Scientific Papers. Series D. Animal Science. Vol. LXI, Number 1, 2018
ISSN 2285-5750; ISSN CD-ROM 2285-5769; ISSN Online 2393-2260; ISSN-L 2285-5750

THE EFFECT OF ADDITION MANGOSTEEN PEEL MEAL (*Garcinia mangostana* L.) IN THE RATION ON THE PROTEIN EFFICIENCY RATIO OF SENTUL CHICKEN

Tuti WIDJASTUTI, ABUN, R. WIRADIMADJA

Faculty of Animal Husbandry, Padjadjaran University, Jl. Raya Bandung - Sumedang Km 21, Sumendang 4536, West Java, Indonesia

Corresponding author email: tuti_widjastuti@yahoo.com

Abstract

Sentul chicken is a specific local chicken from Ciamis region in West Java and a dual- purpose type that can utilized for eggs and meat production. In other way, these birds are very good for chicken meat species, because they have a compact body and white skin colour. One of the alternatives to improve performance is by giving the ration added with a mangosteen peel meal (Garcinia mangostana). Mangosteen peel meal (MPM) is one of the medicinal plants used as a herbal medicine containing xanthone compounds as antioxidants, and antimicrobials. The research aimed is to find out of protein efficiency ratio of Sentul chicken fed diets containing mangosteen peel meal (Garcinia mangostana). This experiment used 100 day old chicks of Sentul chicken that were raised in cages until 10 weeks old. It was used completely randomized design, with four level of mangosteen peel meal (ration without MPM (R_0), and ration that added 2.5% (R_1), 5% (R_2), and 7.5% (R_3), of MPM, and five replications, each replicated consisted of five Sentul chickens. Protein consumption, body weight gain and protein efficiency ratio were parameters observed. The results that using mangosteen peel meal until 7.5%, gave no significant effect on feed and protein consumption, but the use of ration with the addition of mangosteen peel meal at 5% and 7.5% gave a significant effect on body weight gain and protein efficiency ratio. This research indicated that the addition of mangosteen peel meal (MPM) in the ration until 7.5 % gave the best protein efficiency ratio of Sentul chicken.

Key words*: mangosteen peel meal, Sentul chicken, protein efficiency ratio.*

INTRODUCTION

Sentul chicken is a specific local chicken from Ciamis region in West Java and a dual- purpose type that can utilized for eggs and meat production. The growth rate of Sentul chicken is high, if maintained intensive so that it can be slaughter at the age of 10 weeks (Kurnia, 2011). To obtain maximum performance there must be balanced with the provision of quality rations, balanced and in accordance with the needs. Feed additives added to the ration are intended to improve the feed consumption, digestibility, and endurance of chicken livestock. To increase growth is by using antibiotics to increase productivity, but the continuous use of synthetic antibiotics will cause resistant and residual in chicken carcasses, which is harmful to human consumption. An alternative substitute for natural synthetic feed additive one of them is mangosteen peel. Mangosteen peel contains xanthone compounds as antioxidants, and antimicrobials (Mardawati et al*.,* 2008). The nutrient content contained in the skin of mangosteen fruit is 6.45% crude fat, 3.02% protein, ash 2.17%, total sugar 2.10%, and carbohydrates 82.50% (Permana, 2010). Mangosteen skin also contains xanthone compounds that function as antioxidants, antiviral, antifungal and antimicrobial, and are not found in other fruits. Xanthone compounds consist of mangostin, mangostenol A, mangostinone A, mangostinon B, trapezi-folixanthone, tovophyllin B, alpha mangostin, beta mangostin, garcinon B, mangostanol, flavonoid epicatechin and gartanin (Qosim, 2007). Xanthone compounds contained in the skin of mangosteen can improve the structures of intestinal villi in the process of nutrient absorption. Antibacterial herbs are able to suppress the growth of pathogenic bacteria in the intestine (Velmurugan and Citarasu, 2010), so the higher body weight growth of chickens.
Antioxidant compounds (xanthones) contained in mangosteen peel can also prevent or neutralize free radicals due to air pollution in the environment. An increase in ambient temperature over a comfortable temperature zone range causes oxidative stress, leading to the occurrence of free radical attack on the cell membrane. Free radicals are an atom, a

