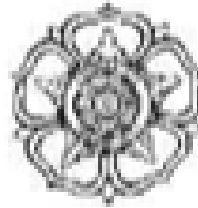


*"Bioteknologi,
Perubahan,
dan Masa Depan"*





Program Studi S2/S3 Bioteknologi
Sekolah Pascasarjana UGM

PROSIDING

*Seminar Nasional Bioteknologi IV
Universitas Gadjah Mada*

BIOTEKNOLOGI, PERUBAHAN, DAN MASA DEPAN

Sekolah Pasca Sarjana UGM, 29 Oktober 2016

KEYNOTE SPEAKERS

Prof. Bernhard Grimm
(Humboldt University Berlin, Germany)
Prof. Enoch Y. Park
(Shizuoka University, Japan)
Prof. Koji Kageyama
(Gifu University, Japan)

REMEWERS

Prof. drh. Widya Asmara, SU, Ph.D
Prof. Dr. Ir. Siti Subandiyah, M.Agr.Sc.
Ir. Donny Widiyanto, Ph.D
Dr. Rarastoeti Pratiwi, M.Sc
Dr. Yekti Asih Purwestri, M.Si Dr.
M. Saifur Rohman, M. Eng. Dr. Tri
Rini Nuringtyas, M. Sc.
Dr. Endang Semianti, M.S., M.Sc.
Dr. Woro Anindito Sri Tunjung, M.Sc.
Dr. Ir. Murwantoko, M.Si.
Dr. rer. nat. Andhika Puspito Nugroho, S.Si., M.Si.
Dr. Zuliyati Rohmah, M.Si.

Sekolah Pascasarjana Universitas Gadjah Mada
Jl. Teknika Utara, Pongung, Yogyakarta, 55281,
Telp : 0274-564239, 544075, 555881, E-mail : sps@ugm.ac.id
<http://pasca.ugm.ac.id>

YOGYAKARTA
29 OKTOBER 2016

PROSIDING SEMINAR NASIONAL BIOTEKNOLOGI IV UNIVERSITAS GADJAH MADA

Tema

Bioteknologi, Perubahan, dan Masa Depan

Sekolah Pasca Sarjana UGM, 29 Oktober 2016

- Keynote Speaker :** - Prof. Bernhard Grimm (Humboldt University Berlin, Germany)
- Prof. Enoch Y. Park (Shizuoka University, Japan)
- Prof. Koji Kageyama (Gifu University, Japan)
- Reviewer :** - Prof. drh. Widya Asmara, SU, Ph.D
- Prof. Dr. Ir. Siti Subandiyah, M.Agr.Sc.
- Ir. Donny Widiyanto, Ph.D
- Dr. Rarastoeti Pratiwi, M.Sc
- Dr. Yekti Asih Purwestri, M.Si -
Dr. M. Saifur Rohman, M. Eng. - Dr.
Tri Rini Nuringtyas, M. Sc.
- Dr. Endang Semianti, M.S., M.Sc.
- Dr. Woro Anindito Sri Tunjung, M.Sc. -
Dr. Ir. Murwantoko, M.Si.
- Dr. rer. nat. Andhika Puspito Nugroho, S.Si., M.Si. -
Dr. Zuliyati Rohmah, M.Si.
- Editor :** - Chahyaning Ardhiani
- Puput Putri Nurbasari
- Laurensia Maria Yulian
- Demas Bayu Handika
- Firasti Agung N. S.
- Cover Design dan Lay Out :** Lintang Pustaka Utama
- Cetakan I :** Agustus 2017
- Publisher :** Sekolah Pascasarjana UGM
- Alamat :** Jl. Teknik Utara, Pongung, Sleman, Yogyakarta
55281
- Email :** sps@ugm.ac.id; biotech@ugm.ac.id
- Website :** <http://pasca.ugm.ac.id/>; [//biotech.ugm.ac.id](http://biotech.ugm.ac.id)

ISBN: 978-602-8683-20-3

All right reserved

No part of this publication may be reproduced without written

BIOTEKNOLOGI permission of the publisher
UNTUK INDONESIA YANG LEBIH BAIK



KATA PENGANTAR

Puji syukur kehadiran Tuhan Yang Maha Esa sehingga penyusunan prosiding seminar dapat terselesaikan. Prosiding ini merupakan media komunikasi hasil penelitian yang telah disajikan dalam Seminar Nasional Bioteknologi IV Universitas Gadjah Mada tahun 2016. Semoga selanjutnya terwujud komunikasi yang bersinergi antara peneliti untuk memberikan sumbangsih dalam mewujudkan masa depan Indonesia yang lebih baik.

Kami mengucapkan terima kasih kepada para peneliti yang menyatakan kesediaannya agar artikel hasil penelitiannya dipublikasikan dalam prosiding seminar ini. Ucapan terimakasih juga kami sampaikan kepada para reviewer atas waktu, tenaga dan pikiran yang dicurahkan untuk menelaah artikel dari peneliti, serta tim penyusun atas jerih payahnya sehingga prosiding ini terbit.

Apabila ada kekeliruan dalam prosiding ini, kami mohon maaf yang sebesar-besarnya. Semoga informasi yang termuat dalam prosiding ini bermanfaat bagi pengembangan ilmu bioteknologi di Indonesia.

Ketua Panitia

Dr. Ir. Chusnul Hanim, M.Si.





