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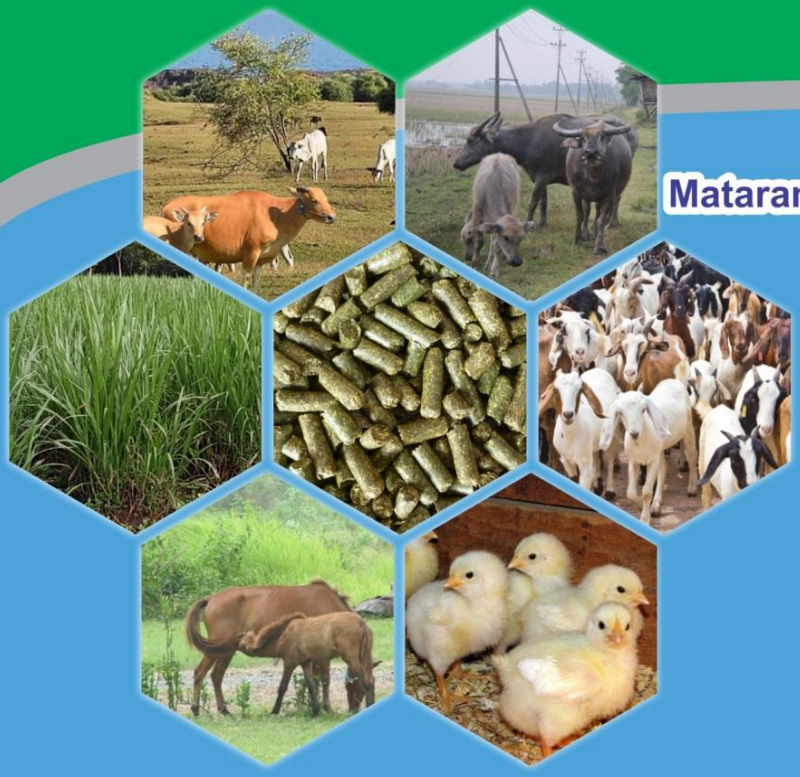
5 TH INTERNATIONAL SEMINAR OF ANIMAL NUTRITION & FEED SCIENCE

Improving Livestock Productivity, Quality and Safety to Respond to the Increasing Demand from Upper and Middle - Class Consumers

PROCEEDINGS

The 5th International Seminar of Animal Nutrition and Feed Sciences



Mataram - Indonesia, 7 - 9 November 2017

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THE 5TH INTERNATIONAL SEMINAR OF ANIMAL NUTRITION AND FEED SCIENCES

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INDONESIAN ASSOCIATION OF NUTRITION AND FEED SCIENTISTS

2017

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REPORT OF THE ORGANIZING COMMITTEE

Welcome to the 5th International Seminar of the Animal Nutrition and Feed Sciences. On behalf of the organizing committee I would like to thank :

- Dr. Rosiadi Sayuti, the Secretary of NTB Governor for his time and effort to officially open this seminar.
- Mrs. Widayati Haryanto, Diector of Feeds DGLHS who will be the keynote speaker in this seminar.

This seminar is attended by more than 100 scientists from Indonesia, Malaysia, Timor Leste, Australia and New Zealand. We really appreciate the participations of our invited speakers:

- Dr. Andrew Ash from CSIRO Australia
- Professor Abdul Razak Alimon, UPM Malaysia
- Professor Dennis Poppi, University of Queensland Australia
- Professor Steve Morris, Massey University, New Zealand

We also planned a special symposium of beef cattle nutrition sponsored by The Australian Centre for International Agricultural Research. At least 15 international scientists were planned to participate in this symposium but, unfortunately, due to Mt Agung potential eruption, our sponsor have cancelled this symposium. This symposium will be conducted at the end of January 2018.

During this seminar, the organizing committee have organized three field trips; 1) cattle fattening and breeding at Karang Kendal with sightseeing to Sendang Gila Water Fall North Lombok, 2) cattle fattening at Repok Nyerot village with sightseeing to Sukarara handweaving, Sade (Sasak traditional village), Kuta and Tanjung Ann beach Central Lombok and 3) Gili trawangan island North Lombok. The organizing committe would like to thank our sponsors;

a. Gold sponsors: NTB government (facilitated by Dr. Rosiady Sayuti) and West Sumbawa Government (facilitated by Dr. Amri Rahman),
b. Silver Sponsors: PT Charoen Phokphand and Indonesian Feedmill Association (facilitated by The Vice President of PT Charoen Pokphand Dr. Desianto Budi Utomo,) and one of our alumni who does not want his name to be announced.

