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on Sustainable Agriculture and Food Security:
Challenges and Opportunities**

Proceeding

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FOREWORD

Agriculture as one of leading economic sectors in some countries, is currently facing many problems. This situation could be overcome by policy and institutional environment which is conducive to increase agricultural productivity while maintaining a sustainable agriculture development and food security. According to this, it is required to develop strategies, a new paradigm, and holistic approach to support the agricultural growth continuum.

In order to make a significant contribution to the better understanding of sustainable agriculture for meeting food security needs and addressing climate change challenges, an International Conference on Sustainable Agriculture and Food Security was held in Bandung Indonesia on 27-28 September 2011. This conference was organized by collaboration of four faculties in Universitas Padjadjaran: Faculty of Agriculture, Faculty of Animal Husbandry, Faculty of Fishery and Marine Science, and Faculty of Agricultural Industrial Technology. Ministry of Agriculture of Republic Indonesia and internationally well-known experts from USA, Finlandia, Singapore, Germany, Malaysia, Romania, Republic of Serbia, China as well as Indonesia were invited as resource speakers.

More than 250 participants from 15 countries attended the conference. The conference shared experiences and views regarding agricultural production in a changing environment towards sustainable agriculture development to maintain food security, and stimulated cooperative research among participating institutions.

About 180 papers are presented and the committee hopes that these papers will be a lasting record of the contributions to this conference and a useful reference for all practitioners in the fields of agriculture in general. Some of the topics presented include critical issues dealing with sustainable agriculture and food security, agrosocio-economy, agritechnology, plant sciences, animal production, and food technology. The committee would like to thank the many reviewers of the papers for their contribution to these proceedings.

The conference and proceeding would have not been accomplished without the support of many individuals, groups and academic units. We owe our gratitude to those who commit and dedicate their self to this conference.

Benny Joy
Chair of ICSAFS

CONTENTS

FOREWORD	iii
CONTENTS	v
INVITED SPEAKERS	1
New Technologies for The Improvement of Yield and Quality of Beef of Domestic Spotted Breed <i>Aleksić S., M.M. Petrović, V. Pantelić, Ž. Novaković, D. Ostojić, N. Stanišić, and M. Novaković</i>	3
The Effect of Pollution on Food Security of Floating Net Cage Aquaculture in The Lake Dhahiyat, Y.	9
Characteristics of Indonesian Lakes and Fisheries Development <i>Lehmusluoto, P.</i>	20
Opportunities for Sustainable Intensification of Agricultural Practices to Improve Crop Productivity of Small Holding Farmers in West Africa <i>Prasad, P.V. V., Jesse B. Naab, Mamadou Doumbia and Timothy Dalton</i>	30
Management of Water Saving and Organic Based Fertilizers Technology for Remediation and Maintaining The Health of Paddy Soils and to Increase The Sustainability of Rice Productivity in Indonesia <i>Simarmata, T., B.Joy and T. Turmuktini</i>	31
New Fruit Technologies in Europe <i>Stănică, F.</i>	48
Empowering Business of “Garut Sheep” for Small Holder Farmers in West Java <i>Tawaf, R., D. Heriyadi, A. Anang, M. Sulaeman and R. Hidayat</i>	58
Biotechnology to Ensure Food Security <i>Teng, P.S.</i>	64
Diversification of Food Products to Support Food Security: Development of Food Products Based on Sorghum Rice and Flour <i>Tjahjadi, C.</i>	65
Application of Genomics Approaches to Unravel The Functional Biodiversity of Farm Animals <i>Wimmers, K. and S. Ponsuksili</i>	73
Ecological Rain-Fed Agriculture in Semiarid Loess Plateau of Northwest China <i>Xiong, Y.</i>	74
Biodiversity and Variety Improvement of Crop Plant <i>Zain, S.M.</i>	75

