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The effect of Lacto-B probiotics on broiler chicken performance

Abun Abun [1,*], Alfian Herfan Prasetya [2] and Tuti Widjastuti [3]

[1] *Department of Animal Nutrition and Feed Technology, Padjadjaran University, Sumedang-West Java, Indonesia.*
[2] *Alumni Department of Animal Nutrition and Feed Technology, Padjadjaran University, Sumedang-West Java, Indonesia.*
[3] *Department of animal production, Padjadjaran University, Sumedang-West Java, Indonesia.*

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Abstract

Broiler chickens are chickens that are raised quickly to produce meat. Broiler chickens have a short growth time because they are genetically modified chickens. Its rapid growth has a negative side: it is easy to get a disease, so the absorption of nutrients does not occur optimally. Farmers in Indonesia usually use antibiotics to overcome this, but antibiotics have a negative impact and are prohibited from being used. An alternative to antibiotics is the probiotic Lacto-B. This study aims to determine the effect of Lacto-B probiotics and the right dose level on broiler chicken performance. The experimental research method used a complete randomized design and ANOVA statistical analysis. Giving Lacto-B probiotics significantly differs ($P<0.05$) on broiler performance. Probiotic Lacto-B, given at 0.5 ml/liter of drinking water, produces the best broiler chicken performance.

Keywords: Broiler chicken; Probiotics; Lacto-B; Drinking water; Performance

1. Introduction

Broiler chickens are one type of chicken strain raised to produce meat. Broiler chickens are widely cultivated in Indonesia because of their fast-growing nature. In addition, the cultivation of broiler chickens is profitable because it can be harvested in approximately one month. The success of productivity can be seen from performance.

The weakness of its growth is the impaired absorption of food substances, making broiler chickens susceptible to disease. Diseases such as those caused by bacteria can attack broiler chickens. As a result, broiler chickens lose their appetite, so the absorption of nutrients does not take place optimally and causes feed to be inefficient. The feed conversion ratio (FCR) will swell if chickens fail to convert feed into meat, and the value of income over feed cost (IOFC) can decrease due to high feed prices not by the meat produced. To overcome this, antibiotics are used in the broiler chicken industry to restore the performance of broiler chickens. Indonesian breeders use Antibiotic Growth Promoter (AGP) as much as 96.97% [1].

Even though it has been banned, breeders still use it. This is because farmers are worried that it will reduce performance and be susceptible to disease. AGP can also function as a nutrient for broiler chickens. However, using AGP causes residues in chicken meat, harming humans who consume broiler chicken meat [2]. The use of AGP was prohibited by the government of the Republic of Indonesia on January 1, 2018, which refers to Law No.41 of 2014 concerning Livestock and Health. AGP must be replaceable because it looks at its shortcomings and prohibitions. Feed additives are additional ingredients in feed that aim to increase feed efficiency and production. Giving probiotics is a solution to replace AGP to maintain broiler chicken performance.

* Corresponding author: Abun Abun

One type of feed additive is probiotics. A group of bacteria in probiotics can provide benefits to its host. The bacteria in probiotics are lactic acid bacteria. Probiotics can be added to feed or drinking water. Probiotics are helpful in the prevention of disease. The purpose of giving probiotics is to increase endurance, digestibility of feed, and good microbial growth [3]. Its administration can be done at the beginning of maintenance. *Lactobacillus acidophilus*, *Bifidobacterium longum*, and *Streptococcus thermophilus* are bacteria commonly used in probiotics.

Lactobacillus can make the digestive tract healthier by modifying its condition and suppressing bacterial growth. *Bifidobacterium longum* produces antimicrobial protein substances such as bacteriocins (*bifidocin B* and *bifidin), acetic acid,* and lactic acid, which help suppress the growth of harmful bacteria. These bacteria grow inside the digestive tract. *Bifidobacterium* can also increase digestive enzyme activity, intestinal villi area for nutrient absorption, and lower intestinal pH [4]. *Streptococcus thermophilus* given to broiler chickens helps digestion of crude fiber of feed consumed and improves feed quality [5]. Probiotics increase nutrient absorption, improve digestion, and maintain the balance of microorganisms [6].

