JURNAL
PRODUKSI
TERNAK
TERAPAN

Vol 06, No 02,Hal 119-125, Juli 2025
http://jurnal.unpad.ac.id/jptt
e-ISSN: 2722-6611
DOI: 10.24198/jptt.v6i2.63139

THE EFFECT OF USING MICROENCAPSULATION PRODUCT OF NONI FRUIT EXTRACT (*MORINDA CITRIFOLIA L.*) IN DIET TO CHARACTERISTICS OF SENTUL CHICKEN MEAT

Sekarupa Rengganis Nusantara, Tuti Widjastuti, dan Heni Indrijani
Faculty of Animal Husbandry, Universitas Padjadjaran
Corresponding author : sekaruparengganisn@gmail.com

ABSTRACT

Sentul chicken is a local from Ciamis Regency that has potential as an alternative source of animal protein. The utilization of microencapsulated noni fruit extract products that are rich in bioactive compounds in the ration is expected to improve the quality of meat through improving the nutritional composition of the ration. This study was using 100 Sentul chickens divided into four treatment groups, where the rations were given with variations in the addition of microencapsulated products at doses of 0, 75, 150, and 225 mg/kg MNFE. The microencapsulation method was carried out by coating noni extract using maltodextrin and drying it using the spray drying method. The results showed that microencapsulation of noni fruit extract had a significant effect on carcass weight, cholesterol content, and fat content of chicken meat. The optimal doses was found at 75-150 mg/kg MNFE which resulted in an increase in carcass weight and a decrease in cholesterol levels and the most effective meat fat. Therefore, using of microencapsulated noni fruit extract not only improves meat quality, but can also be an alternative solution in the livestock industry, especially in reducing the use of Antibiotic Growth Promoter (AGP) and increasing poultry meat quality.

Keywords : *Microencapsulation, Noni Extract, Sentul Chicken, Meat Quality, AGP Alternative.*

Introduction

Sentul chicken is one of Indonesia's local chickens that has different potential in fulfilling animal protein needs for the community. Sentul chicken is a local chicken originating from Ciamis Regency, West Java (Hartono et al., 2016). This chicken is one of the germplasms that is currently being developed by various government agencies as an effort to fulfil the needs of good animal protein sources for the community. Sentul chicken has good potential as a meat and egg producer, so this is one of the important reasons for choosing this chicken as a local chicken industry commodity (Mushawwir et al., 2022).

Chicken meat is one of the livestock products that have high quality and are very easy to obtain by the community. The need for chicken meat is generally obtained from broiler chickens. However, the fulfilment of chicken meat needs can also be obtained from local chickens, one of which is Sentul chicken. In chicken meat, some of the content in it such as cholesterol, fat, and protein levels are things that are considered by the community.

Feed additives are substances that are added to feed to achieve certain goals. Feed additives can consist of various components such as enzymes, probiotics, prebiotics, organic acids, and hormones. The addition of feed additives in feed can help improve metabolic processes in the body of farm animals. One type of feed additive that can be used is noni fruit extract (*Morinda citrifolia* L.).

Noni fruit contains bioactive compounds found in noni fruit, namely vitamin C, xeronin, saponin, anthraquinone, scopoletin, proxeronin, and amino acids that have an impact on increasing carcass weight, reducing abdominal fat, reducing meat cholesterol levels, and reducing meat fat content. Noni fruit also contains flavonoids and phenolics that have antimicrobial and antibacterial properties and can be used as an alternative antibiotic for poultry. The use of noni fruit extract can be a solution to the prohibition of the use of Antibiotic Growth Promo-

tors (AGP) in Indonesia. The use of noni fruit extract in the ration is expected to optimize the absorption of nutrients from the ration in the body of Sentul chickens. Noni fruit can play a role in increasing digestibility in the digestive system, reducing cholesterol, modulating immunity, and can reduce heat stress in livestock (Diarra et al., 2019).

Microencapsulation is one method to protect bioactive compounds from external factors, such as light, moisture, temperature, evaporation, and oxidation during the storage process of noni fruit extract. Microencapsulation is a technology to enclose or coat a core substance with a polymer wall layer that will produce micro-sized particles (Wati et al., 2022). Maltodextrin is one of the good coatings and has non-hygroscopic, elastic, and economical properties. Maltodextrin is a short-chain polysaccharide derived from starch hydrolysis and has water-soluble properties (Handayani et al., 2024). Through the microencapsulation process using maltodextrin, the tannin contained in an extract can be reduced so that the phenolic compounds contained in the material become more stable (Hamid et al., 2020).

