

MAKALAH ILMIAH

ENVIRONMENTALLY FRIENDLY PHENOL FRACTION  
EXTRACTION FROM *SARGASSUM SP.* USING OLIVE OIL  
AS A SOLVENT



OLEH:

Samantha Githa Ratnasonia, Bekti Palupi, Meta Rizki Fitriana,  
Istiqomah Rahmawati, Boy Arief Fachri

Makalah disajikan pada “International Conference on Life Sciences and Biotechnology di Hotel Dafam, , Jember, Jawa Timur, Indonesia pada tanggal 25-26 Novembewr 2019

Diselenggarakan oleh Fakultas MIPA Universitas Jember

## About ICOLIB 2019



International Conference on Life Sciences and Biotechnology (ICOLIB) is biannual international, peer-reviewed conference focuses on life sciences, biotechnology and related fields such as health and medicine, agriculture, biodiversity, environmental, conservation, new and renewable energy.

After successful event of the 1<sup>st</sup> ICOLIB in 2015 “Exploration and Conservation of Biodiversity” and the 2<sup>nd</sup> ICOLIB 2017 “Integrated Biological Sciences for Human Welfare”. Biology Department, Faculty of Mathematics and Natural Sciences – University of Jember proudly present the 3<sup>rd</sup> ICOLIB 2019 with theme **“BIODIVERSITY : Molecules to Biosphere”**

The Conference invites researches, academia, educators, industrial practitioners and professional to meet and share knowledge and results of research. We look forward for significant contributions to all major fields of biology and biology-related fields in theory, methodology and application.





