulawesi, 28.6%, 30.1% Gorontalo, West Sulawesi, 32.2%, 27.2% Maluku, North Maluku 26.9% (Winda Iswandani. 2016).

Caries is a disease of the hard tissue (email, dentin, and cementum) which is caused by the activity of microorganisms in carbohydrates that are able to be fermented. The sign is the demineralization of dental hard tissue which is then followed by the breakdown of organic materials. There are several bacteria that can cause caries, one of which is the bacterium *Staphylococcus aureus*, *Streptococcus sp* and *Lactobacilli sp*.

Streptococcus sp is a gram-positive bacteria round shaped bacterium that is a member of the Firmicutes, and it is a usual member of the microbiota frequently found of the body upper respiratory tract, skin and mouth (Jawetz M. (2005). These bacteria are the most often found bacteria in the oral cavity, and currently is the most common cause of dental caries. This *Streptococcus sp* usually acts as a commensal of the human microbiota and can also become an opportunistic pathogen.

One of the concepts in caries prevention is the control of bacterial population activities, such as with antibiotics. Penicillin is the first used beta-lactam antibiotic because it can suppress the growth and proliferation of microorganisms of the oral cavity (Yani, and Sunarso. 2004). As time goes on, changes in health care practice increase the exposure to antibiotics, therefore increasing resistance to antibiotics (Mardiastuti HW. 2007). Stronger antibiotics may cause more side effects that can be detrimental to patients. In that regard, it is essential to search for alternatives of antibiotics that are natural, inexpensive, and easy to obtain. Natural antibiotics are easily obtained because it is easily accessible, such as bananas.

Banana is a widely consumed fruit. India is the largest banana producer in the world, with a total production of 24,869,490 tons in 2012. Indonesia is one the largest banana producer in Southeast Asia in 2006, as many as 5 million tons, while in 2012 it increased to 6,189,052 tons (Country Ranker. 2014). According to data from the Ministry of Agriculture in 2015, the province of East Java is the largest banana producer with production as much as 1,584,572 tons per year (Kementrian Pertanian. 2015).

Banana, tropical fruit belonging to the *Musaceae* family, is grown in many countries all over the world. All parts of the banana plant, such as flower, pulp, stem, and leaves, have a medicinal application (Fatemeh S *et al.* 2012). Banana has a benefit in pharmacological activities such as anti-allergic, wound healing, antibacterial, antioxidants, and to prevent the occurrence of dental caries (Sampath *et al.* 2012). Active chemicals found in bananas are carbohydrate, vitamin A, B, C, mineral, salts, flavonoids, saponins, and tannins that can inhibit the formation of dental caries (Apriasari *et al.* 2014)

In the past studies, various parts of banana have been shown to have an inhibitory effect on pathogens, making them excellent candidates for the antibacterial

as well as antioxidant sources—the phytochemical components of banana, tannins, phenolic eq. Eugenol has been proved to have antibacterial effects (Vilela *et al.* 2014).

MATERIALS AND METHOD

This study is an experimental laboratory study with a post-test only control group design. The sample used *Streptococcus sp.* in this study are banana extracts. This research was conducted in the microbiology laboratory of Medical School of Universitas Andalas in April 2016. The population in this study is the bacteria *Streptococcus sp.* Samples were cultured *Streptococcus sp* bacteria from the patients in RS Dr. M.Djamil Hospital, Padang.

Bananas were first soaked in methanol, which is evaporated to produce banana extracts. Banana extract with three concentration;25 %, 50 %, and 100 %; were prepared in agar mediums. The next stage is the inhibition test on *Streptococcus sp.*, which has been cultured in the microbiology laboratory of Medical School, Universitas Andalas. *Streptococcus sp.* culture is prepared on a petri dish containing *Nutrient agar blood* plate media. Bacterial cultures are incubated in an anaerobic condition at 37 ° C for 24 hours, then observed for the growth of *Streptococcus sp.* After 24 hours, the zone of inhibition is formed on blood agar media. The zone of inhibition is measured using calipers twice with a diagonal diameter measurement and the average value from both measurements.

