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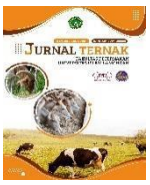

Study Performance Bird Quail Egg Layers (*Coturnix Japonica*) Given Organic Supplements Liquid Gdm In Feed With Different Doses

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ABSTRACT

This study aims to analyze the effect of GDM Liquid Organic Supplement (SOC) in feed on the performance of laying quail (Coturnix japonica). The parameters observed include Hen Day Production (HDP), egg mass, feed conversion, and mortality. The study was conducted for 30 days using 400 6-month-old female laying quails. The research method used a Completely Randomized Design (CRD) with five treatments and four replications. The treatments consisted of P0 (without SOC), P1 (SOC 0.1 %), P2 (SOC 0.3%), P3 (SOC 0.5%), and P4 (SOC 0.7%). Data were analyzed using analysis of variance (ANOVA) and continued with the Duncan Multiple Range Test (DMRT). The results showed that SOC administration had a significant effect (P <0.05) on all observed parameters. Treatment P4 (0.7 %) produced the best performance with a HDP value of 98.02%, an egg mass of 12.74 grams, and the lowest feed conversion of 1.66. In addition, the provision of SOC was able to reduce the mortality rate compared to the control treatment. The increase in performance is thought to be caused by the content of probiotic bacteria in SOC which is able to improve the balance of digestive tract microflora, increase nutrient digestibility, and improve feed utilization efficiency. Based on the results of the study, it can be concluded that the use of GDM Liquid Organic Supplement at a dose of 0.5–0.7 % in feed can increase productivity and feed efficiency and reduce mortality in laying quail.

1. Introduction

The livestock sector is a crucial subsector in agricultural development, playing a key role in meeting the population's need for animal protein. Population growth and public awareness of the importance of nutrition have led to a year-on-year increase in demand for animal protein sources, particularly eggs and meat. One poultry commodity with significant development potential is quail (Coturnix japonica). Quail are known as egg-laying birds with high productivity, a short production period, and are more efficient to raise than other poultry (Antika et al., 2022).

Quail eggs are capable of producing eggs with a high protein content and have considerable economic value. According to Lukito et al. (2012), quail eggs contain 13.1% protein , higher than the 12.7% of broiler chicken eggs. Furthermore, quail eggs contain fat, vitamins, and minerals that are

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beneficial to human health (Atik et al., 2015). Quail's high productivity makes this livestock an alternative to supporting national food security, particularly in the provision of animal protein.

The success of a quail farm is heavily influenced by husbandry management, particularly feed. Feed is a key factor determining livestock productivity, accounting for approximately 60–70% of production costs (Usman Ali et al., 2020). Feed quality and efficiency significantly determine production performance, including Hen Day Production (HDP), egg mass, feed conversion, and mortality. However, quail productivity in the field often declines due to low nutrient absorption efficiency in the digestive tract.

Antibiotic Growth Promoters (AGPs) have long been used to improve poultry performance. However, continued antibiotic use can lead to resistance in pathogenic microorganisms and residues in livestock products that are harmful to human health (Marlina et al., 2016).

The Indonesian government, through Minister of Agriculture Regulation Number 14/PERMENTAN/PK.350/5/2017, has banned the use of AGP in animal feed. Therefore, alternative natural additives are needed that are safe and can increase livestock productivity, one of which is probiotics. Probiotics are live microorganisms that provide benefits to host health by improving the balance of digestive tract microflora (Umi Kalsum et al., 2022). The use of probiotics in poultry has been shown to increase feed efficiency, improve nutrient absorption, boost immunity, and reduce mortality (Nurul and Dwi , 2022). Probiotic microorganisms work by producing digestive enzymes such as protease, amylase, and lipase, which aid the process of nutrient metabolism in livestock.

One probiotic that is increasingly being used in the livestock industry is the GDM Liquid Organic Supplement (GDM SOC). This supplement contains various pathogenic bacteria such as *Bacillus pumilus, Bacillus brevis, Bacillus mycoides, Pseudomonas alcaligenes,* and *Micrococcus roseus* , which function to improve digestive tract health and poultry production performance (Angga et al., 2018). Previous research has shown that the use of *Bacillus subtilis* and *Lactobacillus* -based probiotics can increase egg production, improve feed conversion, and improve egg quality in quail (Jazi et al., 2020).

