# PERFORMANCE OF BROILERS CHICKENS DUE TO THE PROVISION OF RAW PROPOLIS

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**Abstract:** The use of antibiotics as an Antimicrobial Growth Promoter (AGP) for livestock has been banned because antibiotic residues in livestock meat can trigger antibiotic resistance in consumers. Propolis is the natural source that has benefit as antioxidant, antiviral, antifungal and antibiotic. The purpose this study was to determine the effectiveness of the addition of feed from the optimal composition of raw propolis to increasing broiler chicken body weight of broiler chicken. This study used broiler chicken as experimental animals. The chickens were grouped into six groups consist of two control groups and four treatment groups with different level concentrations of propolis (2, 4, 6, and 8 g/kg feed). After treatment for four weeks, addition raw propolis in feed had not been able to provide a positive effect on growth performance that were not significantly different from controls. Group chicken with propolis additions 6 g/kg feed showed the best results compared to other treatment groups. The group had final weight values, food conversion ratio (FCR), and carcass weight in 1970.67 gram, 1.52, and 1349.83 gram, respectively. The best percentage of carcass was owned by group chicken with propolis additions 2 g/kg feed which is equal to 74.46%. Raw propolis can reduce feed consumption but increase feed conversion ratio.

Keywords: antibiotics, body weight, broilers chicken, raw propolis

## 1. INTRODUCTION

Increasing population growth has resulted in an increase in the need for animal protein, especially protein derived from meat. Poultry provides a very large contribution as meat-producing livestock (Lestari et al., 2014). Increasing community welfare has demanded producers to produce poultry meat that is not only tender, cheap, and easy to obtain (Syakir et al., 2017). Consumer demands for food from animals that must be healthy, safe and free from antibiotic residues are increasing Jelita, 2017).

Broiler chicken is a poultry commodity that is beneficial in fulfilling animal protein for the people of Indonesia (Umam et al., 2014). Broiler chicken has a fairly cheap selling price, delicious

taste and aroma, soft texture and is also relatively easy to find on the market, making broiler chicken as an alternative food that is liked by almost everyone (Pratama et al., 2015). Every year, chicken meat needs increase (Umam et al., 2014). Broiler chicken consumption has increased per capita per year, namely for 2015 as many as 4,797 kg, in 2016 as many as 5,110 kg, and in 2017 as many as 5,683 kg ([Kementan RI], 2018).

Efforts should be made to find alternative feed alternatives to replace antibiotics, one of which is using natural propolis ingredients. Propolis is a complex honeycomb resin product collected from various plants which shows a very complex chemical composition (Abdelsameea et al., 2013). Propolis contains aromatic compounds, flavonoids (quercetin), terpenoids, and sugar. There are also minerals Fe, Ca, Mg, K, Na, and Zn. Natural propolis contains a number of amino acids such as valine, isoleucine, leucine, proline, alanine, and glycine which play a role in the formation of body cells. Propolis is also rich in vitamin B1, vitamin B2, vitamin B3, and vitamin B6 (Nasution et al., 2015). Propolis also contains ethanol, vitamin A and vitamin E (Attia et al., 2014). Propolis has various biological activities such as antibacterial, antifungal, anti-inflammatory, anticancer, antioxidant, and antitumor (Temizer et al., 2017).

Provision of propolis in chronic infected respiratory disease (CRD) broilers through drinking water at doses of 0.25, 0.5, and 1 ml / L of drinking water can increase body weight, body weight gain, carcass weight, and can reduce chicken mortality (Anggraini, 2016). Addition of raw propolis with a dose of 4 g / kg standard feed can reduce blood cholesterol levels of broiler chickens (Anugrah, 2018). Addition of raw propolis doses of 4 g / kg standard feed has produced a positive effect on liver function and performance of broiler chickens (Yusuf, 2018).

The purpose this study was to determine the effectiveness of the addition of feed from the optimal composition of raw propolis to increasing broiler chicken body weight of broiler chicken.

## 2. METHODS

### 2.1 Preparation Phase (Krisnan, 2005)

This study used experimental animals and has obtained an Ethical Clearance permit from the IPB Animal Ethics Commission Number: 138 / KEH / SKE / V / 2019. The preparation stage includes preparation of cages and equipment, liming, and disinfection. The cages used are six bulkheads with litter type cages and each enclosure contains six chickens. The enclosure is equipped with treatment numbers, feed, drink, lights and fans. A fan is used when the chicken is two weeks old. Cleaning the cage includes washing the floor and walls of the cage using detergent along with carbolic acid. After that, disinfection of the inside of the cage and eating and drinking equipment is carried out using a disinfectant solution. Then calcification is also done on the floor and wall of the cage. Installation of lights and curtains. Lights act as a source of lighting as well as heating for chickens. The lights used are 75 watts, each one is installed in each enclosure.

After all the lights are installed, each cage is covered by a husk that has been given 1% formalin, then coated with a newspaper. Then each cage was given a heating blunder until the age of the chicken two weeks to maintain the temperature of the environment to keep warm. Husk and newspapers are changed regularly to maintain sanitary cages. Newspaper pads are only used until the chickens are two weeks and so using husk. After the preparation of the cage is finished, the eating and drinking equipment is stored in each cage. Then the cage is rested for one week before the arrival of the chicken.

