

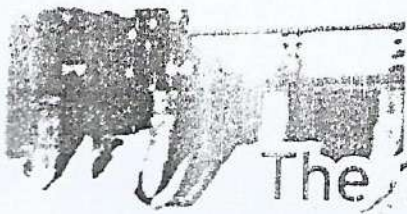


ACIKITA FOUNDATION

<http://www.acikita.org>

Proceeding

ISBN: 978-979-16415-9-3




The 1st ACIKITA International Conference of Science and Technology

Jakarta, July 25 - 27, 2011

Office:

Internasional: Tsuruma 1763-1-202, Machida-shi, Tokyo 194-0004 Japan. Telp. +81-80-4130-1327.
Indonesia: Salzburg SA-1 No.8 Kota Wisata, Cibubur. Telp. +62-21-8493-7507, +62-852-5395-6216.



**Proceedings of The 1st ACIKITA International
Conference of Science and Technology (AICST)**

**Directorate General of Higher Education (DGHE)
Building, Jakarta, July 25-27, 2011**

Editors:

Prihardi Kahar

Jumiarti Agus

Dian Akbas

Kustiariyah Tarman

Insan Iswaldi

ISBN No: 978-979-16415-9-3

September 2011@ Published by ACIKITA Publishing

Hal : Permohonan ijin
Penelitian

Yogyakarta, 24 Juni 2011

Kepada
Yth.. Ketua Program Studi Teknik Kimia
Fakultas Teknologi Industri
UPN "Veteran" Yogyakarta

Dengan hormat,

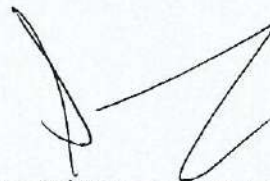
Kami yang bertanda tangan dibawah ini, Staff pengajar Program Studi Teknik Kimia, Fakultas Teknologi Industri, UPN "Veteran" Yogyakarta.

Nama : 1. Mahreni, Ir, M.T, Dr. NIP. 19610703 199303 2 001
2. Sri Suhenry, Ir, M.M. NIP. 030146756

Dengan ini mengajukan permohonan/ijin untuk sebagai pemakalah dalam The 1st ACIKITA International Conference of Science and Technology, yang adakan oleh ACIKITA Fondation, Jakarta pada tanggal 25-27 Juli 2011, dengan judul makalah: Production of (*Sacharomyces Cereviseae* FNCC-3049) in The Flour of Banana Skin Cultura in The Aerobic Condition.

Demikian, surat permohonan ini kami buat sebagaimana mestinya. Atas perhatiannya diucapkan banyak terimakasih.

Hormat kami,



Ir. Sri Suhenry, M.M
NIP 030146756



YAYASAN KESEJAHTERAAN PENDIDIKAN DAN PERUMAHAN
UNIVERSITAS PEMBANGUNAN NASIONAL "VETERAN" YOGYAKARTA

FAKULTAS TEKNOLOGI INDUSTRI
PROGRAM STUDI TEKNIK KIMIA

Jl. SWK 104 (Lingkar Utara) Condongcatur, Yogyakarta 55283
Telp (0274) 486889, (0274) 487154, (0274) 487155 Fax. (0274) 486889



SURAT TUGAS

Nomor : ST/164.a/VI/2011/PSTK

Pertimbangan : 1. Untuk meningkatkan kinerja dosen sesuai dengan Tri Dharma Perguruan Tinggi di bidang penelitian.
2. Untuk meningkatkan kualitas Sarjana Teknik Kimia, Fakultas Teknologi Industri, UPN "Veteran" Yogyakarta

Ditugaskan kepada : 1. Dr. Ir. Mahreni, M.T. NIP. 19610703 199303 2 001
2. Ir. Sri Suhenry, M.M NIP. 030146756

1. Untuk mengikuti Seminar Internasional yang diselenggarakan oleh The 1st ACIKITA International Conference of Science and Technology, yang adakan oleh ACIKITA Fondation, Jakarta pada tanggal 25-27 Juli 2011, dengan judul makalah Production of (Sacharomyces Cereviseae FNCC-3049) in The Flour of Banana Skin Cultura in The Aerobic Condition.
2. Melaksanakan tugas ini dengan sebaik-baiknya dan penuh rasa tanggung jawab.

