The effect of combination of black garlic and turmeric on laying sequence of Magelang duck infected with *Salmonella enteritidis*

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Abstract

The digestive tract is the main key to an animal's health which manifests livestock productivity. Healthy animals produce optimal livestock productivity. The purpose of this study was to determine egg production from a combination of turmeric and garlic against *Salmonella enteritidis* infection or commonly referred to as Salmonellosis disease. The method of preparing turmeric and garlic is done by giving heat treatment at a temperature of ± 70° C, then given by mashing. The results showed that after infection with *Salmonella enteritidis*, abnormal egg-laying occurred, namely eggs are very small than normal. The productivity of magelang ducks infected by *Salmonella enteritidis* and supplemented with black garlic and turmeric (P2) can pursue control treatment (P0) and treatment without infection plus black garlic and turmeric supplementation (P1). Whilst, egg weight from treatment P1 was heavier than P0 and P2 after infection. It can be concluded that the addition of black garlic and turmeric can improve both egg productivity and egg weight. The productivity of Magelang duck eggs infected by Salmonella enteritidis and added turmeric and black garlic can recover within 2.5 weeks after infection.

Keywords: Duck of Magelang, *Salmonella enteritidis*, black garlic, turmeric

Introduction

Salmonellosis is a disease that often affects poultry. Cases of Salmonellosis are widespread in various countries in the world. About 70% of the occurrence of Salmonellosis in animals and humans is caused by 10 to 12 serotypes of *Salmonella* sp (Tabbu, 2000). Salmonellosis is also famous for attacking ducks at various ages. Besides disrupting growth and production, infection of this disease can increase the sensitivity of poultry to various other diseases (Kabir, 2010). If this disease attacks livestock that is extensively raised by traditional breeders, it will make a big loss because the transmission is very fast.

This alarming health condition is an important concern for academics and researchers to find the right solution. Prohibiting the use of antibiotics as growth promoters have the side effect of decreasing the health status of the digestive tract. Another alternative to overcome health-related problems is in the form of probiotics, organic acids, and phytobiotics. The use of phytobiotics is fairly easy to apply to traditional farmers because of its abundant availability and low cost. Fitobiotics are products of plant origin that contain many bioactive compounds (Dono, 2013; Callegari et al., 2015). As one source of phytobiotics, turmeric is very potential to be used as feed additives to replace antibiotics in poultry (Dono, 2009). Giving phytobiotics at a certain level can replace the use of antibiotics as an immune system enhancer. Turmeric contains bioactive compounds (phytochemicals) which can function as anti-bacterial properties (Araujo et al., 2001; De, 2009; Pundir and Jain,

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2010). Similarly, garlic is proven to provide a response to animal health.

Turmeric as a phytobiotic is known for its active ingredient curcumin. While garlic has the active substance allicin. Both of these biological activities were apparently increased when given a treatment in the form of heating (Kurien and Scofield, 2009; Kimura et al., 2017). Previous studies reported the use of garlic with fermentation treatment at a controlled temperature and humidity ± 70 ° C for 12 days to produce black garlic, known as black garlic. Black garlic is reported to have antibacterial activity against P. aeruginosa, E. coli, B. subtilis, and S. aureus in vitro (Aini and Shovitri, 2018). Literature regarding turmeric research with fermentation treatment is very little.

Thus this study will be tested for fermented turmeric and garlic at ± 70 ° C for 12 days on Magelang ducks infected by Salmonella enteritidis. This is important, in order to support the health of Magelang ducks, which until now has been dominated by traditional breeders. The use of phytobiotics is suitable applied to traditional farms. Duck farms are projected to be as popular as chicken farms today, so natural alternatives are needed that can act as growth promoters to support duck productivity optimization.

Materials and Methods

Turmeric and garlic preparation

Garlic is chosen which is large, not rotten, and still intact with other cloves, not broken ones. Garlic is left without peeling and left dry and not moist. One kilogram of garlic is put into the rice cooker and arranged not to overlap to prevent damage to the shape of the black onion. The rice cooker is closed and set in keep warm mode (temperature ± 70 ° C) and left for 12 days. After 12 days, the garlic is removed and selected black onions that have the skin of the cloves are not charred and the garlic in them is black and wrinkled to obtain black onions ((Aini and Shovitri, 2018)). The treatment for turmeric is also the same as garlic. Turmeric rhizome is sufficiently cleaned with a dry cloth. Then put in a rice cooker and fermented for 12 days.

