Effect of liquid probiotic administration on performances, carcass and giblet characteristics in commercial broiler chickens

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Abstract. Administration of antibiotic as feed additive in animal nutrition has been highly concerned due to adverse effect of antibiotic. The purpose of this study was to evaluate administration of liquid probiotic on performances, carcass and giblet characteristics in commercial broiler chickens. Totally 100 mixed sex commercial chickens were randomly distributed to four various treatment groups. Each treatment was administrated various concentration of liquid probiotic in the water (P1=control, P2= 1.0 % of liquid probiotic, P3= 1.5 % of liquid probiotic, and P4= 2.0 % of liquid probiotic) in the drinking water. Broiler chickens were fed commercial feed. Parameters evaluated in this study were broilers performances body weight (BW), feed intake (FI), feed conversion ratio (FCR) and water consumption (WTC) for 4 weeks. The results of the study showed that administration of probiotics was no significantly different (P>0.05) on animal performances (BW, FI and FCR) but significantly different on WTC. Drumstick as part of carcass significantly improved (P<0.05) by administration of liquid probiotics. In conclusion administration of liquid probiotics in broiler had no negative effects on animal performance, carcass and giblet characteristics and it can be applied as alternative feed additives as replacement of antibiotics.

1. Introduction
The role of antibiotics to improve animal performances in sub-therapeutic concentration has been well known for decades through inhibiting pathogen microorganism resulting optimum nutrient absorption. However, due to negative effects of antibiotics such as residues of antibiotics in animal origins (milk, meat and egg) and resistant genes of antibiotics in human [1], [2], thus, administration of antibiotics in animal feed has been forbidden in worldwide. The banning of antibiotics as feed additives in dietary animals resulted in other alternative feed additives to replace antibiotics in animal diet such as pre-probiotics [3], [4], phytotherapeutics [5]-[8], organic acids [9], acidifier [10] and other natural feed additives [11].

Probiotics is one of the alternative feed additives to prevent pathogenic bacteria, improve animal performance, animal products and also animal health [12]. Probiotics known as live microbial feed additives are able to improve feed digestion and host health when fortified into adequate amounts [13]. The function of probiotics in animal nutrition includes to maintain intestinal microflora balance in digestive tract, to alter metabolism process by improving the activity of digestive enzyme and by reducing the activity of bacterial enzyme to produce ammonia, to improve feed consumption and
nutrient absorption and to stimulate immune system in the animal body [14]. In addition, the physiological mechanism action of probiotics as animal feed additives should involve the understanding of interaction amongst microbiome, micobe-microbe and microbe-host, in advance molecular, computational techniques are also required to get better predictability of probiotics as animal feed [15].

The use of probiotics as feed additives in poultry production has been intensively studies. Research conduct by Khan et al., [16] by administering different probiotics in drinking water of broiler concluded that probiotic had positive effects on animal performance, immune system and economy efficiency. In this study, body weight and feed conversion ratio of boiler fed probiotics had significant greater compared to control at the age of 28 and 39 d. Mortality of broiler administrated probiotics treatment was also lower than that of without probiotics administration. The effect of probiotics in carcass traits has been reported by Pourakbari et al., [17] in which administration probiotics in poultry feed increased the weight drumsticks and reduced the weight of wings. Probiotics “Nanggro” is liquid probiotics produced by animal husbandry department Universitas Syiah Kuala by mixing commercial probiotics from bacteria and yeast. This probiotic contains Lactobacillus casei and Saccharomyces cerevisiae with suitable number to be used as feed additives in poultry feed. Application of this probiotics in poultry production was still limited. Therefore, it is imperative required to study about administration this probiotic in commercial broiler chickens.

2. Materials and methods

2.1. Animal and feeding

The growth study was carried out at private enterprise farm in Banda Aceh. Measurement of carcass and giblet characteristics were conducted at Laboratory Nutrition and Feed Technology, The Faculty of Agriculture, Universitas Syiah Kuala, Banda Aceh, Indonesia.