Feed conversion ratio (FCR) is the ratio between the amount of feed used versus the amount of weight produced. The smaller the FCR value, the better the business conditions of chicken livestock. This is because the feed can be appropriately absorbed without wasting nutrients. The increase in body weight corresponds to adding a certain amount of feed, resulting in a more significant proportion of chicken weight.

Income over feed cost (IOFC) is influenced by the growth of broiler chicken body weight produced; the higher the increase, the higher the selling value of the chicken. High weight growth and lower ration prices consumed will result in a considerable IOFC value. The greater the IOFC value, the better maintenance. The high IOFC indicates that revenue from sales is getting higher.

Giving lactic acid bacteria probiotics to broiler chickens through drinking water at a dose of 1ml/liter can reduce FCR values and increase body weight gain [7]. According to [8] stated that probiotic supplementation through drinking water, as much as 1cc / liter of water, was able to show a real difference in broiler chicken performance seen from the conversion of control rations from 1.86 to 1.54 with probiotic supplementation, and the increase in control body weight from 1376 g to 1521 g with probiotic supplementation.

The probiotic used in this study was a probiotic with the name Lacto-B. Lacto-B is a powdered probiotic helpful in improving the normal functioning of the digestive tract, treating digestive diseases such as diarrhea and dyspepsia, and for long-term antibiotic use. The main components of Lacto-B are bacteria that are good for the digestive tract, such as *Lactobacillus acidophilus*, *Bifidobacterium longum*, and *Streptococcus thermophilus.* This probiotic has a composition of *Lactobacillus acidophilus*, *Bifidobacterium longum,* Streptococcus thermophilus*, vitamin C, vitamin B3, vitamin B1, vitamin B2, Vitamin B6, and* zinc oxide.

2. Material and methods

2.1. Experimental livestock

The study used 100 broiler chickens, raised from the age of DOC (Day Old Chicken), to harvest. The strain used is Cobb. Broiler chickens are divided into five groups by insulation according to the treatment given. Each treatment is repeated four times. The number of chickens per treatment is 20 tails. The average weight of DOC is 44.57 grams. The coefficient of variation in DOC weight is 7.43%.

2.2. Probiotic Lacto-B

Feed additives are given through drinking water. Feed additives are given in probiotics containing *Lactobacillus acidophilus, Bifidobacterium longun,* and *Streptococcus thermophillus*. The probiotics used are commercial probiotics tested in the laboratory under the product name Lacto-B. This product is usually used for humans (children). Each sachet contains probiotics *L. acidophilus* as much as 8,811 mg (4.7 x CFU / gram), 10^7*B. longum* as much as 17,622 mg (1.3 x CFU / gram), 10^7*S. Thermophillus* as much as 52,866 *mg, vitamin C as much as 10 mg, vitamin B1 as much as 0.5 mg, vitamin B2 as much as 0.5 mg, vitamin B3 as much as 2 mg, vitamin B6 as much as 0.5 mg, and* zinc oxide *1.3 mg.*

2.3. Ration

The rations used are commercial. The feed ingredients used in the ration are corn, rice bran, soybean meal, fish meal, meat and bone meal, corn protein meal, stone meal, and oil. The ration consists of two types, namely C10 in the form of

fine crumble for the starter period used on days 1-7 and C11 in the form of crumble for the grower to finisher period, which starts to be given on day 8 until harvest. The nutrient content of the feed used can be seen in Table 1.

Table 1 Nutrient feed content

Feed Code	Feed nutrient content in percent (%)						
	water content (max)	crude protein (max)	extract ether (min)	crude fiber (max)	ask (max)	Ca (min)	P (min)
C10	13	23	5	4	7	0.8 – 1.10	0.6
C11	13	22.5	5	5	7	0.8 – 1.10	0.6

Source: PT New Hope Indonesia (2022)

2.4. Research Tools

The study was conducted on a closed-house chicken coop using a litter system. Partitions are made of wood nets and litter using rice husks. The equipment used are:

Automatic feeder to feed broiler chickens automatically
Brooder to maintain the temperature of chickens aged 1-2 weeks
Block to separate chicken treats
Baby chick feeder to give feed to chickens aged 1-2 weeks and control feeding over
Nipple for giving chickens drinking water
Bell drinker to provide water to research chickens
Scales for weighing chickens and feed