Next smoothed with a grinding tool. Turmeric and garlic that have been finely mixed in duck feed. Levels of turmeric and garlic are 1: 1 each 1 g per kg of feed. Gifts are given every day.

Preparation of Salmonella enteritidis culture

Pure Salmonella enteritidis culture was obtained from the Yogyakarta Veterinary Center. A total of 1 ose culture was taken and then grown on broth media Brain Heart Infusion (BHI) 5 ml incubated for 24 hours at 37 ° C. Then centrifuge (500 g, 10 minutes) was carried out to form pellets. Pellets were diluted with 0.85% sterile physiological NaCl solution with turbidity similar to McFarland No. 1 standard which is equivalent to 10^7 colony

forming units (CFU) / ml (Miyamoto et al., 1998).

Materials and Methods

The study was conducted on female Magelang ducks of 30 productive age. A total of 10 ducks were taken randomly to be given research treatment. The treatments given are:

P0 = Ducks not given feed containing turmeric and black garlic + without *S. enteritidis* infection (negative control)

P1 = Duck given feed containing turmeric and black garlic + without *S. enteritidis* infection (positive control)

P2 = Duck given feed containing turmeric and black garlic + infected by *S. enteritidis* orally 10^7 CFU / ml

Maintenance is carried out for 2 (two) months. Ducks were adapted to feed that had been supplemented by black garlic and turmeric for 1 week for P1 and P2 treatments. Furthermore, *Salmonella enteritidis* infection is done once. Maintenance continued for 7 weeks.

Results and Discussion

Based on the picture above, it can be seen if the productivity of magelang duck eggs before being infected by P1 and P2 is higher than the control (P0). But after being infected all three treatments are equally in a condition not to lay eggs. Entering the 4th week, P0 starts production and is followed by P1, while P2 enters the non-laying phase until the beginning of the 5th week. At the end of week 4, productivity of P1 duck eggs began to outperform P0 and reached peak production at the end of week 6 and then decreased in week 7.

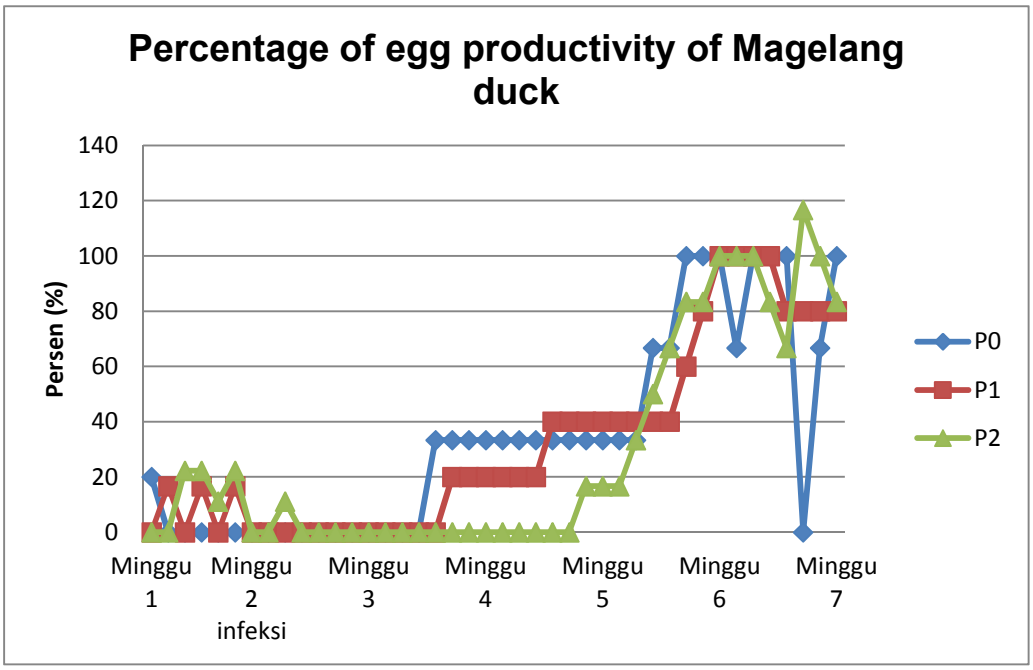

Figure 1. Percentage of egg productivity of Magelang duck

The addition of turmeric and garlic showed its ability to increase the productivity of Magelang duck eggs in healthy ducks compared to controls. Ducks that have been infected and supplemented with turmeric and garlic show recovery of productivity at 3 weeks post infection. According to Zhang et al. (2019) egg laying rate and egg quality decreased after *Salmonella enteritidis* infection. The bacteria apparently colonized the stroma, follicles, isthmus, vagina and reproductive tract of the infected duck.

