

# EXPLORATION OF MANURE FLOUR FROM THE DEGRADATION (MFD) OF BLACK FLY LARVAE (*Hermetia illucens* L.) ON NATIVE LAYING CHICKEN CARCASSES IN SWEET LEMON (*Citrus sinensis*) MARINADE

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**Submission date:** 21-Sep-2022 02:03PM (UTC+0700)

**Submission ID:** 1905227264

**File name:** EXPLORATION\_OF\_MANURE\_FLOUR\_FROM\_THE\_DEGRADATION\_MFD.pdf (342.98K)

**Word count:** 2944

**Character count:** 14805

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**EXPLORATION OF MANURE FLOUR FROM THE DEGRADATION (MFD)  
OF BLACK FLY LARVAE (*Hermetia illucens* L.) ON NATIVE LAYING  
CHICKEN CARCASSES IN SWEET LEMON (*Citrus sinensis*) MARINADE**

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**Abstract**

The part of the piece of meat that has not been separated from the bone was known as carcass, which in the market were found in several forms such as "Dressed" (body parts without blood and feathers), "Eviscerated" (parts of the body without blood, feathers, bowels were clean) and "Ready to cook" was a carcass that has been excreted by blood, feathers, head, feet and all contents of the stomach except gizzard, liver and heart. The use of sweet orange (*Citrus sinensis*) as an inhibiting factor in the occurrence of meat damage so that the quality of the carcass can be maintained. This research has been carried out through an experiment using a randomized block design (RBD) (Steel and Torrie, 1994) in five replications. As the first factor (A) was the utilization of degradation manure (MFD) consisting of A1 (5% MFD), A2 (10% MFD), A3 (15% MFD) and second factor (B) was soaking time with sweet orange consists of B1 (10 minutes immersion), B2 (20 minutes immersion) and B3 (30 minutes immersion). Color, taste, aroma, texture of meat were the observation variables. The purpose of this study was to determine the effect of MFD and soaking sweet orange on the quality of non-race chicken carcasses. Another aim was to convince the public that the use of MFD flour in non-race chicken feed accompanied by soaking method with sweet oranges as a natural preservative will be able to provide a positive value and influence on the quality of the laying hen meat carcasses was another goal. The results of the analysis of variance showed that the immersion duration of sweet orange had a significantly different effect ( $P < 0.01$ ) on taste, not significantly ( $P > 0.05$ ) in texture and significantly effect ( $P < 0.05$ ) on the color of the chicken carcass. HSD test results that the soaking time of 30 minutes with a combination of the use of 15% MFD was still acceptable. In conclusion, carcass immersed for 30 minutes by giving 15% MFD by organoleptic test for taste, aroma, carcass color, can still be accepted by panellists and the public.

**Key words:** aroma, color, flavor, laying chicken (non-race) carcass, MFD, sweet orange.

**INTRODUCTION**

The part of meat that was cut after being separated from the head, legs and stomach contents was known as carcass (Winarno, 1993). The good carcasses range from 65-75% of its life's weight to its slender-curved chest shape like a boat, with the traits not pale, yellowish white, no sour smell, no sticky and tasted wet. Factors before slaughtering include genetic, species, breed, livestock type, sex, age and feed and factors after slaughtering including withering methods, carcass pH and storage methods greatly affect the quality of the carcass (Palupi, 1986). Whereas (Winarno, 1993) states that the quality of carcasses of chicken meat was influenced by the type of ration, age, sex, and genotype, including

premortem and postmortem environmental factors. Utilization of manure from degradation (MFD) which was biodegraded by the black fly *Hermetia illucens*/Black soldier fly in 10% mixture of chicken feed can maintain the quality of chicken meat. Low cholesterol and blood triglyceride, LDL, HDL content under normal conditions were other effects of MFD utilization (Manangkot et al., 2019). MFD from *Hermetia illucens*/Black soldier fly contains protein, fat, ash (DM basis) (Barragan-Fonseca et al., 2017) suitable for poultry feed (Nyakeri et al., 2016). Furthermore, according to Kim et al., 2011, MFD *Hermetia illucens*/Black soldier fly was an alternative feed material produced from livestock waste and rotten fruit waste containing amylase, lipase and protease enzymes and then overhauled into smaller parts

such as maltose, fatty acids, glycerol, and amino acids. Sweet orange (*Citrus sinensis*) as an antioxidant which contains high vitamin C content generally only bears fruit once a year (Mirah, 1981). According to Faramade (2007), the effect of vitamin C was highly dependent on the storage temperature conditions. Meanwhile, according to Helmiyesi et al. (2008), 15 days of storage will reduce vitamin levels. Besides that, sweet orange also contains glucose, fructose, sucrose and alic acid and citric acid, which by Berlian et al (2016) and Setiawan et al. (2019) reported the ability of lemon *Citrus sinensis* to inhibit the growth of *Escherichia coli* bacteria. Rotinsu et al. (2014) revealed that the immersion of broiler meat in lemon Cui juice (*Citrus microcarpa*) for one hour organoleptically such as color, aroma, texture, tenderness and flavor was still acceptable to consumers.