Finally, I would like to give a great appreciation to all members of the organizing committee for their hard work to organize this event professionally. Please let us know if any of the participants has concerns or anything that the committee can help.

Professor Dahlanuddin
Chairman of the organizing Committee

WELCOME ADDRESS

Due to increasing the number of people and their prosperities, the demand for food from animal products is also becoming improve. While production of livestock such as meat and milk bit slow. Many scientists reported that the main constrain of that phenomenon is due to availability and quality of feedstuffs. Currently, the global climate change has also contributed to the feed and food shortage. We do believe this constrain will continue to affect the livestock production in the next future.

To anticipate and overcome these issues, *the Indonesian Association of Nutritionist and Food Scientist* has conducted the 5th International Seminar of Animal Nutrition and Feed Sciences held in Mataram, Nusa Tenggara Barat Province, from 7 to 9 of November 2017. For this series, the Steering committee has discussed several relating issues under the great theme of "**Improving livestock productivity, quality and safety to response to the increasing demand from upper and middle-class consumers**".

More than 100 Animal Nutrition Scientists coming to this memorial events discussing the variety of topics ranging from applied feeding to physiology of ruminants to non-ruminants' nutrition. They came from Australia, New Zealand, Malaysia, Timor Leste, and Indonesia share of their practical and theoretical experiences in their countries, respectively. Those edited paper are compiled in this proceedings.

We do believe this scientific tradition will continue to the future and all papers presented in this proceedings will be benefit for the development of practical and theoretical livestock production. Moreover, doe to variety of scientist background, the editors may not be properly edited those papers published in this issue and we believe that the nature and scientific aspect of the paper are still the authors' responsibility, respectively

The editors and seminar committee may realize that many constrain, limitation, and unusual behaviors during the conducting of this memorial event and two days' seminar may not enough to share our knowledge and experiences. Therefore, this unforgettable event in Mataram will be continued in the 6th International ANFS at Tadulako University in 2019. See you all there!

Mataram, 27 November 2017
Prof. Dr. Ir. Nahrowi, M. Sc

OFFICIAL ADDRESS

THE DIRECTOR GENERAL OF LIVESTOCK AND ANIMAL HEALTH REPUBLIC OF INDONESIA

First of all, I would like to thank the God Almighty, by His grace upon a good health; so that we could attend the event of The 5th Animal Nutrition and Feed Sciences International Conference in Lombok today.

The topic of today's presentation is about "Improving Livestock Productivity, Quality and Safety Using Locally Available Resources". I believe that this has been a very interesting idea to discuss and explore, as we have noted that in order to produce a well-qualified and safe livestock, similarly high quality of animal feed is required. That is, **Safety feed for safety food**.

In this conjunction, I would like to share some of my thoughts about particular policies and programs from Indonesian Government which are devided in three sections. Firstly, I would like to share to main government programs called the UPSUS SIWAB (The National Program to Accelerate the Cattle Population), and fulfil the requirement of animal feed in Indonesia. Secondly, there will be a sharing regarding Ministry of Agriculture regulations. Lastly, I would like to share expectation to all experts in the área of animal feed, in order to support Indonesia to achieve meat self-sufficiency with high quality livestock and animal feed.

I would like to begin with UPSUS SIWAB Program. This Program has been performed with an intensed coordination among technical functions through artificial insemination.The main purpose of this program is to gradually increase domestic ruminant populations (that include beef cattle, dairy cattle, and buffalo); and their products, by intensifying the performance of artificial insemination to our livestock. It is targeted that by 2017, we would be able to breed 4 (four) million acceptors and 3 (three) million pregnant cattles. If this target is succesfully achieved, Indonesian people's demand over meat (which is set to 2 million cattles per year) could be fulfilled. UPSUS SIWAB's main mechanism is to maximise the activity of artificial insemination intensively in the area of cattle breeding. This program also intends to optimalise AI in the semi-intensive location, as well as introduce AI in the extensive location (which still performs more natural breeding activity). With an AI technology and other technical requirements being fulfilled, then we could build more local cattle center.

