The 6th ISTAP
International Seminar
on Tropical Animal Production

"Integrated Approach In Developing Sustainable Tropical Animal Production"

PROCEEDINGS

commemorating:

October 20-22, 2015
Yogyakarta Indonesia

ISBN: 978-979-1215-26-8

Published by:
Faculty of Animal Science, Universitas Gadjah Mada Yogyakarta, Indonesia, 2015
PROCEEDINGS
The 6th ISTAP
International Seminar
on Tropical Animal Production

October 20-22, 2015, Yogyakarta, Indonesia

“Integrated Approach in Developing Sustainable Tropical Animal Production”

Published by:
Faculty of Animal Science
Universitas Gadjah Mada

ISBN: 978-979-1215-26-8

©2015, Faculty of Animal Science Universitas Gadjah Mada

No part of this publication may be reproduced or transmitted in any forms or by any means, electronic or mechanical, now known or heretofore invented, without written permission from the publisher.

Address: Faculty of Animal Science, Universitas Gadjah Mada
Jl. Fauna 3, Kampus UGM, Bulaksumur, Yogyakarta 55281, Indonesia
Phone: +62-274-513363/+62-274-560868
Fax: +62-274-521578
Email: istap@ugm.ac.id
Website: www.istap.ugm.ac.id
Editor-in-Chief

Cuk Tri Noviandi
(Universitas Gadjah Mada, Indonesia)

Editorial Board

Subur Priyono Sasmito Budhi (Universitas Gadjah Mada, Indonesia)
Zaenal Bachruddin (Universitas Gadjah Mada, Indonesia)
Ristianto Utomo (Universitas Gadjah Mada, Indonesia)
Widodo (Universitas Gadjah Mada, Indonesia)
Soeparno (Universitas Gadjah Mada, Indonesia)
Yuny Erwanto (Universitas Gadjah Mada, Indonesia)
Adiarto (Universitas Gadjah Mada, Indonesia)
Ismaya (Universitas Gadjah Mada, Indonesia)
Tety Hartatik (Universitas Gadjah Mada, Indonesia)
Wihandoyo (Universitas Gadjah Mada, Indonesia)
Endang Baliarti (Universitas Gadjah Mada, Indonesia)
Krishna Agung Santosa (Universitas Gadjah Mada, Indonesia)
Sudi Nurtini (Universitas Gadjah Mada, Indonesia)
Budi Gunarto (Universitas Gadjah Mada, Indonesia)
Namung Danar Dono (Universitas Gadjah Mada, Indonesia)
Zuprizal (Universitas Gadjah Mada, Indonesia)
Keshav L. Maharjan (Hiroshima University, Japan)
Henning Otte Hansen (University of Copenhagen, Denmark)
Yukinori Yoshimura (Hiroshima University, Japan)
Allen Young (Utah State University, USA)
Yanin Opatpanakit (Maejo University, Thailand)

Editorial Staff

59. PPO-03-P  Morphological Characteristics and Performance Boerawa Goat in Tanggamus District Lampung Province
Kusuma Adhianto and M. Dima Iqbal Hamdani .......................... 339-342

60. PPO-04-P  Growth, Carcass Production and Meat Quality of Ongole Grade Cattle, Simmental Ongole Crossbred Cattle and Brahman Cross
N. Ngadiyono, Soeparno, Panjono, Setiyono and I. Akhmadi .......................... 343-347

61. PPO-06-O  Growth and Rumen Environment of Pre-weaning Bali Calves Offered Different Forage Based Calf Supplements
IGN Jelantik, ML Mullik, TT Nikolaus, TD Dato, IG Mahardika, NP Suwiti, C Leo Penu, J. Jeremias, A. Tabun .......................... 348-352

62. PPO-07-P  Waste Utilization to Increase Productivity Growth Bali Cattle and Coffee Plants
I Nyoman Suyasa and IAP Parwati .......................... 353-358

