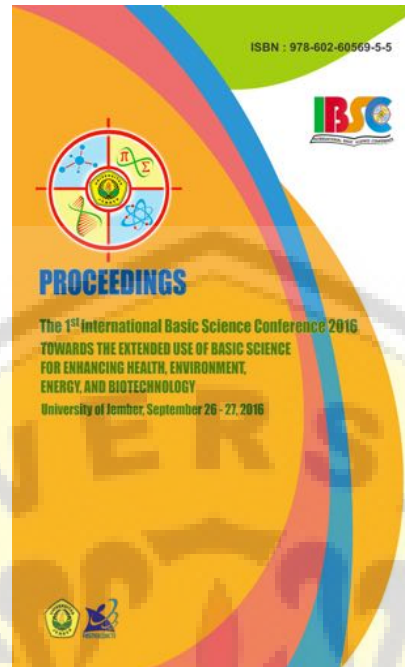


2016: Proceeding The 1st International Basic Science Conference



Proceeding of 1st International Basic Science Conference (1st-IBSC) 2016

ISBN : 978-602-60569-5-5

Presented articles on proceeding 1st International Basic Science Conference

"Towards The Extended Use Of Basic Science For Enhancing Health, Environment, Energy, And Biotechnology"

26-27th September 2016, University of Jember, Indonesia

PUBLISHED: 2017-08-22

GENERAL

Community Strategy for Managing Tropical Forest Resources in The Area of Cagar Alam Pulau Sempu (Nature Reserve of Sempu Island)

Lely Mardiyanti, Rifalatul Isnaini, Sueb Sueb

2-6

BIOREDUCTION ADSORBENT (BIOSORBENT): RECOVERY TECHNOLOGY OF HEAVY METAL POLLUTION (CADMIUM/CD) IN POLLUTED LAPINDO WATER SOURCES USING BACTERIA AND DURIAN LEATHER

Sueb Sueb, Eka Imbia Agus Diartika, Khasanah Sripalupi, Achib Irmawati

7-9

 PDF

COMPARATIVE STUDY OF THE MANAGEMENT OF VANAME SHRIMP (LITOPENAEUS VANNAMEI) BASED ON DEMOGRAPHIC FACTORS AT MOLANG BEACH TULUNGAGUNG

Firda Ama Zulfia, Ika Airin Nur Rohmadhani, Nova Yesika Gultom, Sueb Sueb

10-12

 PDF

ANALYSIS OF THE INFLUENCE OF PUBLIC PARTICIPATION IN THE MANAGEMENT OF RESOURCES SUSTAINABLE WATER MALANG DISTRICT

Ahmad Kamal Sudrajat, Dewi Nur Arasy, Daning Nindya Fitri Arianti, Sueb Sueb

13-15

 PDF

CONSERVATION COCCINELLA SP. AS PREDATOR OF GREEN PEACH APHID MYZUS PERSICAE SULZER ON POTATO INTERCROPPING

Lamria Sidauruk

16-18

 PDF

THE EFFECT OF MYCORRHIZAL INOCULANT AND COMPOST OF VOLCANIC ASH ON GROWTH AND YIELD OF CHILLI (CAPSICUM ANNUM L.)

Ernitha Panjaitan, Nur Syntha Napitupulu, Ezra Matondang

19-22

 PDF

THE POTENTIAL OF ARTHROPODE DIVERSITY FOR ECOTOURISM DEVELOPMENT IN WONOREJO MANGROVE ECOSYSTEM, SURABAYA

Nova Maulidina Ashuri, Abdul Azis, Noor Nailis Sa'adah

23-26

THE EFFECTS OF WATER FRACTION OF BITTER MELON (*MOMORDICA CHARANTIA*) LEAF EXTRACT IN MAMMARY GLAND DEVELOPMENT OF BALB/C MICE (*MUS MUSCULUS*) WITH HISTOLOGICAL AND MOLECULAR BIOLOGICAL ANALYSIS OF PROTEIN APPROACHES

Nur Hayati, Afifah Nur Aini, Nafisatuzzamrudah Nafisatuzzamrudah, Umie Lestari

27-29

 PDF

COMPETITIVENESS AND POTENTIAL OF SHEEP LIVESTOCK AS SOURCE INCREASING INCOME AND PROVIDER OF MEAT ANIMAL IN NORTH SUMATRA

Sarim Sembiring

30-31

 PDF

MORPHOLOGICAL AND PHYSIOLOGICAL CHARACTERS OF CASSAVA (*MANIHOT ESCULENTA* CRANTZ) WHICH WET TOLERANT

Rahmawati Rahmawati, Tri Agus Siswoyo, Didik Puji Restanto, Sri Hartatik, Sigit Soeparjono, Sholeh Avivi

32-35

 PDF

THE EFFECT OF SOY TEMPEH FLOUR EXTRACT ON VAGINA HISTOLOGICAL STRUCTURE OF SWISS WEBSTER OVARIECTOMIZED MICE (*MUS MUSCULUS*)

Mahriani Mahriani, Eva Tyas Utami, Dita Ayu Faradila

36-38

 PDF

THE TOXICITY OF SEEDS EXTRACT OF *ANNONA SQUAMOSA* L., LEAVES EXTRACT OF *TERMINALIA CATAPPA* L. AND LEAVES EXTRACT OF *ACACIA NILOTICA* L. ON THE MORTALITY OF *AEDES AEGYPTI* L. LARVAE

Dwi Wahyuni, Sandy Pradipta, Muhammad Ramadhan

39-41

 PDF

ELEPHANTOPUS SCABER AND SAUROPOUS ANDROGYNUS REGULATE MACROPHAGES AND B LYMPHOCYTE CELLS DURING SALMONELLA TYPHI INFECTION

Muhammad Sasmito Djati, Dinia Rizqi Dwijayanti, Lulut Dwi Nurmamulyosari, Yuyu Fuadah, Muhammad Basyarudin, Nur Jannah

