



INTERNATIONAL CONFERENCE ON OPERATIONS RESEARCH (ICOR)

4th

Policies and Optimal Decisions on Energy and Environment

Sam Ratulangi University, Manado, Indonesia
19 - 20 September 2019

BOOK OF ABSTRACTS



The 4th ICOR 2019

Operations Research (OR) has become powerful decision making tools worldwide. In its use, Management Science (MS) is used as another term for OR. Concept of OR is borderless as it can be derived from various disciplines such as Mathematics, Statistics, Economics, Engineering, Social, etc. to make a new set of knowledge for decision making. Today, OR has become a professional discipline which deals with the application of scientific methods in decision making theory.

The scope of OR can be used to find best solution for both simple and complex problems. It is beneficial in every aspect of human life regarding resources optimization. OR is widely used in important and main fields such as national planning and budgeting, transportation, education, agriculture, environment, and many others. Therefore, research and study involving OR are inevitable.

Number of research and study about OR or using OR as tools is high these years. This is accommodated by Indonesian Operations Research Association (IORA) IORA as one of OR organisations in an annual international conference entitled International Conference on Operations Research (ICOR). ICOR 2019 is the fourth conference (iCOR 4.0). This initiates to bring together OR/MS researchers, academicians and practitioners, whose collective work has sustained continuing OR/MS contribution to decision-making in many fields of application. It can be considered as good platforms for the OR/MS community, particularly in Indonesia, to meet each other and to exchange ideas.

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SECRETARIAT:

Fakultas Matematika dan Ilmu Pengetahuan Alam (Fakultas MIPA)

Sam Ratulangi University Manado, Indonesia

Email : icor2019@unsrat.ac.id

Website : www.icor2019.org

Contact Persons : Nelson Nainggolan (+62813 4073 7994)

Jullia Titaley (+62813 4258 0024)

Christie Montolalu (+62813 5460 7777)

WELCOMING SPEECH

The 4th International Conference on Operations Research 2019

Director General of Conservation of Natural Resources and Ecosystems,
Ministry of Environment and Forestry
Rector of Sam Ratulangi University Prof. Dr. Ir. Ellen Joan Kumaat,
MSc, DEA.
IORA President and Dean of FMIPA University of Padjadjaran Prof. Dr.
H. Sudradjat Supian, MSc.



Distinguished Guests, Ladies and Gentlemen.
On behalf of ICOR 2019 Organizing Committee, I would like to Welcome you all and thank you for being here. Especially to Rector of Universitas Sam Ratulangi for fulfilling our invitation and to give opening speech for this conference. Special thanks also for Keynote Speakers, Plenary Speakers, Contributed Speakers and All Participants of this conference.

This conference can be held in collaboration of Indonesian Operations Research Association (IORA) and Faculty of Science Universitas Sam Ratulangi.

The point of this conference is to provide a perfect event for researchers, academics, and practitioners of Operations Research, to share experience, build communication and network with experts from all over the world. Furthermore, this conference is aimed at promotion and spread of scientific operations research field in Indonesia through Indonesian Operations Research Association (IORA).

The same conference had previously been held three time, initially hosted by Universitas Pakuan Bogor, followed by Universitas Terbuka Tangerang as second host and the third hosted by Unversitas Sam Ratulangi. This conference is now held at Universitas Sam Ratulangi Manado for the forth time, that is why it is known as the 4rd International Conference on Operations Research (ICOR) under a main theme entitled Policies and Optimal Decisions on Energy and Environment.

Number of participants of this conference are more than 300, from 15 countries.
Selected Papers will be published on scopus indexed Journal and IOP Publications.

Lastly, we want to gratefully thank again rector for her help and support, all keynote speakers, plenary speakers, contributed speakers, all participants, and all organizing committee who have given contribution to make this conference happen.

