



PROCEEDINGS

The 1st Poultry International Seminar 2012
The Role of Poultry in Improving Human Welfare

ORGANIZED BY:

FACULTY OF ANIMAL SCIENCE, UNIVERSITY OF ANDALAS, PADANG
WEST SUMATRA INDONESIA

AND

WORLD'S POULTRY SCIENCE ASSOCIATION INDONESIA BRANCH



Faculty of Animal Science, University of Andalas, Padang
Indonesia, 2012

PREFACE

The development of poultry science in the world has a lot of excellent progress in the areas of nutrition, breeding and genetics, product processing, health and disease, and socio-economic. Technological advances of the poultry are scattered in various parts of the world. Indonesia is one of the genetic center for the development of poultry in the world. Some strains of the poultry in the world today comes from the poultry in Indonesia.

Advancement of poultry science achievement in various parts of the world need to be facilitated in an International scale seminar to gather the experts in the field of poultry, and the poultry industry to share the knowledge and experience that has been achieved.

The 1st International poultry seminar is organized by The Faculty of Animal Science University of Andalas, in conjunction with the WPSA Indonesia branch with the theme “The Role of Poultry in Improving Human Welfare”. This seminar is intended to bring together the poultry experts around the world for sharing the ideas, information and experiences on the development of the poultry.

Dean of The Faculty of Animal Science,
University of Andalas, Padang, Indonesia



Dr. Jafrinur, MSP

Papers presented in this seminar have been refereed by external referees and by members of editorial committee. However, the comments and views express in the paper are entirely responsibility of the authors or authors concerned and do not necessarily represent the view of the Faculty of Animals Science or the World Poultry Science, Indonesia Branch.

Enquires regarding the reprint of the proceedings should be address to:

Prof. Dr. Yose Rizal
Faculty of Animal Science
University of Andalas
Padang, INDONESIA
Phone: 08126609314
Fax: +62 751 7146
e-mail: yrizal@faterna.unand.ac.id

ISBN 978-602-96934-6-1

CONTENT

PREFACE	iv
CONTENT	v
INVITED SPEAKERS	
1. FOOD SAFETY AND QUALITY CONTROL OF POULTRY PRODUCTS Roel Mulder	1
2. THE ECONOMICS OF POULTRY WELFARE IN RELATION TO HUMAN HEALTH AND ENVIRONMENT Peter van Horne	5
3. UTILIZATION OF HIGH FIBER BY-PRODUCTS FROM AGRO-INDUSTRY FOR POULTRY FEED Ruangpanit, Y.1, Attamangkune S.2, Amornthewaphat N.3, Rattanatubtimtong S.4, Songserm O.5 And Rungcharoen P	12
4. ORGANIC POULTRY TO IMPROVE THE PRODUCTIVITY OF SMALL SCALE POULTRY FARM AND HUMAN WELFARE IN WEST SUMATRA M. Hafil Abbas	39
5. UTILIZATION OF PALM KERNEL CAKE IN POULTRY DIETS A. Razak Alimo	52
6. THE POULTRY INDUSTRY IN INDONESIA: CHALLENGE AND OPPORTUNITY Desianto B. Utomo	54
7. DEVELOPMENT OF LOCAL GENETIC RESOURCES OF CHICKEN AND DUCK IN INDONESIA L.H. Prasety	62
8. IMPROVING THE UTILIZATION OF CASSAVA LEAF MEAL (<i>Manihot utilissima</i> Pohl.) IN THE CHICKEN DIETS Yose Rizal	79
A. NUTRITION	
1. ESTIMATION THE RELATIVE BIOLAVAILABILITY OF SEVERAL ZINC SOURCES FOR BROILERS WHEN FED A CONVENTIONAL DIETS Mahmood Sahraei 1, Hossien Janmmohamadi, Akbar Taghizadeh, Gholam Ali Moghadam, Seyed Abbas Rafat	88
2. ENZYME SUPPLEMENTATION TO <i>Tamarindus indica</i> IN MASH AND PELLET FORM FOR BROILER CHICKENS N.G.A. Mulyantini	91
3. UTILIZATION OF VARIOUS LEVEL OF PALM KERNEL CAKE WHICH IS MIXED WITH HEMICELL ON PERFORMANCE, CARCASS AND IOFC RAJA DUCK (MOJOSARI-ALABIO) Tri Hesti Wahyuni, Ade Trisna dan Yunilas.....	94
4. EFFICIENCY OF DIFFERENT LEVELS OF <i>Agaricus bisporus</i> MUSHROOM IN COMPARISON TO AN ANTIBIOTIC GROWTH PROMOTER ON INTESTINAL MORPHOLOGY AND MICROFLORA COMPOSITION IN BROILER CHICKENS Nasir Landy, Ashkan Kavyani, Shima Mokhtari Karchegani	101
5. STUDIES ON DIFFERENT RESPONSES OF COMMERCIAL AND KAMPONG LAYING HENS ON FORTIFIED LOCAL MINERAL FEED Khalil	108
6. PERFORMANCE AND CARCASS QUALITY OF BROILER CHICKENS IN RESPONSE TO <i>Prosopis juliflora</i> SEED (PJS) AS A BY-PRODUCT Ali Mohammadi, Javad Nasr, Enayat Rahmatnejad, Shahab Roomiani	112