## 2.2 Implementation Phase (Maghfiroh et al., 2014)

The implementation phase includes the maintenance phase of broiler chickens starting from the DOC until the age of 35 days. The broilers used in this study were 36 birds. The Ross DOC strain used in this study came from PT Cibadak Indah Sari Farm without gender differentiation. The activity was started by weighing the DOC weight of broiler chickens at the arrival of chickens and then the chickens were randomly placed in six experimental cages of each cage containing six broiler chickens. Each tail is paired with a numbered ring on the chicken leg as a differentiator between chickens. Then the DOC that first arrived was given sugar water for two hours to meet the energy needs lost during the trip. After two hours, drinking water is replaced with vita-stress (1 gram / liter of drinking water) to prevent stress on chickens. Vita-stress drink water is given for five days in the first week of maintenance. Maintenance of broiler chickens is carried out during intensive research, feed and drink are given in ad libitum. Feed is given twice a day, in the morning and evening.

Broiler chickens were adapted for seven days with a standard BR 11 starter feed produced by PT Charoen PokPhan Indonesia. After a period of adaptation, eight-day-old broiler chickens begin to enter the treatment period until harvesting is 35 days old. Livestock vaccination is done to prevent viral diseases. The vaccine is given to broiler chickens during maintenance in three stages, namely when they are 3 days, 14 days and 21 days. The ND IB vaccine is given to 3-day-old broiler chickens through eye drops. *Gumboro* vaccine is given to broilers aged 14 days through drinking water. The La Sota ND vaccine is given to broilers aged 21 days through drinking water.

## 2.3 Feed Making Treatment (Eyng et al., 2016)

Raw propolis is stored in the freezer until it freezes. Then the frozen raw propolis is cut into pieces using a knife, then blended until it becomes a smaller shape. After that, the propolis is weighed according to the required amount, then the propolis is crushed again in a mortar and given liquid nitrogen to facilitate the grinding process to become smoother and not sticky when mixed with standard feed. Antibiotic used amoxicillin (20 mg/kg b.wt), colistin (100000 IU /kg b.wt). There are six treatment groups in this study, along with each feed composition can be seen in Table 2.

Table 1 Treatment of feed composition

| Treatment | Feed composition |
|---|---|
| K | basic feed |
| Ab | basic feed + (amoxycilin+colistine) 0.01 g/kg basic feed |
| P1 | basic feed + raw propolis 2 g/kg basic feed |
| P2 | basic feed + raw propolis 4 g/kg basic feed |
| P3 | basic feed + raw propolis 6 g/kg basic feed |
| P4 | basic feed + raw propolis 8 g/kg basic feed |

## 2.4 Harvesting of Broiler Chickens

Broiler chickens were harvested at the 4$^{th}$ treatment week or 5 weeks of age. Before being slaughtered, chicken is finally weighed. The process of slaughtering chicken is carried out in accordance with Islamic Shari'a. Slaughter is done by cutting off the carotid artery, jugular vein and esophagus at the base of the jaw, and trachea. After the chicken is declared dead, the chicken is dipped in hot water for a few seconds, then inserted into the hair removal machine (local

machine). Then cutting the legs, head and contents of the innards is done so that the carcass is obtained and then the carcass is weighed.

### 2.5 Performance parameters of broiler chickens (Alfian et al., 2018)

**Feed consumption (g/chicken).** Feed consumption is obtained by calculating the difference in the amount of feed given during administration of the remaining feed.

Feed consumption (g /chicken) = feed given - leftover feed

**Body weight gain (g/chicken).** Body weight gain was obtained by calculating the difference in body weight of broiler chickens from the beginning of the treatment week to the last week of treatment.

Weight gain = Final body weight (g/chicken) - Initial body weight (g/chicken)

**Feed conversion ratio (FCR).** Feed conversion ratio was obtained by dividing the total feed consumption during treatment with body weight gain produced during the treatment.

$$FCR = \frac{\text{Feed consumption (g/chicken)}}{\text{Body weight gain (g/chicken)}}$$

### Statistic Analysis

Data on feed consumption, body weight gain and feed conversion ratio were analyzed by analysis of variance (ANOVA). Then tested further with Duncan test at the level of confidence of 5%.

## 3. RESULT

### 3.1 Feed Consumption

The total feed consumption for the four weeks of treatment can be seen in Figure 1. The total consumption of feed for the Ab group is slightly lower than the Ab group, although the difference is only around 2.17%. The total feed consumption of the group adding raw propolis feed is lower than in the K and Ab groups. The total feed consumption of the P3 group has the highest total feed consumption among other raw propolis adduct groups.