Food quality can be determined based on organoleptic assessment if done objectively using tools or subjectively based on the ability to observe the human senses as a panelist (Winarno, 1984). Organoleptic determination was done by a panel test, through the assessment of the aroma, taste, color and texture of meat (Soewarno, 1985), as well as the level of preference (Hafid and Aka, 2009). The carcasses of laying hens are strongly influenced by water content, fat, protein and carbohydrate structure. The protein coagulation, collagen gelatinization, water release and starch gelatinization were factors that affect changes in the texture of the carcass. Soaking sweet orange in laying hens carcasses will provide good organoleptic value through the panelist preference level (Hafid and Aka, 2009).

## MATERIALS AND METHODS

The research material was 20 laying chicken carcasses weighing 1.5-2 kg, age 5 months, which comes from the results of maintenance by providing intensive manure feed degradation (MFD) according to treatment. Chickens were fasted before being slaughtered, dipped in hot water 60°C for 30 seconds, removed and put into cold water for 15 seconds then cleaned of feathers, cloaca, viscera of other organs such as liver, gall and heart and head and neck and legs. Then the chest was cut into 36 parts. The sweet orange juice was squeezed as much as 1.5 l divided by 3 containers of 0.5 l each. Each piece of carcass was then soaked in sweet orange juice with the following treatment A1: Soaking for 10 min, A2: Soaking for 20 min, A3: Immersion for 30 min; B1: MFD 5%, B2: MFD 10%, B3: MFD 15%. The observed variables included: taste, aroma, color and texture of the laying hens carcass. Then were organoleptically tested using 15 panelists using hedonic scale (Hafid and Aka, 2009).

## RESULTS AND DISCUSSIONS

*A. Effect of MFD Hermetia illucens/Black soldier fly larvae level treatment and immersion time of sweet orange (Citrus sinensis) water on organoleptic taste of chicken carcasses.*

The mean of observation for the effect of MFD level and the length of soaking in sweet orange based on the level of panellist preference on the taste of carcasses of laying hen was listed in Table 1.

Table 1. Mean influence of MFD larva *Hermetia illucens*/Black soldier fly and soaking time of sweet orange water on the taste of chicken carcasses

Soaking Time (Minutes)	Level of MFD (%)			Mean
	5	10	15	
10	3.67	3.22	3.29	3.39
20	3.62	3.65	3.29	3.52
30	3.75	3.79	3.53	3.69
Mean	3.68	3.55	3.37	

Based on the level of panelists' preference for taste: 3.39-3.69 falls into the category of rather like. ANOVA showed that carcasses containing

MFD flour soaked in sweet orange had a significantly different effect ( $P < 0.01$ ) on the taste of laying hens. Based on the results of

further tests using the Honestly Significant Difference (HSD) test for the effect of soaking time showed that the taste of carcasses of laying hens soaked for 30 minutes was significantly different ( $P < 0.05$ ) from 20 and 10 minutes for the preference level. Soak for 20 minutes was significantly higher than the 10 minutes immersion. The amount of orange juice that permeates the carcass was proportional to the length of immersion in addition to the fact that in the orange juice there were substances that can improve taste such as sugar and acid (Winarno et al., 1984). Based on the results of further HSD test, the interaction between the MFD level and the immersion time for the taste shows a picture that the taste of the laying hens carcass containing MFD at levels up to 10% for all immersion lengths (10, 20 and 30 minutes) was still acceptable panelist.

The presence of protease, amylase, and lipase enzymes in MFD can suppress the growth of bacteria in the carcass so that the endurance of the carcass will be better (Manangkot, 2019) supported by previous research by Yerou et al. (2017), which use sweet orange powder (*Citrus sinensis*) as an antimicrobial and antioxidant activity in food foods. Furthermore, Berlian et al. (2016) reported that lemon juice can inhibit the growth of *E. coli* bacteria.

*B. The effect of MFD Hermetia illucens/Black soldier fly level treatment and soaking time of sweet orange juice on the scent of chicken carcasses.*

The influence of MFD level and soaking time in sweet orange based on panellists' preference level on the scent of broiler carcass is shown in Table 2.

