Effect Of Symbiotic Flour (Lactobacillus Sp. And FOS) To The Egg Quality And Performance Of Laying Hens

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Abstract. The research was to determine the effect of feeding symbiotic flour (Lactobacillus sp. and FOS) to the egg quality and performance of laying hens. The research was a completely randomized design with 5 treatments and 4 replicates. The materials used for this research were 100 laying hens (30 weeks old). The treatments used for the research were dietary feed consisted of T0 (basal feed), T1 (basal feed + 0.2% symbiotic), T2 (basal feed + 0.4% symbiotic), T3 (basal feed + 0.6% symbiotic), and T4 (basal feed+0.8% symbiotic). The observed parameters were performance (feed intake, hen day production, egg mass, feed conversion ratio, income over feed cost (IOFC)) and egg quality (haugh unit, albumin volume, egg yolk volume, egg yolk color, egg yolk cholesterol content). The data analysis was the analysis of variance (ANOVA) and continued by Duncan’s Multiple Range Test. The results showed that using the symbiotic flour (Lactobacillus sp. and FOS) in the feed has significant difference (P<0.05) on IOFC and egg yolk volume, while also had significantly difference (P<0.01) on performance (feed intake, egg mass, feed conversion ratio) and egg quality (albumin volume, egg yolk color, and cholesterol). The research concludes that the addition of 0.8% probiotic flour (Lactobacillus sp.) as feed additive showed the best results.

Keywords: Symbiotic, Performance, Egg quality, Laying hens

1. Introduction
The laying hens have been increasing in number in Indonesia. Laying hens has three growth periods, consisted of starter, grower, and layer periods. The feed is the key to meet the requirement of the three periods of laying hens. Nowadays, the farmers used feed additive in the feed to stimulate growth, increase production performance and inhibit disease. The feed has a correlation with the feed intake and feeds conversion. [1] The used feed additive causes a negative effect on the laying hens, while the residues are in the egg and decreasing the quality.

The symbiotic feed provides an alternative to prevent the negative effect of animal residue. Symbiotic is a combination of prebiotic and probiotic. The symbiotic mechanism in combination with fructose oligosaccharide (FOS) would build a colonization system in the digestive tract, improve the metabolic system and balance the micro-biotic. [2] the used of symbiotic in the feedstuff can stimulate growth and microbial activity that can give benefits to the digestive tract.

[3] The Lactobacillus sp. is the most lactic acid bacteria in the intestinal tract. The Lactobacillus sp produces an essential enzyme that increased quality in the digestive tract of laying hens. The micro-biotic condition is needed in the digestive tract to optimize the production of the egg.
[4] The use of probiotics affected increased feed conversion (10%) and decreased mortality (50%). The used probiotics will stimulate *Bifid bacteria* and *Lactobacilli* to produce fatty acid, lactic acid, and anti-microbial pathogen.

2. Materials and methods

2.1. Materials

The principal equipment for the research are battery cages (20x60x35 cm) feed bunk and drink bunk. The materials are 100 laying hens with hen day production 77.68±6.77%. The used probiotic was *Lactobacillus* sp. at 2.56 x10⁹ CFU/mg and fructose oligosaccharide (FOS) that mixed with the basal feed (corn, concentrated, and rice bran). The drink gave ad libitum. The feed is given at 08.00 a.m. and 15.00 p.m.

2.2. Methods

The research method was a completely randomized design with 5 treatments and 4 replicates. The replicates consist of 5 heads laying hens with total (100 heads). The levels of dietary and prebiotics are as follow:

- T0 = (basal feed + 0% symbiotic)
- T1 = (basal feed + 0.2% symbiotic)
- T2 = (basal feed + 0.4% symbiotic)
- T3 = (basal feed + 0.6% symbiotic)
- T4 = (basal feed + 0.8% symbiotic)

2.3. Variables

The variables observed were performance (feed intake, hen day production, egg mass, feed conversion ratio, income over feed cost (IOFC)) and egg quality (haugh unit, albumin volume, egg yolk volume, egg yolk color, egg yolk cholesterol content).

2.4. Data Analysis

The data analysis using analysis of variance (ANOVA) and continued by Duncan’s Multiple Range Test.