POSTER PRESENTATION PAPERS	
SUSTAINABLE AGRICULTURE	91
Integration of SRI and Fish Farming for Food Security and Sustainable Agriculture <i>Arius, F. and E.G. Ekaputra.....</i>	<i>93</i>
Empowerment Model of the Poor in Disaster Prone Areas in Selo Sub District, Boyolali District as Effort to Realize Livestock Agrotourism <i>Emawati, S.and E.T. Rahayu.....</i>	<i>98</i>
Food Security in Indonesia: Challenge and Opportunity in Asean Region <i>Hariyati, Y. and S.Raharto</i>	<i>105</i>
Utilization of Yard to Increase Household Income and Food Security <i>Herliana, S. and Yogi</i>	<i>114</i>
Effect of Beef Cattle and Horses Feces Mixture of Biogas Formation Process on Sludge Quality <i>Hidayati, Y. A., Tb.B. A.Kurnani., and E. T. Marlina.....</i>	<i>127</i>
Effect of Beef Cattle and Horse Feces Mixture on Biogas and Sludge Productions <i>Kurnani, B.A., Y. A. Hidayati, and E. T. Marlina.....</i>	<i>132</i>
Correlation Between Implementation of Cooperative's Values with the Sustainable Business of Dairy Farmer <i>Nurlina, L.....</i>	<i>136</i>
Water Balanced Analysis to Available Growing Season at Sungai Pinang District-East Kalimantan <i>Sujalu, A. P.</i>	<i>142</i>
Optimizing Agricultural Extension to Support Food Security Program in Indonesia <i>Sugarda, T. and S. Fatimah</i>	<i>148</i>
Agriculture Land Protection in Indonesia "Challenges and Realities" <i>Sule, M. I.</i>	<i>154</i>
Agroforestry as A Sustainable Agriculture System <i>Widaningsih, D. S.</i>	<i>160</i>
Food Security in Natural Disaster Prone Area (The Case of Landslide Disaster in Cibinong Sub-District, Cianjur, West Java) <i>Wulandari, E., H. Hapsari, P.Pardian & D. Esperanza</i>	<i>165</i>
AGROSOCIO-ECONOMIC.....	173
The Trade Liberalization Effect on Smallholder Dairy Cattle in Java <i>Arief, H.</i>	<i>175</i>

Community Based Tourism Development on Eco-Culture Tourism in Tanah Datar Regency, West Sumatra <i>Avenzora, R., T. Sunarminto and N. Koesmaryandi</i>	183
A Trend Shift on Consumption Pattern of Young People From Rice to Potato and Its Determining Factors <i>Deliana, Y. and R. H. Suhardi</i>	191
The Analysis of Supply Response of Rice in Jambi Province <i>Edison, A. Mulyana, Sriati, and M. Yamin</i>	198
E-Marketing Evaluation Using Input-Process-Output Analysis (Case in Yasin HSO as Rice Organic Agent in Bekasi, West Java) <i>Fatimah, S.</i>	206
Evaluation of Extension Workers' Attitude toward Integrated Farming System in Indonesia <i>Putra, R. A. R. S., J. Udomsade, and S. Niyamangkoon</i>	212
The Broker Role in Mangosteen Marketing in Puspahieng District Tasikmalaya Regency <i>Savitri, R. and Y. Deliana</i>	222
Development of Local Knowledge Regarding Native Chicken Selection Method and Potential Productivity Test <i>Sulistiyati, M., M. Sulaeman, and K. Hidayat</i>	229
Social Capital and Adaptive Capability Farmers of Cattle in Cikatomas Subdistrict, Tasikmalaya District <i>Yunasaf, U., S. Winaryanto, and A. Sudradjat</i>	234
AGROTECHNOLOGY-PLANT	241
Assesment of Diversity of Yam (<i>Dioscorea spp</i>) and Cocoyam (<i>Xanthosoma spp</i> and <i>Colocasia spp</i>) Germplasms in Moluccas <i>Alfons, J.B., A. Rieuwpassa, and A. A. Rivaie</i>	243
Impact of Integrated Pest Management (IPM) Implementation Against Rodent's Population in the Storage of Agricultural Products (A Case Study in PT. Medion, Padalarang) <i>Bari, I. N., A. D. Permana and W.D. Natawigena</i>	252
The Success of Hand-Pollination by Using Hot-Water Emasculation Method for Three Indica Rice Cultivars <i>Carsono, N., T. Ariyanti, and M. H. Karmana</i>	259
Population Build-up of Brown Planthoppers on DB1 Transgenic and Non-Transgenic Rice Cultivars <i>Carsono, N., G. I. Prayoga, N. K. Willis, D. Dono, A. Wahyudin, D. Damayanti, M. Herman and K. Toriyama</i>	267