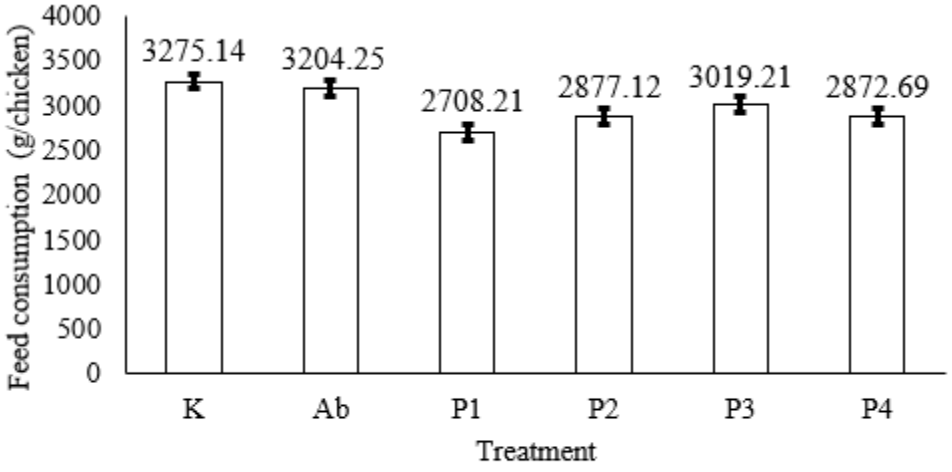


Figure 1 Total feed consumption for four weeks of treatment

### 3.2 Body Weight Gain

The average body weight gain during the four weeks of treatment can be seen in Figure 2. The treatment of raw propolis produced a significant difference in the value of body weight gain produced (P<0.05). The treatment of raw propolis showed a low body weight gain for groups P1, P2, and P4. The biggest body weight gain during treatment was achieved by group Ab, then followed by K, P3, P2, P4, and P1. The value of body weight gain in group Ab was higher than group K, although it was not statistically significantly different from group Ab (P>0.05). Body weight gain in the addition of raw propolis (P) group showed a lower value than K and Ab groups, with values that were significantly different (P<0.05), except for the P3 group the value of body weight gain was not significantly different from group K (P>0.05).

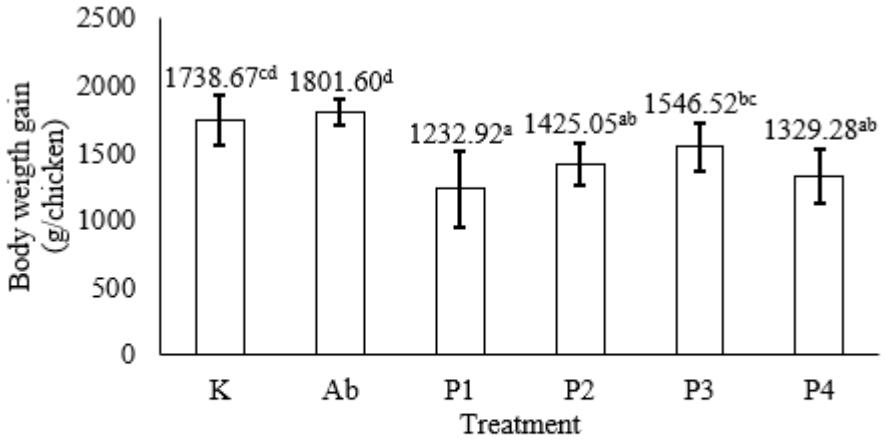


Figure 2 Average body weight gain during treatment.
The different superscript letters above in the numbers show significantly different at the 95% test level P<0.05).

The antibiotic group gave the highest average weight value. Even so, the mean value in the antibiotic group did not give a significant difference to the Normal group at the real level of 10%. Provision of propolis with levels of 2 and 4 g / kg of feed did not have a significant difference in the Normal and antibiotic groups, while levels of 4 and 6 gram were significant at the 10% significance level (Figure 3). The percentage value of carcass is obtained by dividing the carcass weight to its live weight. Furthermore, the percentage of carcass from each treatment group was analyzed of variance (ANOVA) to see that there was a significant effect of treatment (propolis) on the final weight. The p value obtained is 0.0295 or less than 0.05, so the decision is that there is an effect of treatment (propolis) on carcass body weight at the 5% real level. The results of the calculation showed that the highest percentage value of carcass was owned by the P1 group. However, this value was not significantly different from the Normal group, positive control (A), P2, and P4. The smallest carcass weight value belonged to the P3 group whose value was significantly different from the P1 group. However, the carcass weight value of the P3 group was not significantly different from the other groups at the 5% real level.

### 3.3 Feed Conversion Ratio

Feed conversion ratio (FCR) for four weeks of treatment can be seen in Figure 5. The treatment of raw propolis in this study was not significantly different from the of the feed conversion ratio produced (P> 0.05). The FCR produced during the four weeks of treatment

obtained ranged from 1.78-2.35. Numerically, the addition of raw propolis groups showed a greater FCR than the K and Ab groups. Group P1 shows the FCR and the highest standard deviation among the other treatment groups. The P3 group showed a lower FCR compared to other groups of raw propolis additions.