molecule, or a compound in which it contains one or more unpaired electrons, making it highly reactive (Andayani, 2008). The need for antioxidants in rations is considered based on the content of polyunsaturated fatty acids, each 1% polyunsaturated fatty acid required 30 IU/kg vitamin E ration as antioxidant or 30 ppm in the form (DL-α-Tocopheryl acetate) (Leeson and Summers, 2001). Based on the calculation of antioxidant requirement in research ration equal to vitamin E (DL-α-Tocopheryl acetate) about 80 ppm, assuming the highest xanthone content is found in mangosteen skin, ie 107.76 mg per 100 g of fruit peel (Iswari, 2011), the need of mangosteen peel meal in chicken ration is about 7.5% per kg of ration.

The using of mangostee peel meal (MPM) in chicken rations should be limited, because of the presence of tannins known as anti-nutrients, tannins may affect carbohydrate degradation. The content tannin contained in mangosteen peel is 16.8% (Ngamsaeng, 2004). Protein is essential organic substances and essential for growth and production (Leeson and Summers, 2001). The quality of the ration will certainly affect the growth rate of Sentul chicken. To determine the biological evaluation of protein is needed to see its effect on poultry. One of the measures of protein quality is the Protein Efficiency Ratio (PER), which is simply the weight gain of animal divided by protein intake (Leeson and Summers, 2001). The Protein Efficiency Ratio determines the efficiency level of poultry in converting each gram of protein into some weight gain. Sentul chicken is prospective in supply of animal protein of poultry, so we need research toward quality protein ration that will give resulting affect the best body weight.

MATERIALS AND METHODS

Livestock experiments. The study used 100 day old chicks of Sentul chicken witch the average of body weight was 34.00 gram (coefficient of variation 8.09%). The Sentul chicken kept in cage until the age of 10 weeks.

Cage. 20 cages were used and were measured 90 cm long, 90 cm wide and 60 cm high, each cage consisted of 5 chickens

Trial rations. The feed ingredients of ration comprised of yellow corn meal (56.00%), soy-bean meal (12.00%), rice bran (21.50%), fish meal (9.25%), $CaCo_3$ (0.50%) and bone meal (0.75%). Rations were prepared based on protein and metabolic energy requirement for Sentul chicken growth phase, ie. 17% protein and metabolic energy 2850 kcal/kg (Widjastuti, 1996). The treatment consisted of the use of mangosteen peel meal (MPM) ie: P0 = 0% MPM, P1 = 2.5% MPM, P2 = 5.0% MPM and P3= 7.5% MPM.

Experimental design. Experiments were conducted experimentally using Completely Randomized Design, consisting of 4 treatment and 5 replications. Data were analyzed using Variance Analysis and differences between treatments using Duncan Multiple Test. The parameters were protein consumption, body weight gain and Protein Efficiency Ratio (PER).

RESULTS AND DISCUSSIONS

The average protein consumption, body weight gain and Protein Efficiency Ratio (PER) of Sentul chicken from each treatment are showed in Table 1.

Table 1. The protein consumption, body weight gain and Protein Efficiency Ratio of Sentul Chickens

Variable	Treatment			
	P0	P1	P2	P3
Protein Consumption (g)	284.70[a]	263.34[a]	266.80[a]	268.25[a]
Body Weight Gain (g)	387.79[a]	420.62[ab]	431.13[b]	438.10[b]
Protein Efficiency Ratio	1.36[a]	1.60[b]	1.62[b]	1.63[b]

Note: P0 = 0 % MPM/kg ration, P1 = 2.5% MPM/kg ration, P2 = 5% MPM/kg ration; [a-b] Mean values within a row having different superscripts are significantly different by least significant difference test.