7. FEED INTAKE BEHAVIOUR, NUTRIENT INTAKE AND PERFORMANCE OF INDIGENOUS CHICKENS FED A CHOICE DIET UNDER TROPICAL CLIMATIC CONDITIONS IN JAMBI PROVINCE, INDONESIA Syafwan, R.P. Kwakkel and M.W.A. Verstegen 112
8. A COMPARATIVE STUDY ON SOME PERFORMANCE CHARACTERISTICS IN BROILER FINISHER CHICKENS FED RATIONS WITH OR WITHOUT A PROBIOTIC (RE3) Tagoe, B. N. D and F. N. A. Odoi 125
9. THE PHYSICAL AND CHEMICAL CHARACTERISTICS OF EGGSHELL WASTE AS PHOSPHORUS FORTIFICATION: ITS EFFECT ON EGG PRODUCTION AND EGGSHELL QUALITY OF LAYING HENS S. Kismiati, T. Yuwanta, Zuprizal and Supadmo 138
10. PERFORMANCE OF BROILER CHICKENS FED MANNAN OLIGOSACCHARIDES AS ALTERNATIVES TO ANTIBIOTICS FROM ONE TO TWENTY-TWO DAYS OF AGE Zahid Kamran, Shakeel Ahmed, Muhammad Umar Sohail, Hafiz Abdus Samad 147
11. THE EFFECTIVENESS OF EARTHWORM MEAL SUPPLEMENTATION AS ANTIBIOTIC GROWTH PROMOTER REPLACER WITH DIFFERENT PROCESSING METHOD Hardi Julendra¹, Ema Damayanti, Lusty Istiqomah, Septi Nurhayati, M. Faiz Karimy 149
12. THE EFFECT OF *Metroxylon sago* Rotb.-TOFU WASTE PRODUCT FERMENTATION WITH *Monascus purpureus* IN THE RATION ON PERFORMANCE OF EGG QUAIL Suslina. A Latif, Nuraini, Mirzah and A. Djulardi 163
13. EFFECTS OF GUAR MEAL WITH AND WITHOUT HEMICELL ENZYME SUPPLEMENTATION ON EGG YOLK CHOLESTEROL AND SERUM LIPIDS CONCENTRATION IN LEGHORN-TYPE LAYING HENS Mohammad Hasani, Mansour Rezaei* and ZARBAKHT Ansari Pirsaraei 169
14. LIPID PROFILE AND HEMATOLOGICAL RESPONSE IN BLOOD SERUM OF LOCAL CHICKEN (*Gallus domesticus*) SUPPLEMENTED WITH MENHADEN FISH OIL Ning Iriyanti, Elly Tugiyanti, and Endro Yuwono 173
15. EFFECTS OF DIETARY INCLUSION OF SYNBIOTIC AND ZINC SUPPLEMENTATION ON GROWTH PERFORMANCE, ORGAN WEIGHTS AND IMMUNOLOGICAL RESPONSES OF BROILER CHICKENS Mahmood Sahraei, Hossien Janmmohamadi, Akbar Taghizadeh, Gholam Ali Moghadam, Seyed Abbas Rafat 183
16. USING BAY LEAF MEAL (*Syzygium polyanthum*, Wight) IN RATION ON FAT AND CHOLESTEROL LEVELS OF QUAIL MEAT (*Coturnix coturnix japonica*) Lovita Adriani, Roni P, Bagus P Hendronoto A.W. Lengkey 192
17. EVALUATION OF THE EFFECTS OF A MULTI-STRAIN PROBIOTIC (Protexin) AND ORGANIC ACIDS ON PERFORMANCE, AND CARCASS TRAITS OF BROILER CHICKS Farid Farivar, Nasir Landy, Shima Mokhtari Karchegani 198

18. UTILIZATION OF FERMENTED POD CACAO (<i>Theobroma cacao</i> .L) BY <i>Aspergillus niger</i> AS A SUBSTITUTION FOR RICE BRAN ON RAJA DUCK FEED (AGE 0 – 7 WEEKS) Nurzainah Ginting	203
19. THE EFFECT OF JUICE WASTES MIXTURE PROCESSED BY RICE HULL ASH FILTRATE SUBSTITUTION FOR CORN IN THE DIET ON BROILERS' PERFORMANCE Maria Endo Mahata, Mailinda Juwita Sasti, Regina Septia Aryani, Yose Rizal, and Guoyao Wu	206
20. UTILIZATION OF SOYBEAN MILK WASTE AS SUBSTITUTE FOR SOYBEAN MEAL PROTEIN IN BROILER RATION	213
21. EFFECT OF SUBSTITUTIONS THE YELLOW CORN MEAL WITH NOODLE WASTE (INDOMIE [®]) IN DIET ON BROILER PERFORMANCE Mirzah, Ramadani, Effi Susanty	221
22. THE EFFECTS OF CACAO POD MEAL IN DIET ON CARCASS CHARACTERISTICS OF BROILER Tuti Widjastuti, Heri Supratman and Bony Ahmad	228
23. EFFECT OF PELLETING TEMPERATURE ON THE RECOVERY AND EFFICACY OF A MANANNASE THERMOSTABLE IN COCONUT PULP-BASED DIETS Yetti Marlida, Mirzah,, Harentis and Suswita	233
B. PRODUCTION	
1. STUDY ON MOLECULAR: GENETIC DIVERSITY IN D-LOOP MITOCHONDRION DNA OF INDIGENOUS JAVA DUCK (MAGELANG DUCK) Dattadewi Purwantini, Tri Yuwanta, Tety Hartati and Ismoyowati Error! Bookmark not defined.	241
2. MORPHO-BIOMETRIC CHARACTERIZATION OF TWO LOCAL CHICKEN BREEDS IN VIETNAM Do Duc Luc, Nassim Moula, Nicolas Antoine-Moussiaux, Nguyen Chi Thanh, Dang Vu Binh, Pascal Leroy, Frédéric Farnir and Vu Dinh Ton	250
3. TRANSACTION COSTS ON PARTNERSHIP AT BROILER FARMERS IN SOUTH SULAWESI PROVINCE Sitti Nurani Sirajuddin,Palmarudi,Agussalim	254
4. ANALYSIS OF INFLAMMASOME RELATED MOLECULES IN THE RESPONSE TO H5N1 AVIAN INFLUENZA Sarah J. Fardy, Simon Burggraaf, Wayne G Kimpton, Andrew G.D. Bean	259
5. BENGKULU ENDEMIC BURGO CHICKEN GENETIC ASSESSED BY mtDNA D-loop REGION Heri Dwi Putranto, Urip Santoso, Warnoto, Nurmeliastari, Johan Setianto, Bieng Brata, Agus Susilo, Yossie Yumiati, Shuichi Matsumura, Osamu Doi ...	263
6. FACTORS AFFECTING DUCK FARMERS' BEHAVIOR IN RAISING LAYER DUCK IN BREBES REGENCY W. Roessali, B.T. Eddy, S. Marzuki and W Sumekar	268
7. ANALYSIS OF CONTRACT ON POULTRY PARTNERSHIP: REVIEW OF ALLEGED MONOPOLY PRACTICE AND UNFAIR BUSINESS COMPETITION A.R. Siregar and V. S Lestari	275
8. REPRODUCTIVE ORGANS OF MALE QUAIL INFLUENCED BY AFLATOXIN AND BEREVIBACILLUS LATEROSPORUS PROBIOTIC F. Bagherzadeh Kasmani, M.A. Karimi Torshizi	280