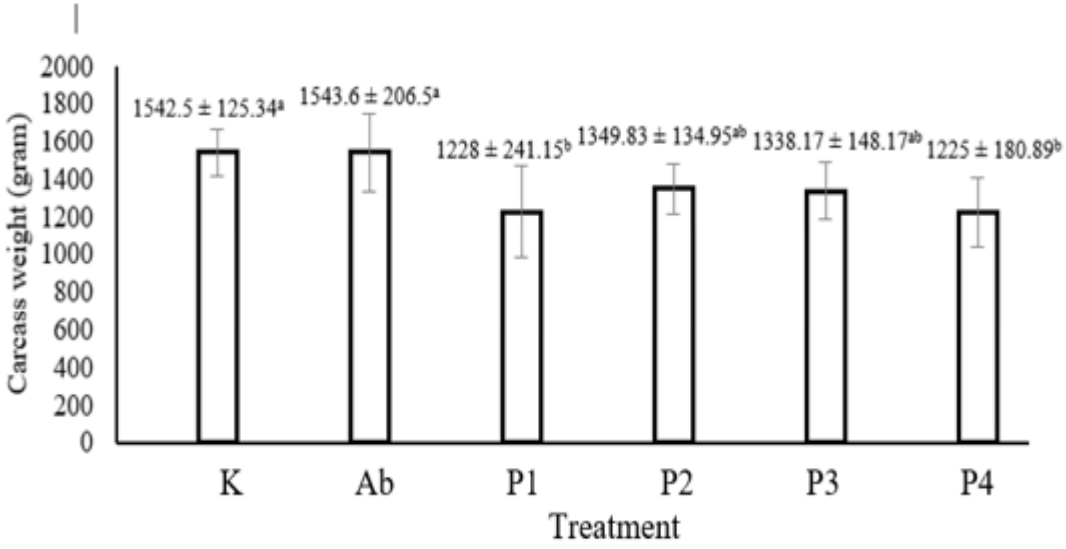


Figure 3 Carcass weight.
The different superscript letters above in the numbers
show significantly different at the 90% test level P<0.05)

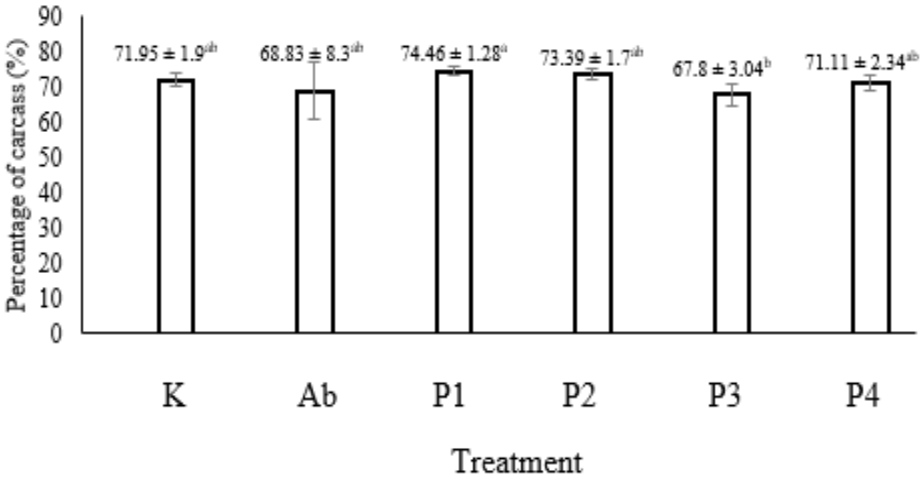


Figure 4 Percentage of carcass
The different superscript letters above in the numbers
show significantly different at the 90% test level P<0.10)

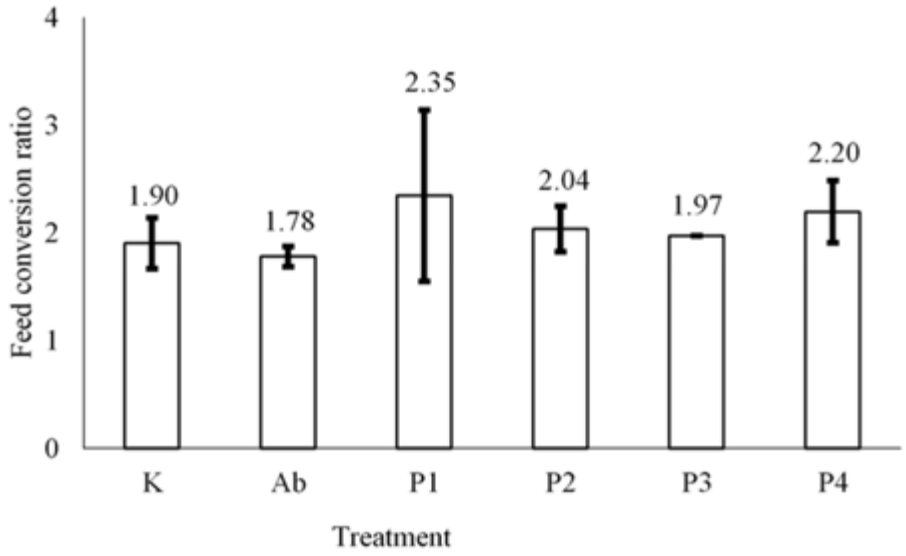


Figure 5 Avarage feed conversion rate of broiler chicken during treatment

### 3.4 Mortality

Mortality is a factor in the success of the development of broiler chicken farms. Broiler chicken mortality in this study can be seen in Table 3. The mortality of broiler chickens in this study was in group Ab on day 33 of maintenance with a dead weight of 1910 gram, whereas in group P1 there were broilers who had paralysis in both legs since the age of 21 days, but still survived to the age of 35 days, despite a decrease in body weight on the week of the third treatment amounting to 1027 gram to 1022 gram in the 4th week of treatment.