SEMI SEMINAR NASIONAL BIOTEKNOLOGI IV
NARASIONAL BOTE INOKNO IV

PROGRAM STUDI BILALULUWALAH

UNIVERSITAS SUNAN GUNUNG DJATI BANDUNG
UNIVERSITAS GADJAH MADA
YOGYAKARTA

DAFTAR ISI

KATA PENGANTAR	ii
DAFTAR ISI	iv
KEPANITIAAN	ix
SUSUNAN ACARA	x
Uji Organoleptik dan Kesukaan Yoghurt Susu Biji Nangka (<i>Artocarpus heterophyllus</i>) dengan Perisa Alami Buah Nangka <i>Annasonia MR dan YM Lauda Feroniasanti</i>	1
Ketahanan Tanaman Cabai (<i>Capsicum annum</i> L.) Generasi Tetua (F ₀) dan Generasi Kelima (F ₅) terhadap Infeksi <i>Fusarium oxysporum</i> <i>Aprilia Dita Pawestri, Rina Sri Kasiandari, Budi Setiadi Daryono</i>	12
Viabilitas Bakteri Asam Laktat dan Khamir pada Kefir dengan Metode <i>Spray Drying</i> <i>Ayu Septi Anggraeni, Hendra Herdian, M. Faiz Karimy, Lusty Istiqomah, A. Angger Sakti, Harun Ar Rasyid</i>	28
Insidensi dan Prevalensi <i>White Spot Syndrome Virus</i> (WSSV) pada Plankton dari Sentra Budidaya Udang Vaname Supra Intensif di Kabupaten Barru <i>Bunga Rante Tampangallo dan Hertinah</i>	41
Analisis Filogenetik pada Sapi Peranakan Angus <i>Dwi Ahmad Priyadi, Yudi Adinata, Tety Hartatik</i>	57
Multipikasi Tunas <i>In Vitro</i> Jeruk Batang Bawah <i>Japansche Citroen</i> (JC) dengan Peningkatan Konsentrasi Vitamin dan Penambahan Sitokinin <i>Dyah Retno Wulandari, Aida Wulansari, Deritha Elly Rantau, Tri Muji Ermayanti</i>	68



Efek Fermentasi oleh <i>Lactobacillus plantarum</i> terhadap Kandungan Asam Amino Ampas Tahu <i>Eka Fitasari dan Budi Santosa</i>	86
Konstruksi Gen <i>cyp71AV1</i> pada Vektor pCAMBIA 1303 dan Transformasi ke dalam <i>Agrobacterium tumefaciens</i> <i>Elfahmi, Lely Sulfiani Saula, Tati Kristianti, Sony Suhandono</i>	94
Seleksi Benih dengan Seed Gravity Table untuk Meningkatkan Perkecambahan dan Pertumbuhan Bibit Piliang (<i>Acacia leucophloea</i>) <i>Etiya Sunita</i>	108
Pengaruh Waktu Maturasi Oosit Terhadap Keberhasilan Produksi Embrio Sapi Bali Secara <i>In Vitro</i> <i>Herry Sonjaya, Hasbi, Lailah Rahim, Sri Gustina, Muhammad Amin</i>	124
Pengaruh Volume Inokulum <i>Zymomonasmobilis</i> pada Produksi Bioetanol dari Kulit Pisang Kepok Kuning (<i>Musa paradisiaca</i> L.) dengan Metode Fermentasi Substrat Padat <i>Hisreidi Funome dan Retno Herrani</i>	140
Evaluasi Performa Pertumbuhan pada Keturunan Ikan Lele Mutiara Transgenik F1 <i>Ibnu Dwi Buwono</i>	150
Kadar Fe dan Zn Beras Padi Lokal Rawa Pasang Surut <i>Izhar Khairullah</i>	173
Aktivitas Penghambatan Ekstrak Etanol Rumpun Laut <i>Caulerpa</i> sp. Terhadap Jamur <i>Aspergillus flavus</i> pada Biji Jagung <i>Julyasih, KSM. dan Purnawati, A.</i>	186



Bacteriological Quality of Milk Cow in Jember Based on the Content of <i>Coliform Bacteria (Escherichia coli)</i> <i>Kennis Rozana, Dwi Wahyuni, Mochammad Iqbal</i>	194
Teknik Sterilisasi dan Regenerasi <i>In Vitro</i> Eksplan Tunas Rumpun Gajah Mini Odot (<i>Pennisetum purpureum cv. Mott</i>) <i>Marhamah Nadir, Rinaldi Sjahrir, Budiman</i>	208
Isolasi dan Seleksi Bakteri Resisten Tembaga dari Tailing PT Freeport Indonesia (PTFI) <i>Maria Massora, Emi Martani, Eko Sugiharto, Roberth Sanwom, Tumpal Sinaga</i>	217
Identifikasi dan Teknik Pengendalian Hama dan Penyakit Benih Kayu Bawang (<i>Azadirachta excelsa (Jack) Jacobs</i>) pada Benih Pasca Panen dan Perkecambahannya <i>Naning Yuniarti, Tati Suharti, Nurhasybi</i>	232
Efek Protektif Jus Campuran Buah Tropis terhadap Kualitas Sperma Tikus Putih (<i>Rattus norvegicus</i>) yang dipapar Asap Rokok <i>Novi Febrianti, Irfan Yuniarto, Haris Setiawan, Ulfiana Zahrotun Naaffah</i>	244
Penggunaan <i>Plant Preservative Mixture (PPM)</i> untuk Sterilisasi Eksplan dan Media pada Kultur <i>In Vitro</i> <i>Novi Syatria dan Jhon Firson</i>	257
Karakter Reduksi Sulfat dan Pengendapan Logam Mn Konsorsium Bakteri Pereduksi Sulfat dari Kotoran Kambing <i>Nur'aini Purnamaningsih dan Endah Retnaningrum</i>	273
Pengaruh Lama Waktu Fermentasi Terhadap Total Asam Titrasi, pH dan Karakteristik Tempoyak Menggunakan Starter Basah <i>Lactobacillus casei</i> <i>Oktaviani P. Megama dan Puspita Ratna Susilawati</i>	282



Eucalyptus pellita germplasm conservation by *in-vitro* cold storage
Reny Hayati Zul, Suharyanto, Irdi Susanti, Gustavo Lopez .. 298

Transformasi Genetik pada Tanaman Tebu (*Saccharum officinarum*) dengan Perantara *Agrobacterium tumefaciens* Strain GV3101 yang Membawa Gen Pelapor GUS
Rika Mustika dan Ery Marwani 308

Efektivitas Konsentrasi dan Lama Ko-Kultivasi *Agrobacterium tumefaciens* EHA105 (pEK B-WD) Pembawa Gen Defensin Wasabi Terhadap Pengkalusan Ekspansi Daun pada Pengembangan Krisan Tahan Penyakit Secara *In Vitro*
Rinaldi Sjahril, Feranita Haring, Muh. Riadi, Arjunayanti Amir, Trisnawaty, A.R. 322

Preparation of a New DNA Calibrator for HER-2 Scoring Application and Its PCR Test Specificity
Rismaya, Bugi Ratno Budiarto, Desriani 338