Further, there are two imperative principals in UPSUS SIWAB relating to the area of animal feed. Firstly, **the feed security**, is ensuring that there will be sufficient supply of animal feed for local breeders. Secondly, **the feed safety**, which is the guarantee that the animal feed available in the market has high quality and is safe for livestock consumption.

The policy in feed security is directed to the supply of the forage, as well as the support of animal feed concentrates and performed with four strategies: (1) Building the source of seeds and forage (2) Increasing the use of agricultural and forest land to perform livestock-integrated programs (3) Accelerating the "pasture" concept and "cut and carry system" (4) Developing animal feed technology.

The development of the seed and forage sources has highly involved coordination from central government to each Technical Implementation Units located in 9 provinces in Indonesia, in order to ensure sufficient supply of seed and forage sources to local breeders.

Morever, Indonesian Government has also performed GERBANG PATAS program to encourage the local community to grow a well-qualified forage and provide more pasture lands to increase the supply of animal feed. This program aims to provide high quality animal feed in the areas where ruminants livestocks are bred; as well as support the development of animal feed barn and water conservation. In the areas which have extensive farming system and potential pasture field, Indonesian Government facilitates the development and maintanance of those areas, through several strategies, which are: the development of ”mini ranches” that are developed by the community and the development of the water source, cattle yard, and holding ground. The government also provides the system and structure to the local community to manage the pasture.

The feed safety policy will be performed through the enhancement of animal feed quality standard and increasing the number of laboratories that are used for testing the animal feed quality and monitoring animal feed that is produced and distributed to Indonesian community.

Starting the second section, Indonesian Government has stipulated two important regulations in supporting the high quality and quantity of animal feed in Indonesia, which are:

1. Regulation of the Agriculture Minister No. 22 year 2017 concerning Animal Feed Registration and Supply. This regulation manages the registration and distribution of animal feed in Indonesia. Each of this feed should have a feed registration number, that is assessed by a well-qualified feed manufacturing practice certification.
2. Regulation of the Agriculture Minister No. 14 year 2017 concerning Animal Drugs Classifcation, which explains about the restriction of antibiotic growth promotor to be added in the production of animal feed.

Both regulations are expected to adrress any challenge relating to the quality and safety of animal feed, that is produced, and then sold and used in the community.

Finally, I believe that we all should work together to address the challenges to improve the livestock productivity, quality, and safety using locally available resources. We really hope that there will be a constant feedback, support and cooperation from all relevant parties, particularly from animal feed organisations and associations such as Indonesian Association of Nutritionist and Feed Scientist (AINI).

Some initiatives that we expect to get more contributions from all animal feed experts and professionals are:

1. Supporting Indonesian Government to evaluate the best strategies relating to accessibility to animal feed and nutrition for breeders, due to the fact that there has been a significant rise in the animal feed price and an increased amount of animal feed competitors and technology from other countries.
2. Creating innovation to increase eficiency livestock breeding system in order to grow domestic livestock population.

3. Creating a positive investment opportunity in the area of animal feed, for example is to involve more middle-scale local business owners to invest and support the production and supply of animal feed in their areas.
4. Developing applied research regarding animal feed alternatives with prospects, which could be produced locally and have good quality.

I would like to extend my sincere appreciation to The Faculty of Animal Science University of Mataram and all members of Indonesian Association of Nutritionist and Feed Scientist (AINI) for organizing this international conference to improve the productivity, quality, and safety of Indonesia's livestock and animal feed, as well as sharing knowledges which is involving experts and professionals from different corners of the world.

To end my speech, please allow me to wish you all the best for your successful deliberation in this conference, and particularly wish that all distinguised guests, ladies and gentlemen, could fully contribute to the learning and development in the area of the welfare of Indonesian livestocks that includes animal feed subject. Therefore, Indonesia could grow as a stronger nation that could achieve meat self-sufficiency and reduce the country's dependency to meat import from other countries.

