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Effect of Various Feed Additives on Carcass and Meat Quality of Two Different Strains of Chickens

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Abstract. Assorted feed additives for broiler chickens, including prohibited antibiotics, are widely sold in the market. The objective of incorporating supplement in feed is to improve broilers' performance and meat quality. This study conducted an experiment to 60 DOC broilers from each Cobb and Lohmann strains. The experiment was conducted in a 2x4 factorial CRD. The treatments were feed additives, i.e. antibiotics, probiotics, acidifiers and phytobiotics. Each treatment was repeated 3 times. The measured variables were carcass and non-carcass percentage as well as physical quality of broiler meat. Analysis of variance showed that feed additives did not significantly affect (P>0.05) carcass and non-carcass percentage and meat physical quality of the two broiler strains. Conclusively, probiotics, acidifiers and phytobiotics are the potential alternatives as a substitute for antibiotics for Cobb and Lohmann broiler chickens as reflected from the carcass percentage and meat quality.

1. Introduction

Broiler chicken is one of the fastest sources of meat growth in the world, and in Indonesia broiler chickens are included in poultry which meat is mostly consumed by humans. Indonesia's climatic conditions, which have high temperature and humidity, cause many disease problems in broiler chickens. Therefore, an antibiotic is used to prevent disease. Its development growth promoter antibiotics (AGPs) are frequently used to increase the bodyweight of poultry. However, there has been a growing concern about the negative effects of AGP and its residues in meat product as well as antibiotic resistance to the consumers.

The impact AGP on the emergence of antibiotic resistance in zoonotic pathogenic bacteria in the gut microbial community of poultry [1]. The prohibition of AGP is regulated in Law Number 18/2009 junto Number 41/2014 concerning Livestock and Animal Health. Article 22 paragraph 4c stated, "Everyone is prohibited from using feed mixed with particular hormones and/or antibiotics as feed additives". AGP incorporated in feed would impact positively on chickens' performance, but it brings negative effects to human health. The antibiotic residue in chicken eggs and muscle tissue [2] would make the human body resist some types of antibiotics.

The commonly used AGP for the poultry industry includes Avilamycin, Flavophospholipol, Enramycin, Monensin, Penicillin, Virginiamycin, Tetracycline, Erythromycin, Salinomycin, and Bacitracin methylene disalicylate (BMD). Accordingly, farmers start to find alternatives for antibiotics, such as probiotic, acidifier and phytobiotic. These substances do not leave residual traces in meat; hence, healthier as a feed additive [3][4][5].

However, the effects of probiotic, acidifier and phytobiotics on chickens are varied. One contributing factor is the strains of broiler chicken. The large variety of broiler strains allows farmers

to select ones with high-performance ones and compatible with environmental conditions. Different genetic qualities in each strain result in different abilities to respond to the environment, hence different growth rates [6]. Further effects are evident on the final weight, carcass weight and meat quality [7]. Accordingly, it is important to investigate the effect of broiler stains and feed additive on broiler carcass and meat quality

2. Methodology

This study used sixty DOC of each Cobb and Lohmann strains. The basal feed used commercial feed contained 20-22% crude protein, 5-6% crude fat, 5% crude fiber (maximum), 8% ash (maximum), 12% water (maximum), 0.8-11% Ca and 0.5% feed additives (minimum) namely antibiotic, probiotic powder, acidifier powder, and mixed garlic, turmeric, and ginger powder. Feed additives were given through the basal feed. A total of 24 slated broiler cages were made of bamboo and wood, measuring 80 cm x 80 cm per unit.

This experimental study was conducted in Completely Randomized Design (CRD) with the factorial pattern. The first factor is the broiler strains (Cobb and Lohmann) and the second factor is feed additives (powder) including 0.125% antibiotic, 0.2% probiotic, 0.8% acidifier and phytobiotic (as well as mixed 0.25% garlic, 2.1% turmeric, and 2.1% ginger powder). The levels of each feed additive are adjusted to the levels recommended on the label of each feed additive, except for the levels of ginger, turmeric and garlic based on the best results of previous studies [8][9]. The eight combined treatments were Cobb broiler given antibiotic, Cobb broiler given probiotic, Cobb broiler given acidifier, Cobb broiler given phytobiotic, Lohmann broiler given probiotic, Lohmann broiler given acidifier, Lohmann broiler given phytobiotic.