9. ENTREPRENEURSHIP ON SMALL HOLDERS POULTRY ENTREPRISE :
West Sumatera Case Asdi Agustar, James Hellyward, Amna Suresti, Rahmi Wati 289
 10. EGG PRODUCTION AND WELFARE OF LAYING DUCKS UNDER VILLAGE SYSTEM IN CENTRAL JAVA INDONESIA Imam Suswoyo and Ismoyowati..... 298
 11. COMPENSATORY GROWTH AND THYROID HORMONE CONCENTRATION OF BROILER CHICKENS SUBJECTED TO FEEDING TIME RESTRICTION A. Azis., M.H. Abbas, and Y. Heryandi 304
 12. DIFFERENCES OF HEMATOLOGICAL, IMMUNE SYSTEM AND WELFARE ON MUSCOVY (*Cairina moschata*) AND MALLARD (*Anas platyrhynchos*) REARED IN DRY AND WET SEASONS Ismoyowati, Mochamad Samsi and Mochamad Mufti 314
 - 13 EVALUATION OF DRIED POWDER OF MUSHROOM (*Agaricus bisporus*) AS AN ANTIBIOTIC GROWTH PROMOTER SUBSTITUTION ON PERFORMANCE AND CARCASS TRAITS OF BROILER CHICKENS Ashkan Kavyani , Shima Mokhtari Karchegani, Nasir Landy 323
 14. THE SOCIAL ECONOMY IMPACT OF AVIAN INFLUENZA TO PULLET BREEDER IN SIDRAP REGENCY Amrawaty,S.N.Sirajuddin,Ilham Rasyid 328
 15. IDENTIFICATION OF THE PRESENCE OF *Salmonella* sp, TOTAL BACTERIAL COLONIES, MOISTURE CONTENT AND PH VALUE ON CHICKEN MEAT SOLD IN TRADITIONAL MARKETS IN PADANG AND PARIAMAN-INDONESIA Yuherman, Arief, Rabin, Son Radu, And Mitsuaki Nishibuchi 334
 16. *Eimeria tenella* INFECTION EFFECT ON ERYTHROCYTES AND HAEMOGLOBIN LEVELS OF BROILER CHICKENS GIVEN DRINKING WATER CONTAINING KENIKIR LEAF EXTRACT (*Cosmos caudatus*), NONI LEAF EXTRACT (*Morinda citrifolia*), AND EARTHWORM MEAL EXTRACT (*Lumbricus rubellus*) Mohammad Faiz Karimy, Hardi Julendra, Septi Nur Hayati, Ahmad Sofyan, Ema Damayanti, and Dwi Priyowidodo 345
 17. THE USE OF PROBIOTIC AND PREBIOTIC (SYMBIOTIC) DERIVED FROM PALM KERNEL CAKE IN REDUCING AMMONIA EMISSION IN THE BROILER HOUSE Yusrizal, F. Manin, Yatno, and Noverdiman 353
 18. EFFECT OF DIFFERENT CURRENT OF ELECTRICAL STIMULATION ON WATER HOLDING CAPACITY, TENDERNESS, COOKING LOSSES, AND pH OF SPENT LAYER MEAT R. Singgih Sugeng Santosa and Dattadewi Purwantini . 363
- POSTER
- 1 THE APPLICATION OF BIOSECURITY AND SPREAD VIRUSES DETECTION OF AVIAN INFLUENZA IN 3 AND 4 CHICKEN FARM SECTOR IN PADANG CITY Tertia Delia Nova, Yan Heryandi, Randi Setiawan 368
 - 2 THE INFLUENCE OF FERMENTED BANANA PEEL BY EM₄ ON CRUDE FIBER, CRUDE PROTEIN AND CRUDE FIBER DIGESTIBILITY IN QUAIL Hera Dwi Triani, Ade Djulardi and Ahadiyah Yuniza 378
 - 3 EFFECTS OF SOAKING DURATION OF “BRINY EGGS” IN GAMBIER WASTE LIQUID ON WATER AND PROTEIN CONTENT, AND SHELF LIFE Deni Novia, Sri Melia, Ade Sukma and Ferisya Dwi Rizki 383