Dikeluarkan di : Yogyakarta

Pada Tanggal : 30 Juni 2011

Ketua

Ir. Tutik Muji Setyoningrum MT
NIP. 19630924 199203 2 002

Contents

Contents	ii
Rundown Schedule of AICST	viii
Location Of AICST	xi
The Nearest Hotel From Location AICST	xii
The 1 st ACIKITA International Conference Of Science And Technology (AICST)	xiii
The Preface from Vice Ministry of National Education of Indonesia	xiv
PAPER FOR ORAL PRESENTATION	1
OP003 RESEARCHING THE EFFECT OF COOPERATIVE LEARNING METHODOLOGY ON PROGRAMMING SUBJECTS Author: Deshinta Arrova Dewi	1
OP002 REFLECTION OF A KOREAN IDENTITY CRISIS AND COLLECTIVE MEMORY IN POST-COLONIAL ERA IN THE SHORT STORY 'KAPITAN LEE' BY CHON KWANGYONG AND DECONSTRUCTION OF THE NOTION OF 'SUPPRESSED KOREAN LANGUAGE' DURING THE COLONIAL PERIOD Author: Ardhyana Rokhmah Pratiwi And Prof. Michael Kim	9
OP001 PROGRAME MODEL OF EARLY CHILDHOOD GROWTH AND DEVELOPMENT SERVICES IN PADANG CITY WEST SUMATERA PROVINCE Author: Helmizar, Rina Yennina, Denas Symond, Dini Rasjmida, Eva Yuniritha Heriyenni, Wiwit Estuti	15
OP004 ANALYSIS OF WATER AVAILABILITY ESTIMATION FOR RURAL SOURCES OF ELECTRIC ENERGY (Case Study In South Mailepet - Mentawai Regency - West Sumatera Province) Author: R. Ismu Tribowo And Novrinaldi	25
OP005 PICOHYDRO IMPLEMENTATION AT SUBANG REGENCY: PRELIMINARY STUDY OF PICOHYDRO INSTALATION FOR MEETING THE NEEDS OF RURAL ELFCTRICITY Author: Novrinaldi and Umi Hanifah	35
OP006 THE DETERMINING FACTORS OF UNEMPLOYMENT IN MALAYSIA: A REGRESSIONS MODELS Author: Gustina And Nurdianawati Irwani Abdullah	47
OP007 ANALYSIS EFFECT OF INTERNAL AND EXTERNAL FACTORS ON LECTURER ATTITUDES TOWARDS INFORMATION TECHNOLOGY AS A TOOLS OF LEARNING Author: Heri Setiawan	57
OP008 ASSESSMENT AND OPTIMIZATION OF SPACES AS THE BASIS FOR AN URBAN ECOLOGICAL NETWORK IN AN INDONESIAN CITY. Author:	64

Hari Iswoyo, Brenda Vale, Martin Bryant

- OP009 INTRA-REGIONAL TRADE IN EAST ASIA: AN EMPIRICAL STUDY ON INTRA-INDUSTRY TRADE OF FOOD INDUSTRY AND FOREIGN DIRECT INVESTMENT 78
 Author: Yuhana Astuti And Lily Kiminami
- OP010 A COMPARATIVE STUDY ON FEATURE SELECTION BETWEEN FAST CORRELATION – BASFD FILTER SOLUTION (FCBFS) AND MAINTAINING MUTUAL INFORMATION – REDUDANCY SYNERGY COEFFICIENT (MMIRSC) 87
 Author: Imelda Atastina
- OP011 HOW DOES CLIMATE VARIABILITY AFFECT HYDROPOWER AT JAVA ISLAND, INDONESIA? 93
 Author: Dody Setiawan, Akhmad Faqih
- OP012 CHLOROPHYLL: PIGMENT FOR HEALTH 99
 Author: Kusmadewi Eka Damayant , Noor Wijayahadi, Niken Puruhita
- OP013 DIVERSITY INDICES FOR QUALITATIVE CHARACTERS OF *Hoya mindorensis* Schlechter, AN INDIGENOUS PLANT OF THE PHILIPPINES 104
 Author: Sasanti Widiarsih
- OP015 DATABASE OF LAND PROFITTY MARKET VALUE DETERMINATION FOR COLLATERAL PURPOSE (Case Study: PT. Bintang Dharma Hurip Pekanbaru) 113
 Author: Qurrotul Aini, Bakri La Katjong, And Vicy Andriani
- OP016 EFFECT OF SURFACTANTS AND FERTILIZERS ADDITION AS BIOSTIMULATION METHOD FOR ENHANCING BIOREMEDIATION PROCESS OF OIL CONTAMINATED SOI 120
 Author: Sandia Primecia And Wahyu Dwi Astuti
- OP017 MUSIC RECOMMENDATION BASED ON AUDIO SIMILARITY USING K-NEAREST NEIGHBOR 124
 Author: Kadek Cahya Dewi, Luh Arida Ayu Rahning Putri
- OP018 POLYSTYRENE COMPOSITE BIPOLAR PLATES FOR PEM FUEL CELL: SYNTHESIS AND CHARACTERIZATION 133
 Author: Dewi Kusuma Arti, Lies A. Wisojodharmo, Eniya Listiani Dewi
- OP019 OXIDATION-VETIVERIA POND AS WATER TREATMENTS IN DKI JAKARTA 141
 Author: Vika Budi Riandini, Prof.I Made Djaja (Lecturer)
- OP020 A CROSS SPECIES AVIAN -HUMAN INFLUENZA EPIDEMIC MODEL: ECONOMIC TRADE-OFF ON THE DISEASE SPREAD AND CONTROLS 157
 Author: Wuryatmo Sidik, Murk Bottema, Mariusz Bajger
- OP021 EVALUATION OF HEALTH AND SAFETY APPLICATION FOR WORKERS (case Study : Implementing NIOSH And RULA In Manual Work Evaluation Based On Information Technology) 166
 Author: Tri Pujadi, Harisno, Erik Sugiarto