42-44

 PDF

The Effort To Increase Production of Super Red Dragon Fruit (*Hylocereus costaricensis*) By Artificial Pollination

Neni Andayani, Lailatun Naria Latifah, Theresia Maria Astuti

45-46

 PDF

EVALUATION OF ZONATION OF THE MANGROVE CONSERVATION AREAS IN PAMURBAYA

Viv Djanat Prasita, Agus Subianto, Asbar Asbar

47-49

 PDF

INPUT OF NUTRIENT (NITROGEN AND PHOSPHORUS) FROM THE CATCHMENT AREA INTO RAWAPENING LAKE OF CENTRAL JAVA

Agatha Sih Piranti, Diana RUS Rahayu, Gentur Waluyo

50-51

 PDF

RELATIONSHIP BETWEEN WATER QUALITY AND ABUNDANCE OF CYANOPHYTA IN PENJALIN RESERVOIR

Badrun Mahera Agung, Agatha Sih Piranti, Carmudi Carmudi

52-56

 PDF

HEMATOLOGICAL CHARACTERISTIC OF THE FEMALE ASIAN VINE SNAKE (*AHAETULLA PRASINA BOIE, 1827*)

I Gusti A. Ayu Ratna Puspita Sari, Endah Sri Palupi

57-59

HIGHLY SPESIFIC BACILLUS CEREUS-PHAGES ISOLATED FROM HOSPITAL WASTEWATER IN BANYUMAS REGENCY

Anwar Rovik, Saefuddin 'Aziz, Hendro Pramono

60-64

 PDF

BIOSYNTHESIS SILVER NANOPARTICLE USING FRESH WATER ALGAE

Dahlia Dahlia, Sherry Aristyani, Robiatul Hadawiyah

65-66

 PDF

EFFECT OF SAPONIN-PODS EXTRACT ACACIA (ACACIA MANGIUM) TO HEMATOCRIT, HEMOGLOBIN AT TILAPIA (OREOCHROMIS NILOTICUS)

Is Yuniar, Win Darmanto, Agoes Soegianto

67-69

 PDF

EFFECT OF DISSOLVED NUTRIENT CONCENTRATION (NITRATE AND ORTHOPHOSPHATE) ON ABUNDANCE OF CHLOROPHYTA IN PENJALIN RESERVOIR BREBES REGENCY

Novi Ariyanti, Carmudi Carmudi, Christiani Christiani

70-73

 PDF

THE ANATOMY OF CAROTENE BIOSYNTHESIS IN BETA VULGARIS L., VAR. RUBRA USING SCAN ELECTRON MICROSCOPE

Dahlia Dahlia

74-76

 PDF

OPTIMIZATION OF YOGURT FERMENTED MILK PRODUCTS WITH THE ADDITION OF NATURAL STABILIZER BASED ON LOCAL POTENTIAL OF TARO STARCH (COLOCASIA ESCULENTA)

Aju Tjatur Nugroho Krisnaningsih, Dyah Lestari Yulianti, Imam Thohari, Puguh Surjowardojo



PDF

PTERIDOPHYTES OF ALAS PURWO NATIONAL PARK AND THEIR MEDICINAL POTENCY

Fuad Bahrul Ulum, Dwi Setyati

80-82



PDF

GENETIC VARIATION OF Aedes Aegypti (DIPTERA : CULICIDAE) BASED ON DNA POLYMORPHISM

Rike Oktarianti, Sri Mumpuni

83-84



PDF

THE EFFECT OF SOY TEMPEH FLOUR EXTRACT TO UTERINE HISTOLOGY OF OVARIECTOMIZED MICE

Eva Tyas Utami, Mahriani Mahriani, Nidaul Hikmah

85-87



PDF

MATING BEHAVIOUR OF CROCIDOLOMIA PAVONANA F.

Purwatiningsih Purwatiningsih, Mirza Devara

88-90



PDF

THE DEVELOPMENT OF SUSTAINABLE RESERVE FOOD GARDEN PROGRAM'S VIDEO IN MALANG CITY

Benny Satria Wahyudi, Mimien H. I Al-Muhdhar, Sueb Sueb, Susilowati Susilowati, Endang Budiasih

92-96



PDF

EFFECT OF MEDIUM COMPOSITIONS ON THE GROWTH OF RICE (ORYZA SATIVA L. CV. CIHERANG) CALLUS



PDF

BLOOD FIGURE OF RAMBON CATTLE FED FORMULATED CONCENTRATE CONTAINING SOYBEAN CAKE, POLLARD AND CORN OIL COMBINE WITH UREA XYLANASE MOLASSES CANDY

Emy Koestanti, Romziah S., Tri Bhawono D.

101-102



PDF

STRATEGIES FOR DEVELOPMENT OF BEEF CATTLE FARMING BASED ON INNOVATION TECHNOLOGY AND FEEDING PROGRAM TO MEET SELF SUFFICIENCY IN MEAT

Romziah S., Hario P. S., Tri Bhawono D.