Table 2 Broiler chicken mortality during treatment

| Group | Mortality (sum of chicken) |
|---|---|
| K | 0 |
| Ab | 1 |
| P1 | 0 |
| P2 | 0 |
| P3 | 0 |
| P4 | 0 |

## 4. DISSCUSION

### 4.1 Feed Consumption

Feed consumption is the amount of feed consumed by livestock. Feed consumption is an important aspect in evaluating the quality of feed. Feed consumption can be calculated by reducing feed fed with leftovers (Nuningtyas, 2014). Feed consumption greatly determines various types of productivity factors such as body weight gain and feed conversion which influence the performance of broiler chickens. Therefore, feed consumption must be optimized,

but still efficient in its use. A fast growth rate is offset by a lot of feed consumption. Feed consumption for each animal is different (Fajrinnalar, 2010).

The feed consumed by broilers greatly determines body weight gain so that it influences the efficiency of a livestock business. Requirements for feed consumed must be of good quality, which contains food ingredients that are suitable for the needs of broiler chickens. The level of feed consumption can be influenced by the energy content in the feed and the ambient temperature conditions. Feeds with lower metabolic energy will spur broilers to consume additional feed to meet energy needs. Another factor affecting the level of feed consumption in broiler chickens that body weight, strain, level of production, level of stress, livestock activity and stress that occur in the chicken. Foods that contain higher protein tend to provide higher body weight, while feeds containing low protein and consumed in small amounts can cause a deficiency or imbalance of amino acids which inhibits growth (Anggitasari et al., 2016).

Factors that affect the level of feed consumption are palatability. Palatability is a preference level to chicken feed. The physical appearance of feed, especially color, is the most important characteristic used by chickens as a determining factor in choosing feed. More chicken like feed with bright colors for example yellow corn (Nuningtyas, 2014). Palatability of feed in livestock is generally influenced by smell, taste, color and texture (Wicaksono et al., 2017). Livestock's capability is also very related to the ability of livestock to regulate energy consumption to meet their needs. Foods with high energy levels will result in a low level of feed consumption Irawan et al., 2018).

The total feed consumption for four weeks of treatment can be seen in Figure 1. The total feed consumption during the treatment from the biggest to the lowest is K, Ab, P3, P2, P4, and P1. The low level of feed consumption of the group treated with the addition of raw propolis compared to the control and antibiotic groups in this study can be caused by the palatability of the feed because feed given raw propolis tends to be dark, stinging, sticky and bitter. The results of this study are in accordance with Duarte et al. (2017). the addition of raw propolis to feed as much as 4% and given to chickens aged 1 to 21 days and ages 1 to 42 days can reduce feed consumption by 5.2% and 3.7% respectively compared to chickens not given raw propolis. Low feed consumption can be caused by the high content of wax esters in raw propolis.

Raw propolis still contains various mixtures of components such as 50% resin consists of phenol and phenolic acid or polyphenols, 30% wax, 10% essential oil, 5% pollen and 5% of other organic compounds (Susilo et al., 2009). Raw propolis has a relatively high wax content and is considered as an impurity because it gives a dark color and bitter taste to propolis (Akhmariadi, 2012). The palatability of feed additives from raw propolis can also be caused by the sticky texture of raw propolis at room temperature making it difficult for the process of consuming it (Thamrin et al., 2016). Decreasing levels of feed consumption can be caused by the characteristics of propolis which has a pungent original odor and a bitter taste so that give a negative influence on the appetite of chicken (Acikgoz et al., 2005).

The total consumption of feed groups P1 and P3 is not in accordance with the effect of the level of palatability of raw propolis on feed because the higher the concentration of raw propolis, the palatability of broilers decreases due to changes in the texture of the feed is more sticky, bitter, and pungent. Group P1 shows a lower feed consumption level than the group treated with the addition of raw propolis which has a higher raw propolis concentration. This happened because in

group P1 there were broiler chickens that were paralyzed and thus affected the average total feed consumption in the P1 group which was lower. As for the total consumption of feed in the P3 group is higher than the addition of raw propolis group which has a lower concentration of raw propolis. This was influenced by the sex of male broilers which caused higher total consumption of P3 group during treatment. According to Fajrinnalar (2010), the level of feed consumption can also be influenced by chicken body weight, gender, daily activities, environmental temperature, quality and quantity of feed. According to Beg et al. (2016), male broilers consume more feed to produce greater weight.

### 4.2 Body Weight Gain

Growth a process that includes additions in the form of tissue builders including meat, bones, liver, brain and other tissues and processes can be influenced by various factors including chicken strains, gender, and environmental factors. The speed of growth of body weight and body size is strongly influenced by genetic and environmental factors. The influence of genetic factors on the appearance of livestock will be achieved optimally, if the environmental conditions in which the livestock allow livestock to grow properly (Zulfanita et al., 2011; Manurung, 2011).