Radio - Sensitivity Callus Inpara 3 Varieties Based On The Growth And Regeneration Of Callus
Rossa Yunita, Nunul Khumaida, Didy Sopandi, Ika Mariska 350

Pertumbuhan Tunas *in vitro* dan Pembentukan Umbi Mikro Kentang Merah (*Solanum tuberosum* L.) dengan Modifikasi Unsur Hara Makro dan Peni ngkatan Konsentrasi Gula
Rudiyanto, Betalini Widhi Hapsari, Tri Muji Ermayanti .. 360

Phylogenetic Analysis of *Salmonella* spp Isolate based on *invA* Gene Sequence
Stefanus Paulus dan Charis Amarantini 378



SEMI SEMINAR NASIONAL BIOTEKNOLOGI IV
NARASIONAL BIOTEKNOLOGI IV

Organisator dan Panitia Penyelenggara

Penyaji dan Pembicara

BERITAS GADAH JADA

UNIVERSITAS JEMBAR MADA

www.beritasgadahjada.com

**Proliferasi dan Regenerasi Kalus Hasil Transformasi
GenrylA dari Tiga Varietas Padi Indica Untuk
Pembentukan Transgenik Padi Tahan Penggerek
Batang**

Suci Rahayu, Sri Koerniati, Ika Mariska..... 389





Biodegradasi <i>Remazol Brilliant Blue</i> dalam Biosystem Vertikal <i>Suyasa, W.B., N.Wirajana, G.A.D.A. Suastuti</i>	408
Manganese (Mn) Stress toward Hyperaccumulators Plants Combination (HPC) Using <i>Jatropha curcasa</i> and Lamtoro Gung (<i>L. leucocephala</i>) In Mychorrizal Addition on soybean (<i>Glycine max</i>) Seedling Stage <i>Tania Sylviana Damawan, Sri Nurhatika, Anton Muhibuddin, Dyah Agustina, Achmad Arifiyanto</i>	420
Efektifitas Enzim Pemecah Polisakarida dalam Makro-Alga <i>Ulva lactuca</i> <i>Tri Poespowati, Ali Mahmudi, Rini Kartika Dewi</i>	436
Total Asam Laktat, Protein, Lemak, Karbohidrat, dan Serat <i>Whey Kefir</i> Susu Sapi Berdasarkan Konsentrasi Starter dan Waktu Fermentasi <i>Tuti Kumiaty, Neneng Windayani, Milla Listiawati</i>	449
Gambaran Histologi Neuron Dopaminergik Substansia Nigra Pars Kompakta Tikus Putih Setelah Induksi Parakuat Diklorida Sebagai Hewan Model Penyakit Parkinson <i>Yosua Kristian Adi, Tri Wahyu Fangestiningih, Hery Wijayanto, Trini Susmiati, Ginus Partadiredja</i>	465
Karakterisasi Benih Tembesu (<i>Fagrea fragans</i>) dari Tiga Puluh Tiga Pohon Induk Asal Sumatera Selatan <i>Yulianti Bramasto, Kumiawati P.Putri, Agus Sofyan</i>	473
Impact Of Water Pollution In The Quality Of Catfish (<i>Pangasius sp.</i>) Spermatozoa <i>Wahyu Herlambang, Jamilatul Arofah, Ambarwati N. Cholifah, Fajriyatun Nufus, Yuli Winarsih, Khusnita Giarti, Wiji A. Suciati, M. Hilman F. A., Alfiah Hayati</i>	489



SEMI SEMINAR NASIONAL BIOTEKNOLOGI IV
NARASIONAL BIOTEKNOLOGI IV

UNIVERSITAS JEMBER

UNIVERSITAS JEMBER

UNIVERSITAS JEMBER

UNIVERSITAS JEMBER

UNIVERSITAS JEMBER

KEPANITIAAN

Pengarah : Prof. dr. Iwan Dwiprahasto, M.Med.Sc., Ph.D

Penanggungjawab : Prof. Ir. Suryo Purwono, MA.Sc., Ph.D :

Ketua Panitia : Dr. Chusnul Hanim, M.Si.

Sekretaris : Dr. Rarastoeti Pratiwi, M.Sc
Cahyaning Ardhiani, S.P.
Ida Ayu Preharsini Kusuma, S.Si.
Bernadia Branitamahisi, S.Si.
Ikhsan Fauzi Wiryawan, S.Si

Bendahara : Joko Budisantoso, S.Psi

Seksi Ilmiah : Dr. Yekti Asih Purwestri, M.Si
Dr. Tri Rini Nuringtyas, M.Sc
Dr. M. Saifur Rohman, M. Eng.
Puput Putri Nurbasari, S.P.
Ari Surya Sukarno, S.Pt. Demas
Bayu Handika, S.Pt. Laurensia
Maria Yulian D.D., S.Pt. Firasti
Agung N. S., S.Fam.,Apt.

Seksi Acara : Annisa Nazera Fauzia, S.Si.
Dini Astika Sari, S.Si.
Venny Kumila Andika
M. Fahmy Avicenna
Joni Kristanto
Ilfan Dwinhoven
Paryono, S.E., M.P.A.

Seksi Publikasi dan Dokumentasi:
Nasrulloh Harino A.G, S.Si
Masreza Parahadi
Santosa Pradana Putra S. N.
Stefani Santi Widhiastuti
Anqqa Dwi Prasetyo

Seksi Konsumsi : Ansiyah
Tri Purwanti
Siti Rochani, S.E.