These eight treatments were repeated three times, and each unit was filled with 5 chickens, hence 120 broilers in total. The chickens were harvested at the age of 35 days and then they were slaughtered by cutting three channels, namely the respiratory tract, and left and right blood vessels in the neck. Then the chicken undergoes processing, namely scalding, plucking, removal internal organ except the giblet (liver, heart, and gizzard), and eviscerating to obtain the carcass and non-carcass. The meat that was analyzed to obtain physical quality of the meat was the breast meat. The physical quality of meat observed consisted of water holding capacity, cooking loss, and meat tenderness. The collected data were subjected to Analysis of Variance (ANAVA), and any significant effect would be subjected to an Honestly Significant Difference test (HSD).

3. Result and Discussion

3.1 Carcass and non-carcass Percentage

Table 1. The average carcass percentage of Cobb and Lohmann Strains

Treatments	Carcass percentage (%)		Non-carcass percentage (%)	
	Cobb	Lohmann	Cobb	Lohmann
Basal feed+antibiotic	74.03±3.01	76.91±5.74	28.98±4.37	20.43±3.51
Basal feed+probiotic	74.53±1.63	74.72±1.92	25.79±1.07	25.28±1.92
Basal feed + acidifier	75.97±0.75	76.06±2.07	24.03±0.75	23.94±2.07
Basal feed + Phytobiotic (garlic+ turmeric + ginger)	75.96±3.99	77.48±5.14	24.04±3.99	25.85±0.87

The carcass and non-carcass percentage of Cobb and Lohmann strain in this study were 74.03–75.97% and 74.72–77.48%, respectively. This result confirmed the previous studies, i.e. 69.16% of Cobb strain [7] and 63.00–66.16% of Lohmann strain [10].

Furthermore, the non-carcass percentage of Cobb (24.03–28.98%) and Lohmannn (20.43–25.85%) in this study was within the normal range as per the previous study namely 22.26-24.13%[10]. Analysis of variance showed that the interaction between different feed additives and broiler strains did not significantly affect ($P>0.05$) the carcass percentage and non-carcass percentage. It

demonstrated that any broiler strains respond similarly to antibiotics, probiotic, acidifier and phytobiotic treatments.

Therefore, probiotic, acidifier and phytobiotic can substitute antibiotics that have been prohibited for animal feed additives. Additionally, the relatively similar genetic quality between Cobb and Lohmann allows farmers to use Lohmann and Cobb interchangeably for their livestock farming. A previous study[11] reported that strains with different characteristics would produce relatively similar carcass and non-carcass percentage when fed on quality feed. Furthermore, [12] and [13] reported that acidifier and phytobiotic play a similar role to that of antibiotics.

Acidifier improves digestibility by increasing the performance of digestive enzymes, decreasing intestinal pH and maintaining the balance microbes in the digestive system. Meanwhile, phytobiotic which is produced from the plant's secondary metabolite (either contain nutrition, no nutrition even anti-nutrition) and incorporated to the feed can increase livestock productivity by improving feed characteristics, increasing the health of the digestive tract by controlling bacteria as well as improving production performance and the quality of livestock products.

Similarly, probiotic bacteria can improve livestock performance by exhibiting a competitive exclusion in the intestines. Besides, probiotic bacteria will modulate body immune of broiler chickens by improving the goblet cells, the inflammatory mitigation and body immune status. Garlic, ginger and turmeric all contain essential oils that act as natural antibiotics. In addition, garlic contains the bioactive substance allicin, while ginger contains oleorosin and gingerol, phenolic compounds, antioxidants.

The bioactive substances in turmeric contain curcuminoid compounds consisting of curcumin, desmetoxicumin as much as 1-5% and bisdesmetoksikurcumin as much as 1-5% and other useful substances such as essential oils consisting of ketones sesquiterpenes, turmerone, tumeone 60%, zingiberen 25%, felandren, sabinen, borneol and sineil. Accordingly, different feed additives would result in a relatively similar carcass and non-carcass percentage.