The growth of livestock is also influenced by the provision of feed additives. Feed additives is a material that does not include a feed substance, which is added to the feed in small amounts with the purpose of spurring growth and increase the population of beneficial bacteria in the digestive tract of chicken (Nuningtyas, 2014). Growth boosters that are often used so far are synthetic antibiotics or often referred to as AGP (*antibiotics growth promoters*) (Ramli et al., 2008). AGP has a beneficial effect in forming livestock performance. AGP can increase growth, feed efficiency and health of livestock that work on gastrointestinal bacteria. The mechanism of AGP's work in producing beneficial changes include killing pathogenic bacteria, reducing bacterial toxin production, reducing the use of important nutrients by bacteria, increasing vitamin synthesis and other growth factors, improving nutrient absorption by reducing intestinal epithelial thickness, and reducing turnover of intestinal mucosal epithelial cells and reduce bowel movements (Modi et al., 2011).

The growth of a livestock can be seen by measuring the increase in body weight (Manurung, 2011). Body weight is an increase in body weight that must be achieved by an animal during a certain period. Body weight gain can be seen through measurements of increase in body weight carried out by repeatedly weighing each time both every day, week, month, and year (Situmorang et al., 2013). Body weight gain can be influenced by feed consumption, gender, environment, strain and feed quality (Nugraha, 2018). Body weight gain is associated with feed that is in terms of quantity related with feed consumption. If the consumption of food decreases or is disrupted, it will disrupt growth (Uzer et al., 2013).

The average weight gain during the four weeks treatment can be seen in Figure 2. The value of body weight gain in group Ab was higher than group K, although it was not statistically significantly different from group Ab ($P>0.05$). These results are in accordance with the research conducted by Elbadawy & Aboubakr (2017), broilers given a combination of amoxicillin and

colistin antibiotics produced higher body weight although not statistically significant (P>0.05) with a control group of broiler chickens who were only given standard feed. The combination of amoxicillin and colistin can improve body weight, feed consumption and FCR. This happens because these antibiotics can reduce the colonization of pathogenic bacteria in the intestine so that absorption of nutrients becomes better.

Amoxicillin is a broad-spectrum derivative of semisynthetic penicillin with low toxicity and is widely used in animal species for the treatment of respiratory, digestive, skin, and other infections. Cholesterol is a mixture of cyclic polypeptides A and B which belongs to the class of polypeptide antibiotics known as polymyxin. Colistine effective against most Gram-negative bacteria, especially *Salmonella, Colibacillus, Pseudomonas, Shigella, Heamophilus* and *Aerobacteria* in poultry and large animals. Cholesterol is used to treat intestinal infections, and suppress colon flora (Elbadawy & Aboubakr, 2017).

The body weight addition of raw propolis addition group showed lower values than K and Ab groups, with values that were not significantly different (P <0.05), except for the P3 group the value of body weight gain was not significantly different from group K (P>0.05). This corresponds to the lower total consumption of feed in the raw propolis group from the K and Ab groups (Figure 1). According to Fajrinnalar (2010), body weight gain is largely determined by the amount of feed consumed. When consumption of feed is high, the value of body weight generated will increase. Therefore, feed consumption must be optimized, but still efficient in its use. The low feed consumption in the group adding raw propolis can be caused by the palatability of these feeds. According to Daneshmand et al., (2012), the low level of palatability to feed can reduce the amount of broiler feed consumption resulting in a decrease in body weight gain.

Addition of raw propolis in feed can reduce broiler body weight gain, the results of this study are in accordance with that obtained by Mahmoud et al. (2013), which stated that the addition of propolis to the feed given to broiler *strains Ross* can significantly reduce body weight gain, feed consumption, and not improve FCR compared to the control group. The decrease in body weight gain obtained in this study is inversely proportional to the results obtained by Klaric et al. (2018), the addition of propolis as a supplement to feed can produce a significant increase in body weight and weight gain. The beneficial effects of propolis extract may be related to the extra influence of propolis on the intestinal microflora which can increase beneficial bacteria and reduce bacteria pathogens that increase digestibility.

The carcass weight resulted from this study ranged from 1225-1543 gram with the average weight of all carcasses in the study was 1371.18 gram. The average value of carcass weight obtained is the same as the research conducted (Risnajati, 2012). According to Risnajati (2012) the carcass weight value of broiler chickens aged 35 days from various different strains is around 1300 gram. The difference in carcass weight values in broiler chickens is influenced by the value of the non-carcass part that is discarded which has a different weight value (Risnajati, 2012). The difference in the value of carcass weight is influenced by nutritional factors, age, and growth rate affecting the carcass components. In addition to the nutritional content in feed, live weight in broilers will also affect the carcass components (Soeparno, 2005).

Based on carcass weight and live weight, the percentage value of carcass can be found. This value indicates the level of whether or not broiler production is good. Good carcass production is seen from the percentage of carcass which ranges from 65-75% (Puspitasari et al., 2019). The

average value of carcass percentage in this study was 71.31%. This can be said to be quite good because it is included in the range according to Puspitasari et al., (2019).