4. EFFECTS OF DOSE AND TIME OF LEAF LAMTORO (*Leucena leucochepala*) FERMENTATION ON DRY MATTER, CRUDE PROTEIN AND CRUDE FIBRE CONTENT Nita Yessirita, M.H. Abbas, Y. Heryandi, A. Dharma 386
5. COMPARATIVE EVALUATION OF LOCAL POULTRY BREEDS STATUS IN ALGERIA, VIETNAM AND THE DEMOCRATIC REPUBLIC OF CONGO Nassim Moula, Frédéric Farnir, Abdellah Salhi, Do Duc Luc, Vu Dinh Ton, Pascal Leroy and Nicolas Antoine-Moussiaux 393
6. EGG QUALITY COMPARISON OF TWO VIETNAMESE CHICKEN BREEDS (RI AND MIA) Nassim Moula, Nicolas Antoine-Moussiaux, Do Duc Luc, Nguyen Chi Thanh, Pham Kim Dang, Vu Dinh Ton, Dang Vu Binh, Pascal Leroy and Frédéric Farnir 399
7. USING OF BUAH MAKASAR (*Brucea javanica* (L.) MERR OIL AS IMUNOSTIMULANT IN BROILERS Suraya Kaffi., Subeki, Zulfahmi 404
8. THE INFLUENCE OF SOAKING TIMES SALTED EGGS IN ONION SKIN SOLUTION (*Allium ascalonicum*) ON PROTEIN AND FAT CONTENT Sri Melia, Deni Novia dan Irdawati 418
9. EFFECT OF IMMERSION TIME AND CONCENTRATION OF THE SOLUTION CHITOSAN ON LEVELS OF PROTEIN, FAT CONTENT AND THE ORGANOLEPTIC ON THE OLD DUCK MEATBALLS Indri Juliyarsi, Sri Melia and Leni Selfiani 423
10. THE EFFECTS OF FED FISH OIL MICROCAPSULE IN LAYING HENS ON CHOLESTEROL AND N-3 AND N-6 FATTY ACID CONTENT Montesqrit, W.G Piliang, S Budiyanto and Desianto B Utomo 432
11. THE NUTRITIVE VALUE OF FERMENTED SAGO PITH (*Metroxylon sago* Rottb) ENCRICHMENT WITH MICRONUTRIENT AS POULTRY FEED Wizna, Helmi Muis, Syafril, Annisa Imran, Welvidani 439
12. EFFECTS OF HERBAGE UTILIZATION AS PHYTOCHEMICAL SOURCE FOR ANTIBIOTIC REPLACEMENT IN DIET ON BROILERS' MORTALITY AND PERFORMANCE Ahadiyah Yuniza And Rusiana 446
13. THE EFFECT OF PHYTASE SUPPLEMENTATION IN BROILER RATIONS ON THE RETENTION OF PHOSPHOR, CALCIUM AND NITROGEN Gita Ciptaan, Yetti Marlida, Periadnadi, and Yose Rizal 453
14. VITAMIN C IN MENGKUDU FRUIT (*Morinda citrifolia* Linn) AS ANTI-STRESS IN BROILER CHICKENS IN TROPICAL REGIONS E. Syahrudin, M.H Abbas, E. Purwati and Y. Heryandi 460

The Seminar Committee

Steering Committee

Dr. Ir. Jafrinur, MSP (Dean of The Faculty of Animal Science)
Prof. Peter van Horne (WPSA Speaker Bureau/Poultry Economic Expert)
Dr. Ir. Yan Heriyandi, MS (Vice Dean for Academic, Faculty of Animal Science)
Prof. Dr. Ir. M. Hafil Abbas, MS (Professor in Poultry Science Production)
Prof. Dr. Ir. Mirzah, MS (Head, Department of Animal Science)
Prof. Dr. Roel Mulder (Secretary General WPSA)
drh. Desianto Budi Utomo, Ph.D. (President, WPSA Indonesia Branch)
Prof. Dr. Julie Robert (President, WPSA Australia Branch)
Prof. Dr. Abdul Razak Alimon, M.Sc.Ag (Professor in Poultry Science, UPM, Malaysia)

Organizing Committee

Chairperson	: Prof. Dr. Ir. Yose Rizal, M.Sc
Vice Chairperson I	: Prof. Dr. Ir. Wizna, MS
Vice Chairperson II	: Dr. Ir. Ade Djulardi, MS
Secretary	: Dr. Ir. Maria Endo Mahata, MS
Treasurer	: Ir. Gita Ciptaan, MS : Ir. Sabrina, MS
Secretary officers	: Dr. Ir. Ahadiyah Yuniza, MS : Dr. Ir. Mirnawati, MS : Dr. Montesqrit, SPt., M.Si : Aronal Arief Putra, SPt., M.Sc
Scientific Program	: Dr. Ir. Irsan Ryanto H. : Ir. Fuad Madarisa, M.Sc : drh. Yuherman, MS., PhD
Fund Rising	: Prof. drh. Endang Purwati RN, Ph.D : Prof. Dr. Ir. Nuraini, MS : Ir. Basril Basyar, MM
Exhibition, Documentation and Publication	: Dr. Rusfidra, SPt., MSi : Rahmi Wati, SPt., M.Si : Dr. Ir. Husmaini, MP
Logistic	: Ir. Helmi Muis, MP : Dr. Ir. Suslina A .Latif, MS : Ir. Firda Arlina, M.Si
Transportation and Accommodation	: Ir. Rijal Zein, MS : Dr. Rusmana W.S.N., M.Rur.Sc

REFEREE PERSONS/EDITORIAL BOARDS

Dr. Roel Mulder (Secretary General WPSA, Nederland)
Prof. Peter van Horne (WPSA Bureau Speaker, Nederland))
Prof. Dr. Julie Robert (President, WPSA Australia Branch, Australia)
Prof. Dr. Abdul Razak Alimon, M.Sc.Ag (Professor in Poultry Science, UPM, Malaysia)
Dr. Ruang Panit (WPSA Bureau Speaker, Thailand)
Prof. Dr. Yose Rizal (Faculty of Animal Science, University of Andalas, Indonesia)
Prof. Dr. M. Hafil Abbas, MS (Faculty of Animal Science, University of Andalas, Indonesia)
Dr. Yusrizal (Faculty of Animal Husbandry, University of Jambi, Indonesia)
Dr. Maria Endo Mahata, MS (Faculty of Animal Science, University of Andalas, Indonesia)
Dr. Ahadiyah Yuniza, MS (Faculty of Animal Science, University of Andalas, Indonesia).