Cytogenetic Analysis of Sweet Potato (<i>Ipomoea batatas</i> (L.) Lam.) In West Java <i>Chandria, W., T. Setiawati, A. Natawijaya, N. Rostini, S. Amien and A. Karuniawan</i>	273
The Use of POMSC Ameliorant for Green Roselle Growth and Production <i>Daud Z. M., R. Ibrahim, A. Md. Zain and A. M. Arshad</i>	282
The Effect of Inorganic Fertilizer and Liquid Organic Fertilizer Combination on Growth and Yield of Tobacco (<i>Nicotiana tabacum</i> L.) Cultivar Nani <i>Dewi I. R.C.Suherman, and Endirifal</i>	288
Applications of N, P, K and Emas Biofertilizer on the Productivity of Lowland Rice (<i>Oryza sativa</i> L.) at Jelekong, Bandung <i>Djasmara, S., A. W. Irwan and K. Saifullah</i>	297
The Effect of <i>Barringtonia asiatica</i> L. (Kurz) (Lecythidaceae) Seed Extract on <i>Spodoptera litura</i> Fabricius (Lepidoptera: Noctuidae) <i>Dono, D., A. Purnama, and D. N. Sukatwoko</i>	301
The Conservation of Gambiers Biodiversity in West Sumatra <i>Fauza, H., I. Ferita, Nurainas, Jamsari, A. Dhalimi, A. Denian, & Murdaningsih H. K.</i> .	313
Efficacy Assessment of <i>Ocimum sanctum</i> Extract to Control Fruit Fly in the Mango Plantation <i>Handayati, W., L. Rosmaharani, Yuniastuti, and D. Sihombing</i>	320
The Application of Photoperiod, IAA, and Phosphorus Fertilizer on Growth and Seed Quality of Soybean <i>Hartawan, R.</i>	326
Screening of Microbial Antagonists for Charcoal Rot Fungus (<i>Rhizoctonia bataticola</i>) <i>Hidayah, N., T. Yulianti and K. S. Wijayanti</i>	334
Postharvest Quality of Three Roselle Varieties (UKMR-1, UKMR-2, UKMR-3) Cultivated on Terengganu Bris Soil <i>Ibrahim, R. and K. M. M. Munawar</i>	340
Influence of Flooding Levels on Changes in C, N Contents and Weight of Rice Straw in Paddy Soil <i>Isnaini, S. and A. A. Rivaie</i>	349
Effect of Date Harvesting on Quality and Quantity Characteristics in Autumn Genotypes of Rapeseed (<i>Brassica napus</i>) <i>Kasraie, P., M. Nasri, M. Khalatbari, A. Shirani Rad, J. Daneshian, H. Tohidimoghadam</i>	355
Effect of Nutrition on Insect Pollinated Tomatoes at Laboratory Scale <i>Kinasih, I., R. E. Putra, and S. Susanti</i>	359
Influence of Entomopathogenic Fungi <i>Metarhizium anisopliae</i> Infection to the Phenoloxidase Activity of <i>Oxya japonica</i> (Orthoptera : Acrididae) <i>Melanie, T. Anggraeni, W. Niloperbowo and R. E. Putra</i>	365

Exploration of Fungi Pathogen of Mangosteen (<i>Garcinia mangostana</i> L.) in Puspahiang District, Tasikmalaya Regency <i>Nasahi C., A. Randani, T. Sunarto, S. Hartati, A. Susanto, and Tohidin</i>	368
Rat Glue Trap Adhesion Made from the Mixture of Colophony, Latex and Lubricant Oil <i>Natawigena, W. D. and I. N. Bari</i>	377
Effect of Botanical Protectant Powder on <i>Callosobruchus maculatus</i> Attack in Maintaining the Viability and Vigour of Mungbean Seed After Three Months of Storage <i>Nuraini, A., M. Kadapi and Nuraini</i>	385
The Effect of Organic Fertilizer Dosage and Planting Distance on Organic Carbon, Population of Total Bacteria, Actinomycetes and Components of Rice Grain Yields (<i>Oryza sativa</i> L) Grown on Inceptisols Cilaja Bandung <i>Nurrobifahmi</i>	391
Mass Trapping <i>Oryctes rhinoceros</i> Beetle Using Light Trap on Oil Palm Plantation <i>Perdana Rozziانشa, T. A., H. Priwiratama and A. Susanto</i>	397
Biological Issues Related to the Development of Hybrid Rice in Indonesia <i>Pieter, Y.</i>	401
Kinship of Banana (<i>Musa</i> sp.) in West Java Based on Morphological and Agronomical Characters <i>Prayoga, M.K., A. Ismail, Murdaningsih H. K. and Fathunnisa</i>	408
Effect of Local Insect Pollination on Tomato Production <i>Putra, R. E., I. Kinasih and D. Raihanasyah</i>	414
Identification of Agglomeration and Critical Success Factors for Development of Fruit Cluster in West Java <i>Rizal, F. and Kastaman, R.</i>	420
Growth and Development of <i>Dendrobium spectabile</i> Orchid Protocorm as Affected by Various in Vitro Media <i>Rizky, W.H., E. Hamidin, and Nuraini</i>	430
Meristem Culture of <i>Vanda packchongblue</i> in Vitro <i>Suminar, E., A. Nuraini, S. Mubarak, Y. Supriati, R. Yunita, M. H. Situmorang</i>	438
Response of Growth, Yield and Quality of Pakchoy (<i>Brassica campestris</i> L., <i>Chinensis</i> Group) to Zeolit and Organic Fertilizer Application at Ultisol Jatinangor <i>Suradinata Y. R.¹, A. Nuraini¹, and S. Hutagalung²</i>	447
Chromosome Analysis of Wild Relative of Sweet Potato Originated from Citatah-West Java <i>Setiawati, T., Karyono, T. Supriatun, and A. Karuniawan</i>	455
Morphology Character Performance of Some Promising Clones of <i>Polianthus tuberosa</i> <i>Sihombing, D. and W. Handayati</i>	462