103-105



PDF

MODIFICATION OF BEAN SPROUT AND UREA MEDIA TO SPIRULINA PLATENSIS CULTURE

Nadya Adharani, Selly Candra Citra, Nova Bagus Hidayat, Agung Hermawan Susanto, Angga Saputra

107-110



PDF

COLLAGEN FROM SEA CUCUMBER (STICHOPUS VARIEGATUS) AS AN ALTERNATIVE SOURCE OF HALAL COLLAGEN

M. H. Khirzin, Sukarno Sukarno, N. D. Yuliana, Laily Yunita Susanti, E. Chasanah, Y. N. Fawziya

111-113



PDF

DEVELOPMENT OF NEW PRODUCT "COCOA SPIRULINA AS FUNCTIONAL FOOD"

Asmak Afriliana, Achmad Subagio, Aminah Abdullah

114-119



PDF

Indrawaty Sitepu

120-122

 PDF

EFFECT OF POMELO (CITRUS GRANDIS) ETHANOLIC EXTRACT ON ATHEROSCLEROTIC PLAQUE FORMATION

Mudzakkir Taufiqurrahman, Kiky Martha Ariesaka, Hilda Khairinnisa, Wahyu Dian Puspita, Azka Darajat, Al Munawir

124-126

 PDF

CLINICAL MANIFESTATION OF ORAL TUBERCULOSIS

Atik Kurniawati, Ni Made Mertaniasih, Mangestuti Agil

127-131

 PDF

IDENTIFICATION OF DERMATOPHYTES BY MULTIPLEX-POLYMERASE CHAIN REACTION, POLYMERASE CHAIN REACTION-RESTRICTION FRAGMENT LENGTH POLYMORPHISM ITS1-ITS4 PRIMERS AND MVAI, AND POLYMERASE CHAIN REACTION (GACA)₄ PRIMER

Rizalinda Sjahril, Firdaus Hamid, Aan Yulianingsih, Novita Prastiwi, Awaluddin Awaluddin, Siska Nuryanti, Faridha Ilyas, Burhanuddin Bahar

132-135

 PDF

IMPACT PSYCHOLOGICAL AND PSYCHO-PHYSICAL WORK DISTRESS ON TOOTH MOBILITY IN RAT MODEL

Zahreni Hamzah, Suhartono Taat Putra, Elyana Asnar STP

136-139

 PDF

ROLE OF REACTIVE OXYGEN SPECIES ON DEVELOPMENTS OF OSTEOCLASTOGENESIS IN AGING

Dyah Indartin Setyowati, Zahreni Hamzah, Zahara Meilawaty

140-143

DETERMINANT FACTOR THAT INFLUENCED ANXIETY LEVEL AND ENERGY INTAKE AMONG ELDERLY

Ninna Rohmawati

144-146

 PDF

P-CARE BPJS ACCEPTANCE MODEL IN PRIMARY HEALTH CENTERS

Hosizah Hosizah

147-150

 PDF

THE EFFORT OF TB CADRE IN THE IMPROVING OF THE SUCCESS OF TB THERAPY AND REDUCING SIDE EFFECTS OF ANTI TUBERCULOSIS DRUGS

Dewi Rokmah, Khoiron Khoiron, Elly Nurus Shakinah, Ema Rahmawati

151-152

 PDF

RISK FACTOR OF GREEN TOBACCO SICKNESS (GTS) AT THE CHILDREN ON TOBACCO PLANTATION

Dewi Rokmah, Khoiron Khoiron

153-156

 PDF

DIRECT SCATTERING PROBLEM FOR MICROWAVE TOMOGRAPHY

Agung Tjahjo Nugroho

158-161

 PDF

MICROSTRUCTURE AND MECHANICAL PROPERTIES OF DISSIMILAR JOINT OF COLD ROLLED STEEL SHEETS 1.8 SPCC-SD AND NUT WELD M6 BY SPOT WELDING

Ratna Kartikasari, Mustakim Mustakim, Joko Pitoyo, Feri Frandika

162-164

FEATURE EXTRACTION OF HEART SIGNALS USING FAST FOURIER TRANSFORM

Hindarto Hindarto, Izza Anshory, Ade Efiyan

165-167

ANALYSIS OF EL NIÑO EVENT IN 2015 AND THE IMPACT TO THE INCREASE OF HOTSPOTS IN SUMATERA AND KALIMANTAN REGION OF INDONESIA

Ardila Yananto, Saraswati Dewi

168-173

SYNTHESIS OF ZINC OXIDE (ZNO) NANOPARTICLE BY MECHANO-CHEMICAL METHOD

Siswanto Siswanto, Anita Yuliati, Mayasari Hariyanto

174-176

MODELLING DYNAMICS OF ZNO PARTICLES IN THE SPRAY PYROLYSIS REACTOR TUBE

Diky Anggoro, Melania Muntini, Im Fatimah, Sudarsono Sudarsono

177-180

THE INFLUENCE OF EXTREMELY LOW FREQUENCY (ELF) MAGNETIC FIELD EXPOSURE ON THE PROCESS OF MAKING CREAM CHEESE

Andika Kristinawati, Sudarti Sudarti

181-183

Au Grade of Epithermal Gold Ore at Paningkaban ASGM, Banyumas District, Central Java Province, Indonesia

Rika Ernawati, Arifudin Idrus, HTBM Petrus

184-187

Renewable Energy Conversion with hybrid Solar Cell and Fuel Cell

Aris Ansori, Indra Herlamba Siregar, Subuh Isnur Haryuda

188-191

Radar Absorbing Materials Double Layer From Laterite Iron Rocks And Actived Carbon Of Cassava Peel In X-Band Frequency Range

Linda Silvia, Bayu Aslama, Ega Novialent, M. Zainuri

192-194

Instantaneous Analysis Attribute for Reservoir Characterization at Basin Nova-Scotia, Canada

Ruliyanti Ruliyanti, Puguh Hiskiawan, Artoto Arkundato

195-196

Deployment Porosity Estimation of Sandstone Reservoir in The Field of Hidrocarbon Exploration Penobscot Canada

Himmah Khasanah, Puguh Hiskiawan, Supriyadi Supriyadi

197-198

Seismic Resolution Enhacement with Spectral Decomposition Attribute at Exploration Field in Canada

Illavi Praseti Pebrian, Puguh Hiskiawan, Artoto Arkundato

199-203

Simulation of I-V Characteristics of Si Diode at Difference Operating Temperature:Effect of Ionized Impurity Scattering

Siti Lailatul Arofah, Endhah Purwandari, Edy Supriyanto

Simulation of self diffusion of iron (Fe) and Chromium (Cr) in Liquid lead by Molecular Dynamic