63. PPO-08-O  Effect of Different Lands on Heat Tolerance Coefficient and Body Weight Gain of Ram Fat Based Sheep
Rachmawati, A., H. Nugroho and E. Y. Wanto .......................... 359-359

64. PPO-09-O  The Effects of Hair Colors Differences on the Performance of Etawah Grade Doe
I Gede Suparta Budisatria, Panjono, Dyah Maharani .......................... 360-364

65. PPO-10-P  Age and Body Weight at Puberty and Service per Conception of Ongole Crossbred Heifer on Smallholder Farming System
Endang Balliarti, Bayu Andri Admoko, Febri Ayranti, Nono Ngadiyono, I Gede Suparta Budisatria, Panjono, Tri Satya Masturi Widi, M. Danang Eko Yulianto, Sigit Bintara .......................... 365-369

66. PPO-11-O  Performance of Three Breeds of Sudanese Cattle
Hassan Ishaq Hassan Haren and Hatim Idris .......................... 370-373

Poultry Science

67. PU-01-P  Biosecurity Measurements in Poultry Farming System in Kuwait
A.A. Alsaffar .......................... 374-376

68. PU-03-O  Effect of Mating and Polymorphism Insulin Like Growth Factor Binding Protein 2 Gene on Body Weight and Heritability of Kampung Chicken
Sri Sudaryati, J.H.P. Sidadolog, Wihandoyo, W.T. Artama .......................... 377-381

69. PU-05-O  The Residual Profile of Ciprofloxacine in Broiler Muscle and Liver
Agustina Dwi Wijayanti, Ambarwati, Wa Ode Sitti Falah Ramli .......................... 382-386
Effect of Mating and Polymorphism Insulin Like Growth Factor Binding Protein 2 Gene on Body Weight and Heritability of Kampung Chicken

Sri-Sudaryati1, J.H.P. Sidadolo2, Wihandoyo1, W.T. Artama2

1Faculty of Animal Science Universitas Gadjah Mada, Indonesia. 
2Faculty of Veterinary Science Universitas Gadjah Mada, Indonesia.
Corresponding email: daryati5@yahoo.com

ABSTRACT: Insulin-like growth factor binding protein 2 (IGFBP2) regulates a broad spectrum of biological activities involved in growth, development, and differentiation. Single nucleotide polymorphisms C1032T of IGFBP2 gene was used to genotyped parents and their progenies of Kampung chicken using PCR-RFLP method. Found 3 genotypes that were CC, CT and TT. Forty pairs mating that were CC<CT (1), TT<CT (2), CT<CT (3), and CC<CT (4), were raised to produce their progenies. Then the progenies was raised until 12 week of age and weekly weighed individually. Weekly body weight was analyzed by analyzed one way of variance, heritability and breeding value was analyzed by formula of Falconer and MacKay (1997). The result showed that even though the weekly body weight inconsistency in weight gain but progeny of mating 3 and 4 had better body weight than progeny of mating 1 and 2. Weekly body weight heritability was low to high (0.013 - 0.681), moderate heritability was on age 2 week (0.446) and high heritability was on 12 week of age (0.681). Breeding value was gain wider with the increasing age. Progeny of mating number 1 and 2 showed slower growth rate than number 3, and the best growth rate was progeny of number 4 at period 8 to 12 week age. It was concluded that IGFBP2 gene was associated with growth and parameter genetic in Kampung chicken.

Keywords: Kampung chicken, IGFBP2, body weight gain, heritability

INTRODUCTION

The Kampung chicken is not the pure native chicken, and is defined as the locally developed slow growing type of chicken. In Indonesia, Kampung chickens dominate meat type chicken market for decades. It raised around 10 – 12 week of age. The Kampung chicken have better resistance against heat stress and many diseases, and their eggs and meat possess better eating qualities. Growth performance of Indonesia Kampung Chicken is still low. Egg production around 25.32 – 28.85 %, egg weight 36.79-37.24 g, fertility 68.76-69.31 %, hatchability 48.91-26.56%, and weight of hatching egg is only 26.13-26.56 g (Sri-Sudaryati, 2010a).