Genetic Variability and Phenotypic Appearance of Some Genotypes of <i>Polianthes tuberosa</i> Hybrid <i>Sihombing, D. and W. Handayati</i>	468
Mass Propagation Technique of Nucleo Polyhedral Virus (NPV)- <i>Setothosea asigna</i> <i>Simanjuntak D. and A. Susanto</i>	476
The Release of Predator <i>Menochilus sexmaculatus</i> Fabricius and <i>Paederus fuscipes</i> Curtis to Control <i>Bemisia tabaci</i> Gennadius on Hydroponic Tomato <i>Sudarjat, T. Sunarto and Y. Ginanjar</i>	480
The Use of Subsoil Added with Compost and Arbuscular Mychorrizal Fungi as Plant Medium on Growth of Palm Oil Seedling <i>Suherman C., A. Nuraini, and L. Waty</i>	489
Growth and Yield of Two Soybean Cultivars Used Seed after Three Months Storage Period <i>Sumadi</i>	497
Potency of Nematodes <i>Steinernema</i> spp. (Rhabditida : Steinernematidae) as a Controller of Fruit Fly (<i>Bactroceradorsalis</i> Complex) (Diptera : Tephritidae) <i>Sunarto, T., A. Susanto, and B. R. Amin</i>	503
Isolation and Characterization of Compounds Sex Pheromones of <i>Cylasformicarius</i> Fab. (Coleoptera: Curculionidae) <i>Susanto, A., U. Supratman, and E. Srinovianti</i>	508
Potency of Crude Extracts of Some Plants as Botanical Insecticides to Control <i>Plutella xylostella</i> larvae (Lepidoptera:Plutellidae) <i>Susniahti, N., A. Susanto, L. Djaya, and B. W. Novianti</i>	518
AGROTECHNOLOGY-SOIL	525
Could Geojute Effective to Control Erosion and Run Off on Areas With Various Land Slope? <i>Bafdal, N.</i>	527
Some Soil Chemical Properties, Nutrient Uptake and Yield of Upland Rice as Affected by Straw Compost and Phosphate Fertilizers on Ultisols Jatinangor <i>Damayani, M.</i>	534
Effect of Biofertilizer (<i>Azotobacter</i> sp. and <i>Azospirillum</i> sp.) and Water Management on Nitrogen Uptake, Growth and Yield of Paddy Rice <i>Danapriatna, N., Y. Sastro, R. Hindersah, T. Nurmala and T. Simarmata</i>	542
Characterization Phosphatase Activity of Soil Microbes and Catalytic Strength on Organic Phosphorous Mineralization <i>Fitriatin, B.N., B. Joy, and T. Subroto</i>	549