2.5. Research Procedure

All feed ingredients, such as water, rations, and probiotics, are prepared. Feed is given through baby chick feeders. Drinking water is provided and mixed with probiotics, and then the pH of drinking water is measured. They make probiotics by dissolving probiotic powder according to the dose of sugar water that has been cooked. Wait for the sugar water to cool and dissolve the probiotics. Every 1 liter of water contains 10% palm sugar water, and then a ratio of 1 liter of water / 100 grams of palm sugar / 1 x probiotics is obtained. Drinking water is provided through a bell drinker. For AGP, mix with feed and stirred well.10^{8}

Maintenance and observation are carried out for 25 days or four weeks. The newly arrived DOC was given sugar water to replace its energy. The ration is given twice a day in the morning and evening. The ration is given through a baby chick feeder for two weeks and then through an automatic feeder. Feed consumption is measured by weighing the remaining in the feed bin the next day. Drinking water is provided adlibitum every day. Drinking water mixed with Lacto-B probiotics is given through a drinker bell. Drinking water is measured by entering the remaining water one day the next using a measuring cup. Drinking water consumption is measured daily. Wet husks can be re-sprinkled with dry husks or turned over using a hoe.

The data are total feed, live chickens' total weight, data such as feed used, body weight growth, and amount of consumption, which are taken daily and accumulated weekly.

2.6. Observed Modifiers

2.6.1. Feed conversion ratio (FCR)

- FCR = total ration consumption (kg): weight gain during the study (total weight of live chickens (kg) – DOC weight)
- Income Over Feed Cost (IOFC)
- IOFC = Revenue – feed costs
- Earnings = Final weight x sale price of chicken/kg
- Feed cost= Feed consumption (kg) x treatment feed price/kg

2.6.2. Trial Plan and Statistical Analysis

The study was conducted experimentally using a completely randomized design consisting of 4 treatments; each treatment was repeated 5 times, so there were 20 experimental units. Each experimental unit has four broiler chickens. The treatment is given through drinking water (Lacto-B probiotics).

- P0: Drinking water + 0 ml of probiotic Lacto-B/liter (control)
- P1: Drinking water + 0.5 ml of probiotic Lacto-B/liter
- P2: Drinking water + 1 ml of probiotic Lacto-B/liter
- P3: Drinking water + 1.5 ml of probiotic Lacto-B/liter

If the results obtained are significantly different, then a test is carried out using the Duncan Multiple Distance test with the formula [9].

3. Results and discussion

The effect of probiotics on the performance and IOFC of broiler chickens, based on the study's results, can be seen in Table 2.

Table 2 Performance and IOFC of broiler chickens during rearing without and with different doses of probiotics

Parameters	Treatment			
	P0	**P1**	**P2**	**P3**
Feed consumption (kg)	2.33	2.14	2.25	2.25
Weight gain (kg)	1.70	1.72	1.74	1.73
Feed conversion ratio	1.37^{c}	1.25^{a}	1.30^{ab}	1.31^{b}
IOFC (IDR)	14614^{c}	16453^{a}	15871^{ab}	15692^{ab}

P0: Drinking water + 0 ml of probiotic Lacto-B/liter (control); P1: Drinking water + 0.5 ml of probiotic Lacto-B/liter; P2: Drinking water + 1 ml of probiotic Lacto-B/liter; P3: Drinking water + 1.5 ml of probiotic Lacto-B/liter.

Based on Table 2, the lowest average feed consumption is P1 treatment with a feed consumption of 2.14 kg per tail, then P2 of 2.25 kilograms per tail, P3 of 2.25 kg per tail, and the highest is P0 with a feed consumption of 2.33 kg per tail. Broiler chickens given additional probiotics through drinking water had no significant effect ($P>0.05$) on feed consumption. The same feed energy content causes the feed consumption of each treatment not to differ much. This is to [10] that chickens given drinking water containing lactic acid bacteria probiotics have no natural effect on feed consumption. A factor affecting feed consumption is the energy content in the feed.

Chickens use feed consumed during rearing, which is used for growth. According to [11], differences in growth and feed consumption that are slightly better than controls indicate that the feed consumed is used for development. Probiotics containing lactic acid can optimize the absorption of nutrients so that their body weight increases.

