e-ISSN 2579-9479
p-ISSN 2828-4348
Accredited by a Directorate General of Higher Education, Research and Technology No. 79/E/KPT/2023

Jurnal Ilmu Peternakan Terapan
March 2025, 8 (2): 74-79
DOI: https://doi.org/10.25047/jipt.v8i2.5813
Available online at https://publikasi.polije.ac.id/index.php/jipt

Quail carcass quality with *Pseudomonas putida* bioemulsifier in effervescent tablet form through drinking water

Kualitas karkas burung puyuh dengan bioemulsifier Pseudomonas putida bentuk tablet effervescent melalui air minum

Achmad Firman Maulana[1], Abdul Hafiizh Nashrulloh Ali[1], Abdi Eka Robbich Fahrudin[1], Muhammad Adam Ridho Hakiki[1], Niati Ningsih[2], Suci Wulandari[2], and Dadik Pantaya[1*]

[1]Business Management Study Program, Animal Science Department, Politeknik Negeri Jember, Jember Regency, East Java, 6812
[2]Animal Feed Technology Study Program, Animal Science Department, Politeknik Negeri Jember, Jember Regency, East Java, 6812
*Corresponding author: dadik_pantaya@polije.ac.id

ARTICLE INFO

Received:
31 August 2024
Accepted:
17 September 2024
Published:
14 January 2025

Keywords:
Bioemulsifier
Carcass quality
Pseudomonas putida
Quail
Tablet effervescent

ABSTRACT

This study aims to determine the effect of adding effervescent bioemulsifier tablets from Pseudomonas putida through drinking water on the quality of broiler quail carcasses. This study used 200 male Golden Quails, divided into 4 treatments and 5 replications, each consisting of 10 quails. The treatments included T0, which was the control drinking water without any bioemulsifier, and T1, T2, and T3, which were supplemented with 0.1, 0.2, and 0.3 g of bioemulsifier/L of drinking water, respectively. The parameters that were observed included the carcass percentage, the physical quality of the carcass, and the amount of abdominal fat in the broiler quail. The experiment was carried out from week 3 to week 5. The experiment used a completely randomised design (CRD), if significantly different, and continued with the Duncan Multiple Range Test (DMRT). The results of this study showed that the addition of bioemulsifier in effervescent form through drinking water in broiler quail was significantly different (P<0.05) on the percentage of carcass and pH value of meat. The conclusion of this study is that the addition of effervescent bioemulsifier tablets to drinking water has an effect on increasing the carcass percentage and pH value of broiler quail.

Kata kunci:
Bioemulsifier
Kualitas karkas
Pseudomonas putida
Puyuh
Tablet effervescent

ABSTRAK

Penelitian ini bertujuan untuk mengetahui pengaruh penambahan tablet effervescent bioemulsifier dari Pseudomonas putida melalui air minum terhadap kualitas karkas puyuh pedaging. Penelitian ini menggunakan 200 ekor puyuh jantan jenis Golden yang dibagi 4 perlakuan dan 5 ulangan, masing – masing ulangan terdiri dari 10 ekor puyuh. Perlakuan terdiri atas T0 = air minum kontrol tanpa bioemulsifier, T1, T2, T3 masing - masing 0,1, 0,2, dan 0,3 g bioemulsifier/L air minum. Parameter yang diamati antara lain prosentase karkas, kualitas fisik karkas, dan lemak abdominal puyuh pedaging. Percobaan dilakukan pada minggu ke 3 sampai minggu ke 5, percobaan menggunakan RAL (Rancangan Acak Lengkap) apabila berbeda nyata dilanjutkan dengan Uji Duncan Multiple Range Test (DMRT). Hasil penelitian ini penambahan bioemulsifier dalam bentuk effervescent melalui air minum pada puyuh pedaging berbeda nyata (P<0,05) terhadap prosentase karkas dan nilai pH daging. Kesimpulan dari penelitian ini penambahan tablet effervescent bioemulsifier pada air minum berpengaruh meningkatkan prosentase karkas, serta nilai pH puyuh pedaging.