Seksi Perlengkapan : Kaselan
Tukjo
Tomy Ruwadi, S.IP
Sujho
Istarto



**TOTAL ASAM LAKTAT, PROTEIN, LEMAK, KARBOHIDRAT,
DAN SERAT WHEY KEFIR SUSU SAPI
BERDASARKAN KONSENTRASI STARTER DAN WAKTU FERMENTASI**

**THE TOTAL OF LACTIC ACID, PROTEIN, FAT, CARBS, AND FIBER WHEY
OF COW'S MILK KEFIR STARTER BASED ON CONCENTRATION
AND TIME FERMENTATION**

Tuti Kurniati¹, Neneng Windayani², Milla Listiawati¹

¹Prodi Pendidikan Biologi, ²Prodi Pendidikan Kimia
Fakultas Tarbiyah dan Keguruan, UIN Sunan Gunung Djati
E-mail: tutikurniati1959@gmail.com

Abstrak

Whey kefir merupakan produk dari pembuatan kefir yang memiliki banyak manfaat karena mengandung zat-zat makanan yang mudah diserap oleh tubuh. Penelitian ini bertujuan untuk mengetahui total asam laktat, protein, lemak, karbohidrat, dan serat whey kefir susu sapi berdasarkan konsentrasi starter dan waktu fermentasi. Data eksperimen dikumpulkan dari sejumlah percobaan pada suhu kamar 25°C. Metode yang digunakan metode eksperimental RAL 3 x 3 dengan 3 kali ulangan, data dianalisis dengan menggunakan analisis variansi. Hasil penelitian menunjukkan kandungan asam laktat tertinggi pada konsentrasi starter 75 g dan waktu fermentasi 72 jam (d_3w_3) sebesar 0,36 unit/ml, protein tertinggi pada konsentrasi starter 75 g dan waktu fermentasi 72 jam (d_3w_3) sebesar 1,07 unit/ml, lemak tertinggi pada konsentrasi starter 25 g dan waktu fermentasi 48 jam (d_1w_2) sebesar 1,45 unit/ml, karbohidrat tertinggi pada konsentrasi starter 75 g dan waktu fermentasi 72 jam (d_3w_3) sebesar 7,96 unit/ml, dan serat tertinggi pada konsentrasi starter 25 g dan waktu fermentasi 24 jam (d_1w_1) sebesar 0,57 unit/ml. Dapat disimpulkan bahwa konsentrasi starter dan waktu fermentasi whey kefir berpengaruh nyata ($\alpha < 0,05$) pada asam laktat, lemak, karbohidrat, dan serat, serta terdapat interaksi. Sedangkan konsentrasi starter dan waktu fermentasi berpengaruh nyata ($\alpha < 0,05$) pada protein, tetapi tidak terdapat interaksi.

Kata Kunci: whey kefir, asam laktat, protein, lemak, karbohidrat, serat

Abstract

Whey kefir has many benefits that contains nutrients easily absorbed by the body. This study was to determine the total of lactic acid, protein, fat, carbohydrates, and fiber whey of cow's milk kefir starter based on concentration and fermentation time. Experimental designed was RAL 3 x 3 with 3 repetitions in room temperature 25°C. The result showed that the highest content of lactic acid at a concentration of 75 g starter and fermentation time of 72 hours (d_3w_3) was 0.36 unit/ml, the highest protein at a concentration of 75 g starter and fermentation time of 72 hours (d_3w_3) was 1.07 unit/ml, the highest fat at a concentration of 25 g starter and fermentation time of 48 hours (d_1w_2) was 1.45 unit/ml, the highest carbohydrate at a concentration of 75 g starter and fermentation time of 72 hours (d_3w_3) was 7.96 unit/ml, and the highest fiber at a concentration of 25 g starter and fermentation time of 24 hours (d_1w_1) was 0.57 unit/ml. It concludes there was an interaction and influence significantly of the concentration of whey starter and kefir fermentation time on lactic acid, fat, carbohydrate ($\alpha < 0.05$), while there was no interaction between the starter concentration and fermentation time ($\alpha < 0.05$).

Keywords: kefir whey, lactic acid, protein, fat, carbohydrates, fiber

Introduction

Kefir is a fermented dairy product using Lactic Acid Bacteria (LAB) such as *Lactobacillus lactis*, *Lactobacillus sp delbrueckii* sub. *Bulgaricus* together yeast and produce acid and ethanol. Kefir grains shaped like a bunch of tiny cauliflower, a length of about 1-3 cm, lobe-shaped, irregular blobs with white or yellowish white color and the texture is slimy but chewy. Kefir grain must be kept alive and grow by moving into fresh milk every day and allow it to grow about 20 hours, during which time period kefir grains will grow 25% more (Farnworth, 2005).

Lactic acid bacteria (LAB) plays produce lactic acid and flavor components, whereas yeast produces carbon dioxide and alcohol. That is why in addition to taste, kefir is not only sour but also there is little flavor of soda, which makes the taste more fresh (Usmiati, 2007).

Kefir has good effects on health, such as controlling cholesterol metabolism, as probiotics for animal antitumor, antibacterial, antifungal, and others (Farnworth, 2003).

Kefir contains 0.65 to 1.33 kg CO₂ per liter, 3.16 to 3.18% protein, fat 3.07 to 3.175, 1.8 to 3.8 percent lactose, ethanol 0.5-1.5% and 0.7-1.0% lactic acid (Ide, 2008)

Kefir whey formed during the process of making kefir, kefir microbes produce acids and enzymes that make the milk is separated into crud and whey the clear liquid. Protein and milk fat contained in the crud while the remaining substance contained in a solution of whey kefir fractions.

Whey kefir contains 320 K Call kefir and whey kefir protein 0.8% - 1%. In addition, whey kefir containing 65% beta-lactoglobulin, alpha laktalbumin 25%, bovine serumalbumin 8%, and immunoglobulin.

Methodology

1. Tools and materials

The tools used are: petri dish, Erlenmeyer flask, flask, test tube rack, test tubes, pipettes volumetric, pipette, an analytical balance, a measuring cylinder 100 cc, incubators, refrigerators, burette, light spirits, electric cookers, cotton, lighters, label paper, scissors, pH meter, magic com, the volume of 1000 ml plastic jar, funnel, stirrer, alcohol 70%, rubber, plastic hose diameter of 0.5 cm. As for the material used as follow.

- a. Materials used in the research are pasteurized cow's milk from Lembang
- b. Isolates Lactic acid bacteria (LAB) in the form of home of kefir of kefir grain.

2. Research methods

Making kefir by way of incubating milk with kefir grains to form two layers. Then do the filtering kefir to kefir whey kefir produced were then tested proximate based on the concentration and time to determine the nutrient content, especially protein, fat, carbohydrates, fiber, and lactic acid found in kefir whey kefir. Method is experimental stage with trials using Completely Randomized Design (CRD - in English abbreviation) factorial design is the first factor concentration d, and the second factor of time w. The pattern of 3 x 3 with three repetitions, with a concentration mokulum d respectively d₁ = 25 g, d₂ = 50 g, and d₃ = 75 g and fermentation time w respectively w₁ = 24 hours, w₂ = 48 and w₃ = 72 hours. The parameters measured were the nutritional content of kefir. While whey kefir fermentation product is lactic acid, protein, fat, carbohydrates, and fiber.