During the study on various treatments, growth in body weight (GBW) ranged from 1.70 - 1.74 kg. The highest body weight was obtained in the P2 treatment of 1.74 kilograms per tail, then P3 of 1.73 kg per tail, P1 of 1.72 kg per tail, and the lowest was P0 of 1.70 kilograms per tail. Broiler chickens supplemented with probiotics through drinking water had no significant effect ($P>0.05$) on the GBW. The P1, P2, and P3 treatments had slightly higher GBW scores than controls. Probiotics can cause this. The presence of beneficial microorganisms in the digestive tract makes food substance absorption in feed more efficient and reduces wasted nutrients due to pathogenic microbes [3]. Factors that influence the value of GBW are the fulfillment of food needs and feed consumption. Therefore, weight gain should positively correlate with feed consumption [12].

Based on Table 2, the feed conversion ratio (FCR) in the treatment between P1 and P2 is not significantly different but differs markedly from the treatment of P0 and P3. The treatment given by probiotics, namely P1, P2, and P3, significantly differed from P0. Providing probiotics at various doses produces lower FCR values because feed consumption is lower than control, and the resulting body weight is not much different. According to [12], the smaller the FCR value, the better the feed efficiency of broiler chickens.

P1 treatment gets a good FCR value because the dose treatment given to broiler chickens follows the need to optimize the digestive work system of broiler chickens so that the dose of 0.5 ml/liter of water gets the lowest value. Conditions and large microbial populations that are suitable compared to other treatments allow microbes in P1 treatment (0.5ml / liter of water) to grow and affect the enzymatic digestion process. The metabolic process of food substances increases in the body of livestock, which ultimately impacts the growth of animals. The death of microorganisms that cause the increase in the number of microbial colonies can occur during the journey to the small intestine. This can be caused by the amount of substrate as a food provider and microbial growing place with the number of microbes in P2 and P3 treatment is not balanced, so some microbes cannot survive [13].

Lactic acid bacteria can produce lactic acid as the end product of hydrogen peroxide, carbohydrate, and bacteriocin remodeling, which increases nonpathogenic bacteria's activity and inhibits and kills pathogenic bacteria [14]. The combination of *Lactobacillus acidophilus* and *Bifidobacterium* in chickens affects feed consumption [15]. The combination of probiotics containing GBW*, Lactobacillus*, and *Bifidobacterium* can change the composition of the intestinal ecosystem that profitable. In the intestines of chickens, changes in conditions that impact resistance to infectious diseases reduce cholesterol levels. *Lactobacillus* in the digestive tract, along with 10^7 *Bifidobacterium* 10^9 is a synbiotic bacterium that can suppress the growth of pathogenic bacteria [13].

Bacteria in probiotic Content can produce several enzymes that contribute to digestion, such as cellulose, amylase, lipase, and proteases, in improving the nutritional quality of chicken feed. These enzymes help metabolism, such as breaking down proteins, fats, and carbohydrates into simpler molecules that can facilitate the absorption of nutrients in the digestive tract [16]. In carbohydrate fermentation, lactic acid bacteria can reduce pH by producing lactic acid. Go down pH in the digestive tract can inhibit the growth of pathogenic bacteria [17].

Drinking water is expected to increase the absorption of food substances for the better and break down nutrients into simpler substances so that the intestine can absorb them. Probiotics have a lower FCR value, indicating that probiotics are optimally given through drinking water. Bacteria contained in probiotics play a role in helping to improve the digestive system in livestock, such as optimal absorption of nutrients and fulfillment of energy levels produced by probiotics so that consumption from livestock decreases GBW because their energy needs have been met compared to controls.

Control treatment with a dose of 0 ml/liter of drinking water resulted in an FCR of 1.37. The results of the control treatment were higher than other treatments. According to [18], giving probiotics can significantly increase feed efficiency, as seen from the go down FCR value compared to control. According to [16] proved that giving probiotics (EM-4) in drinking water as much as 0.5-1.5 ml can increase broiler chickens' productivity and feed efficiency. Probiotics can increase the activity of digestive tract enzymes. The trick is to expand the absorption area because probiotics can affect intestinal anatomy, especially in the density of the intestinal villi, which is denser and longer so that food absorption becomes more perfect [19].