3.2 Meat quality of different strains of broiler chickens

Table 2. Water holding capacity, cooking loss, and meat tenderness of broiler chickens consuming additives-fortified feed

Treatments	pH		Cooking loss		Meat tenderness	
	Cobb	Lohmann	Cobb	Lohmann	Cobb	Lohmann
Basal feed + antibiotic	6.21±0.19	5.88±0.03	31.56±0.89	28.88±0.44	5.49±1.40	6.08±1.35
Basal feed + probiotic	6.17±0.14	5.94±0.11	28.17±1.96	28.55±1.63	4.13±1.02	4.74±0.67
Basal feed + acidifier	6.02±0.09	5.87±0.13	31.81±1.21	28.75±3.15	5.99±2.00	4.87±1.44
Basal feed + Phytobiotic (garlic+ turmeric + ginger)	6.00±0.14	6.02±0.02	29.39±1.08	28.01±0.39	5.24±0.76	5.61±1.47

Analysis of Variance showed that no interaction was observed between feed additives and broiler strains, demonstrated by the non-significant effect on pH, cooking loss and meat tenderness. The contributing factor to this is the similar function of antibiotic, probiotic, acidifier and phytobiotic to inhibit pathogenic bacteria and improve body immune of the livestock[14]; therefore, the chickens are always healthy, on top-performance and with normal glycolysis process which affect the quality of the broiler meat [3][15].

Meat pH in this study was 6.00 – 6.21, which is relatively comparable to 6.00 reported by Irma[16]. The effect of phytobiotics is not significantly different on the quality of meat, because the bioactive substances, essential oils and antioxidants contained in phytobiotics can prevent the pH from dropping too quickly. It is due to the donation of H + ions contain in antioxidants.

An antioxidants are effective in influencing the process of depleting glycogen reserves into lactic acid and preventing the oxidation process by free radicals as well[17]. The rate at which muscle pH decreases which will rapidly result in a low water-binding capacity, because of the increased contraction of the actomyosin that was formed, thus squeezing the liquid out of the meat. The meat

tenderness is one of the factors which determine meat quality. Turmeric has curcuminoid as antibacterial agent, it also stimulated bile duct to produce more bile liquid by cholekinetic and choleretic way.

In liver, lipid metabolism undergoes well, result high ATP to produce more amino acid to develop muscle. Therefore, broilers have more muscle and a little fat. It also optimized gastrointestinal works, increase appetite and growth rate. The garlic and ginger have similar potential as antibacterial agent like turmeric, but the effect in broiler are lower than turmeric [3]. Furthermore, cooking loss and meat tenderness is affected by several factors, including fat content and pH[18].

4. Conclusion

a. This study concludes that different feed additives and broiler strains produced similar carcass percentage and meat quality.
b. Probiotic, acidifier and phytobiotic are the potential substitute for the prohibited antibiotics.

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References

[1] Salaheen S, Kim S W, Haley B J, Van Kessel J A S and Biswas D 2017 Alternative growth promoters Modulate broiler gut microbiome and enhance body weight gain *Front. Microbiol.* **8** 1–11 10.3389/fmicb.2017.02088

[2] Nangguk C A, Detha A I and Wuri D A 2013 Assessment of tetracycline residues in the meat ofbroilers, free-range broilers and rejected layer chickens sold in Kupang city *J. Kaji. Vet.* **2** 175–81 https://doi.org/10.35508/jkv.v2i2.1002

[3] Pertiwi H and Dadi T B 2020 Phytoadditive Suplementation to Improve Production Performance of Broiler Replacing Antibiotic Growth Promoters (AGPs) in Indonesia -a Review *Sylwan* **164** 398–406

[4] Lillehoj H, Liu Y, Calsamiglia S, Fernandez-Miyakawa M E, Chi F, Cravens R L, Oh S and Gay C G 2018 Phytochemicals as antibiotic alternatives to promote growth and enhance host health *Vet. Res.* **49** 1 10.1186/s13567-018-0562-6