The genes that are part of the somatotropic axis play a crucial role in the regulation of growth and development of chickens (Nie et al., 2005). The insulin-like-growth factor (IGF) system is well defined, with profound effects on the growth and differentiation of normal and malignant cells. In biological fluids, IGFs are normally bound to IGF-binding proteins (IGFBPs). (Hwa et al., 1999). The chicken IGFBP2 gene spans approximately 38 kb and is located on chromosome 7 (Schoen et al., 1995). It consists of 4 short exons and 3 long introns, encoding a 275-amino acid polypeptide hormone (Schoen et al., 1995), 289 amino acid and is regulated by growth hormones and the target tissue are liver, brain, lung, and kidney (Qin, 2010).

The genotype-phenotype association analysis showed that the difference induced by the haplotypes derived from the 5 SNP was more significant than that by the single SNP (Lei, 2005). Li et al. (2006) showed that chicken IGFBP2 gene intron 2 C1032T (accession number AY 326194)
polymorphism was associated with growth and body composition traits in an F2 population. Lei et al. (2005), Li et al. (2006), and Sri-Sudaryati (2014) used single nucleotide polymorphisms of C1032T of insulin-like growth factor binding protein 2 (IGFBP2) gene to genotype Kampung chickens by PCR-RFLP method.

The study was to know the effect of mating based on genotyped to study on growth and weekly growth heritability.

MATERIALS AND METHODS

Studied previously (Sri-Sudaryati et al. 2010b) had done successfully to genotyped the C1032T SNP in intron 2 of Kampung chicken IGFBP2 gene using PCR-RFLP method. The digestion of the PCR product of C1032T gave rise to restricted patterns namely CC (477 bp), CT (477/527 bp) and TT (527 bp).

Four males and 12 females which were genotyped IGFBP2 gene were used in this experiment. Four mating pairs based upon genotyped by polymorphism insulin-like growth factor binding protein 2 (IGFBP2) gene of Kampung chicken were used to produce generation 2. Three females were kept with one female per a litter house for ease of parent identification. The mating pairs were: 1. CC><CT, 2. TT><CT, 3. CT><CT, and 4. CC><CT. During 0-6 week of age, the chicken were fed by commercial broiler feed contain 21% CP and ME 3.200 kcal/kg, and then changed with Kampung feed until the bird reach 12 week of age. Kampung chicken contains 13% CP and 2.150 kcal/kg ME. Body weights of the progeny were taken at day 0 (hatching) and at the end of every week. Birds were individually weighed in order to determine their relative growth (RG) as RG = 100 × \( \frac{G2 - G1}{G1} \) (deSmit, 2005). G1 is outset body weight and G2 is the latest body weight. Relative growth were taken 0-4, 4-8, and 8-12 weeks periodically.

Body weight and RG were analyzed by one way analysis of Varian (Kaps and Lamberson, 2004). Genetic parameter such as heritability and breeding value were estimated by Falconer and MacKay (1997). \( h^2 = \frac{\sigma_s^2}{\sigma_s^2 + \sigma_w^2} \), \( h^2 \) is heritability, \( \sigma_s^2 \) is sire component variance, \( \sigma_w^2 \) is waste component variance. Coefficient Breeding value of each sire was calculated by equation, \( I = \frac{0.25 \times 1 + \frac{x}{x=n(m-1)} h^2}{1 + \frac{x}{x=n(m-1)} h^2} \) where I is coefficient breeding value, n is total progeny, and \( h^2 \) is heritability.

Blood sample of progeny from mating pairs number 2,3, and 4 were taken to identified genotyped by polymorphism IGFBP2 gen in order to evaluate the association between genotyped and body weight, RG and sex.