According to [12], probiotics can spur growth because they produce vitamins digestive enzymes, and increase the appetite of broiler chickens. FCR values can be affected by DOC quality, cage quality, nutritional quality, and maintenance management.

The concentration of probiotics also shows a good influence; namely, probiotics can develop and inhibit pathogenic bacteria in the digestive tract. Lactic acid bacteria in probiotics in a product contain as much as 1 x CFU / g because to ensures the probiotic is still alive in the digestive tract. To provide health benefits, the number of probiotics in probiotics amounts to colonies/ml to compete with pathogenic microbes in the digestive tract [20].

Based on Table 2, IOFC values in the treatment between P1 with P2 and P3 did not differ markedly, but GBW treatment of chickens given probiotics differed markedly from controls. This is because the correct dose of probiotics can provide the effect of feed efficiency and weight that is not far apart, so IOFC at P1 is not significantly different from P2 and P3. Giving probiotics or microbes that profitable can affect feed efficiency, appetite, balance of intestinal microorganisms, increased immune system, and increased body weight [21]. One crucial factor is that the amount of feed consumption can determine the IOFC value; low feed consumption can reduce feed costs [22].

P1 obtained the best IOFC values with a dose of 0.5 ml/liter of water of IDR 16,453/tail, P2 dose of 1 ml/liter of water of IDR 15,871/tail, P3 dose of 1.5 ml/liter of water of IDR 15,692/tail, and P0 dose of 0 ml/liter of water of 14,614/tail. In the P0 treatment (control), the highest feed consumption was obtained at 46.50 kg / 28 days, then consecutively from the highest to the lowest was P2 at 45.07 kg / 28 days, P3 at 44.99 kg / 28 days, and P1 at 42.80 kg / 28 days.

The total harvest weight obtained for 28 days in P1 treatment was 35.2 kg or an average of 1.76 kg/tail. The price of chickens contracted during rearing in the body weight range of 1.6-1.69 is IDR 20,700; 1.7-1.79 is IDR 20,320; 1.8-1.89 is IDR 20,300; and body weight 1.9-1.99 is IDR 20,150. The feed cost is C10 phase starter for IDR 9100 / kg and C11 phase grower for IDR 9000 / kg. During the maintenance period, 7.1 kg of C10 feed costs IDR 64,471, and 35.7 kilograms of C11 feed costs IDR 321,438. IOFC obtained by P1 is IDR 16,453 / tail.

The P2 treatment gets a total weight of 35.7 or an average of 1.78 kg/tail. P2 using 9 kg of C10 feed costs IDR 82,440, and using 36 kilograms of C11 costs IDR 324,120. IOFC obtained is IDR 15,871 / tail. P3 treatment resulted in a total weight of 35.4 or an average of 1.77 kg/tail. C10 feed is used as much as 9 kg for IDR 73.619, and 36.9 kg of C11 is used for IDR 332.160. The IOFC produced is IDR 15,692/tail. P0 treatment is the treatment with the lowest IOFC value, which is IDR 14,614 / tail. C10 consumes 8.5 kg at IDR 78,108 and C11 at 37.9 kg at a cost of IDR 341,424. The total weight is 34.8 kg or an average of 1.74 kg/tail.

Giving probiotics through drinking water in different treatments has the same consumption as other treatments. Probiotic administration in treatments 1, 2, and 3 resulted in drinking water consumption of 113, 114, and 115 liters, respectively, while in the control treatment, drinking water consumption was 117 liters. According to [23] stated that adding probiotics containing lignolytic and proteolytic bacteria through drinking water to drinking water consumption has an unreal effect. According to [22] stated that giving probiotics using starbio and EM-4 containing lactic acid bacteria in drinking water and feed can reduce feed consumption, but drinking water consumption is relatively the same.