Thank you very much,

I Ketut Diarmita
Director General of Livestock and Animal Health

CONTENS

ORAL PRESENTATIONS
NON RUMINANT

PLENARY SESSION

MOULD BREAD IN THE FEEDING OF LOCAL DUCKS UNDER SMALL HOLDER MANAGEMENT IN LOMBOK INDONESIA

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ABSTRACT

An experiment was conducted with 75 twenty four weeks old local ducks feeding on three diets formulated by using the mould bread (MB) to assess its effect on laying performance. Three experimental diets were used in the study and proposed in a completely randomized design (CRD). Each treatment group was replicated five times with 5 birds per replicate. Diet 1 (T0) as a control feed was a conventional standard commercial layer duck feed. Diet 2 (T1) was a practical feed applied by small holders with 262 g/kg of dry matter inclusion of mould bread. Diet 3 (T2) was a practical feed applied by small holder with 297 g/kg inclusion of mould bread. Egg production increased ($p<0.05$) by 32.4 per cent and 3.2 per cent of the control when T1 and T2 diets respectively were included in conventional feeding system in small holder managements. Yolk color was lower ($p<0.05$) in group T1 and T2 (9.8) compared to T0 (12.7). Fresh egg yolks were not improved by the dietary tests. Layer ducks fed MB T1 and T2 had somewhat heavier egg weight (62.67g and 61.80g respectively) ($p=0.8233$) compared with layer ducks fed the standard commercial diet (61.44g). Feed costs of the MB ingredients were only 58.3 and 56.3per cent (0.28 USD and 0.27 USD) respectively compared with the standard diet (0.48 USD).

Key words*: egg production, egg weight, feed cost*

INTRODUCTION

The duck industry in Indonesia was dominated by small holders which accounts for 2.3 per cent of poultry population and contributes 1.5 per cent of the duck meat and 15.15 per cent of the duck eggs (DGLAHS, 2016). In other words, layer ducks are more popular than meat ducks. Under an intensive management system applied by the small farmers, the ducks are fed various local feed stuffs although commercial feeds are also available. Rice bran (RB) and yellow corn (YC) are the two energy sources that have long been known as feed ingredients in conventional poultry ration. However, recently the price of these feed stuffs has increased significantly which make the feed cost higher when confinement management system continuous to be implemented. An alternative energy source is necessary to sustain the existence of the small scale farmers. Mould bread is a waste of the retail bread of home industry when the expired date was over. Feeding with mould bread now is becoming accepted as a replacer of rice bran and yellow corn diets for both meat and layer ducks at any growing periods in small scale duck farmers in Lombok, Indonesia. The main reason is because of little cost for the mould bread that could reduce the feed cost which accounts for

60-70 per cent of the production cost. However, this may cause problems when excessive inclusion is applied because little information on this field for laying ducks is available. Therefore, this study was undertaken to evaluate the inclusion levels of mould bread which offer the maximum laying performance without any problems both to the birds and the consumers.

MATERIALS AND METHODS

Experimental design

The experiment was carried out at a duck farm of small group farmers in Mataram, Lombok Indonesia between October 2016 and February 2017, in the rainy season. A total of seventy five twenty four –wk old laying local ducks (Mojosari ducks) were purchased from the local breeder and wing banded, then weighted on an individual basis. They were then allocated randomly to three dietary treatments with five replicates of five birds. They were again weighted at the end of the study to evaluate the body weight changes that may occur.

Animals, housing and management

In a shedding house, the ducks were divided into pens floors which were covered by rice husk with average density of 4 birds/m^2**.** The pens were equipped with two round plastic basins with 20 cm in diameters for a feeder trough and for a drinking water. Lightings were natural during the day and provided by electric bulbs at night. There were no routine management practices such as health and disease control programs were applied. Also, no commercial vitamin and minerals were added into the diets.

Diets and Treatments

The birds were assigned to a completely randomized design. Seventy five of laying ducks were divided into 3 groups of dietary treatments with five replicates (25 birds/dietary treatment) and fed on a commercial layer concentrate and mixed with yellow corn and fine rice bran in the modified ratio of 2:4:4 respectively according to a commercial standard feed acting as the control group. The two other dietary treatments were formulated diets containing 262 and 297 g/kg of dry matter (DM) of mould breads to produce isoenergetic diets of 3,200 kcal /kg (Table 1). The rice bran used in this study was slightly coarse because our preliminary study found that the duck ate more in the coarse rice bran when mixed with the loaves bread than in the fine rice bran. This is more related to the characteristics of wheat

flour which are sticky and viscous making birds difficult to eat or to take up the feed. Restricted feeding methods were applied due to the duck eating behavior to avoid over spillage. Birds had free access to drinking water during the experimental period**.** The diets were offered in a wet form. Spillage of the feed was calculated by weighing and drying the remaining feed on the feeder and drinking water to correct the feed intake.