OP022	IN VIVO ANTIHYPERGLICEMIC TEST OF ALBEDO DURIAN (<i>Durio Zibethinus</i> M) EXTRACT ON ALOXAN-INDUCED DIABETIC WHITE RAT (<i>Rattus Norvegicus</i>) Author: F. M. Cahyani, R. Ratna, Y. D. Panggi And Y. Pravitasari	176
OP023	FOOD RESOURCES AND LOCAL KNOWLEDGE OF TOBELO DALAM PEOPLE Author: Mulyati Rahayu, Siti Susiarti & Moh.Fathi Royyani	182
OP024	IMPLEMENTATION NEURAL NETWORK TO MINE THE PATTERN OF MUTATION AVIAN FLU VIRUSES GENETHICS Author: Arie Vatresia	189
OP025	ASSESSING LEAN MANUFACTURING ACTIVITY IN INDONESIAN INDUSTRIES Author: Anita Susilawati, John Tan, David Bell And Mohammed Sarwar	197
OP026	RECONSIDERATION THE APPLICATION OF THE JAPANESE STYLE OF MANAGEMENT FOR INCREASING THE TEA INDUSTRIAL COMPETITIVENESS IN INDONESIA Author: Didik Purwadi	204
OP027	THE THREE-STEP AWARENESS BUILDING ON BIODIVERSITY FOR THE NATION'S WELFARE AT MOST Author: Ayub Torry Satriyo Kusumo	208
OP028	EFFECT OF CATALYST COUNTER ELECTRODE ON TiO ₂ -BASED DYE SENSITIZED SOLAR CELL PERFORMANCE Author: Ratno Nuryadi And Lia Aprilia	213
OP029	TECHNOLOGY OF MIX FEED PRODUCTION AND UTILIZATION OF DEEP SOIL WATER SOURCE By SUBMERSIBLE PUMP FOR DUMBO CATFISH CULTURE (Case Study At North Coast Of Subang And Indramayu) Author: R. Ismu Tribowo	218
OP030	ALCOHOLIC FERMENTATION OF SACCHAROMYCES CEREVISIAE IMPROVEMENT WITH THE ADDITION COLCHICINE TO Manihot Utilissima Pohl Author: Hasan Subekti	227
OP031	FRAGILE IMAGE WATERMARKING SCHEMES EVALUATION Author: Ekasari Nugraheni, Nova Hadi Lestriandoko, Taufiq Wirahman	232
OP032	HOW TO PROVIDE ACCURATE DATA IN TEACHER AND EDUCATION PERSONNEL DATA COLLECTION: AN APPLICATION DEVELOPMENT PROCESS Author: Sofiana Nurjanah	240
OP033	OP033 - EVALUATION OF THE AVAILABILITY FACTOR OF INFORMATION TECHNOLOGY SERVICES FOR MANUFACTURING COMPANIES Author: Herru Damarjati, Zainal A.Hasibuan	246
OP034	PRODUCTION OF (<i>Sacharomyc's cerevisiae</i>) (FNCC-3049) IN THE FLOUR OF BANANA SKIN CULTURI IN THE AEROBIC CONDITION	254

	Author: Mahreni, Sri Suhenny, Ika Ferlani, Fitri Agustina .	
OP035	CLOTH AS A FLEXIBLE PLATFORM FOR LOW-COST MICROFLUIDIC COLORIMETRIC ASSAY Author: Nilghaz, G.O.F. Parikesit, F.A. Abdul Majid, And D.H.B. Wicaksono	261
OP036	FUTUROLOGY OF BIOMARKER FOR STROKE: A REVIEW Author: Dito Anurogo And Irawan Sa riotomo	264
OP037	THE ANALYSIS OF CHINA INVESTMENT TO INDONESIA PRE- AND POST- ASEAN CHINA FREE TRADE AGREEMENT (ACFTA) Author: Agung Setiyo Wibowo, And Mansur Juned "	278
OP038	GEOGRAPHIC INFORMATION SYSTEM FOR DETERMINATION THE POTENTIAL MICRO-HYDRO DEVELOPMENT Author: Risnandar	285
OP039	BUSINESS STRATEGY DEVELOPMENT FOR GUAVA FRUIT JUICE Author: Risnandar	293
OP040	ANALYSIS OF SUPPLY CHAIN MANAGEMENT (SCM) AGRO HORTICULTURE Author: Risnandar	300
OP041	THE COMMUNICATION EFFECTIVITY OF HEALTH ELUCIDATOR OFFICER IN INCREASING HEALTHY LIFESTYLE AWARENESS OF THE CITY SOCIETY (Case Study In Mergangsan Sub-district, Yogyakarta, Indonesia) Author: Yenni Sri Utami, S.IP, M.Si	307
OP042	THE EFFECT OF MILK BASED SOY GERM PROTEIN PLUS Zn ONSUPEROXIDE DISMUTASE ACTIVITY OF METABOLIC SYNDROME WOMEN Author: Hery Winarsi, Siwi PM Wijayanti, Agus Purwanto	322
OP043	THE CHARACTERIZATION OF DIODE LASER INJECTED CURRENT: PRELIMINARY STUDY FOR MICROWAVE GENERATOR Author: Nurfina Yudasari, Wildan Panji Tresna, M.M. Suliyanti	328
OP044	EXPLAINING THE DECLINE OF PRESSURE ULCER PREVALENCE IN DUCTH GENERAL HOSPITAL AFTER 2004 Author: Yufitriana Amir, Judith Meijers, Ruud Halfens	
OP045	APPLICATION OF TECHNOLOGY OF MIX FEED PRODUCTION FOR EFFICIENCY OF CATFISH CULTURE AT NORTH COAST OF INDRAMAYU Author: Sukirno	346
OP046	SOFTWARE FOR VISUALIZATION MULTIPLE INTELLIGENCES OF STUDENTS ON MULTIPLE INTELLIGENCES TEST Author: Aa Zezen Zaenal A,S.Pd,ST,M.Cs	354
OP047	ANALYSIS OF NSAIDS, STATIN USE AND THE DEVELOPMENT OF URINARY TRACT CANCERS: A POPULATION-BASED CASE STUDY IN TAIWAN Author: David Agustriawan, Horng Jorng-Tzong, Victor Kok, Lin, Hsin-Li,	360