Totally 100 of mixed sex commercial broiler chickens (CP 707) were used in this study. The beginning of body weight were 38.2 ±2.45 g, 38.4 ±2.38 g, 37.8 ±2.53 g and 37.2 ±2.45 g for P0, P1, P2 and P3 respectively. All chickens were randomly allotted in the 20 littered pens (1x1m) with four different treatments (5 chickens each pen). All research facilities were cleaned and disinfected prior to study. All pens were equipped with feeder and manual drinker. Broiler were vaccinated with ND (3rd day) and Gumboro (10th day). Each treatment was administrated different concentration of liquid probiotic in the water (P1=control, P2= 1.0 % of liquid probiotic in the drinking water, P3= 1.5 % of liquid probiotic in the drinking water, and P4= 2.0 % of liquid probiotic in the drinking water). Feed and water were provided ad libitum for the whole experiments. Commercial feed with appropriate nutrient requirement was provided for starter period (23% crude protein; 3000 ME kcal/kg) and grower period (21% crude protein; 3100 ME kcal/kg). The room temperature was maintained from 35°C at beginning and reduced periodically until it reached 24°C after 3 weeks. Feed intake and body weight were recorded weekly.

At the end of experiment, one broiler from each pen was selected to measure carcass and giblet traits. Twenty selected broilers were fasted overnight and only access for water. Broiler were slaughtered in Islamic way to measure carcass dressing percentage and carcass and giblet traits. Each part of carcass and giblet was weighed and recorded for further data analysis.

2.2. Statistical analysis

Analysis of variance for one-way analysis was applied in this study. All data was statistically analyzed and designed to completely randomized design (CRD) as follow:

$$Y_{ij} = \mu + \alpha_i + \epsilon_{ij}$$  \hspace{1cm} (1)

Where $Y_{ij}$ is the value of each observation, $\mu$ is the overall general mean, $\alpha_i$ is the effect of treatment and $\epsilon_{ij}$ is residual error to each observation. The statistical analysis was performed by using SPSS software and expressed as mean±SEM. The statistical significant was declared (P<0.05). Duncan
Multiple Range Test were applied to compare different between treatments [18].

3. Results and discussion
3.1. Broiler performances

The effect of liquid probiotics on performance of commercial broiler chickens (BWG, FI, FCR and WTC) up to 4 weeks is presented in the Figure 1. As indicted from Figure 1, administration of liquid probiotics in animal feed was not significantly difference (P>0.05) on BWG, FI and FCR, but water consumption significantly affected by administration of liquid probiotics (P<0.05). In this study, the body weight of broiler chickens (g±SEM) up to 4 weeks’ study was 1693.45±62.2, 1574.75±71.8, 1495.00±174.7 and 1603.00±99.2 for P0, P1, P2, and P3 respectively. Study was conducted by Samadi et al., [4] using various alternative feed additives on local chickens also did not significantly differ between treatments. In addition, Kumprechtova et al., [19] reported that supplementation of different level of yeast probiotics (Saccharomyces cerevisiae) with two different levels of protein did not influenced of body weight of broiler at the of 21 d and 42 d. Different from research conducted by Alkhalf et al., [20] supplementation of commercial probiotics containing Pediococcus acidilactici (10^9 CPU/g) as feed additive in broiler diets (1.6g, 1.0g and 0.8g) was be able to improve animal performances. The presence of beneficial bacteria in this study increased digestion efficiency and nutrient absorption. Beneficial bacteria in digestive tract of host animals was able to improve animal performance by creating suitable intestinal environment for feed digestion and absorption [21].