Probiotics can support the IOFC value by improving the digestive tract to optimize nutrient absorption. In determining the value of IOFC, increased feed consumption is an essential factor. The lower consumption of broiler chicken feed can reduce feed costs, thus affecting the IOFC value. Chicken consumption will decrease if the feed energy content increases, and vice versa; chicken consumption will increase if it is low [22]. Low consumption can be influenced by the adequacy of energy and nutritional needs in the chicken's body. Probiotics can help optimal absorption of nutrients [15]. The content of vitamin B complex has the benefit of helping the metabolic process so that the absorption of feed nutrients is more efficient and optimal.

Body weight at harvest can also affect IOFC values. Increasing feed consumption, the production and nutritional needs of chickens for basic living are met. The possibility of probiotics in the small intestine causes broiler weight gain because probiotics produce enzymes that are useful for helping the digestion of food substances for chicken growth [21]. Administration of probiotics *L. acidophilus* and *Bifidobacterium sp.* can inhibit the growth of pathogenic bacteria [15]. These microbes can suppress the number of pathogenic bacteria and increase the digestibility of feed. These bacteria can produce lactic acid, which reduces the number of pathogenic bacteria in the digestive tract. Reduced pathogenic bacteria can better absorb nutrients in the digestive tract of chickens [18].

According to [20], the number of live bacteria is recommended more than or to get the effect of probiotics. Doses in the studies conducted are assumed to have as many live bacteria as possible to get the effect of probiotics. Palm sugar water is an energy source and medium for probiotic breeding. An active overhaul of sugar can occur because palm sugar functions as a probiotic nutrient to support the development of several bacteria. Bacteria can use palm sugar's reduced sugar and sucrose content as an energy source [25].

4. Conclusion

Based on the research that has been conducted, the administration of Lacto-B probiotics shows better performance and IOFC value. P1 treatment with a dose of 0.5 ml/liter of drinking water is the best treatment that gets the lowest feed conversion value (1.25) and gives the highest IOFC value (Rp 16,453/tail).

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest is to be disclosed.

References

[1] Prasetyo, A. F., M. Y. M. Ulum, B. Prasetyo, and J. I. Sanyoto. 2020. Broiler Growth Performance After Discontinuation of Antibiotic Growth Promoters (AGP) in Animal Feed Partnership Pattern in Jember Regency. Journal of Livestock, 17(1): 25-30.

[2] Hafsan, H., K. Kiramang, T. H. Aminah, dan R. M. Rusdi. Broiler Farms Practice-Without AGP As An Islamic Conception in The Strategy To Achieve "Asuh" Food. Journal of Islam and Science. 8(1): 29-37.

[3] Akhadiarto, S. 2010. The Effect of Probiotic Temban, Biovet and Biolacta on Carcass Percentage, Weight of Abdominal Fat and Internal Organs of Broiler Chickens. Indonesian Journal of Science and Technology. 12(1).

[4] Abdel-Monei, A. M. E., A. M. Elbaz, R. E. S. Khidr, and F. B. Badri. 2020. Effect of In Ovo Inoculation of Bifidobacterium spp. On Growth Performance, Thyroid Activity, Ileum Histomorphometry, and Microbial Enumeration of Broilers. Probiotics and Antimicrobial Proteins. 12(3): 873-882.

[5] Nurhayati, N. 2013. The Appearance of Broilers Consuming Feed Containing Pineapple Skin Flour Supplemented with Yogurt. Journal of Agripet. 13(2): 13-20.

[6] Harumdewi, E., N. Suthama, and I. Mangisah. 2018. Effect of Feeding Protein Microparticles and Probiotics on Fat Digestibility and Fatty Meat in Broiler Chickens. Indonesian Journal of Livestock Science. 13(3): 258-264.

[7] Azizah, N. K., Sarmanu, B. Utomo, E. K. Sabdoningrum, W. P. Lokapirnasari, and K. Supranianondo. 2020. Effect of Lactic Acid Probiotics in Drinking Water on Broiler Chicken Feed Conversion. Journal of Basic Medical Veterinary. 9(2), 86-91.

[8] Dillak, S.Y., N. P. F. Suryatni, and Y. L. Henuk. Supplementation of Some Probiotics Through Drinking Water to Late Period Broiler Chicken Performance. Journal of Animal Husbandry Nucleus. 1(1): 44-49.

[9] Gaspersz, V. 1995. Analytical Techniques in Experimental Research. Tarsito. Bandung.