	Chen Yu-ching	
OP048	STAKEHOLDER APPROACH ON HOSPITAL ACCREDITATION IN INDONESIA Author: Jenny W. Badjongga IT, Simanjuntak, And Prof. Dr. Hung-En Liao	369
OP049	THE SUCCES OF INITIATION EARLY BREASTFEEDING (IEB) INFLUENCED BY TYPE LABORATORY Author: Anggorowati, Nurul Isnaini Arifah	375
OP050	CELLULASE PRODUCTION BY <i>Trichoderma reesei</i> THROUGH A SOLID SUBSTRATE FERMENTATION PROCESS Author: Sri Wahyu Murni And Siti Diyar Kholisoh	380
OP051	ANALYSIS OF SOLVENT ACCESSIBILITY IN HUMAN PROTEIN Author: Rivo K. Suoth, Yu-Ching Chen	390
OP052	DEGRADATION OF BIOWASTE LIQUID FRACTION IN ANAEROB BATCH REACTOR Author: Etih Hartati, Mindriany Syafila, Prayatni Soewondo, Marisa Handajani, Ravina R. Binol, Sylvina Dian WAP And Enri Damanhuri.	395
OP053	GLUKOMANNAN ILES-ILES (<i>Amorpophallus oncophyllus</i>) AS A FUNCTIONAL FOOD AND HYDROGEL Author: Reki Wicaksono Ashadi	406
OP054	IAINTERFACL ROLE IN C COMPLEX CATION FORMATION OF Fe(III)-PYRIDYLAZO IN LIQUID-LIQUID SYSTEM Author: Yoki Yulizar, Pity Muliawan, And Novena Damar Asri	415
OP055	EFFECT OF 1,10-PHENANTHROLINE ADDITION TO THE INTERFACIAL COMPLEXATION OF NI(II)-DITHIZONE IN HEXANE-WATER SYSTEM Author: Yoki Yulizar, Nerny Wahyuningsih, Novena Damar Asri, And Hitoshi Watarai	422
	PAPER FOR POSTER PRESENTATION	431
PP001	HEPATOPROTLCTIVE ACTIVITIES OF <i>Phyllanthus niruri</i> [L] AND ITS COMBINATION WITH SAPONIN FRACTION OF <i>Luffa acutangula</i> [L.] ROXB KERNELS ON CCL4-INDUCED ACUTE LIVER DAMAGE IN RATS Author: I Ketut Adnyana, R. Leonny Y. Hartiadi, Heni Rachmawati, Irda Fidrianny	431
PP002	EFFECTIVENESS OF INDONESIAN HONEY TOWARD ACCELERATION OF CUTANEOUS WOUND HEALING COMPARED WITH HYDROCOLLOID : AN EXPERIMENTAL STUDY IN MICE Author: Haryanto, T. Urai, K. Mukai, Suriadi, J. Sugama, T. Nakatani	432
PP003	THE PATTERN OF FARMING SYSTEMS IN THE PERIPHERY: A CASE STUDY AT MAJENANG FOREST SUBDISTRICT, WEST BANYUMAS FOREST DISTRICT Author: Ninik Setyowati And Saefudin	437
PP004	EFFECT OF CONCENTRATION AND DURATION OF COLCHICINE TREATMENTS ON GROWTH OF <i>Dendrobium linealee</i> HYBRID IN	438

	VITRO CULTURE	
	Author: Lazarus Agus Sukamto	
PP005	CHARACTERISTIC'S BETWEEN <i>Anoetochilus setaceus</i> AND <i>Anoectophilus formosanus</i> BY APPLICATION OF TDZ IN VITRO	439
	Author: Lazarus Agus Sukamto, Endah Dwi Rahayu And Edhi Sandra	
PP006	THE USE OF CITRAL TO CONTROL SOUR ROT ON ORANGES	440
	Author: Erminawati Wuryatmo, Eileen Scott, Amanda Able, Christopher Ford And Wuryatmo Sidik	
PP007	THE POTENCY OF 'BELIMBING WULUH' (<i>Averhoa belimbi</i> L.) AS MEDICINAL PLANT TO DEVELOP 'TOGA' IN JEMBER REGENCY	441
	Author: Nurul Sumiasri And Ninik Setyowati	
PP008	MEDICINAL CROPS AND ITS POTENTIAL 'N FOREST AREAS OF PUJIHARJO VILLAGE, SOUTH MALANG, EAST JAVA	442
	Author: Wardah And Francisca M. Setyowati	
PP009	ETHNOMEDICINAL OF GINSENG JAWA (<i>Talinum paniculatum</i>) AND KOLESOM (<i>Talinum triangulare</i>) IN SEVERAL REGIONS IN INDONESIA	451
	Author: Francisca Murti Setyowati And Wardah	
PP010	BIODEGRADATION OF HEAVY OIL WASTE BY <i>Salipiger</i> SP. MY7 AND <i>Bacillus altitudinis</i> MY12 USING BIOSLURRY TECHNIQUE	457
	Author: Husnileili Yusran, Mohamadnadi Yani, Suprihatin	
PP011	FUNCTIONAL DRINK OF SEA SLUG (<i>Discodoris</i> sp) AS TAURINE SOURCE	458
	Author: R. Merwita Sari Putri, Nurjanah, Kustiariyah Tarman	
PP012	FORMULATION OF ANTIOXIDANT CONTAINING RAZOR CLAM (<i>Solen</i> sp.) AND HEALTH DRINK	459
	Author: Gardenia Widyasvari, Nurjanah, And Kustiariyah Tarman	
PP013	ECOLOGICAL OF THE SAPLINGS KARIMUNJAWA NATIONAL PARK IN CENTRAL JAVA	460
	Author: Ing. Larashati	
PP014	FOREST REGENERATION ON MOUNTAINS FOREST OF MOUNT CIREMAIN NATIONAL PARK, WEST JAVA	461
	Author: Raza Yusuf And Furwaningsih	
PP015	HOMEGARDEN PLANT DIVERSITY IN UJUNGJAYA AND TAMANJAYA VILLAGES, UJUNG KULON NATIONAL PARK-BANTEN	462
	Author: Purwaningsih	
PP016	THE CORRELATION BETWEEN AGE OF PUBERTY (SPERMACHE) AND LEVEL OF KNOWLEDGE ON REPRODUCTIVE HEALTH IN ADOLESCENT BOYS OF SMP N 1 BANJARBARU	471
	Author: Ika Maulida Nurrahma Wuryatmo, Siti Wasilah And Roselina Panghiyangani	