INTRODUCTION

Quail (*Coturnix japonica*) is a bird species that is growing rapidly in the poultry industry as one of the sources of animal protein for the community. Quail has the advantage of being able to grow quickly (it can be sold at the age of five weeks as poultry for consumption), has fast sexual

maturity (first laying eggs at the age of 40 days), has high egg production (up to 250 eggs per year), and has a shorter incubation period (16–17 days). In addition, because of its small body size (230-250 g for males and 250-300 g for adult females), quail requires less cage space and feed (Nasaka, Nizeyi, Okello, & Katongole, 2018;particularly in urban and peri-urban areas. However, inappropriate feeding practices such as using the same feed classes across different growth stages or beyond the recommended growth stages have been reported among quail farmers. This study evaluated the nutritional properties of quail diets used in urban and peri-urban areas of Uganda. Samples of three classes of quail feeds (starter, grower, and layer diets Tugiyanti & Herijanto, 2018). Quail is mostly kept as an egg producer, even though quail meat is an alternative animal protein that is cheap, affordable, and popular with the community. Male or female retired quail (layers) produce quail meat (Lukanov, Genchev, & Kolev, 2018). Quail meat contains 72.5-75.1% water, 20-23.4% protein, 1-3.4% fat, and 1.2-1.6% minerals. Quail meat has the lowest calories with high protein content (Ribarski & Genchev, 2013; Awan, Shah, Soomro, Barahm, & Tunio, 2017). Increasing the production and quality of quail carcasses continues to be carried out to support the fulfilment of affordable animal protein supplies from livestock. One of the efforts made to improve the quality of quail carcasses is by modifying feed.

The main factor that determines the success of quail farming is feed. The production of feed involves the homogeneous mixing of several feed ingredients, with corn being a widely used source of energy in quail feed (Hidayat, 2021). The quality and quantity of nutrients contained in the feed will affect the production and quality of quail meat carcasses. A decrease in nutrient content, particularly in corn, can impact quail productivity and consequently lead to a decline in carcass quality, as corn serves as a crucial energy source for quail. A decrease in the quality and quantity of nutrients from corn can be caused by uncertain weather conditions and poor post-harvest handling, which causes mould to grow. The activity of microorganisms (fungi) can reduce the starch content in corn by 45%. To overcome this problem, many researchers have conducted research using alternative feed ingredients as energy sources other than corn and oil supplementation in feed.

Optimal use of oil in feed can help the absorption of vitamins A, D, E, and K, distribute essential fatty acids, and increase the efficiency of feed and energy use (Prayogi, 2007). The disadvantage of using oil as a feed ingredient is that it is difficult to digest due to its hydrophobic nature, which prevents it from mixing with water (Zhao & Kim, 2017). The liver produces bile, which emulsifies fat in the poultry digestion process. The function of these bile salts is to emulsify fat in the duodenum, which the pancreas then digests into fatty acids and glycerol (Kiha, Murningsih, & Tristiarti, 2012). However, if the oil content in the feed does not balance with the production of bile salts, the fat digestion process is not optimal.

The quail's body requires an emulsifier to optimize fat digestion, enabling bile salts to convert fat into energy. One such emulsifier is biosurfactant. Microorganisms produce biosurfactant, a hydrophobic and hydrophilic compound that functions as a bioemulsifier by reducing the surface tension between fat and water (Hamzah, Al-Mossawy, Al-Tamimi, Al-Najm, & Hameed, 2020). One of the microorganisms that can produce emulsifiers is bacteria from the genus *Pseudomonas* sp., one of which is *Pseudomonas putida*.

Pseudomonas putida's use as a bioemulsifier through feed presents several disadvantages, such as the small amount of administration and non-homogeneous mixing, which may lead to off-target results. According to Oktavia & Lubis (2018), testing several factors is necessary to determine whether the required number of bacteria can reach the target and enhance the stability or survival of bacterial products. This necessitates an alternative use of *Pseudomonas putida* bacteria as a bioemulsifier through drinking water in the form of effervescent tablets. It might be easier and more effective to use bacteria in the form of fizzy tablets as a feed supplement, and the probiotic preparation that is made can give stable specification values (Nagashima, Pansiera, Baracat, & Gómez, 2013) which when administered in adequate amounts confer health benefits on the host through a beneficial influence on the intestinal microbiota related to competition and to antagonistic and immunological effects. Thus, the objective of this study was the development of effervescent products (tablets and powder.