[10] Hadith, I. 2016. The Effect of Giving Herbs Containing Probiotics in Drinking Water on the Palatability of Broiler Chicken Feed. Jurnal Ilmu Peternakan Journal of Animal Husbandry Science. 1(1): 1-7.

[11] Azizah, N., K. Suradi, and J. Gumilar. 2018. Effect of Lactic Acid Bacteria Concentration of Lactobacillus plantarum and Lactobacillus casei on Microbiological and Chemical Quality of Mayonnaise Probiotics. Journal of Animal Science, Padjadjaran University. 18(2): 79-85.

[12] Ardianto, E., Achmanu, and O. Sjofjan. 2014. Effect of Probiotic Addition in Drinking Water on Broiler Production Appearance. Brawijaya University.

[13] Satyaningtijas, A. S., R. Yufiandri, R. Wulandari, V. M. Darwin, and A. S. Santa Nova. 2015. Performance and Digestibility of Broiler Chicken Feed Given Testosterone Hormone with Stratified Doses. Acta Veterinaria Indonesiana. 3(1): 29-37.

[14] Astini, W., M. A. Al Arif, and S. Mulyati. 2014. The Potential of Commercial Probiotic to Broiler's Weight Gain, Feed Consumption and Feed Conversion of Broiler. Jurnal Agro Veteriner. 2(2): 97-103.

[15] Huda, K., W. P. Lokapirnasari, S. Soeharsono, S. Hidanah, N. Harijani, and R. Kurnijasanti. 2019. Effect of Probiotics Lactobacillus acidophilus and Bifidobacterium on Production of Laying Hens Infected with Escherichia coli. Indonesian Journal of Livestock Science. 14(2): 154-160.

[16] Prawira, I. N., I. M. Suasta, and I. P. A. Astawa. 2019. The Effect of Probiotic Feeding Through Drinking Water on Broiler Carcass Weights and Pieces. Journal of Tropical Livestock. 7(3): 958-969.

[17] Sumarsih, S., B. Sulistiyanto, C. I. Sutrisno, and E. S. Rahayu. 2012. The Role of Probiotic Lactic Acid Bacteria on Poultry Productivity. Journal of R&D of Central Java Province. 10(1): 511-518.

[18] Hardiawan, N. D., I G. Mahardika, and I W. Sudiastra. 2021. Productivity of Broiler Chickens Given Probiotic Additives in Drinking Water. Livestock Scientific Magazine. 24(2): 91-95.

[19] Astuti, F. K., W. Busono, and O. Sjofjan. 2015. Effect of Adding Liquid Probiotics in Feed on Production Appearance in Broilers. Indonesian Journal of Environment and Sustainable Development. 6(2).

[20] Umaroh, R. and A. Vinantia. 2018. Analysis of Animal Protein Consumption in Indonesian Households. Indonesian Journal of Economics and Development. :22-32.

[21] Wizna, W., H. Abbas, A. Dharma, and P. Kompiang. 2013. Potential of Bacillus coagulans from Forest Litter as a Probiotic in Broiler Chickens. Indonesian Journal of Animal Science. 15(1): 75-80.

[22] Pradikta, R. W., O. Sjofjan, and I. H. Djunaidi. 2018. Evaluation of the Addition of Liquid and Solid Probiotics (Lactobacillus sp) in Feed to the Production Appearance of Laying Hens. Journal of Animal Sciences. 28(3): 203-212.

[23] Riswandi, R., S., Sandi, &; F., Yosi. 2012. Combination of Starbio and EM-4 Feeding and Drinking Water to Local Duck Performance at 1-6 Weeks Old. Sriwijaya Livestock Journal. 1(1): 41-47.

[24] Sandi, S. and F. Yosi. 2012. Combination of Starbio and EM-4 Feeding and Drinking Water to Local Duck Performance at 1-6 Weeks Old. Sriwijaya Livestock Journal. 1(1).

[25] Rimadhini, F. N., S. Sumardianto, and R. Romadhon. 2020. Antibacterial Activity of Lactic Acid Bacterial Isolate from Anchovy Rusip (Stolephorus sp.) with Different Liquid Palm Sugar Concentrations. Journal of Fisheries Science and Technology. 2(1): 54-63.