Ernik Dwi S, Artoto Arkundato, Supriyadi Supriyadi, Heru Baskoro, Elva Nurul F

207-208

The Study of Electrical Conductance Spectroscopy of The Inner membrane of Salak

Wenny Maulina

209-210

The Accuracy Comparison of Oscilloscope and Voltmeter Utilized in Getting Dielectric Constant Values

Bowo Eko Cahyono, Misto Misto, Rofiatun Rofiatun

211-213

Window Filter (WinTer) To Capture Pollution of Lead (Pb) For Houses Near The Highway To Prevent Health Problems

Rifang Pri Asmara, Fitri Azizah, Siti Umi Afifah

214-215

Simulation of Solar Cell Diode I-V Characteristics Using Finite Element Methode: Influence of p- Layer Thickness

Greta Andika Fatma, Endhah Purwandari, Edy Supriyanto

216-217

GIS-based optimization method for utilizing coal remaining resources and post-mining land use planning: A case study of PT Adaro coal mine in South Kalimantan



Quantification Model of Qualitative Geological Data Variables for Exploration Risk Assessment in Prospect Cu-Au Porphyry Deposit Randu Kuning, Wonogiri, Central Java

Nurkhamim Nurkhamim, Arifudin Idrus, Agung Harijoko, Irwan Endrayanto, Sapto Putranto

226-231



A Sensor-Based of Detection Tools To Mitigate People Live in Areas Prone to Landslide

Satryo Budi Utomo, Januar Fery Irawan

232-236



Relocation of hypocenter using Jacobian's matrix and Jeffreys-Bullen's velocity model

Faid Muhlis, Risca Listyaningrum, Indriati Retno Palupi

237-238



Analysis Of The Geothermal Potential Based Fault Zone In Burni Telong Bener Meriah, Aceh, Indonesia

Gartika Setiya Nugraha, Marwan Marwan, Oky Ikhrallah, Susanti Alawiyah, Sutopo Sutopo

239-242



Synthesis Of Zeolites From Lombok Pumice As Silica Source For Ion Exchanger

Mega Putri K., Regina G.L. D., Ade L.N. F., Haiyina H. A., Nura H. H., Darminto Darminto

244-247



Optimisation of Extractant and Extraction Time on Portable Extractor Potentiometric Method for Determining Phosphate in Soil

Analysis of protein profile of neem leaves juice (azadirachta indica I. Juss)

I Dewa Ayu Ratna Dewanti, I Dewa Ayu Susilawati, Pujiana Endah Lestari, Roedy Budirahardjo

253-255



PDF

Hydrophobic Aerogel-Based Film Coating On Glass By Using Microwave

Poerwadi Bambang, Diah Agustina P, Christia Meidiana

256-258



PDF

Preparation and Characterization of Cacao Waste As Cacao Vinegar And Charcoal

Mohammad Wijaya, Muhammad Wiharto

259-261



PDF

The Effect of Physico-Chemical Properties of Aquatic sediment to the Distribution of Geochemical Fractions of Heavy Metals in the Sediment

Barlah Rumhayati, Catur Retnaningdyah, Novi Anitra, Ahmad Dodi Setiadi

262-265



PDF

Increased Concentration of Bioethanol by Rectification Distillation Sieve Tray Type

Yuana Susmiati, Mochamad Nuruddin

266-269



PDF

Determination of Lead in Cosmetic Sampels Using Coated Wire Lead (II) Ion Selective Electrode Based On Phyropillite

Qonitah Fardiyah, Barlah Rumhayati, Ika Rosemiyani

270-272

Pyrolysis Temperature Effect on Volume and Chemical Composition of Liquid Volatile Matter of Durian Shell

Waode O.S. Ilmawati, M. Jahiding, Waode O.S. Musnina

273-275

 PDF

High Performance Liquid Chromatography of Amino Acids Using Potentiometric Detector With A Tungsten Oxide Electrode

Yeni Maulidah Mufliah, Zulfikar Zulfikar, Siswoyo Siswoyo, Asnawati Asnawati, Qurrota Ayun

276-278

 PDF

Rainwater Treatment Using Treated Natural Zeolite and Activated Carbon Filter

Lili Mulyatna, Yonik M. Yustiani, Astri Hasbiah, Widya Yopita

279-281

 PDF

Filtration of Protein in Tempe Wastewater Using Cellulose Acetate Membrane

Dwi Indarti, Badrut Tamam Ibnu Ali, Tri Mulyono

282-284

 PDF

Image Encryption Technique Based on Pixel Exchange and XOR Operation

Kiswara A. Santoso, Fatmawati Fatmawati, Herry Suprajitno

286-288

 PDF

Fuzzy Anp Method And Internal Business Perspective For Performance Measurement In Determining Strategy SMEs

Yeni Kustiyahningsih, Eza Rahmanita, Jaka Purnama

289-294

Application of Fuzzy TOPSIS Method in Scholarship Interview

Abduh Riski, Ahmad Kamsyakawuni

295-298

The Effect of Inflation, Interest Rate, and Indonesia Composite Index (ICI) to the Performances of Mutual Fund Return and Unit Link with Panel Data Regression Modelling

Siti S. Purwaningsih, Anny Suryani, Euis Sartika

299-302

Using Logistic Regression to Estimate the Influence of Adolescent Sexual Behavior Factors on Students of Senior High School 1 Sangatta, East Kutai-East Kalimantan

Darnah Darnah, Memi Norhayati

303-306

Application Cluster Analysis on Time Series Modelling with Spatial Correlations for Rainfall Data in Jember Regency

Ira Yudistira, Alfian Futuhul Hadi, Dian Anggraeni, Budi Lestari

307-310

A Zero Crossing-Virus Evolutionary Genetic Algorithm (VEGA) to Solve Nonlinear Equations