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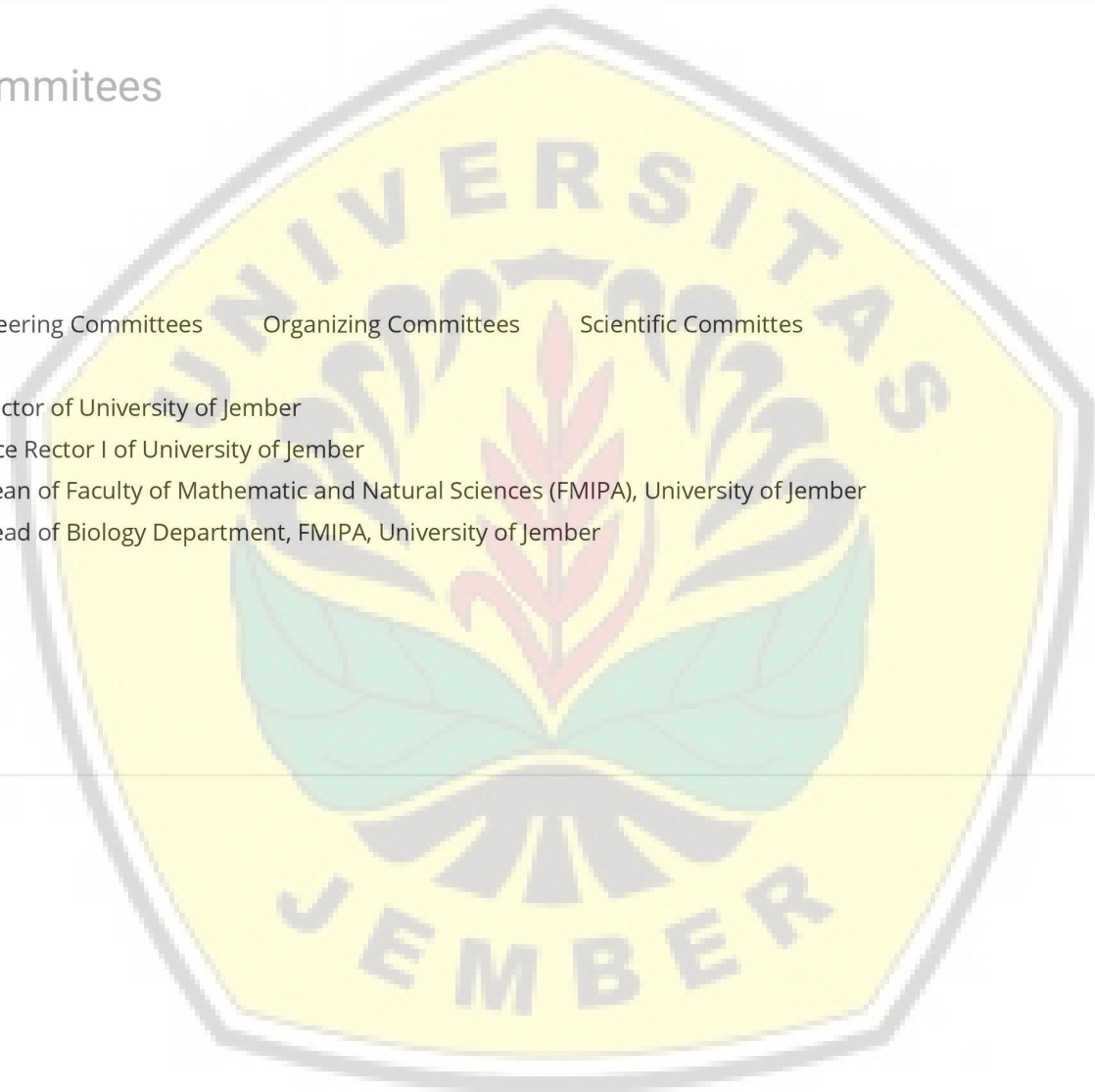
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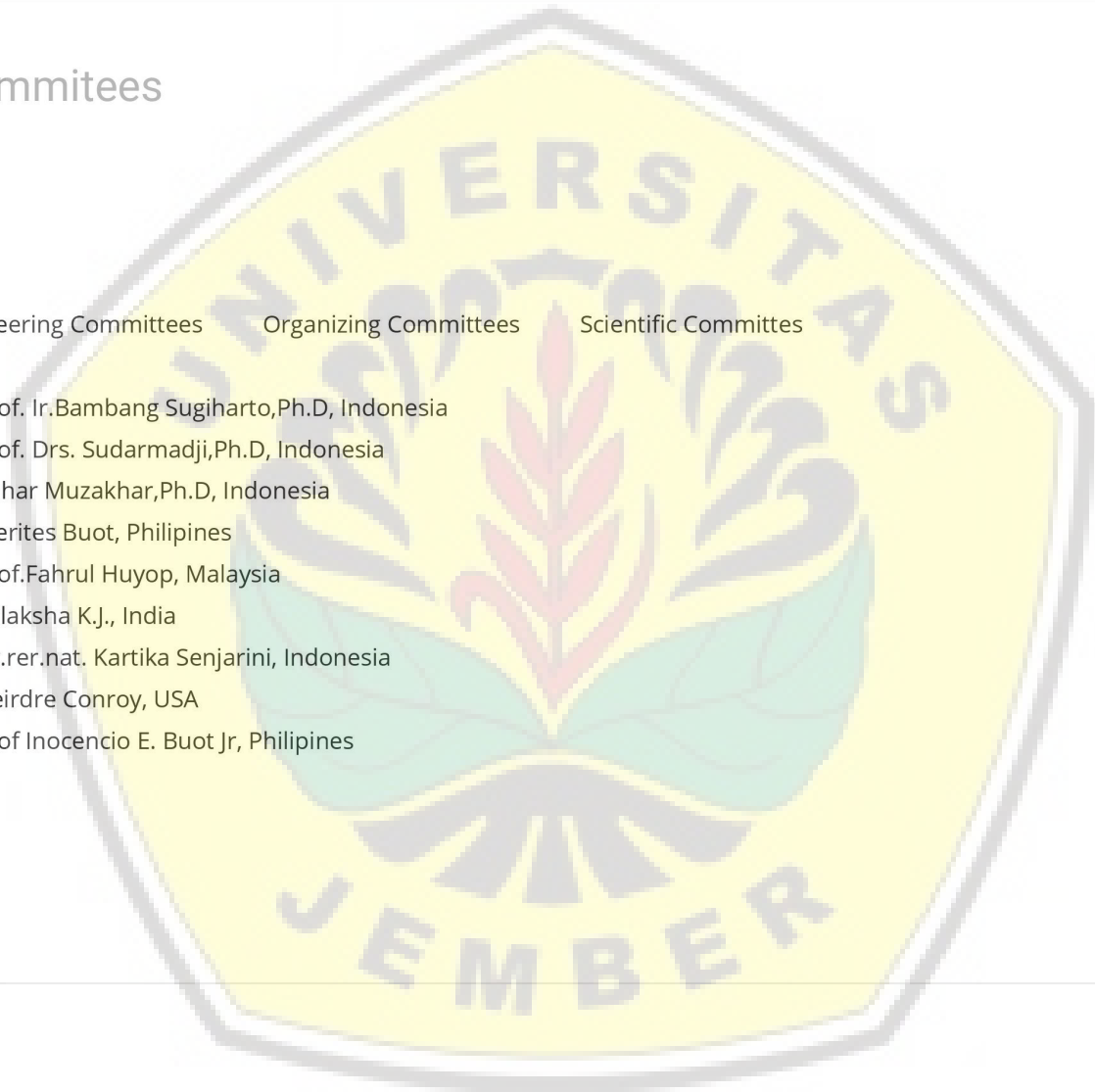
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## Important Dates