Ability of Siderophore Producing Bacteria Isolated from Leuweung Sancang and Tagog Apu to Increase Fe, Fe Absorption, Growth and Yield of Corn Grown on Calcareous Soil from Tagog Apu <i>Herdiyantoro, D., O. Mulyani and R. Hudaya</i>	559
Exploration of Soil Fungi Parasiting <i>Globodera rostochiensis</i> (Woll.) in Various Potato Cultivated Areas <i>Kalay, A. M., S. Natasasmita, T. Suganda, T. Simarmata</i>	567
Change of Some Soil Chemical Characteristics and Yield of Spinach (<i>Amaranthus tricolor</i> L.) Grown on Soil Contaminated with Pb as Affected by Organic Fertilizer <i>Mulyani, O., A. Yuniarti, S. Anggraeni</i>	574
Zn-Foliar Application Influence on Quality and Quantity Features in <i>Phaseolous vulgaris</i> under Different Levels of N and K Fertilizers <i>Nasri M., M. Khalatbari, H. A. Farahani and F. Paknejad</i>	581
Effects of Microbe and Anorganic Fertilizers on Growth and Productivity of Maize (<i>Zeamays</i>) <i>Parmiyatni, S., H. Purwanta and Nurosid</i>	589
The Effect of Azolla Dosage and Application Method on the Growth and Yield of Lowland Rice (<i>Oryza sativa</i> L.) <i>Sebayang, H. T., T. Islami and D. Salamawati</i>	596
Contribution of N ₂ -fixing Endophytic Bacteria to Increase N Content and Yield of Upland Rice Grown on Saline Soil from Indramayu <i>Setiawati, M. R., P. Suryatmana and R. Hudaya</i>	601
Steepness and Position of Slope as Important Factors in Determining Soil Water Content and Bulk Density at Pasirwangi, Garut, Indonesia <i>Siswanto, S. Y., A. Sandrawati, and Sule, M.S.</i>	606
Soil Microbial Biodiversity Distribution in Various Types of Land Use in the North Bandung <i>Solihin, M. A. and B. Natalie</i>	610
Effect of Irrigation System and NPK Fertilizer on NPK and Nickel (Ni) Uptake and Yield of Lowland Rice on Ultisols Morowali <i>Syafruddin, S. Mariam, and A. D. Suyono</i>	620
Straw Compost Application for Paddy Soil Remediation Ecosystem to Increase Rice Productivity in Subang West Java <i>Turmuktini, T., T. Simarmata, Y. Yuwariah, M. R. Setiawati and E. Kantikowati</i>	627
Microbial Diversity of the Degraded Land in Temanggung Indonesia <i>Yulianti, T., N. Hidayah, and Djajadi</i>	634

FOOD TECHNOLOGY	641
Effect of Succinic Acid and Acetic Acid Concentrations on Chemical and Physical Characteristics of Esterified Tapioca	
<i>Herawati, H., I. N. Widiasa, and Kendriyanto</i>	<i>643</i>
Emulsification of Natural Colourant from Sappan Wood (<i>Caesalpinia sappan</i> L) and Its Characterisation	
<i>Herawati, H., S. Yuliani, and N. Harimurti</i>	<i>652</i>
Microbiological Quality of Food Contact Surfaces at Selected 'Satar' Premises in Kuala Terengganu, Malaysia	
<i>Lani, M. N., M. F. M. Azmi, R. Ibrahim, R. Alias and Z. Hassan</i>	<i>658</i>
Early investigation on antibiotic susceptibility tests of <i>Escherichia coli</i> , <i>Salmonella</i> sp. and <i>Listeria</i> sp. isolated from 'Satar' in Marang, Terengganu, Malaysia	
<i>Lani, M.N., N. A. Ramli, R. Ibrahim, R. Alias and Z. Hassan.....</i>	<i>665</i>
Effects of Grilling, Chilling and Re-grilling of 'Satar' on the Survival of <i>Listeria monocytogenes</i>	
<i>Lani, M. N., S. M. Shahidi, R. Ibrahim, R. Alias and Z. Hassan.....</i>	<i>670</i>
Influence of Partial Substitution of Indigenous Flours from Breadfruit (<i>Artocarpus communis</i>) on Properties Breakfast Flakes	
<i>Luna, P, H. Herawati, and S. Widowati</i>	<i>677</i>
Some Physical Properties of Gelatin Extracted from Bone, Skin and Head of Genetically Improved Farmed Tilapia (<i>Oreochromis niloticus</i>)	
<i>Mohamad, N. J. and M. Afandi</i>	<i>684</i>
The Effect of Tofu's Liquid Waste Addition at Cocopeat Medium to Productivity and Triterpenoid Type of Lingzhi (<i>Ganoderma lucidum</i> (Fr.) Karst)	
<i>Rosianna, N., A. P. Wulandari, M. Hanafi, A. W. Sari.....</i>	<i>691</i>
Techno-economy Characteristics of Rambutan Juices	
<i>Setyadjit, A. Mustafa, and E. Sukasih</i>	<i>706</i>
Effect of Flash Evaporation to The Lipoxigenase Activity of Soybean Milk	
<i>Subroto, E., Z. Noor, & M. Astuti</i>	<i>707</i>
Predicted the Shelf Life of Rambutan Juice and Its Validation as Affected by Various Treatment	
<i>Sukasih, Ermi and Setyadjit.....</i>	<i>72221</i>
Pasteurization Technology Improvements and Packaging of Rambutan in Syrup during Storage	
<i>Sunarmani and Setyadjit.....</i>	<i>722</i>
The Influence of Hulling Efficiencies of Decorticated Grains of Sorghum and Conditioning Time by Steeping Water on Yield and Characteristics of Sorghum Flour	
<i>Tjahjadi, C., T. S. Achyar, and M.S. Gani.....</i>	<i>730</i>