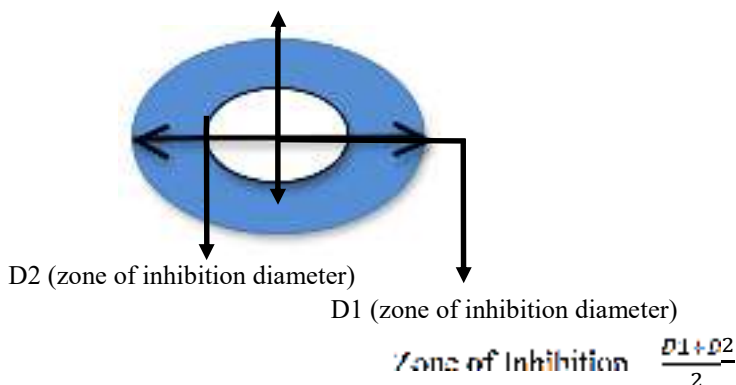


Figure 1. Zone of Inhibition D1 Measurement

RESULTS

Table 1. The Result of Experiment

| Consentration (%) | Zone of Inhibition | Zone of Inhibition | Zone of Inhibition | Average |
|----------------------|--------------------|--------------------|--------------------|---------|
| 100 | 37,5mm | 36,5mm | 37mm | 37mm |
| 50 | 29,5 mm | 30mm | 28,5mm | 29mm |
| 25 | 19 mm | 20 mm | 20 mm | 19,7mm |
| Standard Amoksisilin | | | | 27 mm |

A 24-hours observation showed that the banana extracts have an average zone of inhibition of 33 mm (> 20 mm is categorized as a powerful inhibitory effect).

DISCUSSION

The purpose of this study to determine the antibacterial activity of banana extract on concentration *Streptococcus sp.* that can cause dental caries.

Dental caries begins with the formation of dental plaques. The formation of dental plaques as a biofilm is associated with biofilm growth. Factors associated with biofilm growth is the ability of adhesion, the flow of nutrients, and bacteria coaggregation. This will affect the average growth, virulence, and gene expression of the biofilm. The process of oral biofilm formation on the solid tooth tissue is preceded by specific interaction between adhesion on the surface of the bacteria of the oral cavity and receptors between host and bacteria that coats the surface of the tooth. Staphylococcus and Streptococci, such as *Streptococcus gordonii*, *Streptococcus mitis*, *Streptococcus sanguinis*, and rod-shaped gram-positive bacteria such as *Actinomyces spp.*, may initiated the formation of dental plaques (Lemos *et al.* 2007). *Streptococcus sp* has the ability to synthesize glucans, which causes dental caries by increasing with their adhesion and changes the proportion of *Streptococcus sp* in dental plaques (Ogawa Ayako. 2011 and Banas).

Antibacterial activity of active substances in bananas may disrupt the process of dental plaque formation. In a previous study, Apriasari *et al.* stated that the methanol extract of stems from mauli bananas contains bioactive components, such as *saponins, flavonoids, and tannins.*

According to Prasetyo, *et al.*, (2008), saponin is a secondary metabolic compound that functions as an antiseptic with antibacterial capabilities. The presence of antibacterial substances would halt the formation or transport of each component to the cell walls, resulting in weak structures which, when followed by removal of cell walls and the release of cell contents, will eventually kill or inhibit the growth of bacterial cells (Retnowati *et al.* 2011).

Flavonoids can damage the permeability of the bacterial cell wall, microsomes, and lysosomes as a result of interaction between flavonoids with bacterial DNA. Mirzoeva *et al.* founded that flavonoids are able to release transduction energy towards the cytoplasmic membrane of bacteria, which may inhibit bacterial motility (Retnowati *et al.* 2011).

Flavonoid compounds are divided into subdivisions, such as avones (apigenin) and avonols. Apigenin is a the most effective component in inhibiting GTF enzymes, especially GTFB and GTFC, so it may reduce the adhesion and formation of *Streptococcus sp* colonies. Flavonoids very effective in inhibiting gram-positive bacteria growth, as the polarity of flavonoids makes it easier to penetrate the peptidoglycan layers, which are present in gram-positive bacteria. Flavonoids cause disruption of cell wall functions, such as cell shape maintenance and protection from osmotic lysis. Thus, disruption of the cell wall will cause the cell to undergo lysis (Dewi. 2010).

Tannin has antibacterial activities related to its ability to inactivate adhesin in microbial cells, inactivate enzymes, and disrupt protein transport in the inner layer of cells. Tannin also targets the polypeptide cell wall so that the formation of the cell wall becomes imperfect. This causes the bacterial cells to undergo lysis due to osmotic and physical pressure (Ngajow *et al.* 2013).

Flavonoid compounds and tannin in bananas have the same mechanism that can inhibit bacterial growth and even cause death in gram-positive (*Streptococcus sp*) or gram-negative bacteria, but the mechanisms against gram-positive bacteria is more effective than the gram-negative bacteria. This is because gram-positive bacteria have a simpler cell wall with more peptidoglycans, while the cell walls of gram-negative bacteria have fewer peptidoglycan fewer and are structurally more complex (Fadhilaj. 2014).