RESULTS AND DISCUSSION

The PCR-RFLP method was developed successfully for genotyping the C1032T SNP in intron 2 of the chicken IGFBP2 gene. From the mating TT><CT produced 45 progeny, and 16 females and 6 males was chosen randomly to be identified polymorphism IGFBP2. The mating CT><CT produced 59 progeny, 19 females and 5 males of them were identified too. The mating CC><CT produced 50 progeny and 16 females and 8 males of them were successfully screened. Mating between CC><CC was not screened and had 75 progeny. Three genotypes were detected and defined as CC, CT, and TT.

Progeny body weight (Table 1) were differ at 0, 2, 6, 10 and 12 week old. Body weight at one day old chick showed that progeny from mating 1 and 4 were lower than 2 and 3, but at one week old changed become 1 and 3 were lower than 2 and 4, and the highest was number 4. The lowest
weight at three week of age was the progeny of mating number 3. Inconsistency of body weight was done until the chicken reach 12 week of age. Overall body weight gain of mating number 3 and 4 were better than mating number 1 and 2. All progeny of mating number 1 were all CC genotypes, whereas progeny of mating number 2 were CT and TT genotypes. Progeny of mating number 3 had 3 genotypes and progeny of mating 4 had CC and CT genotypes. The inconsistency of body weight gain of all the mating pairs may be because the effect of allele, genotype, alleles and genotypes frequencies or may be because the diversity of Kampung chicken was very high.

**Table 1.** Weekly body weight (g/bird) and heritability (h²)

<table>
<thead>
<tr>
<th>Age, wks</th>
<th>CC&gt;&lt;CC (n=75)</th>
<th>TT&gt;&lt;CT (n=45)</th>
<th>CT&gt;&lt;CT (n=59)</th>
<th>CC&gt;&lt;CT (n=50)</th>
<th>h²</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>22.52±2.32</td>
<td>23.67±2.99</td>
<td>23.58±2.36</td>
<td>22.98±2.77</td>
<td>0.270</td>
</tr>
<tr>
<td>2</td>
<td>67.86±13.59</td>
<td>70.29±9.19</td>
<td>61.69±13.54</td>
<td>72.72±11.69</td>
<td>0.446</td>
</tr>
<tr>
<td>4</td>
<td>177.50±26.58</td>
<td>178.07±21.97</td>
<td>186.02±35.95</td>
<td>182.98±25.96</td>
<td>0.016</td>
</tr>
<tr>
<td>6</td>
<td>325.12±46.61</td>
<td>293.67±49.43</td>
<td>314.68±74.35</td>
<td>314.58±49.15</td>
<td>0.132</td>
</tr>
<tr>
<td>8</td>
<td>452.05±68.70</td>
<td>440.76±55.77</td>
<td>471.95±75.26</td>
<td>456.58±56.30</td>
<td>0.073</td>
</tr>
<tr>
<td>10</td>
<td>516.67±74.95</td>
<td>516.62±54.34</td>
<td>547.71±69.04</td>
<td>544.58±62.06</td>
<td>0.183</td>
</tr>
<tr>
<td>12</td>
<td>646.00±89.40</td>
<td>614.53±71.80</td>
<td>690.10±81.12</td>
<td>708.86±92.51</td>
<td>0.681</td>
</tr>
</tbody>
</table>

a,b,c Means within a row with no common superscript are different (P≤0.05)
A,B,C Means within a row with no common superscript are different (P<0.01)

The range value of body weight heritability from DOC until 12 week was 0.073 until 0.681. Moderate heritability value was at 2 week body weight (0.446) and the highest heritability value was when chicken reach 12 week old (0.681). Upper-low body weight heritability value was when chicken at 0, 2, and 9 week of age (0.202-0.270). The heritability value of native chicken either in Africa and Asia was low. Dana, et al (2010) reported that heritability of Ethiopian native chicken body weight at 6 week old was low (0.15±0.08) and medium value when hatch body weight (0.40±0.23). Santosh, et al (2012) reported that heritability of Indian native chicken of Aseel breed had heritability 0.3 and Kadaknath breed had heritability value 0.39. Heritability body weight value of Cameroon native chicken according Manjeli, et al (2003) was 0.31±0.03 at hatch time, 4 week old was 0.35±0.03, and 8 week old was 0.34±0.05 and at 12 week old was 0.35±0.05.