This study aims to determine the effect of giving microencapsulated products of noni fruit extract on carcass weight, cholesterol levels, and fat levels in Sentul chicken meat and to determine the best level of addition of microencapsulated products of noni fruit extract in the ration to produce optimal carcass weight, cholesterol levels, and fat levels of Sentul chicken meat.

Materials and Methods

Experimental Livestock

The livestock used in this study were 100 Sentul chickens and intensively reared from 0-12 weeks of age without sex separation (straight run). The Sentul chickens were divided into four groups of feed treatments with five replicates each which were randomly placed into 20 cage units and each cage unit contained 5 Day Old Chick which were labeled with a number on their feet.

Experimental Diet

In this study, the feed ingredients used included yellow corn, soybean meal, coconut meal, anchovy meal, rice bran, bone meal, and coconut oil. The nutrient content and metabolic energy of the feed ingredients can be seen in Table 1.

Table 1. Ingredients of basal ration

Feed Ingredients	Nutrient Content							
	Crude Protein	Crude Fat	Crude Fiber	Ca	P	Lys	Met	ME
	……%……							(kkal/kg)
Yellow corn	8.35	6.47	4.59	0.00	0.02	0.10	0.26	3454.41
Soy Bean Meal	38.09	2.74	5.67	0.22	0.29	2.70	0.66	2425.31
Anchovy Fish Meal	51.69	8.44	0.00	5.50	2.80	6.10	1.70	3009.47
Coconut Meal	22.44	12.97	15.00	0.20	0.20	0.48	0.32	1519.00
Rice Brain	12.40	6.45	14.95	0.12	0.21	0.81	0.26	2042.73
Bone Meal	0.00	0.00	0.00	24.00	12.00	0.00	0.00	0.00
Coconut Meal	0.00	93.97	0.00	0.00	0.00	0.00	0.00	8600.00

Source: Laboratory of Ruminant Livestock Nutrition and Animal Food Chemistry, Faculty of Animal Husbandry, Padjadjaran University (2024)

Furthermore, to find out the composition of the basal ration used along with the nutrient content and metabolic energy of the basal ration can see on Table 2 and Table 3.

Table 2. Basal ration formulation

Feed Ingredients	Ratio Composition (%)
Yellow Corn	56
Soy Bean Meal	11
Anchovy Fish Meal	10
Coconut Meal	15
Rice Brain	5
Bone Meal	2
Coconut Oil	1
Jumlah	100

Source: Calculation Results Based on Table 2 with Trial and Error method using Microsoft Excel.

Table 3. Content of nutrition and metabolic energy of used basic rations

Nutrient	Contents	Requirements
Metabolism Energy (kkal/kg)	2918.19	2850*
Crude Protein (%)	18.00	17-18*
Crude Fat (%)	7.98	Max 8**
Crude Fiber (%)	6.19	Max 8**
Calsium (%)	1.09	Min 0.9**
Phosfor (%)	0.60	Min 0.3**
Lysine (%)	1.08	0.9**
Methionine (%)	0.45	0.3**

Source : Results of Proximate Analysis
*Needs Based on Widjastuti (1996)
**BSN (Badan Standarisasi Nasional) (2013)

Methods

This study uses a direct experimental method on Sentul chickens aged 0-12 weeks. The research design used was a Completely Randomized Design with 4 treatments and 5 replicates, so there were 20 experimental units.

The treatment of the research ration is:
T0 : Basal Ration
T1 : Basal Ration + 75 mg/kg MNFE
T2 : Basal Ration + 150 mg/kg MNFE
T3 : Basal Ration + 225 mg/kg MNFE

Procedure

Making Microencapsulation of Noni Fruit Extract (MEBM) (MNFE)

The microencapsulation process of noni fruit extract (MEBM) is carried out by thinly slicing noni fruit to make simplisia, then drying and smoothing the dried simplisia to continue the extraction stage with the maceration method using 96% methanol. Then mix the noni extract that has passed the maceration, filtration and evaporation stages with maltodextrin (70% extract: 30% maltodextrin). In drying, the spray drying method was used with a temperature of 125°C.