It was interested in our study, despite of no significantly different on broiler performances, administration of liquid probiotics in drinking water reduced FCR values up to 4 weeks’ study with the value of 1.34±0.04, 1.31±0.04, 1.32±0.03 and 1.32±0.05 for P0, P1, P2, and P3 respectively. Reduce ratio feed to gain ratio indicated that probiotics could improve nutrient absorption. As aforementioned informs that FI and BWG of broiler chickens in this study was not influenced by administration of liquid probiotics. It was probably low water consumption of probiotics treatment broilers. Our data indicated that water consumption significantly decreased (P<0.05) by supplementation of probiotics. Reducing water consumption resulted in low feed intake in probiotics animals and influenced other performance animals.

A variety results of probiotic administration in animal production have been report by worldwide scientists from negative, no effect or dramatic positive effects to animal performances. Several factors probably influenced for these discrepancies such as microbial sources and contamination, frequency of administration, environmental factors and method of probiotic administrations. Furthermore, no consistent conclusions of probiotic administration on animal performance was probably low probiotic concentration of the tested probiotics. It was suggested that the efficiency of probiotics in animal could be reached, if daily intake of probiotics was 10^8-10^{11} CPU/g for humans [22] and 10^8-10^9 CPU/g for animals [23].
Figure 1. The effect of liquid probiotics administration on body weight (a) feed intake (b), feed conversion efficiency (c) and water consumption (d) of commercial broiler chickens evaluated each week up to 4 weeks (P1=control, P2= 1.0 % of liquid probiotic in the drinking water, P3= 1.5 % of liquid probiotic in the drinking water, and P4= 2.0 % of liquid probiotic in the drinking water).

3.2. Carcass and giblet characteristics
Carcass characteristics of broiler chickens administrated various concentration of liquid probiotic in drinking water are presented in Table 1. Administration of different levels liquid probiotics did not significantly different (P>0.05) on the carcass weight. However, the percentage of carcass in probiotics treatments was slightly higher compared to control. It might be more absorbed nutrients deposited to carcass traits rather than non-carcass traits. Our study was in accordance with the study conducted by [24] in which broilers fed with probiotics containing *Saccharomyces cerevisiae* at 4 x 10 CFU/g had no effect on carcass yield both in the starter and grower periods. Our findings on carcass weight were in agreement with the other studies as reported by [25]. On the other hand, [26] report that inclusion of yeast probiotics (*Saccharomyces cerevisiae*) about 1.5% was able to improve carcass characteristics parameter of broilers.
Table 1. The effect of liquid probiotics administration on carcass characteristics of commercial broiler chickens (P1= control, P2= 1.0 % of liquid probiotic in the drinking water, P3= 1.5 % of liquid probiotic in the drinking water, and P4= 2.0 % of liquid probiotic in the drinking water).

| Carcass Characteristics | P0              | P1              | P2              | P3              |
|-------------------------|-----------------|-----------------|-----------------|-----------------|
| Carcass Weight (gr)     | 1345.92±109.36  | 1280.49±73.49   | 1303.44±93.75   | 1364.28±158.06  |
| Percentage (%)          | 75.04±2.67      | 76.83±1.81      | 76.35±1.22      | 76.44±2.00      |
| Breast Weight (gr)      | 503.24±53.06    | 471.76±24.18    | 476.56±34.90    | 510.69±67.84    |
| Percentage (%)          | 37.34±1.34      | 36.86±1.01      | 36.57±0.96      | 37.43±2.08      |
| Wings Weight (gr)       | 143.75±9.23     | 133.29±6.41     | 143.62±16.40    | 140.59±13.98    |
| Percentage (%)          | 10.70±0.46      | 10.42±0.30      | 11.00±0.69      | 10.32±0.32      |
| Drumstick Weight (gr)   | 362.55±34.88    | 374.56±37.12    | 398.39±30.07    | 426.17±59.74    |
| Percentage (%)          | 26.95±1.63      | 29.24±2.17      | 30.58±1.26      | 31.22±1.98      |
| Back Weight (gr)        | 328.94±45.92    | 289.60±20.27    | 302.60±45.48    | 281.40±37.27    |
| Percentage (%)          | 23.90±2.16      | 22.64±1.54      | 23.20±3.01      | 20.64±1.65      |

Means followed by different letters within column are significantly different (P<0.05).