Protein Consumption

Table 1 shows that protein consumption is obtained by calculating the amount of feed consumed multiplied by the protein content of the ration. The average protein consumption was 263.34 – 284.70 g. The result of variance analysis showed that the addition of MPM in

ration had no significant effect (P>0.05) on protein consumption. These results illustrate that feed consumption in each treatment is in the same range, so the addition of MPM in rations up to the level of 7.5% did not give a negative effect on feed consumption, and will have an impact on the protein consumed. The ration containing MPM from 2.5% until 7.5% did not influence palatability and chicken appetite. According to Pond and Church (1995), the palatability of rations is an important factor that determines the level of feed consumption and palatability depending on the smell, taste, color and texture of the ration.

Mangosteen peel meal contains tannin which is a limiting factor and anti-nutrients. According Ngamsaeng (2004), the mangosteen peel meal (MPM) contains a fairly high tannin and can affect the palatability rate of the ration, but before used, MPM was dried in the sun first, so the tannin content decreased and it will reduce the bitter taste and smell typical of mangosteen peel, consequently no effect on the feed and protein consumption.

Body Weight Gain

The body weight gain of each treatment is showed in Table 1. The average of body weight gain was 387.79 - 438.10 g. The results of variance analysis showed that the treatments P0 and P1 did not give a significant effect on the body weight gain, but the treatments P2 and P3 were significantly higher (P<0.05) than P0 treatment. The treatments P1, P2, and P3 did not show any significant effect on the body weight gain. Its mean that MPM from 2.5% up until 7.5% in ration did not influence palatability and appetite, so the body weight gain was increased. This is because mangosteen peel meal contains xanthone compounds as antioxidants, anti-viral, anti-fungus and anti-microbial, that can improve the structure of intestinal villi in the absorption of nutrients, and can suppress the growth of pathogenic bacteria in the intestine, thus increasing weight gain (Velmurugan and Citarasu, 2010). Xanthone compounds are also able to suppress oxidative stress that affects the growth rate of better chickens (Lannang et al., 2006).

The content of tannin in mangosteen peel meal does not give negative effect on the body weight gain. According to the research of Rateh (2014), the content of tannins in basal ration with the addition of mangosteen peel meal must be 1.5% or 0.36 g/kg. The calculated tannins contained in rations with mangosteen peel meal in each treatment were still below the tolerance limit, ie P1 = 0.6 g/kg, P2 = 1.2 g/kg, and P3 = 1.8 g/kg. According Kumar (2005), the limit of tannins use in the ration is 2.6 g/kg. Because of that, the body weight gain gave better, than the control treatment without MPM.

Protein Efficiency Ratio (PER)

In Table 1 can be seen that the value of protein efficiency ratio on Sentul chicken were variation from the lowest R0 = 1.36 to the highest P3 =1.63. PER value achieved by each treatment can be seen in Figure 1. The results of the variance analysis show that the treatment with addition of MPM in the ration affected significant the PER.

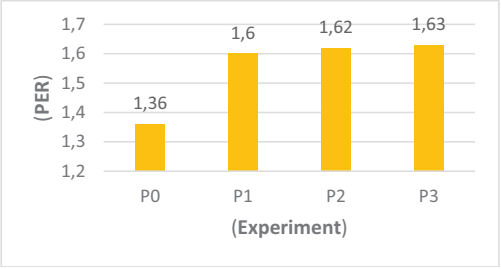

Figure 1. Protein Efficiency Ratio

The efficiency of protein ratio in the treatments P1, P2 and P3 was significant higher (P<0.05) than P0 treatment to the Sentul chicken. PER value of the treatment P1, P2 and P3 did not show any significant effect. This means that use of MPM until 7.5% in the ration produces better PER value than the control ration. This is because the addition of MPM in the ration does not affect the consumption of protein, but increased the body weight of Sentul chicken. Mangosteen peel meal contains xanthone compounds and xanthone compounds found in the peel of mangosteen can improve the structure of the intestinal villi and thus give effect the process of nutrient uptake. Optimal absorption of nutrients will affect the increase in body weight and will consequently have a positive impact on the value of PER. Leeson and Summers (2001) states that the protein

efficiency ratio in the ration related directly to the biological value of protein ration itself.