When compared with carcass weight, the percentage of carcass in this study shows a different value. The positive control group (A) and the provision of propolis 6 g / kg (P3) of feed had a smaller carcass percentage value when compared to the others. The highest percentage value of carcass was owned by group P1 (Figure 4). This shows that although groups A and P3 have a large final weight, their percentage value is smaller. In addition, the order of carcass percentage values also shows that the lower the propolis concentration, the higher the carcass percentage value (Figure 4).

The percentage value of carcass tends to decrease along with the addition of propolis to the feed. This is thought to be due to the high weight value of non-carcass parts such as offal and bones. According to Seven et al. (2011, stated that the provision of propolis powder in broiler feed can increase the liver weight and crop of broilers which are included in the non-carcass parts. The addition of propolis in feed also increases the weight of the thymus and lymph glands because propolis increases the development of the immune system and stimulates the activity of T and B lymphocytes in broiler chickens (Zafarnejad et al., 2017). Provision of propolis powder in broiler chicken feed also increases the activity of phosphorus and magnesium absorption from blood serum to the bones so that the bones become denser and they weigh heavier (Petruska et al., 2012). The length and size of the intestinal villi of broilers also increased due to the provision of propolis in the feed (Tekeli et al., 2010).

### 4.3 Feed Conversion

Feed conversion ratio or *feed convertion ratio* (FCR) is a comparison between feed consumption and body weight gain obtained within a certain period of time. The FCR can be used as a measure of the success of livestock productivity (Nugraha, 2018). Feed conversion ratio showed relationship between the amount of feed needed to produce one unit of weight or egg production. Feed conversion reflects the success of the selection or preparation of feed quality. Feed conversion can be influenced by environmental temperature, physical form of feed, composition of feed and substances contained in feed (Amrullah. 2004).

Feed conversion can be influenced by the amount of feed intake and body weight gain [52]. In addition, FCR may also be affected by the DOC quality, nutritional quality, maintenance management and cage quality (Andriyanto et al., 2015). Main factors that affect feed conversion consist of genetic, ventilation, sanitation, feed quality, type of feed, the use of additives, water quality, disease, drug, maintenance management, lighting, feeding, and social factors (Manurung, 2011).

Feed conversion from beginning to end of maintenance period increased. When the final period of maintenance after the age of four weeks, the growth of broiler chickens becomes slow and starts to decrease, while the use of feed continues to increase (Siswanto, 2010). The larger broiler chickens will consume more feed to maintain weight size. Broiler chickens need 80% of protein to maintain body weight and 20% for growth so that feed efficiency is reduced (Manurung, 2011). Lower feed conversion indicated the efficiency of feed usement because feed consumption to produce meat (Allama et al., 2012).

*Feed conversion ratio* (FCR) for four weeks of treatment in this study can be seen in Figure 5. The treatment of raw propolis in this study did not produce significant differences in feed conversion ratio ($P>0.05$). FCR produced during the treatment ranged from 1.78-2.35. According to Rinsajati (2012), the normal FCR is in the range of 1.75-2.00. The lowest FCR was achieved

by the Ab group of 1.78. This shows that the group of antibiotic additions in this study was more efficient to be converted into meat compared to feed which used addition of raw propolis and controls. According to Modi et al. (2011), antibiotics can increase the absorption of nutrients into the body of broiler chickens so it can increase growth and reduce feed conversion ratio. Good nutrient absorption can occur because the amount of pathogen colonization in the intestine decreases so that the thickness of the intestine becomes thinner and consequently the process of absorption of nutrients becomes more effective.

Numerically the raw propolis addition group showed a greater FCR than the K and Ab groups. This shows that the total consumption of feed for the addition of raw propolis groups is not efficiently converted into body weight composition. This can be caused by the high content of wax found in raw propolis. According to Elbadawy & Aboubakr (2017), broilers metabolize the energy of propolis in a low amount of about 941 kcal / kg of dry matter from the total amount of coarse energy of 5.718 kcal / kg, this can occur because of the high wax content. The wax component is difficult to digest by broilers and mammals, this may occur because the digestive enzymes of the pancreatic lipolytic lipase system are not efficient in hydrolyzing wax esters and the inability of the intestinal microflora to degrade the wax ester.

FCR of the group adding raw propolis P1, P2, and P4 has an FCR more than two. According to Manurung (2011), if feed conversion ratio has increased far above two, so the maintenance is less profitable because there is a waste of feed use. The lower feed conversion ratio shows that the amount of feed used to produce one kilogram of meat is less and more efficient, while the higher the value of feed conversion ratio shows the more wasteful food used to produce one kilogram of meat so it is not efficient.

Group P1 shows FCR and the highest standard deviation among the other treatment groups. This result is thought to be influenced by the condition of one of the broilers chicken who were paralyzed in group P1 and did not body weight gain on the fourth week of treatment, but the total consumption of feed group P1 was not too different from the addition group P2, and P4. These results are consistent with the statement Siswanto (2010), a high FCR can be caused by consumption of feed that is not too different from the other groups, but the resulting body weight gain is lowest. According to Manurung (2011), feed conversion can also be affected by diseases in broiler chickens. The P3 group showed a lower FCR compared to other groups of raw propolis additions. These results are thought to be influenced by the sex of male broilers found in the P3 group. According to Petruska et al., (2012), feed conversion can be influenced by gender. According to Beg et al., (2016), FCR of male broilers was significantly lower than FCR produced by female broiler chickens.