To ascertain the nutrient content of the ingredient, proximate analysis was applied. Prior to the study, all feed ingredients were evaluated for the proximate composition according to the methods of the Association of Official Analytical Chemists (AOAC, 1995). The results of proximate analysis of the mould bread are shown in Table 2.

Table 1: Ingredient and calculated nutrient composition of experimenta diets.

Ingredient (g/kg)	Dietary treatment		
	T0	T1	T2
Yellow corn (YC)	330	279	206
Rice bran (RB)	470	157	154
Commercial layer concentrate (CLC)	200	0	0
Ground fresh water fish (GFWF)	0	302	325
Mould bread (MB)	0	262	297
Total	1,000	1,000	1,000
Calculated nutrient composition			
Metabolizable Energy (kcal/kg)	3,100	3,100	3,100
Crude Protein	170	195	185
Crude Fiber	80	83	80

*% of DM ; No vitamin and mineral added

Table 2. Proximate analysis of expired bread of bakery home industry used in this experiment (%)*

Variety	Moisture	Ash	Ether extract	Crude Fibre	Crude Protein	Carbohydrate
Chocolate bread	23.7	0.81	12.6	0.02	5.4	57.3
Cheese bread	34.3	0.51	7.9	0.14	7.0	49.8
Plain bread	30.6	1.21	9.2	0.08	6.9	51.7

*Analyzed values – 2017

Measurements

The data on feed consumption, egg production and egg weight were recorded daily from 24 to 34 weeks (for the 10- wk of the experimental period). FCR was calculated from the daily feed intake and the egg mass. Egg mass was also calculated from egg weight multiplied by daily egg production. Egg quality characteristics viz. egg weight, fresh yolk weight and yolk pigmentation were measured during the experimental production period. A total number of 150 eggs (5 eggs from each dietary treatment) per week collection were taken and broken out on a clean Petri dish and then yolk color was determined against the Roche Yolk Color Fan scale (RYCF) as a tool for a standard color.

Data Analysis

The data collected for 10 wk of the experimental study were subjected to the General Linear Model (GLM) procedure of SAS version 8 (SAS, 1999). To compare means, Duncan's multiple range test was applied at the level of $p < 0.05$.

RESULTS AND DISCUSSIONS

Body weight changes and laying performance

To the best our knowledge, this is the first study examining the potential expired bread (mould bread) in laying ducks. The author's belief that the ducks are capable of using the mould bread into the desirable production performance. As seen in Table 3 that the initial and final body weights as well as weight gain of the laying ducks fed mould loaves of bread were not significantly different ($p>0.05$) from the control diet although the T1 showed the heaviest birds (1569 g). The result therefore suggests that feeding to laying ducks with mould loaves of bread did not show any detrimental effects on bird's health and their palatability associated with the fungal contamination. This tendency has also been shown on the laying performance.

Feed intake and egg production were affected by dietary treatments ($p<0.05$) but there is no effect on feed conversion ratio attributable to the treatments. Reduced feed intake by 14.9 per cent and 18.6 per cent of the control respectively were observed when 262 and 297 g/kg mould bread were included in a conventional feeding system in small holder managements. Conversely, egg production of T1 and T2 diet fed birds increased by 32.4 per cent and 3.2 per cent of the control group respectively. Although the egg production curves (Figure 1) fluctuated in a similar manner for all groups, it is interesting to note that the