Dr. Nelson Nainggolan, MSi
Conference Chair

FOREWORD

From the Dean
Faculty of Mathematics and Natural Sciences, Sam Ratulangi
University
Prof. Benny Pinontoan, M.Sc

It is a great honor for the Faculty of Mathematics and Natural Sciences (FMIPA), Sam Ratulangi University (UNSRAT), Manado, Indonesia, to organize again the International Conference on Operations Research (ICOR); this year the 4th ICOR (iCOR 4.0), after organized the 3rd ICOR also by FMIPA UNSRAT in 2018. We thank, therefore, the Indonesian Operations Research Association (IORA) for this opportunity. It is an opportunity to open collaborations with other institutions, it is an opportunity to know other researchers, it is an opportunity to look at the problems more



intense and eventually suggest some solutions, optimal solutions, to the problems.

The theme of iCOR 4.0 is Policies and Optimal Decisions on Energy and Environment. The motivation to suggest this theme as that we are facing decreasing of fossil energy sources on one side, but on the other side finding new energies, e.g. renewable energies, seems to create other conflict problems either with the efficiency of costs or with the sustainability of the environment. To look at these problems from the point of view of Operations Research is, therefore, relevant and can give better and optimal solutions.

This year, there are more than 300 participants registered. In compare with the 3rd ICOR with the theme Optimal Decisions for Marine Tourism [1], this is an increasing of about 50% more participants. The number of countries participated this year is 15 which is also increased. This shows increasing interests to both the ICOR and the theme of the conference. We also hope that number the papers successfully published in IOP Proceeding indexed in Scopus this year will be much more than last year.

Welcome to iCOR 4.0, Welcome to UNSRAT, Welcome to Manado. Enjoy your stay, enjoy the nature, the food, the hospitality and experience wonderful moments in Manado and surrounding areas.

Pakatuan wo Pakalawiden. God bless you.

Reference

[1] Pinontoan B 2019 From the Dean Faculty of Mathematics and Natural Sciences, Sam Ratulangi University IOP Conf. Series: Material Science and Engineering 567 pp. 6.

CONGRATULATORY SPEECH BY THE PRESIDENT OF THE INDONESIAN OPERATIONS RESEARCH ASSOCIATION (IORA)

Distinguished Guest, All invited Speakers, Participant, Ladies and Gentlement,
It is great pleasure for me On behalf of the Association of the Indonesian Operations Research Association, I would like to welcome you all at this special event International Conference On Operations Research at the Universitas Sam Ratulangi. This event is the fourth event for IORA-ICOR and congratulations to the Universitas Sam Ratulangi be able to host.



The theme of the conference, Policies and Optimal Decisions on Energy and Environment, reflects our belief that many future challenges in our life need involvement of operations research and typical analytic operations research. Our future and our capacity to reach sustainable development goal such as ensure availability and sustainable manajemen of water and sanitation for all; ensure access to affordable, reliable, sustainable and modern energy for all; take urgent action to combat climate change and its impacts; end proverty in all its forms everywhere; conserve abd sustainably use the oceans, seas and marine resources for sustainable development; end huger, achive food security and improved nutrition and promote sustainable agriculture, ensure healthy lives and promot well-being for all at all ages, ang other challenges require the advances the roles of operations research in collaboration with other diciplines. Operations Research is the application of scientific & mathematical methods to the study & analysis of problems involving complex systems. Analytics is defined as the scientific process of transforming data into insights for making better decisions.

Operations Research is multi discipline therefore interaction with other fields of science is indispensable and proven to have given rise to new areas that improve the ability in decision making and techniques used are modeling.

Typically, applications of Operations Research in these and other areas deal with decisions involved in planning the efficient allocation of scarce resources - such as material, skilled workers, machines, money and time - to achieve stated goals and objectives under conditions of uncertainty and over a span of time. Efficient allocation of resources may entail establishing policies, designing processes, or relocating assets. OR analysts solve such management decision problems with an array of mathematical methodologies.

Completely of the operations research field can be seen in AMS 2000 or MCS 2010.

And now, I need to clarify that IORA is new association in Indonesia he is beginning piloted in workshops in Operations Research and Optimization modelling on June 4, 2011 in the Department of Mathematics Faculty of Mathematics and Natural Science, Universitas Padjadjaran, then be disseminated to several universities, government and industry.