Based on the description above, this study was conducted to determine the extent to which bioemulsifiers from *Pseudomonas putida* bacteria applied in the form of effervescent tablets through drinking water can affect or even improve the quality of quail carcasses.

MATERIALS AND METHODS

The material in this study was 200 DOQ male quail strain Golden and commercial quail starter feed brand Comfeed. The equipment used was maintenance tools such as quail cages, feeders, drinkers, scales, and thermohygrometers, as well as laboratory equipment such as measuring cups, Erlenmeyers, droppers, analytical scales, shakers, ose needles, laminar, autoclaves, fermentors, centrifuges, and ovens.

The manufacture of bioemulsifiers refers to research by Nurhamzah & Pantaya (2022), namely the *Pseudomonas putida* growth medium for one liter consists of 360 g/L molasses, 50 g/L Potato Dextrose Broth (PDB), 50 g/L soy peptone, distilled water and cooking oil as much as 1.5% of the amount of media. The media is poured into 4 10 ml test tubes and 4 200 ml Erlenmeyer. Furthermore, the media is sterilized using an autoclave at a temperature of 121˚C for 2 hours. The cultivation of *Pseudomonas putida* begins with the process of taking one loop of bacteria inoculated into 10 ml of liquid media, then shaken for 48 hours at a speed of 100 rpm and a temperature of 37˚C. The media was transferred into a 200 ml Erlenmeyer flask of liquid media and shaken at 100 rpm at 37˚C for 48 hours, then transferred back into a 15 L medium shaker at 100 rpm for 48 hours. Furthermore, the media was centrifuged at 4200 rpm for 10 minutes, then the sediment was taken. The sediment was added with maltodextrin flour with a ratio of 1:1 then dried using a 40˚C oven for 72 hours and ground namely that the *Pseudomonas putida* growth medium for one litre consists of 360 g/L molasses, 50 g/L Potato Dextrose Broth (PDB), 50 g/L soy peptone, distilled water, and cooking oil, as much as 1.5% of the amount of media. The media is poured into 4 10 ml test tubes and 4 200 ml Erlenmeyer tubes. Furthermore, the media is sterilized using an autoclave at a temperature of 121˚C for 2 hours. The cultivation of *Pseudomonas putida* begins with the process of taking one loop of bacteria inoculated into 10 ml of liquid media, then shaken for 48 hours at a speed of 100 rpm and a temperature of 37˚C. The media was transferred into a 200-ml Erlenmeyer flask of liquid media and shaken at 100 rpm at 37˚C for 48 hours, then transferred back into a 15-litre medium shaker at 100 rpm for 48 hours. Furthermore, the media was centrifuged at 4200 rpm for 10 minutes, and then the sediment was taken. The sediment was added with maltodextrin flour in a ratio of 1:1, then dried using a 40˚C oven for 72 hours and ground.

The effervescent tablet printing process refers to research by Oktavia, Ayudiarti, & Febrianti (2020) using the dry granulation method. The dry granulation method compresses a mixture of dry ingredients into a solid mass, breaks it down again to create a larger powder particle size or granule, then prints these granules to create tablets. The materials for making effervescent tablets are *Pseudomonas putida* bioemulsifier 37.5%, citric acid 10%, sodium bicarbonate 40%, magnesium stearate 1.25%, and lactose 11.25%. Furthermore, manual tablet formulation mixing is carried out with a mortar until homogeneous, and the printing process is continued on an electric tablet printing machine with a weight of 400 mg.

This study used a completely randomized design (CRD) with a one-way pattern consisting of four treatments and five replications. The treatments in this study consisted of T0 = drinking water without the addition of bioemulsifier, T1 = drinking water with the addition of 0.1 g/L bioemulsifier, T2 = drinking water with the addition of 0.2 g/L bioemulsifier, and T3 = drinking water with the addition of 0.3 g/L bioemulsifier. There were 20 experimental units, each consisting of 10 quail. The treatment started when the quail was 16 days old and continued until it was 37 days old. During the first two weeks, we carried out an environmental adaptation process using untreated drinking water. After the environmental adaptation process was complete, effervescent tablet treatment was given once a day and replaced the next day. The variables observed in this study were carcass percentage, abdominal fat percentage, cooking loss, and acidity level (pH).