M. Ziaul Arif, Zainul Anwar, Ahmad Kamsyakawuni

311-315

Analysis of Simultaneous Equation Model (SEM) on Non normally Response used the Method of Reduce Rank Vector Generalized Linear Models (RR-VGLM)

Miftahul Ulum, Alfian Futuhul Hadi, Dian Anggraeni

316-318

The Rainbow (1,2)-Connection Number of Exponential Graph and It's Lower Bound

Gembong A. W., Dafik Dafik, Ika Hesti Agustin, Slamin Slamin

319-320

Construction of Super H-Antimagicness of Graph by Uses a Partition Technique with Cancelation Number

Rafiantika Megahnia Prihandini, Dafik Dafik, Ika Hesti Agustin

322-324

On The Total r -dynamic Coloring of Edge Comb Product graph $G \text{ D } H$

Dwi Agustin Retno Wardani, Dafik Dafik, Antonius C. Prihandoko, Arika I. Kristiana

325-327

On The Metric Dimension with Non-isolated Resolving Number of Some Exponential Graph

S. M. Yunika, Slamin Slamin, Dafik Dafik, Kusbudiono Kusbudiono

328-330

On Total r -Dynamic Coloring of Several Classes of Graphs and Their Related Operations

Kusbudiono Kusbudiono, Desi Febriani Putri, Dafik Dafik, Arika Indah Kristiana

331-336

The Analysis of r -dynamic Vertex Colouring on Graph Operation Of Shackle

Novita Sana Susanti, Dafik Dafik

337-339

On the Rainbow Vertex Connection Number of Edge Comb of Some Graph

Agustina M., Dafik Dafik, Slamin Slamin, Kusbudiono Kusbudiono

340-342

 PDF

On the edge r-dynamic chromatic number of some related graph operations

Novian Nur Fatihah, Arika Indah Kriatiana, Ika Hesti Agustin, Dafik Dafik

343-346

 PDF

Handling Outlier In The Two Ways Table By Using Robust Ammi And Robust Factor

Kurnia Ahadiyah, Alfian Futuhul Hadi, Dian Anggraeni

347-350

 PDF

An Epidemic Model of Varicella with Vaccination

Qurrota A'yuni Ar Ruhimat, Imam Solekhudin

351-355

 PDF

The Correlation Between Perception And Behavior Of River Pollution By Communities Around Brantas Riverbank In Malang

Kuni Mawaddah, Sueb Sueb

357-359

 PDF

Isolation And Screening Of Specific Methicillin Resistant-Staphylococcus Aureus Bacteriophage From Hosiptal Waste At Banyumas

Chairunisa Fadhilah, Saefuddin Aziz, Hendro Pramono

360-364

 PDF

Co(III) as Mediator in Phenol Destruction Using Electrochemical Oxidant



PDF

Design of System Batch Injection Analysis (BIA) for Monitoring the Production of Alcohol (II)

Tri Mulyono, Dwi Indarti, Rizqon Rizqon

370-374



PDF

Preliminary Study Gold Mineralization Hosted By Metamorphic Rocks In The Southeastern Arm Of Sulawesi, Indonesia

Hasria Hasria, Arifudin Idrus, I Wayan Warmada

375-378



PDF

Resistivity Value as Characteristics Of Majapahit Kingdom Era Red Bricks

Supriyadi Supriyadi, Nurul Priyantari, Rosaria Dwi Sukmadewi

379-380



PDF

[VIEW ALL ISSUES >](#)

powered by OJS | Open Journal Systems

PKP | PUBLIC KNOWLEDGE PROJECT

High Performance Liquid Chromatography of Amino Acids Using Potentiometric Detector With A Tungsten Oxide Electrode

*Yeni Maulidah Muflihah¹, Zulfikar¹, Siswoyo¹, Asnawati¹, Qurrota Ayun¹

¹Department of Chemistry, Faculty of Mathematics and Natural Sciences, University of Jember, Indonesia

*Email: yeni.maulidah.fmipa@unej.ac.id

Abstract— High Performance Liquid Chromatography (HPLC) method combine with potentiometric detector was applied as a method for analysis of amino acids (aspartic acid, glutamic acid and arginine). The separation was carried out on a C18 column with isocratic elution of a mixture of acetonitrile and phosphat buffer. Potentiometric detector using a tungsten oxide electrode as working electrode and Ag/AgCl as reference electrode. The detection method was based on the presence of H⁺ ions from amino acids. This application was a development of previous studies that was succesfully applied to detect the presence of amino acids in batch and flow systems. Amino acid determination was characterized by its retention time. Retention time of aspartic acid, glutamic acid and arginine were as follow: 8,46; 13,0; and 15,21 minutes. The optimized separation conditions obtained at a flow rate of 1,2 mL/min with 15% acetonitrile concentration, buffer pH 6,5 with phosphat concentration of 5x10⁻⁴ M. Detector performance tested by the recovery test of samples, and the results obtained for glutamic acid, aspartic acid and arginine respectively: 89,1%, 94,9%, and 110%. Linear range obtained at 10⁻³ M to 10⁻⁷ M. Detection limit were 1,58x10⁻⁷ M for glutamic acid, 6,58x10⁻⁸ M for aspartic acid and 6,51x10⁻⁸ M for arginine.

Key words— amino acid, HPLC, tungsten electrode, potentiometry

INTRODUCTION

Liquid chromatography has become a widely used method for amino acids separation. Liquid chromatographic method often used spectrophotometric, photometric, fluorometric, mass spectroscopy and electrochemical detector [1].

UV detector was the most popular and most widely used detector. This detector are less suitable for the determination of several components that have lack of strong group chromophore, however the detection of analyte must be at high enough concentration [2]. This detector also less selective because some compounds that have the same chromophore group will also be detected by generating adjacent peaks in chromatogram. Most of amino acids do not emit light and contain a little group chromophore. Its allows the use of a UV detector directly only at low wavelengths that can affect the sensitivity and interference. Therefore, using UV spektrophotometer as a detector required more complex treatment such as reaction with other compounds, hydrolysis and derivatization of amino acids [3]. Other commonly used detector is mass spectroscopy detector. This detector is relatively expensive, although quite selective in detecting analytes.