OP034

PRODUCTION OF (*SACHAROMYCES CEREVISIAE*) (FNCC-3049) IN THE FLOUR OF BANANA SKIN CULTURE IN THE AEROBIC CONDITION

Mahreni, Sri Suhenny, Ika Ferlani, Fitri Agustina .

*Department of Chemical Engineering, Faculty of Industrial Technology
Universitas Pembangunan Nasional "Veteran" Yogyakarta
Jl. SWK. No. 104 Lingkar Utara Condong Catur Yogyakarta (55283)
mahreni_03@yahoo.com.*

ABSTRACT

Saccharomyces cerevisiae (FNCC-3049) have been produced in the flour banana skin culture in the aerobic condition at room temperature. The parameters studied were the ratio of starter to the volume of medium, to the number of cells generated. The research was conducted through several steps including: (i) the breeding, (ii) preparation of banana flour skin, (iii) hydrolysis, (iv) inoculation, (v) fermentation and (vi) separation of the product. Analysis of cell numbers using haemocytometer. Growth of cells is done by inserting inoculants into each 200 ml of sterile fermentation culture at a various ratio of starter/culture. Air flowed into the culture and the fermentation performed for 24 hours. Analysis of cell number is conducted for every 3 hours until 24 hours. After 24 hours, cells were separated by centrifugation and dried at 40°C and then weighted. At incubation time of 9 hours the number of cells found = $10^{6.11}$. In these conditions obtained dry weight of the product is 51.9052 grams.

Keyword: S. Cerevisiae, banana skin, aerobic fermentation.

INTRODUCTION

Saccharomyces cerevisiae is an important additive in the food industry and industries that produce wine and beer (alcoholic beverages) [1]. The results have shown that *S. cerevisiae* can be grown in several types of media such as glycerol, vegetable waste such as cabbage and fruit waste, [2] [3] and materials containing sugars such as molasses [4]. The content of total sugar, reducing sugar, and starches for the bananas skin in the range of 7.96, 6.85%, and 7.83% weight and contain proteins that can be used as a medium for growing cells of microorganisms is one example of the kind of baker's yeast (*Saccharomyces cerevisiae*).

Saccharomyces cerevisiae was chosen for its ability to use various types of sugar [5], has the highest digestibility properties when compared with other types of microorganisms [6], which is more tolerant of acidic environment with pH ranging from 4.5 to 5, so the process can take place in the net without having to sterile media [5]. Another report mentioned that the pH optimum growth of *Saccharomyces cerevisiae* is 3.5 to 4.5 [7], large cell diameter of about 0.0005 cm, so it can be separated from the growing medium by centrifugation without the need for coagulation phase [7], easily available and commonly used in the manufacture of bakers yeast [8]. By looking at some of the considerations above, the authors try to make bakers' yeast with the growing medium is a banana skin.

The characteristics of *Saccharomyces cerevisiae* cells are oval or round. Fixed cell shape, so it can help for identification. Cell diameter of approximately 0.0005 cm^[9] and facultative microorganisms^{[10][11]}.

Factors affecting the growth of *Saccharomyces cerevisiae* in the fermentation process are: (i) water. As with other living beings, the *Saccharomyces cerevisiae* requires water to life, grow, and reproduce. For those reasons, during the fermentation process must be available water in sufficient quantities. *Saccharomyces cerevisiae* can life in aw (water activity) in the range of 0.88 to 0.99, but also can life at aw 0.68 to 0.78^[7], (ii) Nutrients (element or compound required by yeast in order to grow and multiply), namely: C, N, F, Mg and vitamins. In the aerobic process conditions, the ratio of the elements C: N: P is 100:5:1. Optimum growth temperature of *Saccharomyces cerevisiae* is 30°C, whereas the minimum temperature is (9 -11) ° C and maximum temperature is (35-37) °C^[7].

Sufficient aeration is one of the most important factor in the production of yeast. The purpose of aeration is to supply free oxygen into the fermentation medium during the process. The amount of oxygen depends on the process of fermentation. If the process is anaerobic, it does not need free oxygen and the resulting product is alcohol. Aerobic process, requiring free oxygen and generate cells. In the anaerobic process, which lasted only glycolysis metabolism and will produce 2 moles of ATP, whereas the aerobic process, glycolysis and the Krebs cycle, both can take place in the cell and produce 38 moles of ATP. The more ATP is produced, the more cells are produced^{[8][12]}. Aeration is done by using a spurger to create the bubbles, to enlarge the surface contact between the air with the media^[13].

MATERIALS AND METHOD

The methodology describes the raw materials, auxiliary materials, equipment and the experiment. In this paper only describes the process of fermentation to produce cells in the form of active dry cell.

Materials.

Raw materials for cell growth media is green banana skin, pure cultures (*Sacharomyces cerevisiae*) (FNCC-3049), culture media starter (bean sprouts, sugar, agar, ammonium sulfate, hydrochloric acid 37 wt.%, Natrium hydroxide (NaOH) 99 wt. %). Auxiliary materials for sterilization is (alcohol 70%, paraffin liquid and sterile cotton).