ANIMAL PRODUCTION	741
The Effect of Kombucha Tea on Blood Cholesterol Level and Hemoglobin Value of Quails (<i>Coturnix coturnix japonica</i>)	
Adriani, L.	743
Identification of Endoparasite in Livestock in Pasir Biru Village Sumedang	
Harlia, E., Reginawanti, R. Sudirja, and E. T. Marlina	747
The Response of Haematological Indicators in Growing Ducks Given Phytate in Diet and Lead (Pb) in Drinking Water	
Kamil, K.A., R. Kartasudjana, and S. Iskandar	750
Acidity and Total Bacteria of Dairy Wastewater Solid and Cassava Waste Flour Mixture Fermented by <i>Aspergillus niger</i> as Broiler Feed	
Marlina, E.T., R. L. Balia, and Y. A. Hidayati	756
Glucose and Triglycerides Content of Duck Blood as The Effect of Kombucha Fermentation	
Mayasari, N., L. Adriani and A. Kurniawan	760
Nutritional Contents of Gecko's Flesh (<i>Gekko</i> spp)	
Prastiwi, A., D. Yudhabuntara, W. S. Nugroho and D. A. Widiasih	766
The Effect of Frog (<i>Rana cancrivora</i>) Cutting Waste-Product Meal in the Ration on Final Body Weight, Carcass Weight and Protein Efficiency Ratio of Broiler	
Widjastuti, T., S. Darana, and R. Siswantoyo	772
Development of a Specific Enzyme Linked ImmunoSorbent Assay (ELISA) for the Detection of Fluoroquinolone Antibiotic Residues in Chicken Liver, Prawn and Milk	
Zahid, M., A. Lee, N. Kumar, and G. Iskander	778
LIST OF PARTICIPATING INSTITUTIONS	789
LIST OF INVITED SPEAKER	792
LIST OF ORAL PRESENTER	7921
LIST OF POSTER PRESENTER	792
LIST OF PARTICIPANT	792
THE BEST OF ORAL PRESENTERS	792
THE BEST OF POSTER PRESENTERS	810
COMMITTEE	792
LIST OF SPONSORS	813

The Effect of Kombucha Tea on Blood Cholesterol Level and Hemoglobin Value Of Quails (*Cortunix cortunix japonica*)

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Abstract

Kombucha has long been known as a traditional medicine which can cure various diseases. Kombucha tea is produced by fermenting sweetened tea using symbiotic growth of fungus and bacteria. The functional properties of kombucha are related to metabolite that has been produced during fermentation process, for example glucuronic. This research aims to determine the effect of kombucha tea on blood cholesterol level, and hemoglobin value of quails. This research used completely randomized design with six treatments of Kombucha tea (0, 10, 15, 20, 25, 30%), each treatment was replicated four times. All treatments were tested for their ability to decrease the total cholesterol and hemoglobin values. The results indicated that total cholesterol levels significantly declined ($P < 0.05$) in all treatments, yet the hemoglobin value was still in the normal range