In addition to improving production performance, probiotic use can also improve the condition of the gut microbiota, thereby suppressing the growth of pathogenic bacteria in the digestive tract (Mazanko et al., 2018). This will result in increased feed efficiency and reduced livestock mortality. Therefore, the use of GDM Liquid Organic Supplement is expected to be an effective and safe natural feed additive alternative to improve the performance of laying quail.

Based on this description, research is needed to investigate the effects of GDM Liquid Organic Supplement in feed at different doses on the performance of laying quail, including Hen Day Production (HDP), egg mass, feed conversion, and mortality. This research is expected to provide scientific information on the effectiveness of using liquid organic probiotics as a natural additive in increasing the productivity of laying quail.

2. State of the Art

Research on the performance of laying quail (*Coturnix japonica*) continues to develop, particularly regarding the use of probiotics and organic supplements as alternatives to *Antibiotic Growth Promoters* (AGPs). The use of AGPs has been banned due to the potential for bacterial resistance and residues in livestock products (Marlina et al., 2016). Therefore, various studies have begun to focus on the use of probiotics to naturally and safely increase poultry productivity.

Previous research has shown that probiotics can improve poultry production performance by improving gut microflora and increasing nutrient absorption. According to Usman Ali et al. (2020), feed efficiency in quail is significantly influenced by optimal digestive tract conditions. This finding is supported by research by Umi Kalsum et al. (2022), which states that non-pathogenic microorganisms in probiotics can improve digestive health, thereby increasing livestock productivity.

A study on the use of probiotics in quail was also conducted by Ilham et al. (2021), who reported that administering probiotics containing 0.1 % *Lactobacillus* and *Bacillus subtilis* increased daily egg production, feed consumption, and feed conversion efficiency. Furthermore, Mazanko et al. (2017) explained that *Bacillus -based probiotics* can improve the quality and production of laying quail eggs. Research by Jazi et al. (2020) also found that *Bacillus subtilis* plays a role in increasing the antioxidant capacity and intestinal health of laying poultry.

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Another study conducted by Ermakova et al. (2020) showed that supplementing *Bacillus subtilis* in quail drinking water can suppress the development of pathogenic bacteria in the digestive tract and increase the carotenoid content of egg yolk. Meanwhile, Suherman et al. (2015) stated that the addition of 0.6% Lactobacillus Plus probiotics can increase *egg* production and *egg mass* of quail compared to treatments without probiotics. Although various studies have discussed the effectiveness of probiotics in poultry, studies on the use of GDM Liquid Organic Supplement (GDM SOC) in laying quail are still very limited. In fact, GDM SOC contains various pathogenic bacteria such as *Bacillus pumilus* , *Bacillus brevis* , *Bacillus mycoides* , *Pseudomonas alcaligenes* , and *Micrococcus roseus* which have the potential to improve production performance and livestock health (Angga et al., 2018). Previous studies generally only focused on one particular type of probiotic, while the combination of various bacteria in GDM SOC has not been studied specifically in laying quail.

Thus, the novelty *of* this research lies in the use of GDM Liquid Organic Supplement at different doses in the feed of laying quail to evaluate its effects on *Hen Day Production* (HDP), *egg mass* , feed conversion, and mortality. This research is expected to provide new scientific contributions in the development of the use of multi-strain probiotics as an alternative natural feed additive in modern quail farming.

3. Method

This study used an experimental method with a quantitative approach to determine the effect of GDM Liquid Organic Supplement on the performance of laying quail (Coturnix japonica). According to Sugiyono (2019), the experimental method is a research method used to determine the effect of certain treatments on other variables under controlled conditions. The study was conducted at Mr. Dimas's quail farm in Trawas Hamlet, Trawas Village, Mojokerto Regency for 30 days, namely from July to August 2024.

The research design used was a Completely Randomized Design (CRD) with five treatments and four replications. According to Hanafiah (2014), a Completely Randomized Design is used when the research environment is considered homogeneous, so that each experimental unit has an equal chance of receiving the treatment. Each experimental unit consisted of 20 6-month-old female laying quails, resulting in a total of 400 animals.