highest egg production was recorded in birds fed with T1 diet (40.9 per cent) and the lowest egg production birds fed with the control diet (30.9 per cent) and tended to increase after 10 wk of the experimental period. The improvement in egg production by birds fed with the mould bread diet could be attributed to enhancement of feed efficiency as a result of the effect of fermentation by gut microflora. There are two possible explanations for these improvements. The first is that fungus growing in the loaves of bread is favorable to the ducks and could work as a probiotic. As reported by previous studies that probiotics have several benefits if supplemented in poultry diets. Significant effects of probiotic were observed by Denev *et al.* (2006) and Boostani *et al.* (2013) on higher body weight in broilers, egg quality in chukar partridge by Hashemipour *et al*. (2011) and laying hens by Shalaei *et al.* (2014). In general, beneficial changes in gut microflora environment that improve host's performance are the main concern of applying probiotics. Another possibility is that mould bread could also take action as prebiotics. The proximate analysis of the loaves of chocolate bread showed that this bread contains 57.3 per cent carbohydrate and 0.02 per cent crude fiber (Table 2) and wheat itself as the major ingredient of bread making had a higher proportion of insoluble (87 g/kg) than soluble (28 g/kg) non-starch polysaccharides (NSP) (Amerah, 2015) as an energy source. Like other poultry, ducks as a monogastric animal cannot digest complex carbohydrate such as NSP (Nikam *et al.,* 2016) and high insoluble NSP is considered to modify the intestinal flora and reduce turnover rate of the intestinal mucosa and to change the immune system (Shalaei *et al.*, 2014). In addition, the use of coarse rice bran in present study may help to increase gut development and nutrient digestibility (Choct, 2015), thus improving feed efficiency. It has been claimed that the benefits of crude fiber affect the intestinal mucosa carbohydrase and binding effect (Hsu *et al.,* 2000). In this case, ducks were apparently tolerant to the mould bread which was evident by no mortality was found during the experimental period and as mentioned earlier that body weight of the mould bread fed birds were also higher than the control diet although this is not significantly different. Slightly different from chickens, however, that body weight gain and hen day production were reduced when laying hens fed with mould-contaminated diet (Akande *et al.,* 2015). Sangsoponjit and Suphalucksana (2016) in their work with broilers fed the commercial ration and mixed with selected microorganisms (such as *Actinomysetes, Aspergillus niger, Rhizopus stolonifer sp, and Trichoderma sp*) reported that increased the nutritive value of the diet in terms of crude fibre, crude protein, and ether extract as a result of the ability of this microbes to produce enzyme cellulase, hemicellulase

and lignin. Thus, the improved performance of the T1 and T2 birds in the present study may be explained by the actions of both probiotics and prebiotics simultaneously. Mirana *et al.* (2016) found that *Aspergillus sp* were the dominant fungi in the expired breads. At this moment, we did not asses the microbiology aspect of which could clarify the microorganisms present in the loaves of bread with respect to types and their characteristics.

The relatively low egg production of all groups in this study was not expected and this could be due to an extreme weather recently. Heavy rain and strong wind blew in the time of the experiment, make birds experiencing environmental stress. Under normal condition, it is predicted that the production performance is better than this current condition.

Table 3. Performance of laying ducks fed different dietary levels of mould loaves of bread during 10 wk of the experiment

Parameters	Dietary treatments			SEM	p-value
	T0	T1	T2		
Initial body weight (g)	1400	1368	1426	33	0.3449
Final body weight (g)	1486	1569	1550	35	0.3638
Gain (g)	86	201	123	51	0.3024
Egg production (%)	30.9^{b}	40.9^{a}	31.9^{b}	3.0	0.0390
Feed consumption (g)	156.9^{a}	133.5^{b}	127.7^{b}	12.2	<.0001
FCR (g/g)	6.036	5.701	5.538	0.320	0.5370
Egg mass (g/bird/wk)	56.34	83.40	54.59	10.42	0.0967

$^{a-b}$ means in the same row with no common superscript differ significantly ($p<0.05$)
T0: commercial concentrate based diet; T1:262 g/kg mould loaves of bread diet; T2:297 g/kg mould loaves of bread diet. SEM –standard error of means

