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The 4th International Seminar on Sciences

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PREFACE

The 4th International Seminar on Sciences (ISS) is an annual meeting organized by the Faculty of Mathematics and Natural Sciences, Bogor Agricultural University (FMIPA IPB). The seminar was held for two days from 19-20 October 2017, at the IPB International Convention Center, Baranangsiang, Bogor. The main theme of this seminar was “Sciences for Green Development” in accordance with the importance of science in maintaining the ecosystem and supporting its sustainability and IPB research expertise. The scope of the seminar comprises these topics:

- Bio-based Functional Materials
- Biophysics, Biomaterials, and Biosensors
- Bioresources, Biosciences, and
- Biotechnology Data Science and Modelling
- Environmental and Climate Change
- Information Technology for Agriculture
- Internet of Things for Sustainable Agriculture
- Life Sciences
- Nanotechnology in Life Sciences
- Renewable Energy
- Actuarial Sciences and Risk Management
- Other related topics

In this year ISS, we were also honoured to have the presence of Canadian Ambassador to Indonesia His Excellency Peter MacArthur who convey his greatest appreciation of the implementation of this activity and the cooperation that exists between FMIPA IPB and University of Waterloo. The 4th ISS this year presents no less than 10 academics / researchers / experts as speakers, both from national and international institutions namely:

- **Prof. Dr. Ir. Kudang Boro Seminar (Institut Pertanian Bogor)**
Transparency & Trace-ability for Agro-based Products is a Must.
- **Prof. Johnny Li (University of Waterloo)**
Hedging Crop Yield with Exchange-traded Weather Derivatives.
- **Prof. Sakakibara Masayuki (Ehime University)**
Environmental Design for Phytotechnology for Sustainable Development in Socioecological Systems.
- **Prof. Santosh Krishna Haram (University of Mumbai)**
Investigation of Nanomaterial for Energy Harvesting and Storage Systems through Electromechanical Prospective.
- **Dr. Kornorn Srikunath (Kasetsart University)**
Contribution of Chromosomics Reveals Diversity of Sex-linked Region and Evolutionary History in Reptiles.
- **Fabio Laurent Lumantau (READI)**
- **Dr. Yaya Rukayadi (Universiti Putra Malaysia)**
Functional Food and Medicinal Properties of Piper cubeba L.
- **Gasidit Panomsuwan, PhD (Kasetsart University)**
A Green Route towards Nanomaterials Synthesis.



- **Dr. Agus Salim (La Trobe University)**
Current Challenges and Opportunities in Statistical Bioinformatics: How Statistics Can Contribute to Medical Advance.
- **Prof. Ali Selamat (Universiti Teknologi Malaysia)**
Big Data Application in Agriculture.
- **Ika Dewi Ana, drg, PhD (Universitas Gajah Mada)**
Studies on Development Calcium Phosphate Ceramics for The Application in Dentistry.

We would like to thank all the contributors and participant who made this event a big success. We are also pleased to announce that a record number of 82 papers will be published in the IOP EES Conference Proceeding and hope that you will also consider to join the upcoming ISS conferences.

ISS 2017 Chairperson



Dr. Yessie Widya Sari

ISS 2017 Proceeding Coordinator

A handwritten signature in blue ink, likely belonging to Dr. rer. nat. Hendradi Hardhienata. The signature is stylized and appears to be 'Hm' followed by a horizontal line.

Dr. rer. nat. Hendradi Hardhienata

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Effect of Probiotic Containing *Enterobacter Spp.*, *Bacillus Spp.*, *Cellulomonas Spp.*, *Actinomyces Spp.* Supplementation on The Laying Performance and Egg Cholesterol of Quail

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Abstract. The purpose of this study was to know the effect of probiotic supplementation to feed consumption, egg production, egg weight, feed conversion, feed efficiency and egg cholesterol. 80 quails of *Coturnixcoturnixjaponica* at 14 weeks of age were completely randomized into five treatments, each treatment consisted of four replication and each replication consisted by five heads. T0 as a control without probiotic supplementation, T1 with the addition of 1 ml probiotic/kg of feed, T2 with the addition of 2 ml probiotic/kg of feed, T3 with the addition 1 ml probiotic/liter drinking water and T4 with the addition of 2 ml probiotic/liter drinking water. The results showed that the probiotic supplementation gave a significant effect ($p < 0,05$) to feed consumption, feed conversion, feed efficiency and egg cholesterol, but couldn't effect ($p > 0,05$) egg weight and Quail Day Production. T4 showed the highest significantly different in feed conversion, feed efficiency and egg cholesterol. It could be better to give 2 ml probiotic containing *Enterobacteria spp.*, *Bacillus spp.*, *Cellulomonas spp.*, and *Actinomyces spp.* in drinking water for the best result.

Keywords: Probiotic, production performance, egg cholesterol, quail

1. Introduction

Japanese quail, the smallest avian species is getting more importance for commercial egg and meat production with high rate of egg production. It has marked advantages such as fast growth, early sexual maturity, high rate of egg production and short generation interval [1].