Keywords: kombucha tea, cholesterol, hemoglobin, quails

Introduction

Kombucha is a fermented tea that is often drunk for medicinal purposes. There are scientific studies that support the health benefits of Kombucha as antimicrobial (Cetojevic-Simin *et al.*, 2008; Sreeramulu *et al.*, 2000), have hepatoprotective qualities (Murugesan *et al.*, 2009) and to be antioxidative (Dipti *et al.*, 2003) are among other benefits. The active ingredients of Kombucha tea, leads to all body systems that are processed through metabolism; unlike the chemical drugs that have side effects. Kombucha tea is an active ingredient that can restored the cell walls without side effects, even to maintain the health of the drinker. Kombucha tea is a natural force that can maintain the vitality, activity, and physical and mental health. Kombucha contains multiple species of yeast and bacteria, as well as the organic acids, active enzymes, amino acids, and polyphenols produced by those microbes. Many health benefits have been reported by drinking Kombucha Tea, e.g. its cleansing properties by detoxifying and aiding the liver and kidneys to flush the toxins from the body. The health benefits of this living beverage are varied, that have been reported by others from drinking Kombucha Tea. According to Williams (2001), yeast ferments contained in kombucha tea are *Candida albicans*, *Sacharomyces* and *Pichia fermentans* while the bacterium are *Acetobacter xylinium*, *Gluconicum bacteria*, and *Acetobacter ketogenum*. The suspension is gluconic acid, gluconic acid, lactic acid, oxalic acid, butyric acid and natural antibiotics materials. In addition to producing some organic acids also produce various kinds of vitamins such as vitamin B1, B2, B3, B6, B12, B15, Vitamin C, minerals, folic acid and enzymes (Naland, 2004). Glucuronic acid is a metabolite that is produced by a healthy liver and aids in the detoxification of the body, is also present in kombucha tea. By drinking kombucha tea daily will help to prevent the body tissues from absorbing all the toxins found in our industrial environment that can lead to illness.

Kombucha tea contains most polyphenol, including flavonoids. One of the flavonoids is catechin derivatives, are antioxidants with the power 100 times higher than vitamin C and 25 times vitamin E, which is also a powerful antioxidant. Changes in LDL (Low Density Lipid) into a form that LDL oxidized by free radicals can cause damage to artery walls and increases atherosclerosis violence. Prevention mechanisms, is the ability to inhibit the absorption of cholesterol and inhibits platelet clumping cells thus preventing the blockage of blood vessels.

Drinking Kombucha Tea Fermentation (TFK) in duck, has efforts to reduce the levels of fat and cholesterol in the duck meat (Lovita, *et al.*, 2010). Fermented kombucha tea can be consumed as food supplement that offers the required compounds in stabilizing the body metabolism. Polyphenol tea is also a powerful antioxidant that can protect LDL oxidation by free radicals. According to Nishima and Freedland (1990), the addition of fermentation products can lower cholesterol levels through the mechanism of inhibiting HMG-CoA reductase enzyme activity (3-hydroxy 3-methylglutaril CoA reductase) as a producer or through the mechanism of increased cholesterol synthesis bile acids. Increased secretion of bile acids will increase the excretion of cholesterol so the cholesterol levels in the tissue decreased. Reducing cholesterol levels due to the inhibition mechanism of synthesis of HMG-CoA played by the components contained in Kombucha tea. HMG-CoA also could form mevalonat acid compound which is a precursor of cholesterol. Supplementation kombucha tea on 0.5% level of the total drinking water, have a tendency to reduced the cholesterol (Mohan *et al.*, 1996), that the total cholesterol and LDL decreased on supplementation 12.5 and 25% levels of the total drinking water, while adding kombucha tea 25% levels of the total drinking water, can increase the HDL in the blood serum, and decrease LDL (Lovita *et al.*, 2010). Thus, microorganisms, bacteria and parasites which secrete toxins in the body, such as uric acid and cholesterol, turns into substances that can dissolved in device removal and issued in the form of urine, sweat and feces (Naland, 2003), as well as the vitamins contained in Kombucha is riboflavin (vitamin B2), niacin (Vitamin B3), piridoksina (Vit B6), cyanocobalamin (vitamin B12), vitamin C, and Polyphenol. Niacin (vitamin B3) plays a role in the metabolism of fats, reduced the levels of bad cholesterol. Epigallocatechin and epicatechin gallat which is a variant of catechins (one polyphenol element) able to act as inhibitors of angiotensin-transferase enzyme that caused high blood pressure. Catechins can prevent high blood pressure, reduce the accumulation of cholesterol in the blood, accelerating the disposal of cholesterol through the feces, as well as free radicals. Catechins may reduce the risk of cardiovascular disease (Anonymous, 2001)

Materials and Methods

The research used 100quails, with average weigh 150 – 170 gram, age 1.5 years The quails kept in the cage, as much as 5 flock, and each unit consist 5 quails, and repeated four times. The ration consist of 16% protein and metabolizable energy 2900 kcal/kg. The formula rations were:

- R0 Control diets
- R1 Diets contain 10% of kombucha
- R2 Diets contain 15% of kombucha
- R3 Diets contain 20% of kombucha
- R4 Diets contain 25% of kombucha
- R5 Diets contain 30% of kombucha

Results and Discussion

1. Effect Treatment on Blood Cholesterol

Table 1. Effect Kombucha tea on Cholesterol Level and Hemoglobine

Treatment	R0	R1	R2	R3	R4	R5
Blood Cholesterol (mg/dl)	300 ^a	169 ^b	160 ^b	167 ^b	156 ^b	155 ^b
Hemoglobin	12.1	12.4	15.5	12.1	10.5	12.3

Note: The same letter on the same line show no significant difference ($P < 0.05$)

Based on Table 1, all treatment could decline cholesterol levels because of the active substances activities in kombucha tea. The addition of fermentation products could decreased the blood cholesterol levels, through the mechanism of inhibition of an enzyme activities that involved in cholesterol biosynthesis (3-hydroxy 3 methylglutaril CoA reductase) or through the mechanism of increased bile acid synthesis. Increased secretion of bile acids will increase the the excretion of cholesterol from the intestine, so that cholesterol levels in the tissue will decreased

Deconjugated bile salts are less efficiently reabsorbed than their conjugated counterparts, which results in the excretion of larger amounts of free bile acids in feces. Also, free bile salts are less efficient in the solubilization and absorption of lipids in the intestine. Therefore, deconjugation of bile salts could lead to a reduction in serum cholesterol either by increasing the demand for cholesterol for de novo synthesis of bile acids to replace those lost in feces or by reducing cholesterol solubility and thereby absorption of cholesterol through the intestinal lumen.

The content of niacin in kombucha tea can reduced the excess of cholesterol in the blood. Vitamin B3 (niacin) has been used since the 1950's to reduced the LDL, cholesterol and triglycerides in the blood and more effective in increasing HDL (Blanc, 2000).

2. Effect Treatment on Hemoglobine

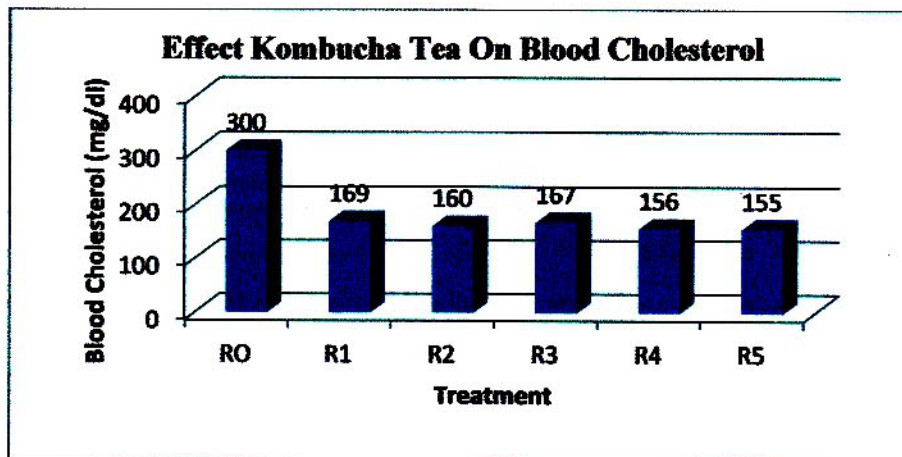


Figure 1. The Effect of Kombucha Tea on Blood Cholesterol.

Based on Figure 1, hemoglobine levels in all treatment are in the normal range because of the active substances activities that contained in kombucha tea. According to Lovita *et al*, (2010), the organic acids produced by lactic acid bacteria such as lactic acid and acetic acid can protect the cell membranes and destroyed other subcellular oxidation reaction by the peroxide bond. Lactic acid bacteria which can increase the elasticity of cell membranes so it will produced better cell membrane, which in turn will improved the ability in maintaining erythrocyte membrane integrity (Ganong, 1985). Other factors that affect their ability to both bacteria, will survives in the lower acid to base environment. Acetic and lactic acid are still within the criteria of normal hemoglobine. Acetic acid, some amino acids and vitamins produced by microbes, is a precursor to the formation of hemoglobin.

Conclutions

1. Adding Kombucha tea 10, 15, and 20% could decline blood cholesterol level as much as 43% and providing that of 25 to 30% could decrease the level by 48%.
2. The Hemoglobine for all treatments is relative constant, but still in the normal range

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