Stage of Rearing

Sentul chickens are reared from 0 weeks to 12 weeks of age. The provision of MEBM products is done by mixing them into the livestock ration. Feeding of Sentul chickens is done twice a day with the amount of feeding adjusted to their age with the percentage of morning and evening feeding 50%: 50 and the provision of drinking water ad libitum. The microencapsulated product of noni fruit extract will be mixed into the ration during the process of mixing feed ingredients.

Data Collection

Chickens were harvested at 12 weeks of age as many as 20 chickens and fed for 8 hours before slaughter. Slaughtering with halal killing method is to cut off three channels in the neck (carotid artery, jugular vein, and esophagus). Then the blood was removed, the fur was cleaned, the viscera were removed, and the neck and head were cut.

Observed Variable

Carcass Weight (grams)

Carcass weight is obtained from empty carcass of chicken without blood, feathers, neck, head, feet, and internal organs measured using digital scales in grams.

Meat Cholesterol Level (mg/dL)

Determination of meat cholesterol levels can be done based on the CHOD-PAP (Cholesterol Oxidase Phenylperoxidase Amino Phenozonphenol) method, namely cholesterol is determined directly in plasma and the reaction side of the cholesterol ester is hydrolyzed, the 3-Oh group is hydrolyzed then

hydrogen which is the result of the same reaction as the analysis of blood cholesterol levels.

$$Meat\ Cholesterol\ Level\ (\mu g/\ mg) = \frac{Absorbant\ Sample}{Absorbant\ Standard} \times 200$$

Meat Fat Level (%)

Meat fat levels is analyzed from meat on the breast, the determination of meat fat content is based on Soxhlet extraction with the principle of fat extracted with fat solvent (chloroform), after the solvent is evaporated, fat can be weighed and the percentage calculated.

$$Fat\ Level\ (\%) = \frac{(Sample\ weight\ before\ extraction - Sample\ weight\ after\ extraction\ and\ drying)}{Initial\ sample\ weight} \times 100$$

Data Methods and Analysis

In this study, a completely randomized design (CRD) was used, and the data analysis used was the Analysis of Variance (ANOVA) model to evaluate the treatment of the observed variables. Furthermore, a further test was carried out, namely Duncan's Multiple Range Test (DMRT) to test differences between treatment means.

Results and Discussion

Table 4. Carcass quality parameter in the treatment of addition MNFE

Variables	Treatments			
	T0	T1	T2	T3
Carcass Weight (gram)	634.20^{ab}	700.00^{b}	673.00^{ab}	614.60^{a}
Meat Cholesterol Level (mg/dL)	36.01^{b}	31.55^{ab}	27.98^{a}	29.61^{a}
Meat Fat Level (%)	13.93^{b}	13.68^{a}	11.68^{a}	12.70^{ab}

Carcass Weight

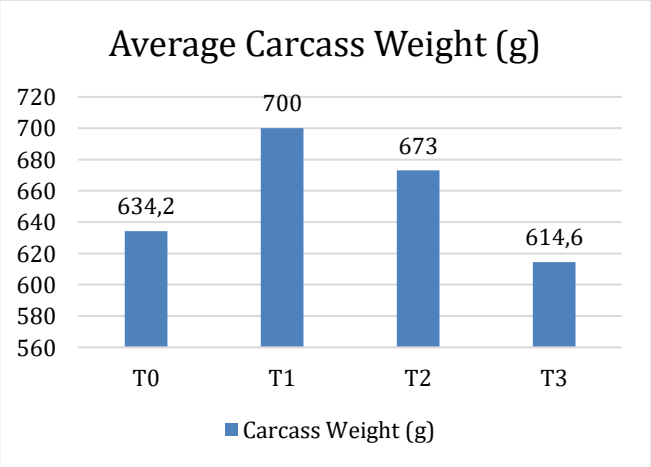

Figure 1. Average carcass weight

Based on the data from Figure 1, it shows that the average carcass weight increased in the range of 65.8 to 86 grams/head. Furthermore, the data were analyzed statistically using analysis of variance to determine the effect of giving micro-encapsulated noni fruit extract (MNFE) products on empty carcass weight. The results of the analysis of variance (ANOVA) showed that the treatment had a real or significant effect (P <0.05) on the carcass weight gain of Sentul chickens, and to determine the differences between treatments and to determine the best level of addition of MNFE products in the ration, further statistical tests were carried out, namely the Duncan multiple range test and are listed in Table 4.