The feed conversion ratio added to raw propolis in this study is in accordance with the results of a study conducted by Mahmoud et al. (2013), which stated that the addition of propolis to the feed given to broiler *strains Ross* did not significantly improve FCR compared to the control group. However, according to Anggraini (2016), additions of propolis doses of 0.25 and 0.5 mL/L of drinking water given to broilers chicken infected with CRD complex can increase growth performance of broiler chickens such as increasing body weight, body weight gain, feed consumption, and decrease FCR and mortality. According to Acikgoz et al., (2005), propolis will work to have a positive effect on the growth performance of broiler chickens when the chicken is in a low hygiene condition.

### 4.4 Mortality

Mortality is an important factor in determining the success of the development of broiler chicken farms (Fajrinnalar, 2010). The mortality of broiler chickens in this study can be seen in

Table 3. Mortality occurred in the group of broilers chicken feed addition of synthetic antibiotics while the other treatment groups did not mortality. However, in the group of addition of raw propolis P1 there were broilers chicken who had paralysis in both legs since the age of 21 days and were still able to survive to the age of 35 days, despite a decrease in body weight at week 3 of 1027 gram to 1022 gram on four week of treatment.

The paralyzed P1 broiler chicken group was suspected of having *tibial dyschondroplasia* (TD). The estimation is supported by the physical characteristics of feet shape in elongated broiler chickens so that it cannot stand and is also supported by the age of broiler chickens when they begin to suffer paralysis which is around 21 days because usually TD in broiler chickens will develop at around 3 and 5 weeks. *Tibial dyschondroplasia* (TD) is skeletal abnormality with the most common associated by rapid growth in many poultry species, which results in deformation and bone imbalance. TD can occur due to calcium insufficiency. TD usually develops between the ages of 3 and 5 weeks. As a result of this deformation can cause fractures, morbidity, and mortality resulting in significant economic losses (Dinev, 2012).

The P1 group who suffered paralysis in this study survived to 35 days because of the role of raw propolis which could improve the body's defense system so that mortality did not occur, although the results were not accompanied by positive effects on growth performance in the broiler chickens. According to Shihab & Ali (2012), the reduction in mortality in broiler chickens can be caused by the ability of propolis to increase immune responses, such as increasing the activity of macrophages and lymphatic tissue function. According to Park et al., (2004), supplementation of propolis as much as 3 g/kg of feed in broilers chicken and laying hens resulted in increased concentrations of IgG and IgM. This can be caused by flavonoid and benzene compounds contained in propolis through the mechanism of B lymphocyte activation, so increases macrophage activity and cytokine levels such as interleukin - 1, 2 and 4 so as to reduce mortality rates in broiler chickens.

Mortality in Ab group occurred on the 33 days old of maintenance with a weight of 1910 gram. Antibiotics in this study were given continuously for four weeks of treatment with a dose of 10 mg/kg of feed which each week the number of antibiotics increased with increasing feed requirements. Therefore, it is suspected that deaths in the antibiotic group in this study were due to the accumulation of antibiotics amoxicillin.

According to Anadon et al., (2007), the dose of amoxicillin antibiotics commonly given to chickens is 10 mg/kg of chicken body weight. The dose of 10 mg/kg body weight is an effective dose in the treatment of various systemic diseases in poultry. Amoxicillin is used to treat various infections including urinary tract infections, upper and lower respiratory tract, digestive tract, and various other infections caused by aerobic bacteria Gram positive and Gram negative.

Amoxicillin is an oral semi-penicillin derivative with a broader spectrum of activity than other penicillin. Amoxicillin is distributed to the liver, lungs, gall bladder and prostate. Amoxicillin can increase liver enzyme levels and produce jaundice and bile secretion abnormalities. Liver damage is a side effect that occurs due to the treatment of amoxicillin. A severe case of liver damage due to amoxicillin is a death that is associated with progressive liver failure and loss of the bile duct syndrome (Kim et al., 2011).

The control group (K) broiler chicken in this study did not die. This may be caused by the location of the K group cage closer to the air vents and wind sources thus creating comfortable

environmental conditions. According to Tuson (2018), stated that the cause still mainstain in the control group while for groups given antibiotics and garlic flour died. It can be caused by several reasons such as the use of the amount of chicken slightly thus providing more space for proper ventilation, there are not chemicals or strong substance, digestive system chickens not adaptive for supplements or additives, space to move freely, and produce less ammonia, uric acid or other toxic substances released by chickens. However, if the stool sample from this control group is analyzed in the laboratory, the results are found in the families of *Enterobacteriaceae* such as *Salmonella typhi* and *Salmonella choleraesuis*.

## 5. CONCLUSION

Group chicken with propolis additions 6 g/kg feed showed the best results compared to other treatment groups. The group had final weight values, food conversion ratio (FCR), and carcass weight in 1970.67 gram, 1.52, and 1349.83 gram, respectively. The best percentage of carcass was owned by group chicken with propolis additions 2 g/kg feed which is equal to 74.46%. Raw propolis can reduce feed consumption but increase feed conversion ratio.

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