3. Data analysis

This nutrient content data based on the proximate analysis were statistically tested by analysis of variance ANAVA and if there are differences, tested further by Duncan Multiple Range Test with significance level of 5% (Sudjana, 1995).

Table 1. Combination Treatment Kefir Fermented Milk of *Whey kefir* Based *Starter* of concentration and Fermentation Time

Concentration <i>Starter</i> (d) Time of Permentation (w)	2,5 % (d ₁)			5 % (d ₂)			7,5 % (d ₃)		
	24 hours (w ₁)	1d ₁ w ₁	2d ₁ w ₁	3d ₁ w ₁	1d ₂ w ₁	2d ₂ w ₁	3d ₂ w ₁	1d ₃ w ₁	2d ₃ w ₁
48 (w ₂)	1d ₁ w ₂	2d ₁ w ₂	3d ₁ w ₂	1d ₂ w ₂	2d ₂ w ₂	3d ₂ w ₂	1d ₃ w ₂	2d ₃ w ₂	3d ₃ w ₂
72 hours (w ₃)	1d ₁ w ₃	2d ₁ w ₃	3d ₁ w ₃	1d ₂ w ₃	2d ₂ w ₃	3d ₂ w ₃	1d ₃ w ₃	2d ₃ w ₃	3d ₃ w ₃

Further testing is about proteins, fats, carbohydrates, and fiber in *whey kefir* through proximate analysis. Analysis of nutrient content were analyzed by proximate based on a modified method of (AOAC) Association of Official Agricultural Chemists (1990) for protein content, fat content, carbohydrate content, fiber content, and the content of lactic acid.

4. Place and time of Research

Research conducted at the Laboratory of Biology and Chemistry Laboratory in State Islamic University Sunan Gunung Djati.

Results and Discussion

1. Results

a. Total Lactic Acid

Lactic acid test is performed to determine the content of lactic acid *whey kefir* in milk based *starter* concentration and fermentation time, presented in Table 2 and Figure 1.

Table 2. Statistical Analysis Lactic Acid

doses	time	examination			number	mean	average	total
		1	2	3				
d1	w1	0,16	0,17	0,18	0,51	0,17		
d1	w2	0,28	0,26	0,28	0,82	0,27	0,25	2,25
d1	w3	0,26	0,36	0,30	0,92	0,31		
d2	w1	0,15	0,17	0,16	0,48	0,16		
d2	w2	0,32	0,28	0,32	0,92	0,31	0,27	2,46
d2	w3	0,35	0,37	0,34	1,06	0,35		
d3	w1	0,29	0,28	0,27	0,84	0,28		
d3	w2	0,35	0,31	0,33	0,99	0,33	0,3244	2,92
d3	w3	0,39	0,34	0,36	1,09	0,36		

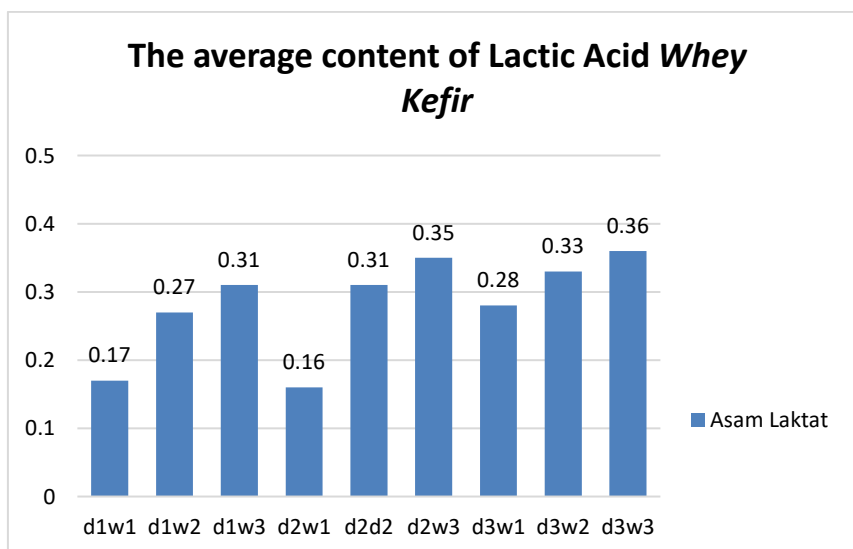


Figure1. Bar Graph Showing the Average Content of Lactic Acid *Whey Kefir* Starter Based Concentration and Fermentation Time

Table 3. Dual Direction Concentration (d) and Time (w) Lactic Acid

Treatment	w1	w2	w3	Amount	Average
d1	0,51	0,82	0,92	2,25	0,25
d2	0,48	0,92	1,06	2,46	0,27
d3	0,84	0,99	1,09	2,92	0,32
total	1,83	2,73	3,07	7,63	
average	0,20	0,30	0,34		

Treatment that produces lactic acid *starter* is the concentration of 75 g (d3) and incubated for 72 hours (w3) significantly, d3w3 is higher lactic acid content compared to other treatments.

Table 4. Analysis of Variance

source of diversity	db	JK	KT	Fhit	F Table		Information.
					0,05	0,01	
treatments	8	0,12819					
concentration (d)	2	0,02610	0,01305	24,63636	3,55	6,01	Sig. different
time (w)	2	0,09123	0,04561	86,12587	3,55	6,01	Sig. different
interaction (dw)	4	0,01086	0,00271	5,12587	2,93	4,58	Sig. different
errors	18	0,00953	0,00053				
total	26	0,14					

Results of analysis of variance shows a concentration of 75 g starter (d3) and whey kefir fermentation time of 72 hours (w3) are significant ($\alpha < 0.05$) the content of lactic acid, and there are interactions between starter concentration and Fermentation time

b. Total Protein

Tests conducted to determine the protein content of *whey kefir* milk which is based on the concentration of *starter* and fermentation time, presented in Table 5 and Figure 2.