**Table 2.** Weekly breeding value

<table>
<thead>
<tr>
<th>Age, wks</th>
<th>CC&gt;&lt;CC (n=75)</th>
<th>TT&gt;&lt;CT (n=45)</th>
<th>CT&gt;&lt;CT (n=59)</th>
<th>CC&gt;&lt;CT (n=50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-11.01 to 9.26</td>
<td>-11.29 to 6.90</td>
<td>-8.38 to 6.90</td>
<td>-11.63 to 10.31</td>
</tr>
<tr>
<td>2</td>
<td>-73.87 to 67.15</td>
<td>-35.75 to 35.61</td>
<td>-67.04 to 49.25</td>
<td>-46.95 to 51.37</td>
</tr>
<tr>
<td>4</td>
<td>-32.20 to 32.33</td>
<td>-20.30 to 16.83</td>
<td>-31.21 to 42.11</td>
<td>-22.50 to 20.47</td>
</tr>
<tr>
<td>6</td>
<td>-181.61 to 151.03</td>
<td>-123.33 to 131.40</td>
<td>-201.61 to 296.13</td>
<td>-162.40 to 193.77</td>
</tr>
<tr>
<td>8</td>
<td>-191.95 to 183.70</td>
<td>-134.31 to 117.48</td>
<td>-191.00 to 175.44</td>
<td>-147.74 to 121.62</td>
</tr>
<tr>
<td>10</td>
<td>-212.00 to 293.17</td>
<td>-159.30 to 168.54</td>
<td>-293.49 to 232.32</td>
<td>-178.48 to 216.32</td>
</tr>
<tr>
<td>12</td>
<td>-364.33 to 424.43</td>
<td>-249.91 to 341.80</td>
<td>-452.70 to 245.47</td>
<td>-380.54 to 453.93</td>
</tr>
</tbody>
</table>
Breeding values range wider when chicken become older, and breeding value has correlation with heritability. Heritability at 2 week of age is higher than at 3 week of age, the breeding value at 2 week is better than at 3 week old. Individual chicken has own breeding value. The breeding value showed the expectation of progeny for the next future. Since highest heritability value happened at 12 week body weight, it had better chosen chicken with highest breeding value at 12 week old. The highest breeding value were progeny from 4, 1, 2, 3 respectively.

CONCLUSIONS

It concluded that weekly body weight progeny of mating CT<CT and CC<CT better than progeny of mating CC<CC and TT<CT. Heritability weekly body weight value was low at 3, 4, 5, 6, 7, 8, 10, and 11 week old (0.013-0.183), upper-low at 0, 1, and 9 week old, moderate at 2 week of age and high at 12 week of age. Breeding value become wider range with the increasing age. Progeny of mating number 4 had the best growth rate, and all showed that native chicken had slow growth rate.

ACKNOWLEDGEMENT

The current study was funded by project under the Post-graduate University of Gadjah Mada Indonesia project number: LPPM-UGM/1488/2009, June, 18 2009 and Doctor Grant Project from Director General of Higher Educational, Ministry of Education, and project number: 481/SP2H/PP/DP2M/VI/2010, June 11, 2010

REFERENCES


Sri-Sudaryati. 2010a. The effect of chicken litter house on the reproductive of black and white native chicken. 4th national seminar on indigenous poultry. Faculty of Animal Science Diponegoro Indonesia.


This is to certify that
SRI SUDARYATI
has participated as
ORAL PRESENTER
at the 6th International Seminar on Tropical Animal Production
"Integrated Approach in Developing Sustainable Tropical Animal Production"
Faculty of Animal Science, Universitas Gadjah Mada, Yogyakarta, Indonesia
October 20th - 22nd, 2015

Chairman
Prof. I Gede Suparta Budiastria, Ph.D.
Organizing Committee
Dean
Prof. Dr. Ali Agus
Faculty of Animal Science
Universitas Gadjah Mada