**Early Bird Registration** March 25 – August 25, 2019

### Submission and Payment

**Abstract Submission**

September 25, 2019

October 25, 2019

**Full Paper Submission**

October 25, 2019

November 10, 2019

**Deadline Payment**

October 25, 2019

**Conference**

November 25-26, 2019





## The 3<sup>rd</sup> ICOLIB

### Speakers

	<p>Prof. Takatoshi Kiba/ Plant Signaling / Bioagricultural Sciences/ <a href="#">Nagoya University</a>/ Japan</p> <p><b>“Nitrogen starvation responses in plants”</b></p>
	<p>Prof. Kim Jong Kee/ Holticulture/ <a href="#">Chung-Ang University</a>/ Anseong/ South Korea</p> <p><b>“Regulation of Aliphatic Glucosinolates Biosynthesis in Radish (<i>Raphanus sativus</i> L.) Plant”</b></p>
	<p>Prof. Koichi Kato/ Biomedical and Health Sciences/ <a href="#">Hiroshima University</a>/ Japan</p> <p><b>“Bioengineering Challenges Toward Regenerative Medicine”</b></p>
	<p>Prof. Budi S. Daryono/ Molecular Genetic and Breeding/ <a href="#">Gajah Mada</a></p>



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[University/](#) Indonesia

**“The Dynamics and Evolution of Plant Viruses in Indonesia Influenced by Climate Change”**



Hari Sulistiyowati, Ph.D./ Valuation Ecology/

[The University of Jember/](#) Indonesia

**“The Need to Appraise Biodiversity: A Challenge for Ecological Valuation Perspective”**



Prof. Dr. Fahrul Zaman/ Fakultas Sains/

[Universiti Teknologi Malaysia/](#) Malaysia

**“Characterisation and Exploring Biotechnological Potential of Halophilic Bacterium Isolated from Hypersaline Environment for Bioremediation”**



## SCIENTIFIC PROGRAM

**Monday, November 25<sup>th</sup> 2019**

TIME	VENUE: HALLROOM	PAGE
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08.05-08.15	Indonesia Raya Anthem and Hymne UNEJ	
08.20-08.20	Speech: Chairman 3 <sup>rd</sup> ICOLIB : <b>MukhamadSu'udi, Ph.D</b>	
08.20-08.30	Speech: Rector of Jember University : <b>Moh. Hasan, Ph.D</b>	
08.30-08.40	Token of Appreciation	
08.40-08.45	Pray ( <b>Kosala, S.Si, M.Si</b> )	
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10.30-11.15	<b>Speaker 2.</b> The Dynamics and Evolution of Plant Viruses in Indonesia Influenced by Climate Change <b>Prof. Budi Setiadi Daryono</b> , Laboratory of Genetics and Breeding, Faculty of Biology, Universitas Gadjah Mada, Yogyakarta <b>Chairperson: Prof. Dr. Ir. Bambang Sugiharto, M.Agr.Sc</b>	
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**Tuesday, November 26<sup>th</sup> 2019**

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08.45-09.30	<p><b>Speaker 5.</b> The Need to Appraise Biodiversity: A Challenge for Ecological Valuation Perspective</p> <p><b>Hari Sulistiyowati, Ph.D</b>, Associate professor of Biology Department, MIPA Faculty-University of Jember</p> <p><b>Chairperson: Dr. Ir. Siswoyo, MSc.</b></p>	
09.30-10.00	<b>Coffea Break</b>	
10.00-10.45	<p><b>Speaker 6.</b> Characterisation and Exploring Biotechnological Potential of Halophilic Bacterium Isolated from Hypersaline Environment for Bioremediation?</p> <p><b>Prof. Dr. Fahrul Huyop</b>, Biosciences Department, Faculty of Science, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Malaysia</p> <p><b>Chairperson: : Drs. Asmoro Lelono, MSc., Ph.D</b></p>	
<b>VENUE: HALLROOM</b>		
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13.30-14.30

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Chairperson: Syubbanul Wathon, S.Si ,M.Si

1. **Optimization of Cellulase, Pectinase and Xylanase**

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# Environmentally Friendly Phenol Fraction Extraction from *Sargassum sp.* Using Olive Oil as a Solvent

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**Abstract**— To minimize the impact of using an organic solvent to the environment, some oil-based solvent such as olive oil was proposed as a solvent to extract phenolic compounds from *Sargassum sp.* This work is to observe the effect of olive oil as solvent extraction to the yield of phenol. This work is also to determine optimum conditions as well.