Livestock feed nowadays become very expensive resulting in decrease in livestock production [2]. Recently the ban on the use of antibiotic as a growth promoters (AGP) in animal feeds, due to their residual effect in animal products as well as the development of bacterial resistance in animals and human body, have made a way to find alternatives of antibiotics [3]. It is generally accepted that direct-fed microbials (DFMs), defined as a source of viable microorganisms, as an alternative to antibiotics [4]. Probiotics or direct-fed microbials (DFM) are live microorganisms, when administered in adequate amounts, give a health benefit on the host [5]. Most probiotic strains which used in livestock are members of the *Bacillus* and *Enterococcus* genera [6].

Feeding Probiotic can reduce feed conversion [7]. In addition to increase the quantity of eggs produced, the fact that this probiotic can reduce egg cholesterol level may encourage people especially in developing countries to consume more eggs and enjoy good health as well as other benefits derived from egg [8].

The probiotic use in quail through feed and water, then expect that the consumption of probiotics can improve the efficiency of feed, then increase egg production. The purpose of this study was to know the effect of probiotic containing *Enterobacteria*, *Bacillus spp.*, *Cellulomonas spp.* and *Actinomyces spp.* supplementation to feed consumption, egg production, egg weight, feed conversion, feed efficiency and egg cholesterol.

2. Materials

The isolates of *Enterobacteria spp.*, *Bacillus spp.*, *Cellulomonas spp.*, and *Actinomyces spp.* isolated from bovine rumen fluid waste of Surabaya Abattoir, Indonesia, from previous study [9]. Organic quail feed was made from organic grain and other crop without any antibiotic, chemical composition and other prohibited materials. A total of 80 laying quails (14 weeks) from Bojonegoro, Indonesia.

3. Methodology

3.1 Study Area and Farm Management

The research was conducted in the Faculty of Veterinary Medicine, Universitas Airlangga, Surabaya, Indonesia. Probiotics used in this study contained cellulolytic and proteolytic bacteria consisted of *Enterobacteria*, *Bacillus spp.*, *Cellulomonas spp.* and *Actinomyces spp.*

A total of 80 laying quails (14 weeks) were randomly assigned to five treatments, with four replication each treatment and five heads each replication, the treatments were as follow: T0 was control with 100% quail feed, T1 was quail feed with 1 ml probiotic/gram of feed, T2 was quail feed with 2 ml probiotic/gram of feed, T3 was quail feed with 1 ml probiotic/liter water drinking and T4 was quail feed with 2 ml probiotic/liter water drinking

The probiotic liquid, dissolved in water (free chlorine and other antiseptics), then allowed to stand for 24 hours without aeration. The probiotic solution (T1 and T2) sprayed evenly into 100 kg of feed and then left the feed dried and the other probiotic solution (T3 and T4) then stirred evenly into drinking water.

3.2 Data Collection and Statistical Analysis

Feed intake, egg production, egg weight were recorded daily during the experimental period that lasted 28 days. Feed intake was a number of feed given divided with feed which not consumed. Egg weight was calculated by egg weight by egg production. Egg production was calculated in quail-day production (QDP) with the ratio of eggs produced per day and the total of females quail in population in 100%. Feed conversion was calculated as a ratio of feed intake by the egg weight. Feed efficiency was calculated as a ratio of egg weight by feed intake. The egg cholesterol measured after four week of treatment, with 5 randomized eggs each treatment, with enzymatic colorimetric method.

3.3 Statistical Analysis

Data analysis was performed by Analysis of Variance (ANOVA). If the result showed differences or significantly different then continued with Duncan Multiple Range Test [10]. Statistical analysis performed with SPSS for Windows 21.0.

4. Results and Discussion

The results showed that the probiotic supplementation gave a significant effect ($p < 0.05$) to feed consumption, feed conversion and feed efficiency, where T4 was significantly the highest ($p < 0.05$). Balanced gastrointestinal microflora were major functional effects attributed to the consumption of probiotics [11], then the utilization of selected probiotics might improve the metabolism of the host animals in various ways, there were absorptive capacity, protein metabolism and energy metabolism [12], then improved the digestion of food and minimized feed consumption [13]. This result in line with [14] reported that addition of probiotic to broiler chicken diets decreased feed conversion significantly. [15] reported that the supplementation of probiotics to laying hens improved hen performance, there were feed efficiency, egg production and egg quality. [16] reported that diets with probiotic supplemented showed a potential to improve feed efficiency. Moreover, the supplementation via drinking water might also contribute to the improvement, which consistent to previously studies that probiotic administration via drinking water appeared to be superior than in-feed supplementation method [17]. The result showed in Table 1.