3. Results and discussion

3.1. The Symbiotic Effect in Performance

| CODE | Variables | Feed Intake** | IOFC* | HDP | Egg Mass** | Feed Conversion* |
|------|-----------|---------------|-------|-----|------------|------------------|
|      | (g/head/day) | (RP/head/day) | (%)   | g/head/day |                  |
| T0   | 124.64±0.39b | 240.24±16.73a | 78.19±2.96 | 48.66±1.00a | 2.57±16.73a     |
| T1   | 124.06±0.61b | 321.44±39.54b | 82.11±1.22 | 53.61±2.17a | 2.33±0.99a      |
| T2   | 123.90±0.88b | 300.96±39.09b | 81.54±2.48 | 53.03±2.19a | 2.32±0.07a      |
| T3   | 123.58±1.32b | 274.04±17.45a | 81.16±2.09 | 52.04±1.23b | 2.38±0.04a      |
| T4   | 121.01±0.31b | 306.29±35.63b | 82.32±1.56 | 53.65±1.93b | 2.26±0.09a      |

** Superscript showed a highly significant difference (P<0.01)

*a Superscript showed a significant difference (P<0.05)

3.1.1 The Symbiotic Effect in Feed Intake

Based on table 1, results from the research showed that the highest feed intake was shown in T0 (124.64±0.39) with (basal feed + 0% symbiotic) and the lowest was shown in T4 (121.01±0.31) (basal feed + 0.8% symbiotic). The treatment from lower to higher be T4, T3, T2, T1, T0 The average of feed
intake are significantly different (P<0.01). The used of symbiotic in the feed are impacted to the health of the digestive tract, while the function of the beneficial microbial (Lactobacillus sp) is to optimize the function of the digestive tract that can absorb nutritive value in the feedstuff in order to optimize and the nutrient requirement in the laying hens are fulfilled.

[5] The symbiotic will optimum in order to beneficial bacteria to growth actually in the intestinal. The beneficial bacteria (Lactobacillus sp) in the laying hens intestinal increased the production, increasing the feed efficiency, and increasing the quality and health in order to inhibit pathogen bacteria due to effect to pathogen microbial to optimizing the absorbing nutrient from feedstuff. [5] the feeding of probiotic and symbiotic would increase total feed intake and villus.

According to the table, the T4 is in the lower result, while the symbiotic would optimize the nutrient absorption in the feedstuff. The optimum condition of the nutrient absorbing in the feed would decrease the feed consumption and improve the feed intake and cause the laying hens to stop the feeding. [3]

The nutrient requirement in metabolism energy would affect the feed intake, due to the energy are the main factor of the consumption. Feed intake factors depend on body weight, feed size, energy, production, health, and environment. The higher temperature in the environment causes higher drinking than feeding activity while the basal feed mixed with the symbiotic would optimize the nutrient absorption due to the nutritive value requirement.

3.1.2 The Symbiotic Effect in Income Over Feed Cost
Based on table 1, T3 showed higher income over feed cost (321.44±39.54) compared to T0 is (240.24±16.73). The treatment from lower to higher be T0, T3, T2, T4, and T1. The average of villus height is significantly different (P<0.05). The feeding of the symbiotic optimizes the nutrient absorption and increases the egg production noting that the nutrient would be converted thus increase the income over feed cost as well.

[3] feeding the symbiotic or probiotics can improve feed efficiency that can calculate the amount of income over feed cost, the increasing of the egg production effect to the amount of the income over feed cost in the laying hens. [7] T

The income over feed cost depends on several factors e.g. egg mass and the feed intake, the price of the egg in the market. [8] Feed conversion would affect the income over feed cost due to the decreased production cost. [9] The income over feed cost are due to the feed cost, while the lower price of the feed effect to the income over feed cost.

3.1.3 The Symbiotic Effect in Hen Day Production
Based on table 1, results from the research showed that the highest hen day production was shown in T4 (82.32±1.56) with (basal feed + 0.8% symbiotic) and the lowest T0 was (78.19±2.96) (basal feed + 0% symbiotic). The treatment from lower to higher be T0, T1, T2, T3, T4. The average of hen day production is not significantly different (P>0.05). The symbiotic did not give significant effects due to genetics, environment, temperature, health, and stress factors.

[5] The level of given feed during the growth periods did not give a significant effect on the ovum production to optimize egg production. [1] The basically the probiotic combination with the prebiotics is to optimizing intestinal and absorbing the nutritive value but the probiotics cannot optimize the function of reproductive organs physiology of laying hens. The used probiotics are not optimum in the early periods due the function has effective to the grower periods.

The level of probiotics will optimum due to the nutrient absorbing will cause the number of ovum and organs to maximize and optimize production. [10] The combination of prebiotics and probiotics affect the intestinal absorbing. [5] The level of probiotics given can increasing the hen day production due to the energy resources and protein content in the symbiotic are effect on the amount of egg production.