CONCLUSIONS

It can be concluded that the addition of mangosteen peel meal (MPM) in the ration until 7.5% gave the best effect on the Protein Efficiency Ratio of Sentul chicken and mangosteen peel meal can be an alternative source of feed additive from herbal.

ACKNOWLEDGEMENTS

The research work has been conducted in the Grand Research Academic Leadership project. Sources of funds were from Padjadjaran University, through the Directorate of Research, Community Service and Innovation Padjadjaran University, Indonesia.

REFERENCES

Andayani R., 2008. Penentuan aktivitas antioksidan kadar fenolat total likopen pada buah tomay (*Solanium lycopersicum* L). Jurnal sains dan teknologi farmasi 13(1).

Iswari K., 2011. Kulit Manggis Berkhasiat Tinggi. Madya Centradifa. Jakarta.

Kumar V., Elangovan A.V., Mandal A.B., 2005. Utilization of reconstitued high tannin sorgumin the diets of broiler chicken. J.Anim. Sci., 18(4), 538-544.

Kurnia Y., 2011. Morfometrik Ayam Sentul, Kampung dan Kedu pada Fase Pertumbuhan dari Umur 1-12 Minggu. Skripsi. Program Alih Jenis. Departemen Produksi dan TeknologiPeternakan, Fakultas Peternakan, Institut Pertanian Bogor. Bogor.

Lannang A.M., Komguem J., Ngninzeko F.N., Tangmouo J.G., Lontsir D., Ajaz A., Choudhary M.I., Sondengam B.L., Ur-Rahman A., 2006. Antioxidant benzophenones and xathones from the root bark of *Garcini smeathmannii*. Bull. Chem. Soc.

Leeson A., Summers E., 2001. Nutrition of the Chicken. 4th ed. Department of Animal and Poultry Science University of Guelph, Canada.

Mardawati E, Cucu Achyar S., Herlina Marta, 2008. Kajian Aktivitas Antioksidan dan Ekstrak ulit Manggis (*Garcinia mangostana* L.) dalam Rangka Pemanfaatan Limbah Kulit Manggis di Kecamatan Puspahirang Kabupaten Tasikmalaya. Laporan Akhir Penelitian. Lembaga Penelitian UNPAD. Bandung.

Ngamsaeng A., 2004. Effects of mangosteen peel (*Garcinia mangostana* L.) supplementation on rumen ecology, microbial protein synthesis, digestibility and voluntary feed intake in beef steer. Tropical Feed Resources Research and Development Center, Department of Animal Science, Thailand.

Permana A.W., 2010. Kulit Buah Manggis Dapat Menjadi Minuman Instan Kaya Antioksidan.WartaPeneltian dan Pengembangan Pertanian Vol. 32, No.2, BP2TP, Badan Litbang. Kementan RI, Indonesia.

Pound W.G., Churc D.C., Pond K.R., 1995. Basic Animal Nutrition and Feeding. Edke-4, New York, John Wiley & Sons.

Qasim Warid Ali, 2007. Kulit Buah Manggis Sebagai Antioksidan. Artikel Tim Ahli Divisi TTG Lembaga Pengabdian Masyarakat (LPM) Universitas Padjadjaran, Bandung. 35.

Rateh Wulandari., Irfan Djunaidi H., Edhy Sudjarwo, 2014. Pengaruh penambahan tepung kulit manggis (*Garcinia mangostana* L.) sebagai feed addive terhadap penempilan produksi burung puyuh. Artikel fapet.ub.ac.id.

Vemurugan S., Citarasu T., 2010. Effect of herbal antibacterial extracts on the gut floral changes in indian white shrimp *Fenneropenaeus indicus*. Rom. Biotech. Lett., 5709-5717

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. Disertasi. Program Pascasarjana Unpad. Bandung.