Recently, potentiometric detection has also been used in conjunction with various method for determination of amino acid. The use of this detection method due to their extensive application areas and reliability, short analysis time, high sensitivity and selectivity [4,5,6]. Potentiometric technique has been applied using ion-selective electrodes. The use of antimony wire electrode for the determination of carboxylic acids in FIA and HPLC had also been published. Masruroh and Dewi [7,8] also published a potentiometric using tungsten oxide electrode for detecting amino acids in batch and flow system. Tungsten, has been known as one of metal that can serve as a pH indicator [9]. Chen was conducted to detect carboxylic acids with tungsten oxide is highly prospective for the potentiometric detection in flow system [10]. The use of potentiometric detector in conjunction with liquid chromatography for carboxylic acids analysis has also been published [10].

Experimental

a. Instrumentation

pH meter (Jenway), ultrasonic degasser, HPLC instrument: Waters associates models, Waters 515 pump, Rheodyne 7125 injection valve with a sample loop 20 μ L (Waters Associates, Miliford, MA). Column μ -bondapak C-18, 3,9 x 300 mm with a particle size of 10 μ m (Waters Associates), potentiometric detector: tungsten oxide electrode (working electrode), Ag/AgCl electrode (reference electrode), and the potential differences

between electrode monitored by a digital voltmeter Sanwa PC 500 connected to a PC.

b. Reagen and Solution

All reagen used were analytical grade and dissolved with distilled water. Buffer solution prepared by mixing 5x10⁻⁴ M Na₂HPO₄·2H₂O and 5x10⁻⁴ M NaH₂PO₄·2H₂O to obtain pH 5,5, pH 6,0, pH 6,5, pH 7,0 and pH 7,5 measured by Jenway pH meter. Carrier solutions were prepared by dissolving acetonitrile with distilled water and filtered by whatman membrane. Stock solutions of amino acids were prepared by dissolving aspartic acids (Merck), glutamic acids (Merck) and arginine (Merck) and adjusted with distilled water to make 1x10⁻¹M. The solutions then filtered with Whatman filter with a pore size of 0.2 μ m, and diluted to the required concentrations when necessary.

c. Preparation of Tungsten Oxides Electrodes

Preparation of tungsten oxide electrode referred to [10] as well as [9] with the following steps: tungsten rod with a diameter of 1 millimeter washed with acetone than heated in a furnace with a temperature of 500° C for 1 hour until the tungsten surface become yellow-green. Tungsten electrodes than cooled up and were stored in a solution of 1 x 10⁻³ M NaOH for 24 hours and before use, the tungsten electrode was washed with distilled water.

d. Optimization of HPLC Condition and Characterization of Tungsten Oxides Electrodes

Flow rate: the effect of flow rate was analyzed by changing the flow rate at 0,4; 0,6; 0,8; 1,0 and 1,2 mL/min. Composition of eluent (carrier) and pH of the solution was maintained constant. The optimum flow rate was obtained by plotting the variation of the flow rate of the potential (mV).

Eluent (carrier) Composition: Determine the effect of eluent composition by varying the eluent composition of 5%, 10%, 15% and 20% acetonitrile, with constant pH and flow rate. The optimum eluent composition was obtained by plotting the variation of the eluent composition on the potential (mV).

Buffer pH: Determine the effect of pH buffer solution by varying buffer pH solution at pH 5,5; 6,0; 6,5; 7,0 and 7,5, but constant eluent composition and flow rate. The optimum pH was obtained by plotting the variation of pH on the potential (mV).

Calibration curve: a series of standart solution with concentration of 10⁻³ M, 10⁻⁴ M, 10⁻⁵ M, 10⁻⁶ M, and 10⁻⁷ M was measured at optimum condition of flow rate, buffer pH and eluent composition

Reproducibility: standart solution of amino acids (glutamic acids, aspartic acids and arginine) with concentration of 10⁻³ M, 10⁻⁴ M, 10⁻⁵ M, 10⁻⁶ M, and

10^{-7} M were measured by HPLC-potentiometric detection using tungsten oxide electrode.

Recovery test: the sample used was a mixture of standard solution of glutamic acid, aspartic acid and arginine. Measurements were conducted using the optimum conditions of optimization flow rate, eluent composition and pH buffers.

RESULT AND DISCUSSION

The selectivity of separation in High Performance Liquid Chromatography (HPLC) reversed phase can be altered by changing various parameters, such as the flow rate, buffer pH, and carrier composition.

Flow rate was one of parameters that has a correlation with the retention time, so it can be used as an optimized parameter for components analysis in the sample. Retention time will be inversely proportional to the flow rate of the carrier. The slower the flow rate of the carrier, the greater the retention time. The smaller the retention time in this case did not mean the better the signal would be generated. The flow rate in the system can be used to improve the chromatographic retention time, resolution and selectivity of a separation

a. Development of the Optimum Flow rate

The results of potential difference measurements for six different flow rates used, can be seen in Figure 1. The potentiometric responses of tungsten oxide electrode and Ag/AgCl showed the optimum potential difference at flow rate of 1,2 mL/min. At this flow rate, almost all H^+ ions from amino acids were eluted and detected at the same time. The higher the H^+ ions detected at the same time, the higher the response.