3.1.4 The Symbiotic Effect in Egg Mass
Based on table 1, the highest egg mass was achieved in T4 (53.65±1.93) with (basal feed + 0.8% symbiotic), while the lowest was T0 (48.66±1.00) (basal feed + 0% symbiotic). The treatment from
lower to higher be T₀, T₁, T₂, T₃, T₄. The average of egg mass are significantly different (P<0.01). The level of symbiotic given is significantly different are due to the absorbing process in the intestinal are optimum and metabolism in the entire bodies laying hens.

[11] The feed efficiency in the entire level of the symbiotic level is effective to the egg production, the level of the absorbing are optimizing in the intestinal organs to produce the egg. [1] the amount of the egg mass multiplied with the hen day production will determine the egg mass, while several factors are effect to the amount of the egg mass. [3] The hen day production are not factors that affect to the egg mass but depend on the feed intake. [12] The important factors affected by the egg mass are protein content and amino acid this condition due to the 50% of dry matter in the egg are the protein in order to an amino acid to synthesis the protein to produce the egg. [7] The nutritive value in the egg mass is the protein, linoleic acid, and amino acid content in the feedstuff. The egg mass depends on several factors e.g. genetic and age. [12] The egg mass standard of laying hens is around 52-53 g/head/day.

3.1.5 The Symbiotic Effect in Feed Conversion

Based on table 1, results from the research showed the feed conversion was found in T₄ (2.57±16.73) with (basal feed + 0% symbiotic), while the lowest was in T₁ (2.26±0.09) (basal feed + 0.8% symbiotic). The treatment from lower to higher be T₄, T₃, T₂, T₁, T₀. The average of egg mass are significantly different (P<0.01). The level of given symbiotic is significantly different due to the level symbiotic given (Lactobacillus sp. and FOS) are optimizing the microbial population in the intestinal in order to inhibit the pathogen microbial is optimum. [10] The ecosystem microflora in the intestinal can affect performance and the health, while the unbalancing microflora depends on the colonization pathogen bacteria and the feeding of probiotics can improve the performance.

[2] the optimizing of the microbial in the probiotics has a function for protolitic enzyme and ligninolytic enzyme that can be used of the hens to convert the nutritive value in the feedstuff. [15] The lower feed conversion are showed the efficiency of the laying hens to convert the feedstuff into the egg. [4] The feed conversion depends on feed intake and egg production. Table 1 showed that feed intake and feed conversion are lower control variables. [13] Feed conversion depends on age, sex, physiological status, body weight, temperature, and environment. [4] The higher feed conversion caused by lower feed intake that cycle to produce egg is decreasing. The other factors are microbial activity, enzyme activity, protein digestibility, and metabolize energy that happens in the intestinal of laying hens. The cycle of absorbing nutrient content higher and feed efficiency also increased.

3.2. The Symbiotic Effect in Egg Quality

Table 2. Egg Quality

| CODE | Haugh Unit* | Albumin Volume** | Egg Yolk Volume | Egg Yolk Color** | Cholesterol** |
|------|-------------|------------------|----------------|-----------------|--------------|
|      | (ml)        | (ml)             | (ml)           | (mg/100gr)      |              |
| T₀   | 71.86±3.46  | 33.17±2.00       | 15.08±0.32     | 8.79±0.16       | 218.93±16.73 |
| T₁   | 73.04±1.97  | 37.46±1.47       | 15.50±0.56     | 9.04±0.28       | 217.21±1.69  |
| T₂   | 74.16±2.93  | 39.58±2.07       | 15.63±0.29     | 9.37±0.34       | 213.49±2.59  |
| T₃   | 76.70±1.61  | 39.67±2.15       | 15.34±0.90     | 9.51±0.19       | 213.84±1.39  |
| T₄   | 77.89±1.66  | 40.25±3.47       | 14.92±0.29     | 9.87±0.63       | 209.38±1.38  |

** Superscript showed a highly significant difference (P<0.01)
*Superscript showed a significant difference (P<0.05)

3.2.1 The Symbiotic Effect in Haugh Unit

Based on table 2, results from the research showed that the highest haugh unit was shown in T₄ (77.89±1.66) with (basal feed + 0.8% symbiotic) and the lowest was T₀ (71.86±3.46) (basal feed +...
0% symbiotic). The treatment from lower to higher be T₀, T₁, T₂, T₃, T₄. The average of the haugh unit is significantly different (P<0.05). The increased of the haugh unit due to the absorbing nutrient in the intestinal while the level symbiotic optimizing the substrate to process Lactobacillus sp. and FOS to producing the higher lactic acid.