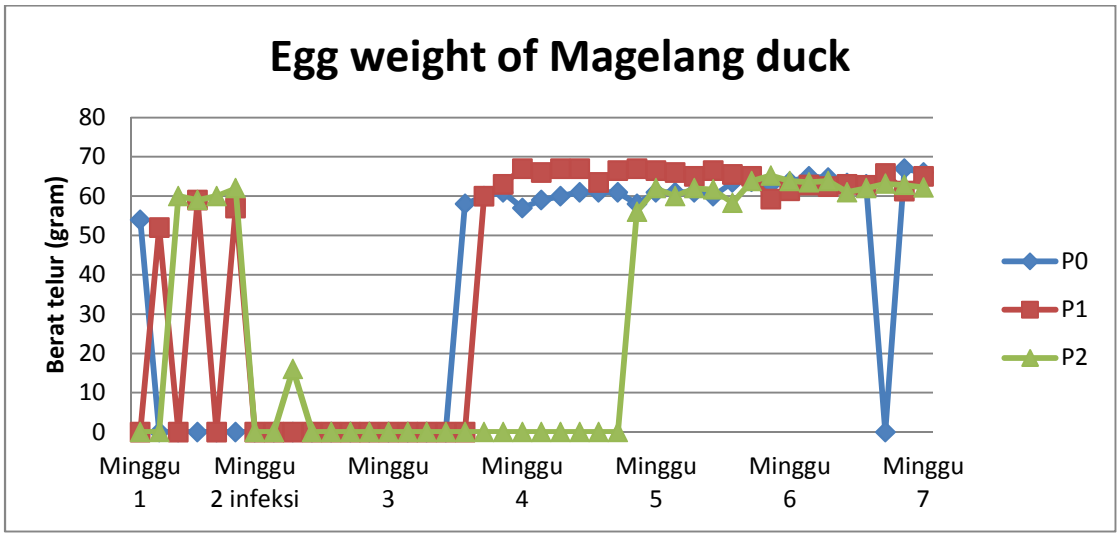

Figure 2. Egg weight of Magelang duck

The weight of Magelang duck eggs during maintenance is presented in Figure 2. It can be seen that before being infected and before being fed with turmeric and onion supplemented feed, the weight of P0 was 55 grams, while P1 and P2 were close to 60 grams. After infection with P2, the egg's weight has decreased dramatically to 18 grams.

Furthermore it was seen that after infection ie at the beginning of the 4th week until the middle of the 6th week, the weight of P0 eggs was greater (± 65 grams) than the weight of P1 eggs (± 60 grams). Meanwhile P2 egg weight equals P0 (control) egg weight in the middle of the 5th week. Recovery of normal egg productivity after Salmonella (P2) infection occurs within 2.5 weeks. The addition of turmeric and black garlic has a role as phytobiotics. Turmeric has an active substance that acts as an antibiotic in the form of curcumin. Curcumin plays an important role in reducing Salmonella motility by shortening flagella and reducing flagella density (Marathe et al., 2016). Thus the virulence effect of flagella which has a Toll-like receptor 5 is inhibited. While the effect of black garlic is the presence of antibacteria obtained from the compound S-Allyl-Cystein (SAC) which is a conversion of the active substance alicin. SAC is obtained through the aging process. SAC content in black garlic five times more than fresh garlic. Based on research by Ngan et al. (2017), black garlic gives inhibition against Salmonella.

Conclusion

It can be concluded that the addition of black garlic and turmeric can improve both egg productivity and egg weight.The productivity of Magelang duck eggs infected by Salmonella enteritidis and added

turmeric and black garlic can recover within 2.5 weeks after infection.

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