The research data were analyzed statistically using the Analysis of Variance (ANOVA) test, and if there was a significant effect ($P < 0.05$), further testing was carried out using the Duncan Multiple Range Test (DMRT). Data analysis used

the Statistical Program for Social Science (SPSS) application.

RESULTS AND DISCUSSION

The results of this study indicate that the addition of effervescent bioemulsifier tablets through drinking water can provide a significant effect (P>0.05) on carcass quality. Table 1 shows that the addition of 0.2 g/L of bioemulsifier yielded the highest carcass percentage results in T2.

The study suspects a significant effect (P>0.05) due to the addition of Pseudomonas putida bioemulsifier, which causes an emulsification process in the quail's body. This process involves the binding of fat by bile salts, resulting in an emulsion that facilitates nutrient absorption and digestion in the livestock's body. Jannah, Prasetyo, Siswanto, & Pantaya (2021) also say that *Pseudomonas putida* works as a bioemulsifier that can lower the surface tension of fat and water and break fat down into micelles to make the process of turning fat into energy easier. The addition of emulsifiers with a predetermined concentration can reduce the surface tension of fat and water, thereby facilitating the process of fat metabolism into fatty acids and glycerol, which in turn produces energy in the form of ATP. Growth will take place well with optimal energy in the livestock's body. Furthermore, favorable livestock growth will affect the optimal carcass percentage level.

The ANOVA analysis revealed no significant effect (P>0.05) on the percentage of abdominal fat in broiler quail when *Pseudomonas putida* bacterial bioemulsifier was supplemented in the form of effervescent tablets. The study's insignificant results were attributed to the same energy content in the rations and the slaughter of quails at the same age, which resulted in a relatively similar percentage of abdominal. In addition to protein content, energy plays a significant role in the process of abdominal fat formation; the lower the energy content in the ration, the less fat is produced (Sanjaya, Wibawanti, & Mudawaroch, 2019). The accumulation of excess energy in the abdominal cavity leads to the accumulation of abdominal fat cavity. The body weight and percentage of abdominal fat will both rise as the fat content in the ration increases (Siswantoro, Prasetyo, Utomo, & Mubarokah, 2022). Good carcass quality is a carcass with a low fat content, so in terms of carcass quality, the least amount of abdominal fat is better (Disa, Endang, & Siti, 2014).

The results of the ANOVA analysis showed that the percentage of giblets in broiler quails had no significant effect (P>0.05). This is thought to be due to the same crude fibre content in the ration. This is in line with the opinion of Dharmawati & Kirnadi (2012) that the increase in giblet weight is not due to livestock growth but because its function is quite difficult in digesting food into smaller particles and mixing the material with digestive enzymes produced by the proventriculus and bile, so that giblet swelling is influenced by the crude fibre content of the feed.

Based on the results of the ANOVA analysis, the cooking loss of broiler quail showed no significant effect (P>0.05). According to Soeparno (2015), the cooking loss value of meat is generally between 1.5 and 54.5%. The insignificant cooking loss in this study is thought to be due to the effect of providing rations with the same amount of crude fibre for each treatment. Consumed crude fibre traps fat, resulting in a decrease in the absorbed nutrients. Wanniatie, Septinova, Kurtini, & Purwaningsih (2014) concur that the presence

Table 1. Effect of addition of effervescent bioemulsifier tablets on carcass percentage, carcass physical quality, abdominal fat, and percentage of giblet of broiler quail

Parameter	T0	T1	T2	T3	P Value
Carcass percentage (%)	67.12±1.27ab	66.66±1.15ab	68.29±1.34b	65.64±1.04a	0.02
Abdominal fat (%)	0.49±0.21	0.69±0.29	0.75±0.34	0.64±0.25	0.51
Cooking loss (%)	30.14±1.32	31.18±1.20	29.55±1.27	30.38±0.97	0.23
pH value	5.71±0.09a	5.77±0.19ab	5.89±0.05b	5.91±0.54b	0.04

Note: T0 = Without bioemulsifier (control); T1 = Bioemulsifier 0.1 g/L; T2 = Bioemulsifier 0.2 g/L; T3 = Bioemulsifier 0.3 g/L and different superscripts ab indicate significant differences

of crude fibre in the digestive tract of poultry can trap fat, thereby reducing the amount of fat the poultry's body absorbs. This has a significant impact on cooking loss because intramuscular fat inhibits or reduces the amount of meat fluid that is released during heating, even though meat with a higher intramuscular fat content will still lose more fat. Meat with a lower cooking loss value has a relatively better quality compared to meat with a high cooking loss value because it loses less nutrients during cooking (Soeparno, 2015).