[2] The higher lactic acid will produce carbon dioxide, the substrate will stimulate the Lactobacillus sp. and activate the protolithic continued with produce the peptide and amino acid. [3] The amino acid that produces can balance the ovomucin and lecithin in otherwise to increase the egg quality mainly in the haugh unit. The result given an additional [14] that ovomucin affect albumin through magnum secretion. Ovomucin is the main indicator to determine the albumin and the cycle depend on protein consumption.

3.2.2 The Symbiotic Effect in Albumin Volume (ml)
Based on table 2, results from the research showed that the highest albumin was shown in T₄ (40.25±3.47) with (basal feed + 0.8% symbiotic) and the lowest was T₀ (33.17±2.00) (basal feed + 0% symbiotic). The treatment from lower to higher be T₀, T₁, T₂, T₃, T₄. The average of albumin are significantly different (P<0.01). The result is significantly different due to the laying hens are absorbing nutritive value well and increasing the albumin. [3] The mechanism optimizing the nutritive value in the symbiotic is by producing lactic acid, acetate acid, carbon dioxide, hydrogen peroxide, bacteriocins, inhibit the pathogen bacteria in order to symbiotic absorbing the nutrient in the epithelial wall. [14] The specific character in the albumin is its lysosome content. The level given of the symbiotic in the form of the internal quality of the egg is showing significantly effect. [10] stated the factors affected by the albumin content are age, temperature, breed, strain, nutritive value, body weight and time produce of the egg.

3.2.3 The Symbiotic Effect in Egg Yolk Volume (ml)
Based on table 2, results from the research showed that the highest egg yolk volume was shown in T₀ (15.08±0.32) with (basal feed + 0% symbiotic) and lowest was T₄ (14.92±0.29) (basal feed + 0.8% symbiotic). The treatment from lower to higher be T₀, T₁, T₂, T₃, T₄. The average egg yolk volume is not significantly different (P>0.05). The result is due to the nutritive value in the feedstuff are not relatively same, the content in the feed that consumption by hens is not given effect to the egg yolk. In order to increase the egg yolk volume, there are several factors besides the age. The laying hens used in the research are 30-35 weeks this condition affects the production of laying hens are not in the peak production due to the ovarian is not optimal. The other factors are from the strain. [4] The factors which affect egg yolk volume include age, temperature, strain, breed, nutritive value, body weight, and time to produce the egg. [9] The higher temperature would affect the hormonal activity that stimulates the reproductive organs and decrease the egg yolk volume.

3.2.4 The Symbiotic Effect in Egg Yolk Color
Based on table 2, results from the research showed that the highest egg yolk color was shown in T₄ (9.87±0.63) with (basal feed + 0.8% symbiotic) and the lowest was T₀ (8.79±0.16) (basal feed + 0% symbiotic). The treatment from lower to higher be T₀, T₁, T₂, T₃, T₄. The average egg yolk color is significantly different (P<0.01). The increased of the egg yolk color is due to the carotene content in the egg, while the carotene consists of xanthophyll pigment. [2] the used of the symbiotic due to content of the Lactobacillus sp and FOS that increasing the number of the carotene pigment in each treatment. The yellow pigment is automatically absorbing by the intestinal to the target organs. The given of symbiotic can support the life of bacteria in intestinal. [11] The yellow pigment consists of xanthophyll, beta carotene, and Cytoxan.

3.2.5 The Symbiotic Effect in Cholesterol
Based on table 2, results from the research showed that the highest cholesterol content was found in T₄ are (218.93±16.73) with (basal feed + 0% symbiotic) and lowest was in T₀ (209.38±1.38) (basal feed + 0% symbiotic). The treatment from lower to higher be T₀, T₁, T₂, T₃, T₄. The average egg yolk color is significantly different (P<0.01). The used symbiotic consist of Lactobacillus sp is decreasing
the cholesterol content in order to inhibit the synthesis of cholesterol. The cycle starts from the HMG-KoA reductase inhibition (HydroxiMethyl Glutaryl-KoA reductase) that has the function of forming mevalonate in cholesterol synthesis. [2] the decreasing of the cholesterol content is due to competes of the microbial with HMG-KoA reeducates (HydroxiMethyl Glutaryl-KoA reeducates) that binding with the HMG-KoA Reeducates enzyme. [5] The decreasing cholesterol content is due to the lactic acid bacteria that produce the Bile Salt Hydrolase (BSH).

4. Conclusions
The results showed that using the symbiotic flour (Lactobacillus sp. and FOS) in the feed has significant different on income over feed cost (IOFC) and egg yolk volume and significantly different on performance (feed intake, egg mass, feed conversion ratio) and egg quality (albumin volume, egg yolk color, and cholesterol) The addition of 0.8% probiotic flour (Lactobacillus sp.) as feed additive showed the best overall egg quality and production performance.

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