Based on the results of Duncan's multiple range test, T1 (BR + 75 mg/kg MNFE) is significantly different from T3 (BR + 225 mg/kg MNFE). Thus T0 (BR + 0 mg MNFE, T2 (BR + 150 mg/kg MNFE), and T3 (BR + 225 mg/kg MNFE) showed results that were not significantly different. This indicates that the addition of MNFE products that are too high will also not have a significant effect on increasing the carcass weight of Sentul chickens produced.

The results of this study are greater when compared to the research of Widjastuti et al. (2023) that the weight of the carcass of 12 weeks old Sentul chickens is 474.65-599.41 grams/bird. Indra et al. (2015) stated that the average carcass weight of adult male Sentul chickens reached around 694.16 grams/bird. The increase in weight is attributed to the nutritional content of noni fruit, especially vita-

min C, which plays an important role in suppressing stress levels in chickens, thus contributing to the increase in carcass weight. In addition to vitamin C, noni fruit also contains bioactive and phenolic compounds that support the growth of Sentul chickens and can indirectly increase carcass yield (Widjastuti et al., 2023). Furthermore, noni fruit is also rich in flavonoids, compounds known to have high antioxidant activity. Flavonoids play a role in protecting blood vessels from damage and reducing cholesterol buildup. This effect can improve nutrient absorption and metabolic efficiency of the chicken body, which in turn has a positive impact on carcass weight gain (Fuhrman & Aviram, 2001).

Meat Cholesterol Level

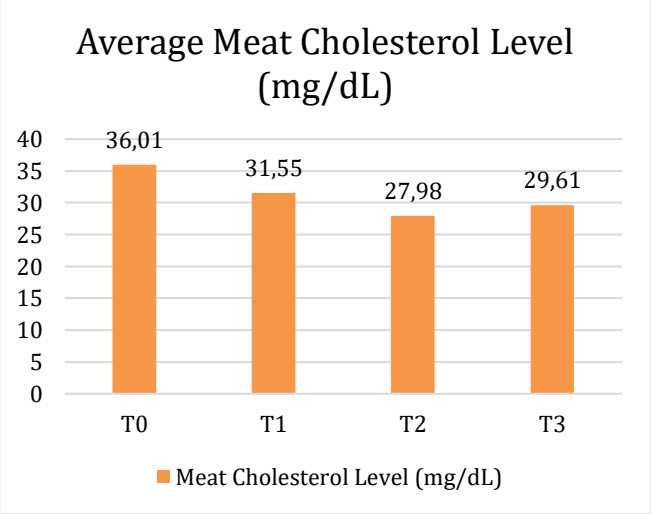

Figure 2. Average meat cholesterol level

Based on the data from Figure 2, the average meat cholesterol level decreased in the range of 6.4-8.03 mg/dL. The results of the analysis of variance showed that the treatment of MNFE products significantly affected the cholesterol levels of Sentul chicken meat (P <0.05). The results of Duncan's multiple range test analysis showed the results as listed in Table 4.

In Table 4, the results of Duncan's multiple range test analysis on the effect of MNFE product feeding on meat cholesterol levels show that T0 (BR + 0 mg/kg MNFE) is significantly different from T2 (BR + 150 mg/kg MNFE) and T3 (BR + 225 mg/kg MNFE). Based on the results of Duncan's multiple range test, it shows that the provision of MNFE products can significantly reduce meat cholesterol levels, especially in the T2 treatment (BR + 150 mg/kg MNFE).

The results of this study show that the cholesterol level of Sentul chicken meat is good when compared to the results of Widjastuti et al. (2023) research which shows that the cholesterol level of Sentul chicken meat given MNFE products with a dose of 125-375 mg MNFE/kg of feed can produce cholesterol levels of 91.16 – 94.65 mg/dL. The decrease in meat cholesterol levels is influenced by the content of active compounds contained in noni fruit extract, including flavonoids and alkaloids. According to Ahn et al. (2020), flavonoids work in lowering cholesterol levels by inhibiting the activity of *Hydroxymethylglutaryl-CoA* (HMG-CoA). Flavonoids are secondary plant metabolites with high inhibitory activity in the lipase enzyme produced by the pancreas, where this lipase enzyme plays an important role in fat absorption (Muntholib et al., 2020). Manafe (2022) stated that increased excretion of cholesterol and bile acids in the excreta can inhibit the absorption of cholesterol in the intestine, so that it can cause inhibition of cholesterol synthesis at various levels of biosynthesis which can ultimately reduce cholesterol in meat.