9. THE PHYSICAL AND CHEMICAL CHARACTERISTICS OF EGGSHELL WASTE AS PHOSPHORUS FORTIFICATION: ITS EFFECT ON EGG PRODUCTION AND EGGSHELL QUALITY OF LAYING HENS

S. Kismiati¹, T. Yuwanta², Zuprizal² and Supadmo²

¹*Faculty of Animal Agriculture, Diponegoro University*

²*Faculty of Animal Science, Gadjah Mada University*

Corresponding E-mail : kismiati59@gmail.com

ABSTRACT

Two experiments were conducted to investigate the physical and chemical characteristic of phosphorus fortified eggshell waste by phosphoric acid and its effect on egg production and eggshell quality of laying hens. Experiments 1, eggshell waste was washed in water temperature of 80° for 15 minutes and then divided into 4 group. Group 1, eggshell waste without phosphoric acid (control) ; group 2, eggshell waste is soaked in phosphoric acid 3% for 15 minutes; group 3 : eggshell waste is soaked in phosphoric acid 4% for 15 minutes and group 4 eggshell waste is soaked in phosphoric acid 5% for 15 minutes. The total of bacteria, the phosphorus content and breaking strength were measured to evaluate the physical and chemical character of egg shell waste. Experiment 2 is the application of the result of experiment 1 in hens feed. Forty-eight laying hens (Isa Brown strain) at 25 weeks of age were used in this study. Completely Randomized Design used in this experiment. The results of this experiment showed that the increase concentration of phosphoric acid decreases the total of bacteria, increases the phosphorus content and decreases eggshell waste breaking strength. The different concentration of phosphoric acid had not significantly effect on egg production (feed intake, calcium intake, phosphorus intake, egg weight) and egg shell quality (eggshell weight, eggshell percentage, the calcium content).

Key words: egg shell waste, bacteria, phosphorus fortification, egg production and eggshell quality.

I.INTRODUCTION

The low rate of egg production and the eggshell quality accounts for highly economic losses of the egg producer. The factors influencing egg production and eggshell quality are the genetic, feed nutrition, and disease factor. N R C (1994), Squires (2003) and Lesson and Summers (2005) stated that feed is the very determining factor on egg production and eggshell quality. Egg formation need high calcium (Ca) and phosphorus (P). The requirement of calcium of hens at the laying period is 3.5%; while the requirement of phosphorus is 0.45%. Deficiency of Ca and P may decrease egg production and eggshell quality. The calcium level of feed 3% were optimum for maintaining the optimum eggshell quality in quails (Philomina and Pillia Ramakrishna, 2000). The experiment of Safaa *et al.* (2008) showed that an increase in Ca intake from 4.08 to 4.64 g/hen per day improved egg production (71.2 vs. 74.9%), egg mass (49.0 vs. 51.4 g), and feed conversion ratio (2.43 vs. 2.30 kg of feed/kg of egg). In addition, an increase in Ca intake improved shell weight (9.98 vs. 10.20%), shell thickness (0.342 vs. 0.351 mm). The study of Pelicia *et al.* (2009) showed the Ca level in feed significantly effected on egg production. The increase of Ca in feed as much as 3 – 4.5% improve the eggshell quality. Then, the research of Pelicia *et al.* (2011) showed that the calcium level of the feed as much as 4.5% produce lower egg production than 3.0 and 3.75%. Egg production at the level Ca of the feed 3.0; 3.75 and 4.5%

respectively 91.3; 90.5 and 87.6%. The requirement of phosphorus is lower than calcium; however, phosphorus has a very high price

Eggshell waste contains high calcium and little phosphorus and protein but contributes to environmental pollution. The phosphorus of eggshell waste is an inorganic phosphorus and having a high availability. Said (1996) stated that eggshell contains 37.0 – 37.4% Ca; 0.12 – 0.13% P; and 5.2 – 5.9% protein. According to Ogawa *et al.* (2004) eggshell contains 94.4% CaCO₃; 0.73% Ca₃(PO₄)₂; 0.84% MgCO₃; and 3.3% protein. Nakano *et al.* (2003) explained that chicken eggshell contained many essential amino acid in the eggshell membrane. The surface of eggshell has many bacteria. Musgrove (2005) found salmonella bacteria on the eggshell. Davis *et al.* (2008) found salmonella enteritidis and salmonella heidelberg on surface of hens eggshell. Washing eggshell using hot water is one of many methods to kill the bacteria. Middleton and Ferket (2011) reported that phosphoric acid may be used as antibacterial of chicken carcass meal that will be used as the feedstuff. Phosphoric acid increased phosphorus content of chicken carcass meal. Feed industry also uses phosphoric acid to create dicalcium phosphate. Dicalcium phosphate (DCP) is commons source of inorganic phosphorus for animal feed.

This experiment has the objectives of finding out the physical and chemical characteristics of eggshell fortified by different concentration of phosphoric acid and its effect on egg production and eggshell quality. The use of phosphoric acid would be expected to result in decrease amount bacteria, decrease eggshell strength, improve phosphorus content of eggshell waste and egg production and eggshell quality.

MATERIAL AND METHOD

Experiment 1.