IORA is a container that provides a forum for scientists Operational Research and to expand our horizons through the exchange of knowledge and application technology, IORA established on August 25, 2014 by deed of Notary Number 42 and the Minister of Justice and Human Rights Number. AHU-00439.60.10.2014.

IORA members came from a variety of fields, education, researcher, government, industry, practitioners etc, in 2017 members numbered 130 members and until now IORA members numbered 240 members, and we wait for those who have become members through www.iora.or.id. Ladies and gentlement,

We need to inform that at the current conference will also be held meeting IORA board. Finally, Have a nice International Conference on Operations Research. I hope there are plenty of benefits we can share and empower through this and hopefully your participations and contributions will make this conference a productive and successful one.

President, The Indonesia Operations research Association

Prof. H. Sudradjat Supian, M.Sc., Ph.D

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Phytochemical Screening and DPPH Test of Tropical Red Algae of *Eucheuma spinosum* in North Sulawesi Waters, Indonesia

Lena J. Damongilala¹, Defny S. Wewengkang², Fitje Losung¹

¹Fakultas Perikanan dan Ilmu Kelautan, Universitas Sam Ratulangi Manado, Sulawesi Utara, Indonesia 95115

²Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Sam Ratulangi Manado, Sulawesi Utara, Indonesia 95115

(Email: lenajeane@unsrat.ac.id, wdefny@yahoo.com, veralosung@unsrat.ac.id)

INTRODUCTION

In past few decades, the extensively research on functional foods and their bioactive constituents have been conducted to provide health benefits though bioactive compounds, as these compounds target mechanisms that manage, prevent, and/or treat infectious and metabolic diseases. The formulation of bioactive constituents of foods is powerful active molecules naturally present in small quantities those have contributes to regulating biological mechanisms. This fact showed the potential application of plant-based bioactive compounds, including marine algae as a novel source of functional food ingredients and food preservative.

The development of the functional foods has been done a lot because natural foods contain many bioactive compounds [1]. Functional foods can be defined as natural or processed foods that contain biological active compounds, food in a specified amount, effective and non-toxic, providing clinically proven health benefits for the prevention, management or treatment of chronic diseases [2], [3]. In general, functional food is strictly regulated but not recognized by law in most countries, so there is no definition according to the law [4]. The concept of functional food refers to food products that are a source of nutritional compounds and provide other benefits to consumers [5].

In the last few years, marine resource as a source of new drug development and healthy food is very interesting [6]. Seaweed or algae are primitive plants that do not flower and do not have stems, leaves and roots [7]. Marine algae and their constituents have a key position in the progression of modern studies and knowledge on biological activity or active substances. The marine environment, which contains a vast array of organisms with unique biological properties, is one of the most underutilized biological resources.

In order to adapt to these extreme conditions, most algae produce a high variety of secondary metabolites that often have potent biological activities. To date, algae and microalgae are referenced in the literature as sources of bioactive compounds for use as functional food ingredients [8], [9]. Algae contain several compounds including acids, amines, antibacterial substances, antifungal and antiviral agents, lipids, sterols, steroids and fatty acids, phenolic compounds, phytochromes, pigments, sugars, and alcohol. This algae content is a useful source of products and medicines [10], [11], [12]. Seaweed can be used as a source of natural antioxidant compounds because its crude extract shows antioxidant activity [13]. Algae are rich in bioactive ingredients and can be applied to biotechnology, some of the findings from these algae have been explored but there are still many that need to be explored more deeply. Of the three algal classifications, red algae (*Eucheuma spinosum*) have unique and therapeutic properties that must be studied further for the benefit of the world, and

mostly found in tropical, coastal, continental, temperate and cold water. Red algae have around 6,000 species that are including of 670 marine genera [14], [15]. Red and brown algae are mainly used as human food sources. Fresh and dried seaweed is consumed by many people; especially those who live in coastal areas [16]. Red algae have brilliant colors because of the pigment phycoerythrin and phycocyanine. These algae can live at a greater depth than brown and green algae because they absorb blue light [17]. *E. spinosum* are considered to be the most important source of many biologically active metabolites compared to other classes of algae [18]. *E. spinosum* can contain bioactive compounds such as flavonoids, alkaloids, saponins, tannins and derivatives that have antibacterial [12] and antioxidant properties [19].