*Sargassum sp.* powder was put in a flask and the olive oil was pouring into the flask. The mixture was macerated at room temperature in the darkroom. The investigated variables such as particle size (60-100 mesh), extraction times (1-3 days) and ratio dried *Sargassum sp.* to olive oil (1:2- 1:4 g/g) were employed to define the optimum condition. Since the extraction time is completed, the extract was separated and analyzed qualitatively using thin-layer chromatography. The phenol compound was quantified using the folin ciocalteu method. To investigate the effect of the process, the response surface method based on the central composite design was applied in this work.

This work informs the highest yield (37 wt%) was gained at the condition of t=3 days, ratio *Sargassum sp.* to an olive oil of 1:4, and particle size of 100 mesh. This work also shows that among other variables, particle size is the most significant factor in this process.

**Keywords:** *Sargassum sp.*, olive oil, phenolic compounds, maceration

## I. Introduction

The use of solvents plays an important role in a large number of operating units in chemistry and chemical engineering (Capello et al., 2007). Solvents are substances that are liquid during application and will dissolve other substances (Handa, 2008). The environment we live in has experienced a crisis of environmental damage in the last few decades. The use of environmentally friendly solvents is one alternative to reduce the impact of damage to the environment. In 'Green Chemistry' the solvent that is indicated as an environmentally friendly solvent is a non-volatile organic compound (VOC) which has high solubility, low toxicity and is also environmentally friendly. The solvent must be obtained from renewable resources at a reasonable price and easy to recycle. Thus, olive oil can potentially be a 'green alternative' solvent because of its good consistency with ideal solvent properties (Yara et al., 2017).

Olive oil has been used in recent years as a solvent in extraction. Olive oil can extract various substances such as essential oils, phenols, antioxidants, color pigments, and aromatic compounds (Moldão et al., 2004; Kang and Sim, 2007; Krichnavaruk et al., 2008; Ayadi et al., 2009; Nevado et al., 2012; Zaru et al., 2014).

Olive oil is a non-polar and lipophilic compound. One of the main constituents of olive oil is triglycerides (Yara et al., 2017). The mechanism of extraction carried out by olive oil is the formation of phenol-triglyceride complexes by hydrogen bonds. Triglycerides can also dissolve phenolic substances (Teng and Talebi, 2012).

About 2/3 of the earth's composition is water. The sea is one of the largest forms of the water reservoir with a population of life that is also still not fully explored by humans. Seaweed, commonly known as marine microalgae, resides in the ocean and is mostly classified as brown, red, and green algae depending on their pigmentation (Venkatesan et al., 2017).

The chemical composition of brown algae or *Sargassum sp.* is 14–44% ash, 4–68% carbohydrates, 9–20% proteins and 0.5–3.9% lipids (%DW) (Holdt and Kraan, 2011). *Sargassum sp.* contains active compounds such as alginate, phenols, and fucoxanthin can be used as food, medicine, cosmetics, and textiles (Kadi, 2005; Hifney et al., 2015; Barquilha et al., 2017). Other compounds owned by *Sargassum sp.* are active compounds such as alkaloids, phenols, steroids, and also triterpenoids (Kusumaningrum, 2007).

## II. Materials and Methods

### A. Materials

Materials used include *Sargassum sp.* which is cultivated in Lampung, dried in the sun to dry then crushed to form into powder, then sieved with several particle sizes such as 60, 80, and 100 mesh. The solvent used is extra virgin olive oil produced by Costa D'Oro Spoleto, Italy.

The instrument used in testing the total phenol is UV-Vis Spectrophotometer UV-2600-240 V EN.

### B. Methods

#### Extraction of *Sargassum sp.* by Maceration Method

Samples of *Sargassum sp.* 60, 80, and 100 mesh with a weight of 10 grams for each sample which is then macerated in a ratio powder to liquid (1: 4 - 1: 2 or 0.25 - 0.5 g/g) and also time (1-3 days). The sample is put into the beaker glass then the solvent is added according to the ratio variable and allowed to