Based on the results of the ANOVA analysis, the pH value of quail meat showed a significant effect ($P < 0.05$). This is thought to be due to the addition of *Pseudomonas putida* bacterial bioemulsifier, which is a microorganism that produces rhamnolipid biosurfactants. Rhamnolipids are a type of biosurfactant from the glycolipid group. Glycolipids can be produced if the growth medium for *Pseudomonas putida* bacteria contains fatty acids and glucose. Cooking oil can provide fatty acids, while molasses can provide glucose. In the manufacture of bioemulsifiers, cooking oil and molasses have been added as a growth medium for these bacteria. The addition of glucose in the form of sugar can increase the levels of glycogen in livestock's bodies. According to Dewi (2012), high glycogen levels will affect the final pH value of the meat, which is below 6.0, while meat that has a lower glycogen content will get a final pH value above 6.0. According to Sanjaya et al. (2019), the amount of glycogen in meat can also influence its pH value. In this study, the addition of Pseudomonas putida bioemulsifier results in a high glycogen content in the quail body, despite the meat's pH value remaining below 6.0 at 5.71 to 5.91. The high presence of free water in the meat leads to a high population of bacteria, thereby affecting its quality and potentially influencing consumer preference (Soeparno, 2015).

CONCLUSIONS

Based on the research results, it can be concluded that supplementation effervescent tablets of *Pseudomonas putida* bacterial bioemulsifier through drinking water can increase the percentage and quality of quail carcasses.

ACKNOWLEDGMENTS

The research team and authors would like to thank the Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia for providing funding for this research through PKM RE 2022.

REFERENCES

Awan, F. N., Shah, A. H., Soomro, A. H., Barahm, G. S., & Tunio, S. G. (2017). Carcass yield and physico-chemical characteristics of Japanese quail meat. *Pakistan Journal of Agriculture, Agricultural Engineering and Veterinary Sciences. 33*(1), 111–120.

Dewi, S. H. C. (2012). Korelasi antara kadar glikogen, asam laktat, pH daging dan susut masak daging domba setelah pengangkutan. *Jurnal AgriSains*, *4*(5), 59–70.

Dharmawati, S., & Kirnadi, A. . (2012). Pengaruh penggunaan tepung daun alang-alang (*Imperata cylindrica*, sp) dalam ransum terhadap kadar lemak, kholesterol karkas dan organ pencernaan itik alabio jantan. *Ziraa'ah*, *34*(2), 150–160.

Disa, A. S., Endang, S., & Siti, H. W. (2014). Pengaruh tingkat protein ransum terhadap bobot abdominal puyuh jantan. *Journal Universitas Padjadjaran*, *4*(1), 1–11.

Hamzah, A. F., Al-Mossawy, M. I., Al-Tamimi, W. H., Al-Najm, F. M., & Hameed, Z. M. (2020). Enhancing the spontaneous imbibition process using biosurfactants produced from bacteria isolated from Al-Rafidiya oil field for improved oil recovery. *Journal of Petroleum Exploration and Production Technology*, *10*(8), 3767–3777. https://doi.org/10.1007/s13202-020-00874-9

Hidayat, C. (2021). Review: penggunaan sorgum sebagai bahan pakan sumber energi pengganti jagung dalam ransum ayam pedaging. *Jurnal Peternakan Indonesia (Indonesian Journal of Animal Science)*, *23*(3), 262. https://doi.org/10.25077/jpi.23.3.262-275.2021

Jannah, M., Prasetyo, B., Siswanto, D., & Pantaya, D. (2021). Pengaruh penambahan *bio-emulsifier* dari *Pseudomonas fluorescens* pada pakan terhadap performa broiler. *Conference of Applied Animal Science Proceeding Series*, *2*, 32–37. https://doi.org/10.25047/animpro.2021.4

Kiha, A. F., Murningsih, W., & Tristiarti, D. (2012). Pengaruh pemeraman ransum dengan sari daun pepaya terhadap kecernaan lemak dan energi metabolis ayam broiler. *Animal Agricultural Journal*, *1*(1), 265–276.