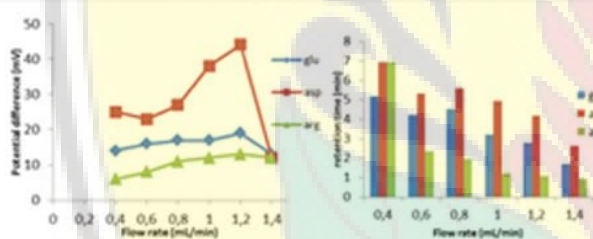


Figure 1. Effect of flow rate on potential differences and retention time of amino acids

Mobile phase (carrier) composition also affecting the separation process in HPLC. Different composition of acetonitrile-water would make different separation. Optimum separation and condition obtained by analyzing retention time and potential differences.

b. Optimum Mobile Phase Composition

Mobile phase (carrier) composition also affecting the separation process in HPLC. Different composition of acetonitrile-water would make different separation. Optimum separation and condition obtained by analyzing retention time and potential differences.

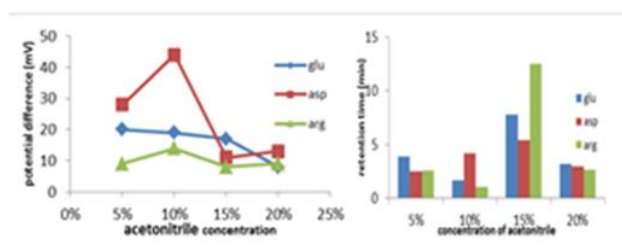


Figure 2: Effect of acetonitrile concentration on (a) potential difference and (b) retention time

Based on Figure 2, that potential differences decreased when acetonitrile concentration increased and

optimum potential difference at 10% acetonitrile. At this composition, the potential differences was high, but the retention time of aspartic acid and arginine at this concentration were close to each other. In this concentration, aspartic acid and arginine were difficult to be separated, so that the concentration of acetonitrile used was that having a large enough difference in retention time for each amino acid was at a concentration of 15%, although at different concentrations of 15% was not the optimum potential but the retention times for the three amino acids at these concentrations differ greatly.

c. Optimum PH

The influence of pH buffer on the electrode responses was investigated using a different pH of phosphat buffer (5,5 to 7,5) at concentration 5×10^{-4} M. Buffer solution can maintain the pH of the environment from the effect of the addition of a little acid/strong base, or by dilution. Buffer also can maintain the stability of the sample. In solution, amino acids are able to ionized to produce H^+ ions. The process is depends on pH of the solution.

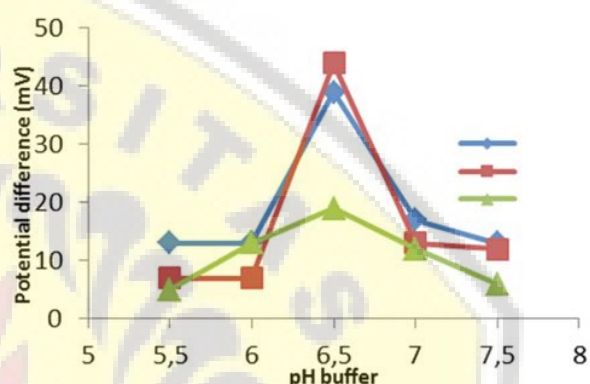


Figure 3: Effect of pH buffer to potential differences

The characteristic of an amino acid is determined by its R group. Each amino acid has a different pKa value for its R group. For aspartic acid pKa was 3,86, glutamic acid 4,25 and 12,48 for arginine. K_a shows the ionization constants of the amino acids. The greater the K_a of amino acids, the stronger the amino acid. The stronger amino acids, the greater the H^+ ions generated. Based on the data obtained, the more produce H^+ ions were aspartic acid, glutamic acid, and then the last one was arginine. So that the potential differences generated by aspartic acid was higher when compared with glutamic acid and arginine, because electrodes can detect more H^+ ions.

All of the peaks of amino acids emerge earlier and sharper if the pH is too high, and peaks the chromatograph later if the pH is too low. Optimization results show that at pH 7,0 and pH 7,5, potential differences all three amino acids decreased. At the buffer of pH 5,5, pH 6,0 and pH 6,5 the amount of H^+ ions in solution increased. Electrode will detect total H^+ ions from the buffer or from amino acids. At pH 7 and pH 7,5 buffer contained more OH^- ions than the number of H^+ ions, so that the H^+ ions are ionized from the three amino acids that will be drawn by the negative force of the buffer. As a result of H^+ ions in solution becomes slightly, so that the potential differences decreased.

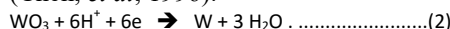
d. Potentiometric Detection in HPLC Analysis

Amino acids dissociated in water and produce H^+ ions. Tungsten coated with tungsten oxide would be very sensitive to the changes of H^+ ions concentration in solution. This pH difference will lead to different responses that occur as a result of reactions in the tungsten oxide layer, which is followed by changes in the level of oxidation of tungsten.

According to Fenster, et.al, 2008, reaction to the dependence of concentration of H^+ in tungsten oxide electrode was:



Potential difference (ΔE) obtained when the amino acids were injected based on the following reaction (Chen, *et al*, 1996):



$$\Delta E = E_2 - E_1 = \text{const.} + \frac{RT}{F} \log \left(\frac{H^+_{\text{solute}}}{H^+_{\text{buffer}}} \right) \dots\dots\dots(3)$$

Where E_2 is the peak of the potential of solute (amino acids), E_1 is the peak of the potential of buffer (phosphate buffer), H^+ buffer is the concentration of H^+ from the buffer (phosphate buffer) and H^+ solute is the concentration of H^+ from the amino acid is injected, R is the gas constant, T is temperature and F is the faraday constant. At constant pH and buffer composition, equation 3 can be simplified to:

$$\Delta E = E_2 - E_1 = \text{const.} + 0,059 \log(H^+_{\text{solute}}) \dots\dots\dots(4)$$

Based on equation 4, tungsten oxide electrode with electrode Ag/AgCl as reference provide potential difference changes linearly to the changes in the concentration of amino acids through changes in the concentration of H^+

e. Separation and Electrode Characteristics

Sensitivity based on the measurement results obtained by the slope of 4 mV / decade for glutamic acid, 8,8 mV /decade for aspartic acid and 4.3 mV /decade for arginine. Detection of $1,58 \cdot 10^{-7}$ M for glutamic acid, $6,58 \cdot 10^{-8}$ M for aspartic acid and $6,51 \cdot 10^{-8}$ M for arginine.