To search for new prospective natural antioxidant sources, the extract of inhibition activity extract of tropical algae *E. spinosum* against 2,2-diphenyl-1-picryl-hydrazyl-hydrate (DPPH) have been suggested.

RESULTS AND DISCUSSION

Phytochemicals screening of *E. spinosum* extracts :

In order to know composition of their secondary metabolite, the preliminary phytochemical was screening and data as described in Table 1. Data of the presence secondary metabolite constituents of samples by phytochemical analysis showed that the ethyl acetate extract containing major secondary metabolites including flavonoid, steroid, terpenoids, saponin and tannin, while the alkaloid was not identified. On the other hand, methanol and *n*-hexane extracts contained same compounds of tannin, but different content of terpenoid, steroid and steroid, respectively. This data is a strong base of edible algae *Eucheuma spinosum* in this study can suggested as potential natural source bioactive compounds. The finding data was supported by previous study those showed that *Eucheuma spinosum* indicated as an important antioxidant compound [20].

Table 1. Data of phytochemical analysis the *E. spinosum* extracts

No.	Secondary metabolites	Reagent	Samples			
			MeOH	<i>n</i> -Hexane	EtOAc	H ₂ O
1	Flavonoid	a. HCl + Mg	-	-	-	-
		b. H ₂ SO ₄ (2N)	-	-	-	-
		c. NaOH (10%)	-	-	+	-
2	Alkaloid	Pereaksi Dragendorf	-	+	-	-
3	Steroid	Lieberman-Burchard	+	-	+	-
4	Triterpenoid		+	-	+	-
5	Saponin	HCl + H ₂ O	-	-	+	-
6	Tanin	FeCl ₃ (1%)	+	+	+	+

Antioxidant (DPPH) activity of extract :

In an attempt to pursue active antioxidant activities of edible algae *Eucheuma spinosum*, this study had confirmed that *n*-hexane, ethyl acetate and H₂O extracts were active against both antioxidant assay of DPPH and SOD, respectively. The test shows that *E. spinosum* extract can scavenging DPPH free radicals with increased concentration, especially on ethyl acetate extracts with repeated repetitions. However, water, ethyl acetate, and *n*-hexane extract of *E. spinosum* were active with inhibition zone values of 2,478.1, 402.8, and 1,537.1 ppm, respectively as shown in Table 2.

Table 2. Antioxidant (DPPH) activity of the *E. spinosum* extract

No.	Samples	Inhibition Activity (IC ₅₀ /ppm)			
		<i>n</i> -Hexane	EtOAc	H ₂ O	MeOH
1	Extracts	1,537.1	402.8	2,478.1	-
2	3-(3-methoxyphenyl)propanal	-	87,97	-	-
3	Quercetin	-	-	-	20.98
4	Catechin	-	91.82	-	-

Based on the assay data against DPPH assay showed that the ethyl acetate extract is the most active to scavenger free radicals with IC₅₀ value of 402.8 ppm, while if compared to references compounds of quercetin and chatechin with IC₅₀ values of 20.98 and 91.82 ppm, respectively, the activity of ethyl acetate extract was less active [21], [22]. In the previous published paper, Damongilala *et al* (2013) have reported that methanol extract from *E. spinosum* and *E. cottonii* can scavenge DPPH radicals with IC₅₀ values of 75.27 and 64.73 ppm [23]. According to phytochemical analysis, the secondary metabolites of flavonoid, steroid, terpenoids, saponin and tannin those contained in ethyl acetate extract to have linier correlation with its antioxidant activity. So, this initial data is as important finding for further guide to isolate their actives constituents [24], [25], [26].

DPPH is a stable free radical that is widely used to evaluate natural antioxidants, algae or algal products because of its stability, simplicity and reproducibility. Some antioxidants can react slowly or not react to DPPH [27]. DPPH as a stable free radical with reserve electron delocalisation contributes to intense violet color which is converted to pale yellow after reduction [28].

Keywords : DPPH, *Eucheuma spinosum*, North Sulawesi, Phytochemical

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