Table 5. Statistical Analysis of Protein

doses	time	examination			amount	mean	average	total
		1	2	3				
d1	w1	0,54	0,61	0,51	1,66	0,55		
d1	w2	0,62	0,65	0,54	1,81	0,60	0,60	5,42
d1	w3	0,64	0,76	0,55	1,95	0,65		
d2	w1	0,75	0,63	0,52	1,9	0,63		
d2	w2	0,69	0,61	0,63	1,93	0,64	0,66	5,97
d2	w3	0,77	0,68	0,69	2,14	0,71		
d3	w1	0,91	0,89	0,95	2,75	0,92		
d3	w2	0,89	0,97	0,98	2,84	0,95	0,98	8,79
d3	w3	0,99	1,12	1,09	3,2	1,07		

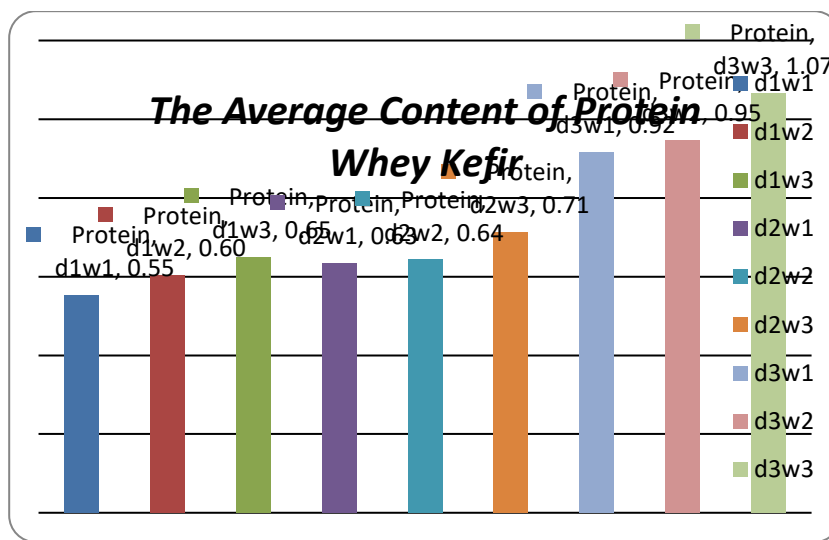


Figure 2. Graph that shows average *Whey kefir* on content of protein Based on the concentration of *Starter* and Fermentation Time

Table 6. Dual Direction of Concentration (d) and Time (w) Protein

treatment	w ₁	w ₂	w ₃	amount	average
d ₁	1,66	1,81	1,95	5,42	0,60
d ₂	1,90	1,93	2,14	5,97	0,66
d ₃	2,75	2,84	3,20	8,79	0,98
Total	6,31	6,58	7,29	20,18	
Average	0,70	0,73	0,81		

Treatment that produces the highest protein concentration starter is 75 g (d₃) and fermentation time 72 hours (w₃) significantly, d₃w₃ is higher protein content than other treatments.

Table 7. Analysis of Variance

source of diversity	Db	JK	KT	Fhit	F Table		information
					0,05	0,01	
treatment	8	0,79					
concentration(d)	2	0,73	0,36	77,15	3,55	6,01	Sig. different
time (w)	2	0,06	0,03	6,05	3,55	6,01	Sig. different
Interaction (dw)	4	0,01	0,00	0,33	2,93	4,58	Not sig. different
errors	18	0,08	0,00				
total	26	0,87					

Results of analysis of variance show a concentration of 75 g starter (d3) and whey kefir fermentation time of 72 hours (w3) significantly ($\alpha < 0.05$) on protein content, but there is no interaction between the concentration of starter fermentation time.

c. Total Fat

Fat test is performed to determine the fat content in milk of *whey kefir* which is based on the concentration of *starter* and fermentation time, presented in table 8 and Figure 3.

Table 8. Statistical analysis Fat

doses	time	experiment			amount	mean	average	total
		1	2	3				
d1	w1	1,33	1,3	1,26	3,89	1,30		
d1	w2	1,46	1,42	1,47	4,35	1,45	1,31	11,8
d1	w3	1,21	1,18	1,17	3,56	1,19		
d2	w1	1,27	1,22	1,34	3,83	1,28		
d2	w2	1,16	1,18	1,23	3,57	1,19	1,22	10,99
d2	w3	1,17	1,19	1,23	3,59	1,20		
d3	w1	1,02	1,09	1,11	3,22	1,07		
d3	w2	1,03	1,05	1,06	3,14	1,05	0,99	8,88
d3	w3	0,84	0,83	0,85	2,52	0,84		

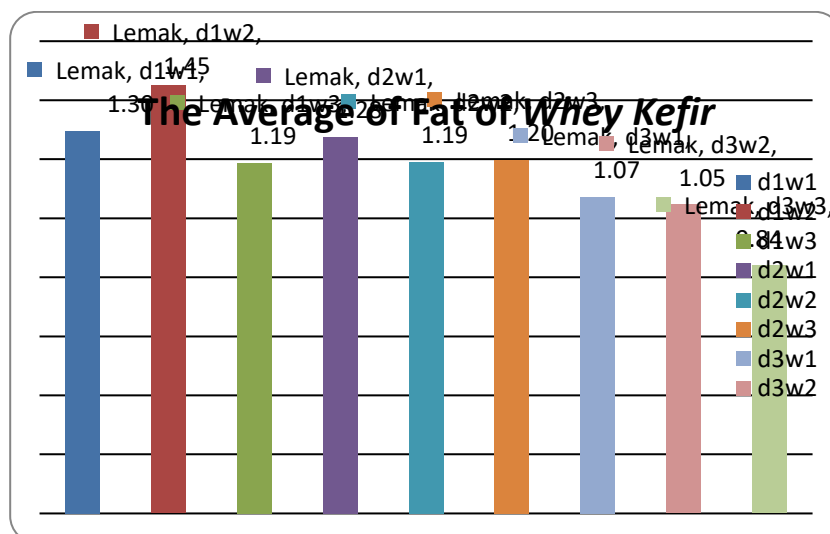


Figure 3. Graph that shows average Fat Whey Kefir Based on the concentration of Starter and Fermentation Time

Table 9. Dual Direction Concentration (d) and time (w) Fat

treatment	w1	w2	w3	amount	average
d ₁	3,89	4,35	3,56	11,80	1,31
d ₂	3,83	3,57	3,59	10,99	1,22
d ₃	3,22	3,14	2,52	8,88	0,99
total	10,94	11,06	9,67	31,67	
average	1,22	1,23	1,07		

The treatment resulted in the highest concentration of fat 25 g starter (d1) and fermentation time of 48 hours (w2) which is significantly d1w2 higher fat content than other treatments.