Equipment.

Balance, pH sticks, microscopes, glass cover, haemocytometer, vacuum oven, thermometer and filter paper (Whatman 93). Process equipment such as knives, blenders, electric stove, stirrer, filter, autoclave, test tubes, pipettes, needle Ose, a set of glassware, shakers, aerator, flow meter, centrifuges and counter.

Experiment

The process to growth of *Saccharomyces cerevisiae* in a sterile medium (inoculation medium).

The composition of medium for cell inoculation are: 12.5 g of a Flour Banan Skin and 2.5 g for sprouts in the form of powder into a glass beaker that has been sterilized and then dissolved with aquadest until the volume of solution is 125 ml and boil for 15 minutes to obtain homogeneous solution. Furthermore, the solution is filtered and cooled. Into the solution was added 7.5 g of sugar and reboil to obtain the culture media. The solution then inserted into the reaction tubes that have been sterilized and then covered with cotton that has been soaked in paraffin. Test tube containing sterile solution then inserted into the autoclave at the temperature of 121°C for 15 minutes. Subsequently cooled to room temperature and turned in to solid. Next, to the solid media planted each two ose of pure cultures of *Saccharomyces cerevisiae* using streak plate method, and then incubated at room temperature for 48 hours. After 48 hours obtained the sub-master's culture of *Saccharomyces cerevisiae*.

Preparation of Starter

Starter made by inoculating 1 ml of pure cultures of *Saccharomyces cerevisiae* that has been dissolved into sterile medium in the 5 pieces of sterile Erlenmeyer, each of which contained the media that have the pH in the range of 3, 3.5, 4; 4.5; 5. Then incubated while shaken with a shaker at room temperature. Every 3 hours the number of cells were analyzed for up to 24 hours. The graph of the number of cells against the incubation time describe the pattern of growth of *Saccharomyces cerevisiae*. In general cases, the growth pattern consist of several phases of growth namely: lag phase, exponential phase, stationary phase and death phase. From these growth charts we could determine the optimum of pH and the optimum of incubation time, resulting in the highest of the number of *Saccharomyces cerevisiae* cells.

Materials Preparation.

Preparation of raw materials includes the production of starch and the process of hydrolysis of banana skin. Banana skin that is still quite fresh washed and peeled the outside then cut into thin pieces. After it is weight and dried under the sun to constant dry weight with water content in the range of (10-12) wt.%. The banana skin that have been dried mashed with the blender to obtained powder banana skin. The banana skin then put into sterilized jars and sealed, then stored in a dry. The process of hydrolysis conducted with mix the powdered of banana skin (1636.36 g) and aquadest (163.64 ml) then added 883.41 g of sugar and 83.95 g of ammonium sulfate, 180 ml of 10 wt.% of HCl. The mixture then heared to boiling for 30 minutes while stirring to produce slurry then cooled to room temperature. The hydrolysis take place during heating of the slurry. The slurry then filtered, obtained filtrate. The filtrate be used for starter media and fermentation media. The pH of the starter and fermentation media is a just with NaOH 99%. The variation of pH of the starter media in the range of (3, 3.5, 4; 4.5; 5). The starter media is divided into 25 pieces in the sterile Erlenmeyer, 40 ml for every erlenmeyer. While the fermentation medium is divided into 4 pieces of a sterile Erlenmeyer, 200 ml for each erlenmeyer. Furthermore, all the Erlenmeyer is closed with sterile cotton wrapped paper and sterilized in the autoclave at a

temperature of 121°C for 15 minutes and then cooled to room temperature. The result is a sterile starter media and fermentation media.

Fermentation.

The process to produce a starter is not described in this paper. Starter is a cell of *S. cerevisiae* that had been cultured in the medium of a banana skin in a small volume in order to adjust cell growth environment at this stage of fermentation. When cells were cultured directly in the fermentation media, the possibility of cells cannot grow optimally. Another goal will be achieved is to determine the optimum pH of the cell growth of *S. cerevisiae*. So in the next process is the process of fermentation, the pH of the media shall be in accordance with the optimum pH of the starter. In the fermentation process the volume ratio of starter and fermentation media was varied.

The volume ratio of starter/media was varied between (10% v 20% v 30% v, and 40% v). The volume of each medium are 200 ml. Air before entering the media of fermentation are sterilized by passing to a 10 wt.% of iodine solution. Sterile media containing starter of *S. Cerevisiae* were incubated with air flowed. The incubation carried out for 24 hours, which is taken 1 ml of solution for every 3 hours for analysis of the cell number. The number of cell plots against time of incubation to obtain the cell growth curve of *S. cerevisiae*. Growth curve is used to determine the optimum incubation time and pH that produces the highest cell number. Cells that generated then separated from fermentation broth using a centrifuge.

Harvesting Products (*Saccharomyces cerevisiae* in the form of active dry yeast).

After fermentation is complete, the cell (solid) is separated from the liquid fermentation broth) using centrifuged with the speed of 2000 rpm for 10 minutes. The solid of biomass is filtered with filter paper (Whatman 93). Filter paper was dried at 110°C and weighted until constant weight before its used. The cell on filter paper weighed using electrical balance and the residue that sticks to the filter paper dried in vacuum oven at temperature of 40°C to obtain bakers yeast in the form of active dry yeast (dry product).

Product analysis.