Meat Fat Level

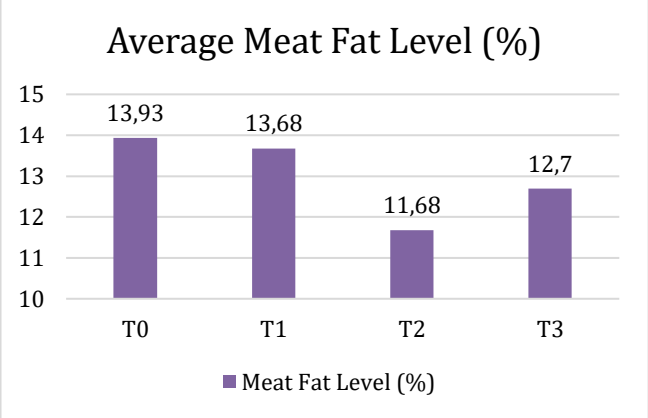

Figure 3. Average Meat Fat Level

it shows that the average fat content of Sentul chicken meat has decreased in the range of 1.18-1.72% from the test results of meat fat content produced from the treatment without the provision of MNFE products. The results of the analysis of variance also showed that the treatment of MNFE products had a significant effect on the fat content of Sentul chicken meat (P <0.05), so the Duncan multiple range test was conducted to determine the optimal level of MNFE product provision and the test results are listed in Table 4.

Duncan's multiple range test results showed that P0 (RB + 0 mg MNFE) was significantly different from P1 (RB + 75 mg/kg MNFE) and P2 (RB + 150 mg/kg MNFE). However, P0 (RB + 0 mg/kg MNFE) and P3 (RB + 225 mg/kg MNFE) were not significantly different, thus indicating that P2 (RB + 150 mg/kg MNFE) is the optimal level of MNFE product addition in reducing the fat content of Sentul chicken meat.

The provision of MNFE products in this study had a good effect on the fat content of Sentul chicken meat, with an average of 4.14%-5.46%. The results of research Fenita et al. (2011) showed that the provision of noni water can reduce the fat content of broiler meat up to 66.52%. The process of fat formation in the body of chickens is influenced by the amount of energy obtained through consumed feed, where the energy comes from the conversion of carbohydrates and fat stores in the body (Ayuti et al., 2022). The content of alkaloids and terpenoids contained in noni fruit can function to overcome high blood pressure and obesity. In addition, the active substance that plays a role in reducing fat content in meat is a steroid compound known as sitosterol. (Fenita et al. (2011) stated that sitosterol compounds have a way of working by stopping the absorption of cholesterol so that it can reduce cholesterol levels in the blood and ultimately can reduce meat fat levels.

Conclusion

The use of microencapsulated products of noni fruit extract in Sentul chicken rations has a positive effect and a significant impact on the characteristics of chicken meat. The optimal dose obtained from the results of dose testing is at the level of adding MNFE products as much as 75-150 mg/kg in the ration. At these doses, there is an increase in carcass weight and a decrease in cholesterol and fat levels in Sentul chicken meat so that this shows an increase in the quality of the meat produced. Bioactive compounds contained in noni fruit extract, such as flavonoids, alkaloids, terpenoids, sitosterol, and many more bioactive compounds in noni fruit that play an active role in increasing body weight and reducing cholesterol and fat levels of meat so that this can be a good alternative to improve meat health and reduce dependence on Antibiotic Growth Promoter (AGP). Therefore, the addition of microencapsulated products of noni fruit extract in the ration can be used as an innovative solution in improving the quality of poultry meat, especially Sentul chicken meat.

Acknowledgment

This research was funded by the Directorate of Research and Community Service and Innovation, Universitas Padjadjaran, with contract number: 4026/UN.3.1/PT.00/2024. The authors would like to thank the Director of Research and Community Service and Innovation for supporting this research.