The objective of research 1 is to find out the physical and chemical characteristics of eggshell waste phosphorus fortified with using phosphoric acid in different concentrations. The concentration of phosphoric acid is 3; 4 and 5%. Eggshell waste is collected from food industry using egg as the ingredient. The eggshell waste is soaked in the hot water with the temperature of 80 °C for 15 minutes, then it is divided into 4 groups. Group 1 : the eggshell is not soaked in phosphoric acid as the control, group 2 : the eggshell waste is soaked in phosphoric acid 3%, group 3: the eggshell waste is soaked in phosphoric acid 4%, and group 4: the eggshell waste is soaked in phosphoric acid 5%. The soaking is as long as 15 minutes.

Twelve eggshells divided into 4 treatment are used to observe the amount of bacteria. The counting of bacteria amount uses the Davis (2008) model. For the proximate and calcium and phosphor content of the eggshell analyses uses the AOAC method, used by Hall (2003). Breaking strength of eggshell waste was evaluated by Texture Analyzer TA Plus (Pelicia *et al.*, 2009).

Experiment 2.

The experiment 2 was used the eggshell waste of experiment 1 in hens feed. The objective of experiment 2 is to find out the influence of phosphoric acid concentration used for phosphorus fortification on the eggshell waste used as hen feed on egg production and eggshell quality. Feed 1: uses eggshell waste that is not soaked in phosphoric acid (control); feed 2: uses eggshell waste soaked in phosphoric acid 3%; feed 3: uses eggshell waste soaked in phosphoric acid 4%; feed 4: uses eggshell waste soaked in phosphoric acid 5%. The experiment uses 48 isa brown strain hens with the age of 25 weeks and it is conducted for 12 weeks. As many as 12 hens are provided with feed 1, 12 hens are provided with feed 2,

12 hens are provided with feed 3, and 12 hens are provided with feed 4. The composition of feedstuff and nutrient ingredients of feed are presented in Table 1.

Table 1. The Ingredients and Calculated Composition of Diet Treatment

Ingredients (%)	Treatment			
	Feed 1	Feed 2	Feed 3	Feed 4
Eggshell waste	5.00 ¹	5.00 ²	5.00 ³	5.00 ⁴
Corn	70.00	70.00	70.00	70.00
Soybean extract	10.00	10.00	10.00	10.00
Poultry Meat Meal	11.00	11.00	11.00	11.00
Topmix*	0.25	0.25	0.25	0.25
DCP **	1.10	1.00	0.80	0.75
Ca CO ₃	2.40	2.50	2.70	2.75
Salt	0.25	0.25	0.25	0.25
Calculated composition	100.00	100,00	100,00	100,00
ME (kcal/kg)	2892.50	2892.50	2892.50	2892.50
Crude Protein (%)	16.50	16.50	16.50	16.50
Ca (%)	3.50	3.50	3.50	3.50
P available (%)	0.50	0.50	0.50	0.50
Lycine (%)	1.10	1.10	1.10	1.10
Methionine (%)	0,44	0,44	0,44	0,44

¹eggshell waste is not soaked in phosphoric acid (control), ² eggshell waste is soaked in phosphoric acid 3%
³eggshell waste is soaked in phosphoric acid 4%, ⁴eggshell waste is soaked in phosphoric acid 5%;

* Metionin, lisin, vitamin A, D₃, E, K, B₁, B₂, B₆, B₁₂, C, Ca-pantothenat, Niacin, Cholin Chloride Mn, Fe, I, Zn, Co, Cu, Santoquin dan Zinc Bacitracin.

** Di Calcium Phosphate

The Completely Randomized Experimental Design was used in this experiment. The observed parameters are: feed intake, calcium intake, phosphorus intake, egg production, egg weight, eggshell weight, percentage of eggshell, and eggshell thickness. The measure data of feed intake, calcium intake, phosphorus intake, and egg production are collected during the research. Egg weight, eggshell weight, percentage of eggshell, and eggshell thickness are collected for 3 days in every 4 weeks and they are conducted in the 3 last days of 4 weeks.

RESULTS

Experiment 1

The effect of phosphoric acid concentration on physical and chemical characteristic of eggshell waste.

The amount of bacteria, calcium content, phosphorus content, and eggshell breaking strength of eggshell waste soaked in control and soaked by phosphoric acid 3-5% are shown in Table 2. Phosphoric acid decreases the amount of bacteria and increases phosphorus content. Phosphoric acid 5% results in lower bacteria and highest phosphorus content of eggshell waste.

Table 2. Total Bacteria, Calcium and Phosphorus Content of Eggshell Waste Fortified Phosphorus by Different Phosphoric Acid Concentration

Phosphoric acid concentration	Total bacteria (cfu/g)	Calcium (%)	Phosphorus (%)
control	1.9×10^6	34.83	0.30
3%	1.3×10^4	35.19	0.85
4%	1.0×10^4	35.23	1.46
5%	1.0×10^3	37.98	1.76

Furthermore experiment shows that phosphoric acid 5% produce the lower eggshell breaking strength. Table 3 present the effect of concentration of phosphoric acid on eggshell breaking strength.

Table 3. Eggshell Waste Breaking Strength on the Used of Different Phosphoric Acid concentration

Phosphoric acid concentration	Eggshell breaking strength (kgf/second)	Breaking strength changed (kgf/second)
control	0,492	-
3%	0,478	- 0,014
4%	0,462	- 0,016
5%	0,442	- 0,020

Experiment 2

The effect of phosphoric acid concentration on egg production.

The egg production parameters presented in Table 4. The use phosphoric acid concentration of 3 – 5% for phosphorus fortified eggshell waste is used as a source calcium and phosphorus mineral feed of laying hens did not significantly effect ($P > 0.05$) on feed intake, calcium intake, phosphorus intake and egg production. Egg production tends to increase together with the increase of phosphoric acid concentration although the increase is not significant.

Table 4. The Effect of Phosphoric Acid Concentration on Laying Hens Production Parameter.