Table 10. Sidik Ragam

source of diversity	db	JK	KT	Fhit	F Table		
					0,05	0,01	information
treatment	8	0,72					
concentration (d)	2	0,50	0,25	210,41	3,55	6,01	Sig. different
time (w)	2	0,13	0,07	54,93	3,55	6,01	Sig. different
interaction (dw)	4	0,08	0,02	17,70	2,93	4,58	Sig. different
errors	18	0,02	0,00				
Total	26	0,74					

The analysis of variance shows a concentration of 25 g *starter* (d1) and whey kefir fermentation time of 48 hours (w2) significant effects to ($\alpha < 0.05$) fat content, and there is interaction between the concentration of *starter* fermentation time.

d. Total Carbohydrates

Tests of carbohydrates conducted to determine the content of carbohydrates in milk whey kefir based on *starter* concentration and fermentation time, presented in Table 11 and Figure 4.

Table 11. Statistical Analysis of Carbohydrates

doses	time	experiment			number	main	average	total
		1	2	3				
d1	w1	1,76	1,88	2,32	5,96	1,99		
d1	w2	5,69	5,68	5,71	17,08	5,69	4,72	42,48
d1	w3	6,43	6,49	6,52	19,44	6,48		
d2	w1	2,29	2,42	2,43	7,14	2,38		
d2	w2	5,35	5,57	5,51	16,43	5,48	5,08	45,68
d2	w3	7,34	7,45	7,32	22,11	7,37		
d3	w1	4,01	3,83	4,32	12,16	4,05		
d3	w2	5,72	5,92	5,96	17,6	5,87	5,96	53,64
d3	w3	7,91	7,98	7,99	23,88	7,96		

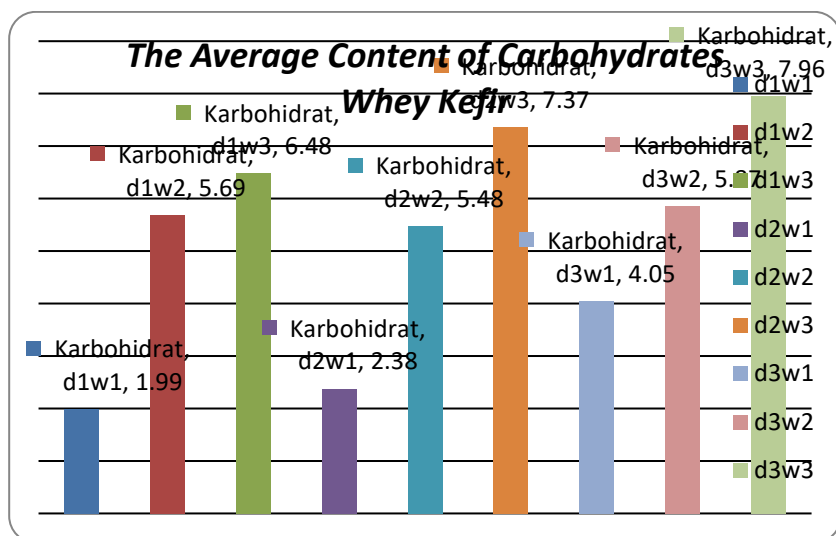


Figure 4. Chart showing Carbohydrate
Whey Kefir Starter Based on Concentration and Fermentation Time

Table 12. Dual Direction Concentration (d) and time (w) Carbohydrates

treatment	w ₁	w ₂	w ₃	number	average
d ₁	5,96	17,08	19,44	42,48	4,72
d ₂	7,14	16,43	22,11	45,68	5,08
d ₃	12,16	17,60	23,88	53,64	5,96
Total	25,26	51,11	65,43	141,80	
average	2,81	5,68	7,27		

The treatment produces the highest concentration of carbohydrates 75 g starter (D3) and fermentation time of 72 hours (w3) d3w3 significant effect to higher carbohydrate content than other treatments.

Table 13. Sidik Ragam

source of diversity	db	JK	KT	Fhit	F Table		information
					0,05	0,01	
treatment	8	102,89					
concentration (d)	2	7,34	3,67	171,05	3,55	6,01	Sig. different
Time (w)	2	92,11	46,05	2146,85	3,55	6,01	Sig. different
interaction (dw)	4	3,45	0,86	40,17	2,93	4,58	Sig. different
errors	18	0,39	0,02				
Total	26	103,28					

The analysis of variance shows a concentration of 75 g starter (D3) and *whey kefir* fermentation time of 72 hours (w3) significant effect to ($\alpha < 0.05$) against the carbohydrate content and the interaction between the concentration of *starter* fermentation time.

e. Total Fiber

Testing of fiber is performed to determine the fiber content of *whely kefir* in milk *starter* based on concentration and fermentation time, presented in Table 14 and figure 5.

14. Statistical Analysis of Fiber

doses	time	experiment			number	main	average	total
		1	2	3				
d1	w1	0,57	0,56	0,58	1,71	0,57		
d1	w2	0,29	0,24	0,26	0,79	0,26	0,37	3,36
d1	w3	0,27	0,28	0,31	0,86	0,29		
d2	w1	0,09	0,14	0,11	0,34	0,11		
d2	w2	0,21	0,18	0,19	0,58	0,19	0,15	1,37
d2	w3	0,14	0,16	0,15	0,45	0,15		
d3	w1	0,16	0,14	0,21	0,51	0,17		
d3	w2	0,07	0,12	0,08	0,27	0,09	0,11	0,98
d3	w3	0,06	0,07	0,07	0,2	0,07		