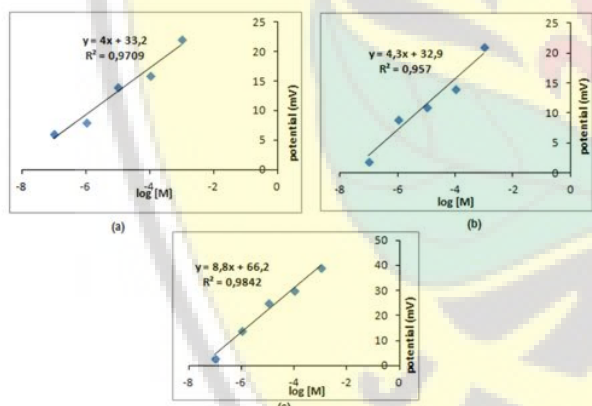


Figure 5. Calibration curve of (a) glutamic acid (b) Aspartic acid and (c) Arginine

Reproducibility is a repetition that performed between measurements in order to produce the smallest possible limit or generated data to be precise, and expressed by KV (coefficient of variation) that indicates the level of measurement error due to repetition.

Table 1 Coefficient of variation of the amino acids at different concentration

Amino acids concentration (M)	KV Arginine	KV Glutamic acids	KV Aspartic acids
10^{-7}	3,5	11,7	0,0
10^{-6}	7,7	8,7	5,0
10^{-5}	6,4	0,0	2,8
10^{-4}	0,0	4,4	2,3
10^{-3}	3,3	3,1	0,0

Recoveries of the analyte in a sample were expected above 80% (80-110%). Recovery test was used to know the sensitivity of method for separation and detection the amino acids in HPLC.

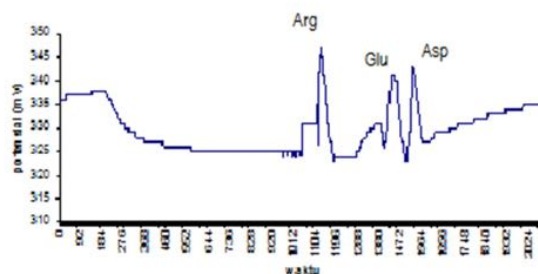


Fig 6. Chromatogram of separation of amino acids

Based on the results of the recovery test, glutamic acid recovery value was 95.9% while for aspartic acid 89.1%, and 110% for arginine. Recoveries of the analyte was affected by the sample injection technique and the separation effectiveness.

CONCLUSION

Potentiometric detector using tungsten oxide electrode was a potential detector for amino acids. Analysis of the amino acids aspartate, glutamate and arginine has a linearity of 0.9842 for aspartatic acid, 0.9709 for glutamic acid and 0.957 for arginine. Detection limit of 6.58×10^{-8} M for aspartic acids, 1.58×10^{-7} M for glutamic acid and 6.51×10^{-8} M for arginine. Flow rate, pH buffer and acetonitrile concentration affected the separation and detection of amino acids.

REFERENCES

- [1] Strydoma, D.J, Andersenb, T.T, Apostok, I, Foxd, J.W, Paxtone, R.J, Crabbf, J.w, 1993, Techniques to protein chemistry IV: Cystein and tryptophan analysis of ABRF92-AAA, Academic press, inc, pp. 279-288
- [2] Hanko, V.P, and Rohrer, J.S, 2004, Determination of amino acids in cell culture and fermentation broth media using anion-exchange chromatography with integrated pulsed amperometric detection, *Analytical Biochemistry*, vo. 324, pp. 29-38
- [3] Gomez-Ariza, J.L, Villegas-Portero, M.J, Bernal-Daza, V, 2005, Characterization and analysis of amino acids in orange juice by HPLC-MS/MS for authenticity assessment, *Analytica chimica acta*, vol.540, pp. 221-230.
- [4] Canel, E., Guitope, A., Doyan, A. and Killick, E. 2006. The determination of protonation constants of some amino acids and their ester by potentiometry in different media. *Journal of solution chemistry*, vol. 35, no.1, pp.5-19.
- [5] Wang, K, Xu, J, Tang, K, and Chen, H, 2005, Solid contact potentiometric sensors for ascorbic acids based on cobalt phthalalocyanine nanoparticles as ionosphere, *Talanta*, vol. 67, pp. 798-805
- [6] Chen, Z and Alexander, P.W. 1997. Liquid Chromatography of carboxylic acid using potentiometric detection with a tungsten oxide electrode. *Anal. Science*, 540:221-230.
- [7] Masruroh, H., 2009, Deteksi Asam Amino Secara Potensiometri Menggunakan Elektroda Tungsten Oksida dalam sistem Batch, minor theses, Jember University, unpublished
- [8] Dewi, R.N., 2009, Analisis Asam Amino Glutamat, Aspartat dan Arginin secara Flow Injection Potentiometry Menggunakan Elektroda Tungsten Oksida, minor theses, Jember University, unpublished
- [9] Monser, L, Adhoum, N, Sadok, S, 2004, Gas diffusion flow injection determination of total inorganic carbon in water using tungsten-oxide electrode, *Talanta*, vol. 62. pp. 389-394
- [10] Chen, Z and Alexander, P.W. 1996. Potentiometric detection of carboxylic acids by flow injection analysis using a tungsten oxide electrode *Anal.Science*, **332**: 187-192
- [11] Chen, Z., and Xu, J. C., 1999. Potentiometric detection of ascorbate using a graphite carbon electrode, *Anal.Science*, vol. 49, pp. 661-665