Methods of analysis number of cells of *Saccharomyces cerevisiae* appropriate with the standard of microbiology lab prepared by [14]. First of all prepare haemocytometer tools and glass lid, and then cleaned with alcohol for sterile. By using a needle loop, put the sample of material that has been diluted, in the middle of haemositometer. After it closes the section with a glass lid. Haemositometer then placed on a microscope and counted the number of cells in each box. Next determine the average number of cells in 32 boxes and the analysis was repeated for 3 times. The means were called \bar{Y} , so that can determine the number of cells per ml of volume. Given: Haemocytometer have a box size: the depth of 0.1 mm, area 0.0025 mm², the volume of 25 x 10⁻⁵ mm³. Each 1 ml = 1000/25. x10⁻⁵ = 40 x10⁻⁵. So that the number of cells per ml = 40 x10⁻⁵ x \bar{Y} x dilution. Dilution = 1:100

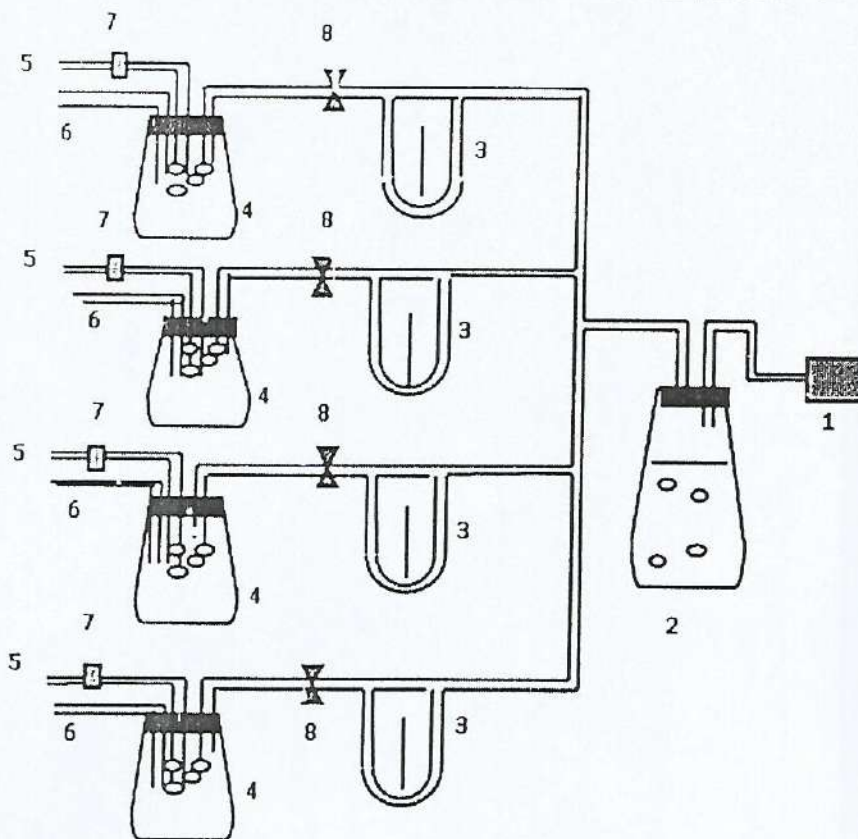


Figure 1. The equipment of fermentation (1). Aerator, (2) Erlenmeyer fill with 10 wt.% of iodide solution, (3) Flow meter, (4) Erlenmeyer with sterile media, (5) Sampler, (6) Air effluent (7) Clamp, (8) Control valve.

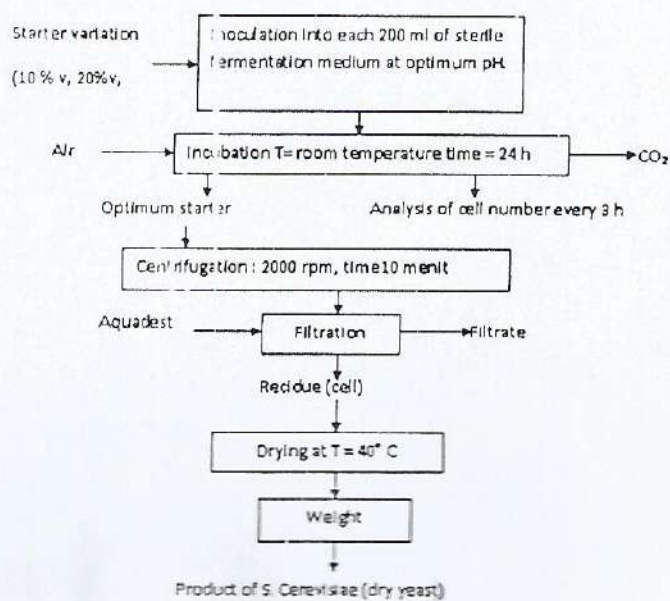


Figure 2. Flow diagram of fermentation and product separation of *S. Cerevisiae*

RESULTS AND DISCUSSION

Optimum conditions in the process of cell growth in the starter media. Two use of original cells of *S. Cerevisiae* inserted into the breeding media. Media that has been planted with seedlings placed on a shaker instrument. The temperature at room temperature. Cell growth was analyzed every 3 hours to 24 hours. The number of cell was analyzed using a haemocytometer and the data of the number of cell is shown in Table 2 and 3 at various pH between (3, 3.5, 4; 4.5; 5).

Table 2. Log number of cells of *Saccharomyces cerevisiae*/ml in the breeding of starter media at various of pH.

pH	Incubation time (h)							
	3	6	9	12	15	18	21	24
3	5.82	5.84	5.86	5.88	5.88	5.84	5.82	5.8
3,5	5.89	5.9	5.91	5.92	5.94	5.94	5.92	5.89
4	5.91	5.94	5.94	5.9	5.89	5.89	5.86	5.85
4,5	5.94	5.98	5.99	6.01	6.01	6	6	5.96
5	6.07	6.07	6.08	6.07	6.04	6.02	6.01	6

Table 3. Log number of cells of *Saccharomyces cerevisiae*/ml in the fermentation stage in the optimum pH at various starter ratio/medium.