References

Ahn, S., Jun, S., & Joung, H. (2020). Association of total flavonoid intake with hypo- HDL-cholesterolemia among Korean adults: Effect modification by polyunsaturated fatty acid intake. *Nutrients*, *12*(1). https://doi.org/10.3390/nu12010195

Ayuti, S. R., Purnama, H. R., Azhari, A., Isa, M., Helmi, T. Z., Novita, A., Herrialfian, H., Darniati, D., & Makmur, A. (2022). Pengaruh Penambahan Ampas Kelapa (Cocos nucifera L) Fermentasi pada Pakan terhadap Persentase Karkas dan Kadar Lemak Ayam Broiler. *Jurnal Peternakan Indonesia (Indonesian Journal of Animal Science)*, *24*(3), 288. https://doi.org/10.25077/jpi.24.3.288-297.2022

Diarra, S. S., Amosa, F., & Lameta, S. (2019). Potential of Morinda (Morinda citrifolia L.) Products as Alternative to Chemicaladditives in Poultry Diets. *Egyptian Journal of Veterinary Science(Egypt)*, *50*(1), 37–45. https://doi.org/10.21608/ejvs.2019.7469.1062

Fenita, Y., Warnoto, & Nopis, A. (2011). Pengaruh pemberian Air Buah Mengkudu (Morinda citrifolia L) terhadap Kualitas Karkas Ayam Broiler. In *Jurnal Sains Peternakan Indonesia* (Vol. 6, Issue 2, pp. 143–150).

Fuhrman, B., & Aviram, M. (2001). Flavonoids protect LDL from oxidation and attenuate atherosclerosis. *Current Opinion in Lipidology*, *12*(1), 41–48. https://doi.org/10.1097/00041433-200102000-00008

Hamid, Thakur, N. S., & Thakur, A. (2020). Microencapsulation of wild pomegranate flavedo phenolics by lyophilization: Effect of maltodextrin concentration, structural morphology, functional properties, elemental composition and ingredient for development of functional beverage. *LWT Food Science A*, *133*(August), 110077. https://doi.org/10.1016/j.lwt.2020.110077

Handayani, A. S., Gabryelle, K., Setyawan, M. A., & Syabila, A. N. (2024). Effect of Hydrolysis Reactor Design on Maltodextrin Production. *Materials Science Forum*, *1113*, 119–126. https://doi.org/10.4028/p-ocUQ1d

Indra, W., Wiwin, T., & Widjastuti, T. (2015). Bobot Potong, Karkas, dan Income Over Feed Cost Ayam Sentul Jantan Pada Berbagai Umur Potong. *Student E-Journals*, *4*(3).

Manafe, M. E. (2022). Subtitusi Krokot (Portulaca oleracea L.) dalam Ransum terhadap Kandungan Kolesterol Daging, Darah dan Trigliserida pada Ayam Broiler. *Jurnal AgroSainTa: Widyaiswara Mandiri Membangun Bangsa*, *6*(1), 9–14. https://doi.org/10.51589/ags.v6i1.86

Muntholib, Sulistyaningrum, D., Subandi, & Marfu'ah, S. (2020). Identification of flavonoid isolates of Papaya (Carica papaya L.) seed and their activity as pancreatic lipase inhibitors. *AIP Conference Proceedings*, *2231*(April). https://doi.org/10.1063/5.0003456

Mushawwir, A., Adrini, L., Suwarno, N., Puspitasari, T., & Plasma, M. (2022). Dampak Kitosan Iradiasi Terhadap Profil Metabolit Plasma Darah Ayam Sentul. *Jurnal Ilmu Dan Industri Peternakan*, *8*, 11–19.

Standar Nasional Indonesia, [SNI]. (2013). *SNI 7783.1:2013 Pakan Ayam Buras Starter*.

Wati, R. R., Sriwidodo, S., & Chaerunisa, A. Y. (2022). Peningkatan Stabilitas Fitokonstituen melalui Pendekatan Mikroenkapsulasi. *Majalah Farmasetika*, *7*(1), 39. https://doi.org/10.24198/mfarmasetika.v7i1.35265

Widjastuti, T. (1996). *Penentuan efisiensi penggunaan protein, kebutuhan protein dan energi untuk pertumbuhan dan produksi telur ayam sentul pada kandang sistem cage dan sistem litter (Tesis)*. Universitas Padjadjaran. Indonesia.

Widjastuti, T., Nurlaeni, L., Hasbuna, A., Setiawan, I., Yudaasmara, I., & Tanwiriah, W. (2023). The Microencapsulation of Noni Fruit Extract (Morinda Citrifolia L.) with Maltodextrin and Its Implementation As Feed Additive on Carcass Quality and Histology of Intestinal Sentul Chicken. *International Journal on Advanced Science, Engineering and Information Technology*, *13*(1), 104–109. https://doi.org/10.18517/ijaseit.13.1.18370