Table 1. The result of feed consumption, feed conversion, feed efficiency in 4 week of treatment

Treatment	Feed consumption (g) \pm SD	Feed conversion \pm SD	Feed efficiency \pm SD
T0	23.0227 ^c \pm 0.01673	2.1239 ^c \pm 0.01321	47.5178 ^a \pm 0.00837
T1	21.4060 ^b \pm 0.02074	1.9644 ^a \pm 0.01304	48.6541 ^e \pm 0.01325
T2	22.0545 ^c \pm 0.01581	2.0593 ^b \pm 0.01140	50.5962 ^c \pm 0.01893
T3	22.4333 ^d \pm 0.01791	2.0579 ^b \pm 0.01472	48.3588 ^b \pm 0.01734
T4	21.3587 ^a \pm 0.01304	1.9645 ^a \pm 0.02550	50.3900 ^d \pm 0.0342

a, bcde different superscript in the same column showed a different effect ($p < 0.05$)

The results showed that the probiotic supplementation couldn't effect ($p > 0.05$) Quail egg weight and Quail Day Production, where the treatment showed lower egg weight and egg production. Egg production was costly in terms of energy and protein. The required energy for egg formation may be derived from daily feed intake. Daily feed intake was more important source of nutrient for small birds like quail than body reserved. If energy or protein was limited, birds could compensate by reduced egg size or the number of eggs laid [18]. The effectiveness of probiotic application might depend on factors such as microbial species composition (example single or multistrain), liveability, supplemental administration dose, method and frequency of application and diet composition [16]. Although egg weight was a highly heritable trait, the beneficial effect of probiote on egg weight may be attributable to a favorable environment in the intestinal tract, which might help to assimilate more nutrients [15].

This result contrast with [19] reported that egg production improved by approximately 50% on supplementation with 10^7 cfu/g of probiotic under normal environmental conditions. [20] reported that there were significant improvements in egg production and egg quality when 500 mg of *B. subtilis* culture/kg was added to the diets. [21] observed significant ($P < 0.05$) improvements in feed efficiency and egg production when 20-week-old layer hens were fed a probiotic mixture that included *Lactobacillus* strains. Similarly, [22] reported that probiotic (BioPlus 2b) fed to 27-week-old Brown-Nick layers could increase egg production. [23] reported that *Lactobacillus salivarius*^{CB} + *Bacillus subtilis*, showed significantly increased egg production and daily egg yield as well as decreased feed conversion. [24] reported that the inclusion of 0.6% liquid metabolite combinations, produced from three *L. plantarum* strains, demonstrated the best effect in improving the hens' egg production. [25] reported that the inclusion of *Bacillus licheniformis* in the hen diet was

effective to increase egg production. [26] reported that supplementation of feed mixture with probiotics increased egg production. [23] reported that dietary supplementation of 0.01% probiotic improved egg production and egg quality. The result showed in Table 2.

Table 2. The result of egg weight and QDP in 4 week of treatment

Treatment	Egg weight (g) \pm SD	Quail day production (%) \pm SD
T0	10.9072 ^d \pm 0.01140	55.7677 ^e \pm 0.02074
T1	10.8276 ^c \pm 0.15210	52.7273 ^c \pm 0.01581
T2	10.7244 ^a \pm 0.02074	41.8222 ^a \pm 0.01140
T3	10.8485 ^c \pm 0.02341	55.0300 ^d \pm 0.01801
T4	10.7567 ^b \pm 0.01346	50.0300 ^b \pm 0.01721

The results showed that the probiotic supplementation gave a significant effect ($p < 0,05$) to egg cholesterol. Probiotics were reported to have hypocholesterolemic [27]. Some lactic acid bacteria might secrete high-activity bile salt hydrolase (BSH) during metabolism, and this secretion could considerably affect cholesterol levels [28].

Probiotic supplementation might also played a good role to change the lipid metabolism as various studies showed that probiotics could reduce total cholesterol and triglyceride contents of egg yolk [29]. [30] reported that Probiotics reduced cholesterol concentrations in egg yolk. [22] reported that supplementation probiotic *Bacillus licheniformis* and *Bacillus subtilis* decreased egg yolk cholesterol. [19] reported that the cholesterol content of eggs produced by probiotic (*Lactobacillus* culture) fed hens was significantly lower by 15.3% and 10.4% when compared to those of the control hens at 24 and 28 weeks of age, respectively. Other researchers [16] observed also beneficial effects of the tested probiotic on egg quality such as a lower cholesterol content. The result showed in Table 3.

Table 3. The result of egg cholesterol in 4 week of treatment

Treatment	Egg cholesterol (mg/g) \pm SD
T0	19.0222 ^c \pm 0.01064
T1	6.7600 ^a \pm 0.01876
T2	6.9302 ^b \pm 0.02134
T3	13.5697 ^d \pm 0.01924
T4	12.4480 ^c \pm 0.01856

5. Conclusion

It can be conclude that the probiotic can't increase quail production and egg weight, but can decrease the feed consumption, feed conversion, egg cholesterol, then increase feed efficiency. The administration of 2 ml probiotic/liter drinking water show the best result.

Authors' Contributions

WPL designed the research. NH and SH helped in designing theresearch. ARD and AF carried out the data collection and assisted in manuscript preparation; WPL, BK and ADA collected materials for manuscript. All authors have read and approved the final manuscript.

Acknowledgements

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