% Volume of starter	Incubation time (h)							
	3	6	9	12	15	18	21	24
10%v	6.07	6.1	6.11	6.09	6.08	6.08	6.07	6.02
20%v	6.09	6.1	6.1	6.06	6.05	6.03	5.99	5.98
30%v	6.08	6.09	6.08	6.08	6.07	6.04	5.98	5.98
40%v	6.09	6.09	6.07	6.07	6.04	6	6	5.99

Table 2 shows that the highest number of cells obtained at pH = 5. Furthermore, the fermentation process in the medium of a banana skin with a volume of 200 ml performed at pH = 5. Variation of the % volume of the starter/media between (10%, 20%, 30% and 40%).

Table 3 shows the number of cells in each % volume of starter and the incubation time of 3 hours to 24 hours. Table 3 shows that at pH = 5 and the incubation time of nine hours obtaine the highest number of cells/ml was $10^{6.08}$. Based on literature review, the pH optimum for growth of *Saccharomyces cerevisiae* is 4.5 - 5, while the pH optimum obtained from the results of this experiment is 5. Optimum pH differences may be caused by different growth media composition with the media that usually use for *S. Cerevisiae* fermentation as well as monosaccharide as a source of food for *S. Cerevisiae*. *S. cerevisiae* grown in glucose medium showed a lower optimum pH of 4.5. The other reason when viewed from the optimum pH of enzyme produced by *Saccharomyces cerevisiae* cells in the fermentation process, namely for the enzyme amylase of 4.8 and for the enzyme invertase at 5, so that the number of cells of *Saccharomyces cerevisiae* obtained an optimum at pH = 5. Because the enzyme amylase and invertase role is to degrade starch in banana flour.

Table 3, shows that for 10 % starters, stationary phase is reached at 9 hours. The number of cells/ml equal to $10^{6.11}$ while for 40 % of starters, stationary phase is reached faster, ie at 3 h. The number of cells/ml equal to $10^{6.09}$. Based on these data, it can be concluded that the greater the % volume of the starter, then the time to reach the stationer phase is faster. After the stationer phase, that a decline in the number of cells of *Saccharomyces cerevisiae*. This is because for the 40% is not proportional to the amount of nutrients available, meaning that the limited amount of nutrients result in a decrease in the number of cells. Lack of availability of oxygen, which is due to increased in the % volume of the starter, causing the amount of oxygen required is not sufficient. So it can be concluded that 10% starter is optimum. The dry weight of cell at 10% volume of starter and at pH=5 is 51.9052 grams.

CONCLUSION

The calculation of the number of cells at any incubation time of 3 hours up to 24 hours found that the best condition at breeding starter and fermented at pH = 5 and 10 % volume of starter produce 51.9025 grams of dry weight of cells.

REFERENCES

- [1] Vrsalovic' Presec'ki A., Vasic'-Rac'ki, D. Modelling of the alcohol dehydrogenase production in baker's yeast. *Journal of Process Biochemistry*, 40: 2781-2791, (2005).
- [2] Mannazzu, I., Budronil, M., Zara, S., Zara, G., Ciani M., Comitini, F. Utilization Of Raw Glycerol From Biodiesel Industry For The Production Of Yeast Biomass and Secondary Metabolites Special Abstracts / *Journal of Biotechnology*, 150S: S1-S576, (2010).
- [3] Lo Curto, R.B., Tripodo, M.M.. Yeast production from virgin grape marc *Bioresource Technology*, 78: 5-9, (2001).
- [4] Jalaluddin A. Khan, Khalid O. Abulnaja, Taha A. Kumosani & Abou-Zeid A. Abou-Zaid. Utilization of saudi date sugars in production of baker's yeast. *Journal of Bioresource Technology*, 53: 63-66, (1995).
- [5] Stewart, G.G. and Russell. 1985. *Biology of Saccharomyces*. Dalam *Biology of Industrial Microorganism*. Cummings Publ. Inc. London.
- [6] Lipinsky, E.S. and Litchfield, J.H. 1974. *Single Cell Protein in Perspective*. *Food Technol.* 28 (5): 16-24.
- [7] Prescott and Dunn. 1959. *Industrial Microbiology*. Mc Graw Hill. New York.
- [8] Frazier, W.C. and Westhoff, D.C. 1979. *Food Microbiology*. Mc. Graw Hill Company Ltd. New Delhi.
- [9] Litchfield, J.H.. *Single Cell Protein*. *Science*, 219: 740 – 746, (1983).
- [10] Schlegel, H.G. 1994. *Mikrobiologi Umum*. Terjemahan. Gadjah Mada university Press. Yogyakarta.
- [11] Lans, W.E.M. and Graff, O.G. 1980. *Effects of Fatty Acids Structure on Yeast Cell Physiology*. Current Developments in Yeast Research Pergamon Press Oxford.
- [12] Bailey, J. E. and Ollis, D. F. 1988. *Dasar-dasar Rekayasa Biokimia*. Terjemahan PAU IPB. Bogor.
- [13] Muyanto. 2001. *Pengaruh Agensia Anti Buih Terhadap Pertumbuhan dan Produksi Saccharomyces cerevisiae*. Prosiding Seminar Nasional "Kejuangan" Teknik Kimia. UPN. Yogyakarta.
- [14] Woro, Y. dan Basuki. 1996. *Mikrobiologi: Landasan Teori Untuk Praktikum*. Lab. Fakultas Pertanian UPN "Veteran" Yogyakarta.