CONCLUSION

It can be concluded that bananas contain antibacterial compounds, namely saponin, flavonoids, and tannin, that can reduce the occurrence of dental caries. This is because the active substance can cause damage to the bacterial cell wall and inactivate the adhesion of microbial cells that will cause *Streptococcus sp* with 50 % and 100 % cells to die. In the 25 % cells to growth inhibitor. This could halt the process of dental caries.

REFERENCES

- Apriasari ML, Iskandar, Suharto E. (2014). Bioactive compounds and antioxidant activity of methanol extract mauli bananas (*Musa sp*) Stem. Melbourne: ICBBB Presentation;
- Banas A. Jeffrey. Virulence Properties of *Streptococcus mutans*. *Frontiers in Bioscience*. 2—4;9:1267-1277.
- Country Ranker. (2014). [Online]. Available: <http://www.countryranker.com/world-top-10-largest-producers-countries-of-bananas/>
- Dewi FK. (2010). Aktivitas antibakteri ekstrak etanol buah mengkudu (*Moridancitrifolia*, Linnaeus) terhadap bakteri pembusuk daging segar. Skripsi. Surakarta: Fakultas Matematika dan Ilmu Pengetahuan Alam Universitas Sebelas Maret;
- Fadhilaj A. (2014). Uji aktivitas antibakteri ekstrak methanol batang pisang mauli (*Musa sp*) terhadap *Streptococcus mutans*, Skripsi. Banjarmasin: Fakultas Kedokteran Universitas Lambung Mangkurat;
- Fatemeh S, Saifullah R, Abbas F, Azhar M. 2012. Total phenolics, flavonoids and antioxidant activity of banana pulp and peel flours: influence of variety and stage of ripeness. *International Food Research Journal*, 19(3), 1041-1046.
- Jawetz M. (2005); Adelberg's. *Mikrobiologi kedokteran*. edisi 23. Alih Bahasa: Huriwati Hartanto dkk. Penerbit Buku Kedokteran ECG: Jakarta.

B. Natural Medicine

- Kementrian Pertanian. (2015). Website. [Online]. Available: <http://www.pertanian.go.id/Data5tahun/HortiASEM2015/Produksi%20Pisang.pdf>
- Lemos A. C. Jose, Jacqueline Abranches and Robert A. (2007). Burne. Response of cariogenic Streptococci to environmental stresses. *Curr. Issues Mol. Bio.*;7:95-108.
- Mardiastuti HW. (2007). Emerging resistance pathogen: situasi terkini di Asia, Eropa, Amerika Serikat, Timur Tengah dan Indonesia. *Majalah Kedokteran Indonesia.*;5:76.
- Ngajow, M Abijulu J, Kamu VS. (2013). Pengaruh antibakteri ekstrak kulit Batang Matoa (*Pometiapinnata*) terhadap bakteri *Staphylococcus aureus* secara in vitro. *Jurnal MIPA UNSRAT.*;2(2):131
- Ogawa Ayako (2011). Inhibition of *Streptococcus mutans* biofilm formation by *Streptococcus salivarius fruA*. *applied and environmental microbiology.*;77(5):1572-1580.
- Retnowati Y. (2011). Pertumbuhan bakteri *Staphylococcus aureus* pada media yang di ekspos dengan Infus daun sambilojo (*Andrographispaniculata*). *Saintek*;6(2):7-8.
- Sampath, K.P, Bhowmik, D.m Duraivel S., and Umadevi, M. (2012). traditional and medicinal uses of banana. Vol. 1. PP. 51-59.
- Sulafa.2012.Available:<http://www.codental.uobaghdad.edu.iq/uploads/lectures/5th%20class%20prevention/Professor%20Dr.%20Sulafa%20El%20Samarrai-Etiology%20of%20dental%20caries.pdf>
- Vilela C, Santos SA, Villaverde JJ, Oliveira L, Nunes A, Cordeiro N, Freire CS, Silvestre AJ. 2014. Lipophilic phytochemicals from Banana Fruits of Several *Musa* Species. *Jour-nal of Food Chem*, Nov 1, 247-252.
- Wanarfi, Erico.(2012) Hubungan kejadian karies gigi molar pertama permanen dengan dental neglect pada siswa kelas 4 dan 5 SDN 06 pulau anak air kec. mandiangin koto selayan. *Kedokteran Gigi Universitas Andalas*.
- Winda Iswandani. 2016. Availabe: http://repository.upi.edu/15618/5/Ta_JKR_1205696_Chapter1.pdf
- Yani C.R, Sunarso B.(2004). Resistensi bakteri oral biofilm terhadap antibakteri golongan betalaktam, *Indonesia Journal of Dentistry*;11(2): 84.