[5] Gunal M, Yayli G, Kaya O, Karahan N and Sulak O 2006 The effects of antibiotic growth promoter, probiotic or organic acid supplementation on performance, intestinal microflora and tissue of broilers *Int. J. Poult. Sci.* **5** 149–55 10.3923/ijps.2006.149.155

[6] Kalia S, Bharti V K, Gogoi D, Giri A and Kumar B 2017 Studies on the growth performance of different broiler strains at high altitude and evaluation of probiotic effect on their survivability *Sci. Rep.* **7** 1–8 1038/srep46074

[7] Risnajati D 2017 Comparison of Final Weight, Carcass Weight and Carcass Percentage of Various Broiler Strains *Sains Peternak.* **10** 11–4 10.20961/sainspet.v10i1.4808

[8] Natsir M H and Muharlien E W dan 2016 The use of a combination of turmeric flour (Curcuma domestica) and ginger (Zingiber officinale) in the encapsulated and non-encapsulated forms on the characteristics of the intestines and intestinal microflora of broilers *Bul. Peternak.* **40** 1–10 *ISSN-0126 0400* https://doi.org/10.21059/buletinpeternak.v40i1.8890

[9] Nuningtyas Y F 2014 Pengaruh penambahan tepung bawang putih (Allium sativum) sebagai aditif terhadap penampilan produksi ayam pedaging *Ternak Trop.* J.Tropical Animal Production **15** 65–73

[10] J Sibarani V D Y and D M 2014 Percentage of carcass and non-carcass and abdominal fat of broiler chickens treated with citric acid acidifier in double step down feed *Anim. Agric. J.* **3** 273–80 http://ejournal-s1.undip.ac.id/index.php/aaj

[11] Melly Pratiwi, Muh. Amrullah Pagala A S A 2016 Carcass production and abdominal fat of Cobb and Lohmann strains broiler chickens were fed different diets *JITRO* **1** 1–17 DOI: http://dx.doi.org/10.33772/jitro.v3i1.986

[12] Maya Septiana O sofjan dan M H N 2014 Effects of Addition of Natural Acidifier and Phytobiotic Mixtures in Non and Encapsulated Forms in Commercial Feed on Quality of Laying Chicken Eggs Animal science Faculty University of Brawijaya 1–11

[13] Cecep Hidayat R 2019 Review: Opportunities for Developing Phytogenic Feed Additives as Substitute for Antibiotics in Broiler Rations in Indonesia *J. Ilmu dan Teknol. Peternak. Trop.* **6** 188–213 10.33772/jitro.v6i2.139
[14] Akhadiarto S 2014 Effect of addition of local probiotics in the diet of broiler chicken performance **16** 16 22 https://doi.org/10.29122/jsti.v16i1.3397
[15] Husein Abdurrahman Z and Yanti Y 2018 Overview of the Effect of Probiotics and Prebiotics on Chicken Meat Quality *J. Trop. Anim. Prod.* **19** 95–104
[16] Irmayani 2019 Analysis of Microbial Contamination and pH Value of Broiler Chicken Meat on Lakessi Traditional Markets in Parepare City *J. Galung Trop.* **8** 1–8 DOI: http://dx.doi.org/10.31850/jgt.v8i1.431
[17] Tugiyanti E, Ibnu H.S, Novie A.S E S dan S M 2016 Pengaruh pemberian tepung daun sukun ke dalam pakan terhadap kualitas daging itik tegal jantan Umur 9 minggu *Prosiding Seminar Nasional Peternakan 2016 Optimalisasi Sumberdaya Lokal Peternakan Rakyat Dalam Mendukung Pengembangan Badan Usaha Milik Rakyat (BUMR)* pp 174–82
[18] Tugiyanti E, Yuwanta T, Zuprizal and Rusman 2013 Improving performance, meat quality and muscle fiber microstructure of native Indonesian muscovy duck through feed protein and metabolizable energy *Int. J. Poult. Sci.* **12** 653–9 10.3923/ijps.2013.653.659

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