Parameters	Phosphoric acid concentration (%)				Average ^{ns}
	0	3	4	5	
Feed intake (g/hen/day)	117.42	118.68	113.10	111.68	115.22
Calcium intake (g/hen/day)	4.11	4.15	3.96	3.91	4.03
Phosphorus intake (g/hen/day)	0.59	0.59	0.57	0.56	0.58
Hen day production (%)	90.75	93.23	96.10	96.03	94.03
Egg weight (g)	59.97	59.19	58.10	59.56	59.21

^{ns} ; not significant (P >0.05)

The effect of phosphoric acid concentration on egg eggshell quality.

Table 5 presented the effect of phosphoric acid on eggshell quality. The eggshell quality is not so different in control and the use of phosphate acid 3 – 5%.

Table 5. The Effect of Phosphoric Acid Concentration as Used to Soaking Eggshell Waste on Eggshell Quality of Laying Hens

Variable	Phosphoric acid concentration (%)				Average ^{ns}
	0	3	4	5	
Eggshell weight (g)	5.66	5.61	5.66	5.67	5.65
Eggshell percentage (%)	9.44	9.48	9.75	9.51	9.55
Eggshell thickness (mm)	0.38	0.37	0.37	0.37	0.37

^{ns} ; not significant (P>0.05)

DISCUSSION

Experiment 1

The use of phosphoric acid decreases the amount of bacteria on the eggshell waste. The increase concentration of phosphoric acid (control; 3; 4 and 5%) decreased bacteria of eggshell waste. The amount of bacteria are 1.9×10^6 ; 1.3×10^4 ; 1.0×10^4 and 1.0×10^3 cfu/eggshell waste (Table 2). The lowest of bacteria is in the use of phosphoric acid concentration 5%. Davis *et al.* (2008) found that the eggshell has *Salmonella enteritidis* and *Salmonella Heidelberg*. Bacteria salmonella is potential pathogens of human and poultry. The research results indicate that phosphoric acid may be used as the anti-bacteria substance for eggshell waste as stated by Guinotte and Nys (1991). Middleton and Ferket (2001) used phosphoric acid for kill bacteria of poultry mortality carcasses meal. acid addition decrease the pH to prevent microbial spoilage and to destroy pathogenic organisms. Phosphoric acid

reduced significantly total aerobic counts of sausages. The maximum reduction by 1 log cfu_g-1 in relation to sausages untreated with the acid (Barros *et al.*, 2010). The research results showed that the higher the concentration of phosphoric acid is, the better it is used as anti-bacteria substance.

The calcium and phosphorus of the eggshell waste contents shows that calcium content is relatively same; however, phosphorus content increases together with the increase of phosphoric acid concentration. The use of phosphoric acid 5% results in the highest phosphorus content. The phosphorus contents in control, the use of phosphoric acid 3, 4, and 5% are as follows (0.30; 0.85; 1.46; and 1.76%). Middleton and Ferket (2001) stated that phosphoric acid is used in the feed industry to create dicalcium phosphate.

The further experiment shows that phosphoric acid decrease the eggshell breaking strength. The eggshell breaking strength decreases together with the increase of phosphoric acid concentration (Table 3). The decrease of eggshell breaking strength is caused by the chemical reaction between Ca CO₃ existing in the eggshell with phosphoric acid /H₃PO₄. Guinotte and Nys (1991) stated that phosphoric acid may be used to soak sea shell so that it will break easily. Bain (2006) reported that the eggshell breaking strength has a correlation with fragmentation (break easily). The high eggshell breaking strength on eggshell shows that the eggshell breaks easily.

Experiment 2

Egg production

Feed intake, calcium feed intake, phosphorus feed intake, egg production, and egg weight are not significantly different in the use of different phosphoric acid concentrations. The experiment uses the feed that has the same nutritional content so that feed intake, calcium intake, phosphorus intake, egg production, and egg weight are not significantly different. Leeson and Summers (2005) stated that the factor limiting feed intake is energy. The higher the feed energy is, the lower the feed intake. The research result conducted by Nahashon (2007) showed that the increase of energy as much as 2800 – 2900 kcal decreases feed intake.

Calcium and phosphorus intake are influenced by feed calcium and phosphorus level. The use of feed with different calcium levels and same energy results in different calcium intake and the feed intake is not significantly different. Calcium intake is linear to feed calcium level. The level calcium of the feed 3; 3.5; 4 and 4.5% did not significantly effect on feed intake but increased calcium intake. The intake of phosphorus increased linearly with dietary phosphorus levels of the feed (Pelicia, 2009). Squire (2003) stated that calcium and phosphorus are very important minerals for egg formation.

Soaking eggshell in phosphoric acid increases phosphorus content of the eggshell (Table 2) but all treatment feed are iso protein, energy, calcium and phosphorus. The differences in phosphoric acid concentrations cause the decrease of DCP and Ca CO₃ usage in feed. Squire (2003) stated that calcium and phosphorus are very important minerals for egg formation. Saunder-Blade (2009) reported that the calcium source of the feed did not affected on egg production and egg weight. The research of Casarteli *et al.* (2005) showed that the different source of calcium and phosphorus did not significantly effect on egg production and egg weight of laying hens at 32 – 48 weeks. The research result shows that the use of phosphorus acid for eggshell fortification may replace DCP although it is just a little.

Eggshell quality

Phosphoric acid concentration (3; 4; 5% and control) does not significantly influence (P >0.05) on the eggshell quality (egg weight, egg percentage and eggshell thickness). Robert (2004) stated that eggshell quality is influenced by genetic, feed nutrition, age, and disease factors. Calcium and phosphorus have very important roles in the process of eggshell

forming. The forming of eggshell takes place in the uterus and it requires the longest time. At that time, the gland in the uterus secretes CaCO_3 and $\text{Ca}_3(\text{PO}_4)_2$ as much as about 6 g (Squire, 2003). Calcium and phosphor contents are the same in all treatment feed so that the quality of eggshell is also not significantly different. The result of research is in accordance with the research conducted by Safaa (2008) that the same calcium and phosphor levels do not influence on the quality of eggshell. The eggshell percentage similar with the study of Pelicia *et al.* (2009) that eggshell percentage linearly with calcium intake. Casarteli *et al.* (2005) research about the effect of calcium and sodium phosphate, micro granulated dicalcium phosphate and triple super phosphate in feed on eggshell quality. The result of the research showed that the egg quality did not different.