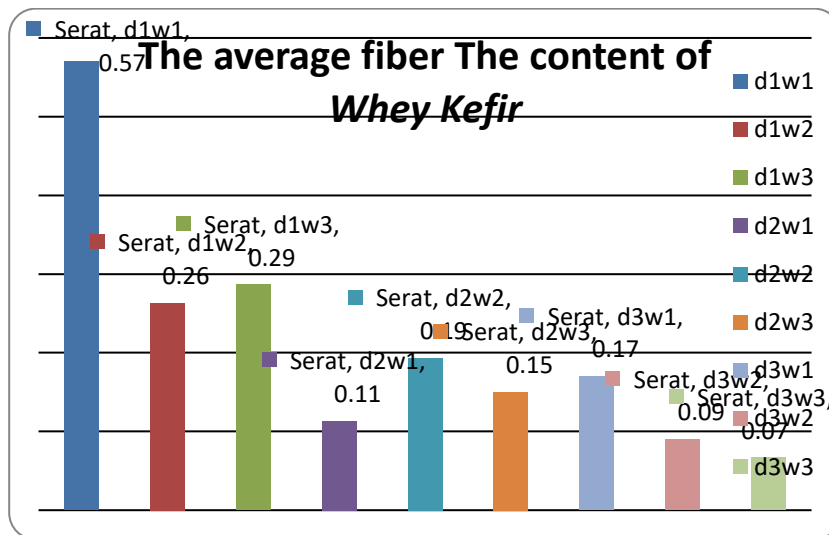


Figure 5. Graph showing Fibre *Whely kefir* Based on concentration and time *starter* Fermentation

Table 15. Dual Direction Concentration (d) and time (w) Fiber

treatment	w1	w2	w3	number	average
d ₁	1,71	0,79	0,86	3,36	0,37
d ₂	0,34	0,58	0,45	1,37	0,15
d ₃	0,51	0,27	0,20	0,98	0,11
total	2,56	1,64	1,51	5,71	
average	0,28	0,18	0,17		

The treatment produces the highest concentration of fiber 25 g starter (d1) and fermentation time with 24 hours (w1) d1w1 significant effect to higher fiber content than other treatments.

Table 16. Sidik Ragam

source of diversity	db	JK	KT	Fhit	F Table		Ket.
					0,05	0,01	
treatment	8	0,56					
concentration (d)	2	0,36	0,18	391,06	3,55	6,01	Sig. different
Time (w)	2	0,07	0,04	78,63	3,55	6,01	Sig. different
interaction (dw)	4	0,13	0,03	69,82	2,93	4,58	Sig. different
errors	18	0,01	0,00				
total	26	0,57					

The analysis of variance shows a concentration of 25 g *starter* (d1) and *whely kefir* fermentation time of 24 hours (w1) significant effect to ($\alpha < 0.05$) on the fiber content, and there is interaction between the concentration of *starter* fermentation time.

2. Discussion

The content of lactic acid in the milk whey kefir relatively rise (Figure 1). It is caused by acid-producing microbial activity that converts carbohydrates (lactose) into lactic acid. According to Magalhaes et al. (2011), lactic acid is produced from the breakdown of lactose and sucrose metabolism of carbohydrates. Under optimal conditions lactic acid bacteria (LAB) at room temperature is able to change 95% of glucose into lactic acid.

According to Ide (2008), kefir has the acidity range of 0.85% to 1%. The increase in total acid kefir is caused by BAL and mutually beneficial yeast. During the fermentation of lactose BAL changes into lactic acid, to produce ethanol.

The process of fermentation of yeast to produce ethanol and CO₂ increases, stimulated the growth of *L. bulgaricus* which produce proteolytic change proteins into peptides and amino acids (R., et al., 1992). In addition, the enzyme causes the degradation of proteins into amino acids (Cahyadi, 2006). This causes the protein content of the whey milk kefir relative increase (Figure 2). According to Buckle et al., (2007) the contents of protein is dissolved in whey ranges between 0.5-0.7%. Bahar (2008) states that kefir seeds containing khamir with protein content of about 40-60%.

Then the fermentation process causes the fat content decreased (Figure 3). Savitri (1996) states that the longer the fermentation, the proliferation of BAL will rise and cause lipase produce more fat until the hydrolysed also more and more, it could lead to a decrease in fat content.

Unlike fat, carbohydrate content is relatively increased. It is caused by the activity of the yeast enzyme that converts maltose carbohydrates into maltose. In the process of fermentation kefir, yeasts/ khamir and LAB change of complex organic molecules such as proteins, carbohydrates, and fats into simpler compounds that are soluble and high digestibility.

Conclusion

The content of lactic acid starter highest concentration of 75 g and fermentation time 72 hours (d3w3) of 0.36 units / ml. The highest protein contents of 75 g starter concentration and fermentation time of 72 hours (d3w3) of 1.07 units / ml. The highest fat contents at a concentration of 25 g starter and fermentation time of 48 hours (d1w2) was 1.45 units / ml. The highest concentration of carbohydrate is 75 g starter and fermentation time of 72 hours (d3w3) of 7.96 units / ml. The highest fiber contents of 25 g starter concentration and fermentation time of 24 hours (d1w1) of 0.57 units / ml. The

concentration of starter and fermentation time on whey kefir significantly effects ($\alpha < 0.05$) in lactic acid, fat, carbohydrates, and fiber, and there is interactions. The starter concentration and fermentation time significantly effects ($\alpha < 0.05$) in protein, but there is no interaction.

References

- AOAC. 1984. Official Methods of Analysis of the Association of Official Analytical Chemist, 14th Edition Arlington Virginia.
- Farnworth, E.R., 2003, Handbook of Fermented Functional Foods, CRC Press, USA.
- Farnworth, E.R., 2005, Kefir-A Complex Probiotic Food Research and Development Centre, Agriculture and Agrifood, Canada, ST. Hyacin the Queback, Canada.
- Ide, P. 2008. Health Secret of Kefir, Menguak Keajaiban Susu Asam untuk Penyembuhan Berbagai Penyakit. PT. Elex Media Komputindo: Jakarta.
- Murti, T.W., H. Fuadi, dan A.A. Wibowo. 2005. Analisis Senyawa Odor Susu Fermentasi. Prosiding Seminar Nasional Keamanan Pangan Produk Peternakan UGM, Yogyakarta
- Usmiati, S. 2007. Kefir, Susu Fermentasi dengan Rasa Menyegarkan, Warta Penelitian dan Pengembangan Pasca Panen Pertanian, 29 (2): 12-13.