The treatment in the study consisted of:

P0 = commercial feed without GDM Liquid Organic Supplement
P1 = commercial feed + GDM Liquid Organic Supplement 0.1 %
P2 = commercial feed + GDM Liquid Organic Supplement 0.3 %
P3 = commercial feed + GDM Liquid Organic Supplement 0.5 %
P4 = commercial feed + GDM Liquid Organic Supplement 0.7 %

Determination of the number of repetitions is carried out using the Federer formula according to Hanafiah (2014), namely :

t(n-1) \geq 15

Description:

(t) = number of treatments

(n) = number of repetitions

Based on the calculations, the minimum number of repetitions was four times.

The variables observed in the study included Hen Day Production (HDP), egg mass, feed conversion, and mortality. According to Suherman et al. (2015), HDP is calculated based on the percentage of the number of eggs produced compared to the number of animals raised. Egg mass is calculated by multiplying HDP by the average daily egg weight. Feed conversion is calculated by comparing the amount of feed consumed to the mass of eggs produced, while mortality is calculated as the percentage of animals that died during the study.

The research data were analyzed using analysis of variance (ANOVA) to determine the effect of the treatment on the observed variables. According to Gaspersz (2013), analysis of variance is used to test the average differences between treatments in experimental research. If the analysis results

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indicate a significant effect, the Duncan Multiple Range Test (DMRT) is continued to determine the differences between treatments. All data analysis was performed using SPSS.

4. Results and Discussion

Results

The results of the study showed that the administration of Liquid Organic Supplement (SOC) GDM in feed had an effect on Hen Day Production (HDP) of laying quail. The highest average HDP was obtained in the P4 (0.7 %) treatment at 98.02%, while the lowest value was found in the P0 control treatment at 94.20%. The increase in HDP in the treatment given SOC GDM indicates that probiotic supplementation can increase quail egg productivity. The increase in HDP is thought to be due to the content of probiotic bacteria in SOC GDM such as *Bacillus pumilus* , *Bacillus brevis* , and *Bacillus mycoides* which can improve the balance of intestinal microflora so that the nutrient absorption process becomes more optimal. According to Umi Kalsum et al. (2022), probiotics can increase digestive efficiency and help the absorption of nutrients so that egg production increases. The results of this study are also in line with the opinion of Suherman et al. (2015) who stated that the addition of probiotics in feed can increase quail egg production.

The ANOVA analysis results showed an F value of 16.873 with a significance of $p< 0.05$, which means that the administration of SOC GDM had a significant effect on the HDP of laying quail. Based on Duncan's further test, treatment P4 showed the best results compared to other treatments. This indicates that a dose of 0.7 % is the optimal dose in increasing daily egg production.

The average egg mass of quail in this study increased with increasing doses of SOC GDM in the feed. The control treatment (P0) produced an egg mass of 12.04 grams , while the P4 treatment (0.7%) produced the highest value of 12.74 grams. The increase in egg mass was influenced by increased egg production and the ability of livestock to utilize feed nutrients. Widodo (2016) stated that protein is a major component in egg formation, so increased protein absorption will increase egg mass. In addition, the presence of probiotics in the digestive tract helps increase digestive enzyme activity so that nutrients are more easily absorbed by the livestock's body. The results of this study are in line with research by Suherman et al. (2015) who reported that probiotic supplementation can increase quail egg mass. According to Usman et al. (2022), increased egg mass is also related to increased efficiency of nutrient metabolism in laying hens. Based on the ANOVA results, the F value was 2.764 with a significance of $p < 0.05$, indicating that the administration of SOC GDM had a significant effect on egg mass. Duncan's test showed that treatments with higher doses tended to produce better egg mass than the control.

The results showed that the administration of SOC GDM was able to reduce the feed conversion value of laying quail. The best feed conversion value was obtained in the P4 (0.7 %) treatment at 1.66, while the highest value was found in the control treatment at 1.76. The lower feed conversion value indicates a more efficient feed use. The decrease in feed conversion is thought to be due to the probiotic content in SOC GDM which can improve digestive tract health and improve nutrient absorption. According to Mazanko et al. (2018), probiotics can increase the production of digestive enzymes and suppress the growth of pathogenic bacteria, thus making nutrient utilization more efficient. In addition, Soomro et al. (2019) stated that probiotic supplementation can improve growth performance and feed utilization efficiency in poultry. The results of this study are also in accordance with the opinion of Hasanah et al. (2014) who stated that feed quality and the ability of livestock to digest nutrients significantly affect feed conversion. With the presence of probiotics, nutrients in feed are more optimally utilized for egg production, thereby increasing feed efficiency. The results of the ANOVA analysis showed an F value of 2.864 with a significance of $p<0.05$, which means that the provision of SOC GDM had a real effect on the feed conversion of laying quail.