Lukanov, H., Genchev, A., & Kolev, P. (2018). Comparative investigation of egg production in Wg, Gg and Gl Japanese quail populations.

Trakia Journal of Sciences, *16*(4), 334–343. https://doi.org/10.15547/tjs.2018.04.011

Nagashima, A. I., Pansiera, P. E., Baracat, M. M., & Gómez, R. J. H. C. (2013). Development of effervescent products, in powder and tablet form, supplemented with probiotics Lactobacillus acidophilus and Saccharomyces boulardii. *Food Science and Technology*, *33*(4), 605–611. https://doi.org/10.1590/S0101-20612013000400002

Nasaka, J., Nizeyi, J. B., Okello, S., & Katongole, C. B. (2018). Nutritional quality of quail feeds used in Urban and Peri-Urban areas of Uganda: Chemical and energy composition. *Poultry Science Journal*, *6*(1), 63–70. https://doi.org/10.22069/psj.2018.14150.1294

Nurhamzah, M., & Pantaya, D. (2022). Bio-emulsifier supplementation from Pseudomonas putida that cultivated on medium containing waste palm oil as feed additive on poultry. *IOP Conf. Series: Earth and Environmental Science*, 1–5. https://doi.org/10.1088/1755-1315/980/1/012021

Oktavia, D. A., Ayudiarti, D. L., & Febrianti, D. (2020). Physical properties of the probiotic effervescent tablet from tapioca and maltodextrin coatings. *E3S Web of Conferences*, *147*(February). https://doi.org/10.1051/e3sconf/202014703024

Oktavia, D. A., & Lubis, L. (2018). Pengaruh konsentrasi penyalut terhadap viabilitas bakteri dan daya larut tablet effervescent probiotik. *Jurnal Pascapanen dan Bioteknologi Kelautan dan Perikanan*, *13*(2), 153-164.

Prayogi, H. S. (2007). Pengaruh penggunaan minyak kelapa dalam ransum terhadap konsumsi pakan, peningkatan bobot badan, konversi pakan dan karkas broiler. *Jurnal Ternak Tropika*, *7*(2), 18–27.

Ribarski, S., & Genchev, A. (2013). Original contribution effect of breed on meat quality in japanese quails (*Coturnix coturnix japonica*). *Trakia Journal of Sciences*, *11*(2), 181–188. Retrieved from http://www.uni-sz.bg

Sanjaya, A., Wibawanti, J. M. W., & Mudawaroch, R. E. (2019). Pengaruh pemberian tepung daun mengkudu (*Morinda citrifolia L.*) Dalam pakan komersil terhadap kualitas fisik daging burung puyuh (*Cortunix-cortunix japonica*). *Surya Agritama*, *8*(1), 53–65.

Siswantoro, D., Prasetyo, B., Utomo, S. ., & Mubarokah, W. (2022). Pengaruh pemberian pakan fermentasi daun murbei terhadap karkas dan lemak abdominal ayam. *Jurnal Agriekstensia*, *21*(1), 1–8.

Soeparno. (2015). *Ilmu dan Teknologi Daging*. Yogyakarta: Gadjah Mada University Press.

Tugiyanti, E., & Herijanto, S. (2018). Carcass production and meat tenderness characteristics of culled quail fed with azolla microphylla flour supplemented basal feed. *Buletin Peternakan*, *42*(4), 315–321. https://doi.org/10.21059/buletinpeternak.v42i4.36368

Wanniatie, V., Septinova, D., Kurtini, T., & Purwaningsih, N. (2014). Pengaruh pemberian tepung temulawak dan kunyit terhadap *cooking loss*, *drip loss* dan uji kebusukan daging puyuh jantan. *Jurnal Ilmiah Petrernakan Terpadu*, *2*(3), 121–125.

Zhao, P. Y., & Kim, I. H. (2017). Effect of diets with different energy and lysophospholipids levels on performance, nutrient metabolism, and body composition in broilers. *Poultry Science*, *96*(5), 1341–1347. https://doi.org/10.3382/ps/pew469