CONCLUSION

The concentration of phosphoric acid 5% was the best antibacterial and the best phosphorus fortified of the eggshell waste. The concentration acid of phosphoric from 3 to 5% is sufficient to maintain the egg production and eggshell quality.

ACKNOWLEDGEMENT

The experiment project was funded by Directorate Gneneral of Higher Education, Ministry of National Education of Republic of Indonesia (Doctor Gran). The authors would like to thank to the Director General of Higher Education, Ministry of National Education of Republic of Indonesia who have provided funding. The authors would also like to the Dean of the Faculty of Animal Science and the Rector of the Gadjah Mada University.

REFERENCES

- Bain, M. M. , N. MacLeod, R. Thomson, and J. W. Hancock. 2006. Microcracks in eggs. *Poult. Sci.* 85:2001–2008
- Barros, J. R., L. Kunigk, C. H. Jurkiewicz. 2010. Incorporatio of nisin natural casing for the control of spoilage microorganisms in packaged sausage. *Brazilian J. Microbiology* 41: 1001-1008
- Casartelli, EM., O.M. Junquera, A.C. Laurentiz, R.S. Filardi, J. Lucas Junior and L.F. Araujo. 2005. Effect of phytase in laying hen diets with different phosphorus source. *Brazilian. J. Poul. Sci.* 7(2) : 93 – 98.
- Davis, A.L., P.A. Curtis, D.E. Conner, S.R. McKee and L.K.Kerth. 2008. Validation of cooking methode using shell egg inoculated with Salmonella Serotypes Enteritidis and Heidelberg. *Poult.Sci.* 87:1637–1642.
- Guenotte, F. and Y. Nys.1991. Effect of particle size and origin of calcium source on eggshell quality and bone mineralizes in egg laying hens. *Poult. Sci.* 70:583-592.
- Hall, R.E. , R.B.Shirly, R.I.Bakalli, S.E.Aggrey, G.M.Pesti and H.M. Edwards Jr.2003. Power of two methods for the estimation of bone ash of broiler. *Poult. Sci.* 82:414-418.
- Lesson, S. and J. D. Summers. 2005. *Commercial Poultry Nutrition 3rd Edition.* Uni versity Books Guelph, Ontario, Canada.

- Middleton, T. F. and P. R. Ferket. 2001. Effect of level of acidification by phosphoric acid, storage temperature, and length of storage on the chemical and biological stability of ground poultry mortality carcasses. *Poult. Sci.* 80:1144-1153.
- Musgrove, M.T., D.R. Jones, J.K. Northcutt, M.A. Harrison, N.A. Cox, K.D. Ingram and A.J. Hinton, Jr. 2005. Recovery of Salmonella from commercial shell egg by shell rinse and shell wash methodologies. *Poult. Sci.* 84 : 1955 – 1958
- Nahashon, S. N. , N. A. Adefope, A. Amenyenu, and D. Wright 2007. Effect of varying concentrations of dietary crude protein and metabolizable energy on laying performance of pearl grey guinea fowl hens. *Poult. Sci.* 86:1793– 1799
- Nakano, T., Ikawa, N. I. And Ozimek. 2003. Chemical composition of chicken eggshell and shell membranes. *J. Poult. Sci.* 82:510-514.
- North, M.O. 1984. *Commercial Poultry Production*. Avi Publ. West Port, Connecticut.
- N.R.C.1994. *Nutrient Requirement of Poultry*. Ninth revised edition. National Academy Press. Washington, D.C.
- Ogawa H. , M. Uehara, T Kuwayama, M. Kawashima and K. Tanaka. 2004. Change in Calcium, Magnesium and Phosphorus contents of eggshell during stay in oviduct uterus in the guineafowl and the chicken. *J. of Poult. Sci.* 41: 236 -240.
- Pelicia, K. , E.A. Garcia, A.B.G. Faitarone, A.P. Silva ,D.A. Berto, A.B. Molino and F. Vercese. 2009. Calcium and available phosphorus levels for laying hens in second production cycle. *Brazilian J. of Poult. Sci.* 11 (1): 39 – 49.
- Pelicia, K., J.L.M. Muraio, E.A. Gracia, V.M.C. Viheiro, D.A. Berto, A.B. Molino, A.B.G. Faitarone, , F. Vercese . G.C. Santos dan A.P.Silvia.. 2011. Effect of dietary calcium levels and limestone particle size on the performance, tibia and blood of laying hens. *Brazilian J. Poult. Sci.* 1(13):29-34.
- Philomina P.T.¹ and Pillai Ramakrishna, M.G. 2000. Effect of dietary calcium and age on the egg shell quality in Japanese quails. *Indian J. Poult. Sci.* 35 (1):62- 65.
- Safaa, H.M., M.P. Serrano, D.G. Valencia, M. Frikha, E. Jimenez-Moreno and G.G. Meteos. 2008. Productive performance and egg quality of brown egg laying hens in the late phase of production as influenced by level and source of calcium in the diet. *Poult. Sci.* 87 : 2043 – 2051.
- Saunders-Baldes, J.L.; J.L.Maclsaac; D.R. Korver and D.M. Anderson. 2009. The effect of calcium source and particle size on the production performance and bone quality of laying hens. *Poult. Sci.* 88: 338-353.
- Squires, E. J. 2003. *Applied Animal Endocrinology*. CABI Publishing,