Table 2. Mean effect of MFD *Hermetia illucens*/Black soldier fly flour treatment and soaking time of sweet orange juice (*Citrus sinensis*) on the scent of laying chicken carcasses

Soaking Time (Minutes)	Level of MFD (%)			mean
	5	10	15	
10	3.85	3.37	3.26	3.49
20	3.81	3.65	3.11	3.52
30	3.65	3.87	3.36	3.63
Mean	3.77	3.63	3.24	

The average effect of soaking time based on the level of panellist preference for aroma ranged from 3.49 to 3.63 (rather dislike). Furthermore, the average influence of storage duration based on the level of panellist preference for the scent of laying chicken carcasses ranged from 3.24 to 3.77 (rather dislike). ANOVA showed that the immersion time had a not significantly different effect ( $P > 0.05$ ) on the scent of broiler carcass, but the interaction between the immersion time and MFD level had a significantly different effect ( $P < 0.01$ ) on the scent of free-range chicken carcasses. Based on the results of further tests using the HSD test for interaction between the MFD level and storage time showed that there are variations in the

assessment seen in the panellists, caused by differences in eating habits of the panelists. Different patterns and eating habits in human groups cause different levels of preferences (Hafid and Aka, 2009).

*C. The effect of MFD Hermetia illucens/Black soldier fly level treatment and soaking time of sweet orange juice on the color and texture of chicken carcasses*

The mean values of observations for the effect of MFD level and sweet orange immersion time based on panelists' level of preference on carcass color and texture are listed in Table 3.

Table 3. Mean value of influence of MFD *Hermetia illucens*/Black soldier fly and old levels soaking sweet orange juice (*Citrus sinensis*) on color and texture of laying chicken carcasses

Soaking Time (Minutes)	Level of MFD (%)			Mean
	5	10	15	
10	3.73	3.16	3.75	3.55
20	3.86	3.57	3.57	3.67
30	3.60	3.85	3.86	3.77
Mean	3.73	3.52	3.72	

The immersion time for the panelists level of preference for color and texture ranged from 3.55 to 3.77 as well as the effect of the MFD level on the preference level ranging from 3.52-3.73 or in the disliked category. Based on ANOVA results, the immersion time had a significantly different effect ( $P<0.05$ ) on the color and texture of chicken carcasses, while the level of MFD and its interactions had a significantly different effect ( $P<0.01$ ) on the color of chicken carcasses. Further tests using the HSD test for soaking time showed that the color of chicken carries soaked for 30 minutes was the same as 20 minutes but was higher ( $P<0.05$ ) than the 10 minutes immersion. Presumably because the longer soaked, the absorption will be higher so that it affects the color and texture of the carcass. Dyes namely carotene and vitamin C can affect the color and texture of the carcass also allegedly because the long soaking affects the number of chemical reactions such as fat oxidation and meat dyes that change the color and texture of the carcass. In addition, the ability of preservatives to prevent chemical reactions that occur was reduced which Mirah (1981) states that poultry meat contains dyes (myoglobin) and the presence of heme groups with one Fe atom molecule that was easily degraded and hydrolyzed so that the color and texture of the carcass changes. Based on the results of further tests the level of preference by using the HSD test for interaction between the MFD level and the immersion time of sweet orange juice showed that the color and texture of the carcass soaked for 10 minutes at the MFD level was 10% lower than those immersed for 20 and 30 minutes at the MFD level 5-15% at 10, 20 and 30 minutes. While the color and texture of the carcass soaked for 10, 20 and 30 minutes at the 5% MFD level is equal to 10 and 20 minutes at the 15% MFD level even though the preference

level was still lower than the 30 minutes MFD 10 and 15% immersion also 20 minutes at MFD level of 5%. Furthermore, the color and texture of the carcass soaked for 10 minutes at the MFD level of 5% was the same as the favorite level soaked for 10 and 30 minutes at the MFD level of 15% and soaked for 30 minutes at the MFD level of 10%. Rotinsulu et al. (2014) suggested that the immersion of broiler meat in lemon cui juice *Citrus microcarpa* for one hour organoleptically for color, aroma, texture, tenderness and flavor were still acceptable to consumers.

## CONCLUSIONS

Laying chicken carcasses soaked in sweet orange juice for 30 minutes with an MFD level of 15% can still maintain the quality of the carcass based on organoleptic assessment of the taste, aroma, color and texture of the carcass even though based on the panelists' assessment including the dislike ones, but still acceptable.