In poultry industry, maximal profit can be reached when the percentage of saleable products is higher than that of non-saleable products. To reach the maximal saleable products, farmers should feed their broilers with high qualified feed to fulfil the animal requirements. Table 1 shows that carcass-cut (breast, wings and back) of broiler carcass was not significantly different (P>0.05) between treatments. Our study is in accordance with the other study [27] in which broilers received 3 different probiotics, 2 levels in drinking water had no difference of cut yield. However, leg yields was higher in probiotic treatments than control. This result was in line with our study in which the percentage of drumstick increased linearly with the high concentration of probiotic in drinking water. It seems the role of probiotics to deposit nutrients in edible portion of carcass properly works. Habibi et al., [28] reported that administration of bactocell and protexin probiotics in broiler chickens was higher yield cut of carcass compared to control. The presence of beneficial bacteria probably was able to increase nitrogen availability to animals.

The Effect of liquid probiotics administration on giblet characteristics of commercial broiler is shown in Table 2. The weight of giblet (gizzard, heart and liver) was no significantly influenced (P>0.05) by inclusion of probiotics in drinking water. It was indicated that administration of probiotics as feed additive had no negative effect on the internal organ of animal. The range weight of giblet was around 28-31 g, 6-8 g and 30-34 g for gizzard, heart and liver respectively. Similar results was reported by Panda et al., [29] where supplementation of probiolac in animal diet with the amount fo 100, 150 or 200 mg/kg diet had no effect on the weight of internal organs including liver, heart and gizzard.
Table 2. The effect of liquid probiotics administration on giblet characteristics of commercial broiler chickens (P1=control, P2= 1.0 % of liquid probiotic in the drinking water, P3= 1.5 % of liquid probiotic in the drinking water, and P4= 2.0 % of liquid probiotic in the drinking water).

| Giblet   | Treatment | P0       | P1       | P2       | P3       |
|----------|-----------|----------|----------|----------|----------|
| Gizzard  |           | 28.44±5.45 | 31.41±1.92 | 28.95±4.71 | 30.14±3.00 |
|          | Percentage (%) | 1.60±0.37 | 1.89±0.12 | 1.69±0.23 | 1.70±0.2  |
| Heart    |           | 7.61±1.42  | 7.19±1.82  | 6.96±1.33  | 8.04±1.02  |
|          | Percentage (%) | 0.42±0.07 | 0.43±0.12 | 0.41±0.08 | 0.46±0.07  |
| Liver    |           | 31.17±4.32 | 30.61±4.96 | 30.13±1.19 | 34.69±6.28 |
|          | Percentage (%) | 1.74±0.19 | 1.84±0.34 | 1.77±0.13 | 1.95±0.32  |

Chumpawadee et al., [30] reported that inclusion of cassava yeast (Saccharomyces cerevisiae) as probiotic source in broiler feed did not have any effect on the percentage of liver and gizzard with the range percentage of 3.25-3.53% and 1.94-2.19% for liver and gizzard respectively. No significant different on gizzard and liver weight of broiler administrated prebiotics, probiotics and symbiotic has been reported by Sarangi et al., [31, 32]. The weight of gizzard and liver was higher compared to our results due to different time harvest (42 d vs 28 d).

4. Conclusions
The results of our study concluded that administration of liquid probiotics in broiler had no negative effects on animal performance, carcass and giblet characteristics. Probiotics administration significantly influenced water consumption of broiler and affected other animal performances parameters. Drumstick as part of carcass significantly improved by administration of liquid probiotics. No negative effect found in animal organs parameters (gizzard, hearth liver) of broilers indicated that no significantly difference of giblets traits between probiotics treated animals and control animals.

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