The mortality rate in this study showed low results in the treatment given SOC GDM. The control treatment had a mortality of 5%, while in the treatment with the addition of SOC GDM, mortality reached 0%. This indicates that the administration of SOC GDM can increase the immune system of quail. The low mortality is thought to be because the probiotic content in SOC GDM is able to maintain the balance of intestinal microflora and improve the livestock's immune system. Eko et al. (2019) stated that probiotics can improve the microecology of the digestive tract, thus improving livestock health. In addition, Soeharsono et al. (2010) explained that probiotic bacteria such as *Lactobacillus* can inhibit the

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development of pathogenic microorganisms that cause disease in poultry. The results of this study also support the opinion of Farida (2015) who stated that the poultry mortality rate can be reduced through good husbandry management and the provision of quality feed. With the addition of SOC GDM supplementation, the health condition of quail becomes more stable, so the mortality rate can be reduced. The ANOVA results showed an F value of 48.979 with a significance of $p< 0.05$, which means that the administration of GDM SOC has a very significant effect on the mortality of laying quails. Overall, the administration of GDM Liquid Organic Supplement in feed has a positive effect on the performance of laying quails. The best treatment was obtained at a dose of 0.7 % which was able to increase HDP, egg mass, improve feed conversion, and reduce mortality.

The effectiveness of SOC GDM is supported by the content of apathogenic bacteria such as *Bacillus pumilus* , *Bacillus brevis* , *Bacillus mycoides* , *Pseudomonas alcaligenes* , and *Micrococcus roseus* which act as probiotics in improving digestive tract health and nutrient metabolism efficiency. According to Angga et al. (2018), probiotics in SOC GDM can improve livestock performance by increasing digestibility and endurance. Thus, the use of SOC GDM can be recommended as a natural feed additive to replace antibiotic growth promoters (AGP) in quail egg farming because it can optimally increase livestock productivity.

Discussion

1. Hen Day Production (HDP)

The results of the study showed that the administration of GDM Liquid Organic Supplement in feed had a significant effect on Hen Day Production (HDP) of laying quail. Treatment with a dose of 0.7 % produced the highest HDP value of 98.02%, while the control treatment without supplementation only reached 94.20%. This increase in HDP indicates that probiotic supplementation is able to increase metabolic efficiency and nutrient absorption in the quail's digestive tract. The increase in daily egg production in this study is thought to be caused by the content of probiotic bacteria such as *Bacillus pumilus* , *Bacillus brevis* , and *Bacillus mycoides* which help improve the balance of intestinal microflora and increase digestive enzyme activity. According to Mazanko et al. (2018), probiotics can increase the production of digestive enzymes and reduce the population of pathogenic bacteria so that the nutrient absorption process becomes more optimal. The results of this study are also in line with the opinion of Suherman et al. (2015) who stated that the addition of probiotics in feed can improve the performance of quail egg production.

Furthermore, the probiotics in GDM Liquid Organic Supplement are also thought to improve digestive health, allowing more energy from feed to be utilized for egg production rather than maintaining body condition. According to Umi Kalsum et al. (2022), probiotics can improve the balance of intestinal microorganisms and increase feed digestibility, thus positively impacting poultry production performance. Therefore, administering GDM Liquid Organic Supplement at high doses can optimally increase quail egg productivity.

2. Egg Mass (Egg Weight)

The results showed that administering GDM Liquid Organic Supplement increased the egg mass of laying quail. The 0.7 % dose treatment resulted in the highest egg mass of 12.74 grams compared to the control treatment of 12.04 grams. The increased egg mass indicates that probiotic supplementation can help improve egg production quality by optimizing nutrient utilization.

The increase in egg weight is thought to be influenced by the increased availability of protein and amino acids resulting from improved digestion due to the activity of probiotic microbes. Widodo (2016) stated that protein is a major component in egg formation and most of the protein consumed by poultry is used for egg production. Furthermore, probiotics are capable of producing protease and amylase enzymes that aid the nutrient breakdown process, resulting in more efficient nutrient absorption. The results of this study are consistent with those of Suherman et al. (2015), who reported that administering probiotics in feed increased egg mass in quail. According to De Araujo et al. (2022), the use of liquid organic supplements containing beneficial bacteria, minerals, and vitamins can accelerate growth and increase the efficiency of nutrient utilization. Therefore, the higher the dose of GDM Liquid Organic Supplement given, the better the quail's ability to produce egg mass .