## REFERENCES

- Barbagan-Fonseca, K.B., Dicke, M., van Loon, J.J.A. (2017). Nutritional value of the black soldier fly (*Hermetia illucens* L.) and suitability as animal feed- a review. *J. Insects as Food and Feed*, 3(2), 105-120.
- Berlian, Z., Fatiqin, A., Agustina, E. (2016). Penggunaan perasan Jeruk nipis (*Citrus aurantifolia*) dalam Menghambat Bakteri *Escherichia coli* pada Bahan Pangan. *Jurnal Bioilmi*, 2(1), 51-54.
- Faramade, O. O. (2007). Kinetics of ascorbic acid degradation in commercial orange juice produced locally in Nigeria. *African Crop Science Conference Proceedings*, 8, 1813-1815.
- Harapin, H., Rahim, A. (2016). Pengaruh Pemberian Pasta Jahe (*Zingiber officinale* Rosaceae) Terhadap Kualitas Daging Ayam Kampung. *JITRO*, 3(3).
- Manangko, H.J., Rondonuwu, L.S.J., Pinontoan, O.R., et al. (2014). Black soldier fly larvae manure degradation as fish meal replacer in native chicken

- ration. *Lucrări Științifice - Seria Zootehnie*, 62, 139-142.
- Manangkot, H., Najoan, 13 Toar, W., Rotinsulu, M., Turangan, S. (2019). The intervention of *Hermetia illucens* L. (Diptera: Stratiomyidae) in manure 26 overment on blood lipid profile of native chicken. *Scientific Papers. Series D. Animal Science*, LXII (1), 256-261. 1
- Helmiyeni, H., Hastuti, R.B., Prihastanti, E. (2008). Pengaruh Lama Penyimpanan Terhadap Kadar Gula dan Vitamin C Pada Buah Jeruk Siam (*Citrus nobilis* var. *microcarpa*). *Buletin Anatomi dan Fisiologi*, XVI 6 2), 33-37.
- Kim, W., Bae, S., Park, K., et al. (2011). Biochemical characterization of digestive enzymes in the Black Soldier Fly, *Hermetia illucens* (Diptera: Stratiomyidae). *J Asia-Pac Entomology*, 1 11 11-14.
- Rotinsulu, M., Hadju, R., Sakul, S. (2014). Sifat Organoleptik Daging Broiler Dengan Lama Perendaman Berbeda Dalam Perasan Lemon Cui. *Jurnal Zootek*, 34(2), 139-147.
- Mirah, A. D. (1981). *Pengaruh penyuntikan Papain Pada Pengempukan Daging Ayam Secara Antemortem*. Tesis. Fakultas Peternakan UNSRAT, 1 20 ado
- Setiawan, M. A., Retnoningrum, M. W. (2019). Aktivitas AntiBakteri Biji Jeruk Manis (*Citrus sin* 23) Terhadap Bakteri *Eschericia coli*. DOI: <https://doi.org/10.23917/bioeksperimen.v5i1.7989>
- 4 Nyakeri, E.M., Ogola, H.J., Ayieko, M.A., Amimo, F.A. (2016). An open system for farming black soldier fly larva as a source of protein for small scale poultry and fish production. *J. Insects as Food and Feed*, 3(1), 51-10.
- 10 Oikeh, E., Oriakhi, K., Omoregie, E. (2013). Proximate analysis and phytochemical screening of Citrus 17 ensis Fruit Wastes. *Bioscientist*, 1(2), 164-170.
- 17 Palupi, W.D.E. (1986). *Tinjauan Literatur Pengolahan Daging*. Pusat Dokumentasi Ilmiah Nasional, LIPI, Jakarta. 3
- Sakaria, S., Wawo, B. (2004). *Penyusunan Ransum Ayam Buras Secara Sederhana*. Hasil Penelitian yang tidak dipublikasikan. Fakultas Peternakan Universitas Hasanudin. 27
- Soewarno, T.S. (1985). *Penilaian Organoleptik*. Bhratara 9 Aksara, Jakarta.
- Steel, R.G.D, Torrie, J.H. (1994). *Prinsip dan Prosedur Statistika*. Diterjemahkan oleh Bambang sumantri. Edisi ke-2. PT. Gramedia Pustaka U 8 na, Jakarta.
- Yerou, K. O., Bouhadi, K. I., Meddah, B., Touil, A. T. (2017). The use of orange (*Citrus sinensis*) peel as antimicrobial and antioxidant agent. *Journal of Fundamental and Applied Sciences*, 9(3), 1351-1357.
- Winarno, F.G. (1984). *Kimia Pangan dan Gizi*. PT. Gramedia Utama. Jakarta.
- Winarno, F.G. (1993). *Pangan Gizi teknologi dan Konsumen*. PT. Gramedia Pustaka Utama, Jakarta.

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