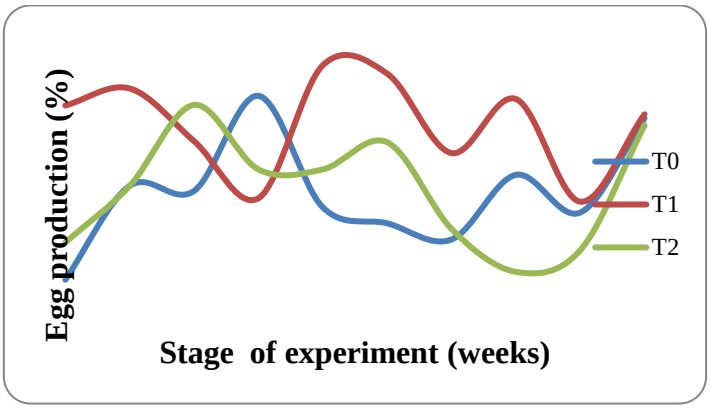

Figure 1. Egg production of different mould loaves of bread fed in laying ducks

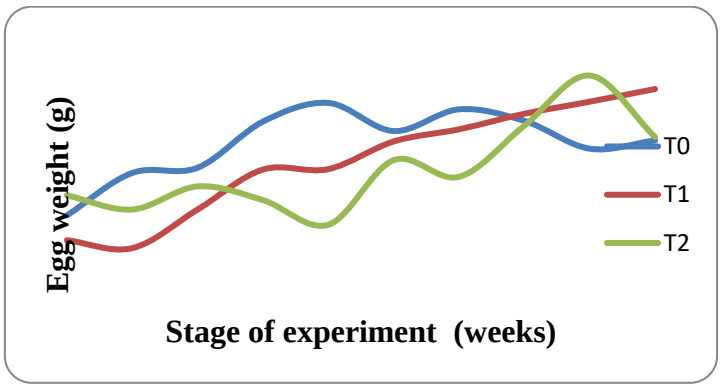

Figure 2. Egg weight of different mould loaves of bread fed in laying ducks

Egg quality characteristics

The results on selected characteristics of egg qualities are shown in Table 4. It appears that inclusion of mould loaves of bread in layer diet for ducks at 262 and 297 g/kg dietary levels had a substantial improvement of yolk color in the control diet. This is quite probable to be related to the higher level of yellow corn as a single source of *xantophyll* included than in the tested diets (400 g/kg versus 279 and 206 g/kg corns – Table 1). Corn has been long as the most common feed stuff used in poultry nutrition for egg yolk pigmentation (Blessinz *et al.*, 1963). Although there is no statistically significant difference in egg weight and fresh egg yolk weight when layer ducks were fed diets with different levels of mould bread (Table 4), there was a marked tendency for heavier egg weight (Figure 2) and egg yolk with the dietary mould bread level was lower.

Table 4. Selected characteristics of egg qualities of laying ducks fed different dietary levels of mould loaves of bread.

Parameters	Dietary treatments			SEM	p-value
	T0	T1	T2		
Egg weight (g)	61.44	62.67	61.80	1.42	0.8233
Fresh yolk weight (g)	22.17	23.98	22.73	0.9634	0.4711
Yolk color (RYC)	12.7^{a}	9.8^{b}	9.8^{b}	0.3284	0.0001

$^{a-b}$ means in the same row with no common superscript differ significantly ($p<0.01$)

T0: commercial concentrate based diet; T1:262 g/kg mould loaves of bread diet; T2:297 g/kg mould loaves of bread diet; SEM –standard error of means

Health records

As mentioned that there was no mortality found during the study. It means that the mould bread did not affect on the bird's health.

Economic analysis

Calculated feed cost per kg (Table 5) showed that the lowest feed cost per kg feed was for the T2 diet (0.27 USD or 58 per cent of T0), in which 297 g/kg mould bread was included. However, the ducks fed with this diet had both low egg production and egg weight. Conversely, the T1 diet (0.28 USD or 56% of T0), in which 262 g/kg mould bread was fed, had the highest egg production compared to either the control or the T2 diets. The control diet which a commercial concentrate diet used had the most expensive feed cost (0.48 USD). It means that mould contaminated bread was not only cheap but also gave heavier eggs than the control diet.

Table 5. Estimates of feed costs based on the retail market price when the study conducted

Ingredient	Price /kg	T0	T1	T2
		IDR		
Yellow corn	6.000	2.400	2.736	2.742
Rice bran	2.000	800	506	380
GFWF	2.500	-	278	278
Mould bread	1.000	-	180	242
Commercial concentrate	8.000	3.200	0	0
Feed cost per kg		6.400 (0.48 USD)	3.700 (0.28 USD)	3.642 (0.27 USD)

T0: commercial concentrate based diet; T1:262 g/kg mould loaves of bread diet; T2:297 g/kg mould loaves of bread diet
*1 USD = IDR 13,300

CONCLUSIONS

- Mould loaves of bread are potential to replace in part of energy source in duck feeding at level of 262 g/kg in course rice bran and corn based diets.
- Egg production increased by 32.4 per cent by feeding with mould loaves of bread with lower feed cost than the standard diet.
- Ducks are tolerant to the fungus contaminated diet which was shown by the increase in body weight and no mortality or health disorder due to this feeding trial.

ACKNOWLEDGEMENTS

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