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3. Feed Conversion

Feed conversion in this study showed improved results as the dosage of GDM Liquid Organic Supplement increased. The control treatment had the highest feed conversion value of 1.76 , while the 0.7% dose treatment produced the lowest feed conversion value of 1.66. Lower feed conversion values indicate more efficient feed use in egg production. This improvement in feed efficiency is thought to be related to the activity of probiotic bacteria in improving digestive tract health and assisting the nutrient fermentation process in the intestine. According to Eleftherios Bonos et al. (2021), *Bacillus pumilus* can increase feed conversion efficiency by increasing digestive enzyme activity and inhibiting the growth of pathogenic bacteria. Furthermore, Soomro et al. (2019) explained that probiotic supplementation can improve growth performance and nutrient utilization efficiency in poultry.

The results of this study are also supported by Maknun et al. (2015), who stated that increasing egg mass and feed consumption efficiency will reduce the feed conversion ratio. The lower the feed conversion ratio, the less feed is needed to achieve optimal egg production. Therefore, administering GDM Liquid Organic Supplement has been shown to increase feed utilization efficiency in laying quail.

4. Mortality

The results of the study showed that administering GDM Liquid Organic Supplement reduced the mortality rate of laying quail. The control treatment showed higher mortality compared to the probiotic treatment. The low mortality rate in the probiotic treatment indicates that GDM Liquid Organic Supplement improved the quail's immune system and health.

The decrease in mortality is thought to be due to the ability of probiotics to maintain the balance of intestinal microflora and inhibit the growth of pathogenic bacteria. According to Soeharsono et al. (2010), the probiotic *Lactobacillus sp.* can inhibit the growth of pathogenic microorganisms in the digestive tract, thus improving poultry health. Furthermore, Muhammad Bilal et al. (2021) stated that probiotics can improve the poultry immune system by increasing antibody production. A good rearing environment and the support of probiotics in maintaining the physiological condition of poultry also help reduce stress in quail. Farida (2015) stated that poultry mortality is influenced by environmental factors, cage sanitation, feed quality, and livestock health conditions. With the presence of probiotics, the health condition of quail becomes more stable, thereby reducing mortality rates.

5. Effectiveness of GDM SOC Liquid Organic Supplement

Overall, the research results show that GDM Liquid Organic Supplement is effective in improving the performance of laying quail. Dosages of 0.5–0.7 % provide the best results for Hen Day Production, egg mass, feed conversion efficiency, and mortality. This effectiveness is related to the content of apathogenic bacteria such as *Bacillus pumilus* , *Bacillus brevis* , *Bacillus mycoides* , *Pseudomonas alcaligenes* , and *Micrococcus roseus* , which function as probiotics.

According to Angga et al. (2018), GDM Liquid Organic Supplement can improve poultry performance by increasing digestibility, metabolism, and endurance. Furthermore, the use of probiotics as a feed additive is also a safer and more environmentally friendly alternative to antibiotics. Marlina et al. (2016) stated that continuous use of antibiotics can lead to bacterial resistance and residues in livestock products, making the use of probiotics a better solution. Therefore, the use of GDM Liquid Organic Supplement in feed can be recommended as a strategy to increase the productivity and efficiency of quail egg farming businesses.

5. Conclusions

Based on the results of research on the provision of GDM Liquid Organic Supplement in the feed of laying quail (Coturnix japonica) with different doses, it can be concluded that the addition of GDM Liquid Organic Supplement has a significant effect ($P < 0.05$) on the production performance of laying quail. Supplement administration can increase Hen Day Production (HDP), increase Egg Mass, improve feed conversion efficiency, and reduce mortality rates. Treatment with a dose of 0.7% showed the best results compared to other treatments, with a Hen Day Production (HDP) value of 98.02%, Egg Mass of 12.74 grams, and the lowest feed conversion of 1.66 which indicates a more optimal feed use efficiency. In addition, the administration of GDM Liquid Organic Supplement is also able to increase the immune system of quail so that the mortality rate is lower than the control treatment. Overall, the use of GDM Liquid Organic Supplement in the feed of laying quail can be recommended as an alternative natural

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feed additive to increase productivity, feed efficiency, and livestock health, especially at doses of 0.5%–0.7%.

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