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Indian J. Anim. Res., 52 (6) 2018 : 882-886 AGRICULTURAL RESEARCH COMMUNICATION CENTRE Print ISSN:0367-6722 / Online ISSN:0976-0555 www.arccjournals.com/www.ijaronline.in The effect of palm kernel cake fermentation with Sclerotium rolfsii by adding humic acid in broiler diets Mirnawati*, G. Ciptaan and A. Djulardi amyloliquefaciens and Humic Substances and Its Utilization as a Feed Ingredient for Broiler Chickens", Asian-Australasian Journal of Animal Sciences, 2014">Faculty of Animal Science, amyloliquefaciens and Humic Substances and Its Utilization as a Feed Ingredient for Broiler Chickens", Asian-Australasian Journal of Animal Sciences, 2014">University of Andalas, Padang, West Sumatera, amyloliquefaciens and Humic Substances and Its Utilization as a Feed Ingredient for Broiler Chickens", Asian-Australasian Journal of Animal Sciences, 2014">Indonesia. Received: 20-11-2017 Accepted: 31-01-2018 DOI: 10.18805/ijar.B-864 ABSTRACT An experiment was conducted to evaluate the effect of palm kernel cake fermentation (PKCF) with Sclerotium roflsii by adding humic acid as broiler amyloliquefaciens and Humic Substances and Its Utilization as a Feed Ingredient for Broiler Chickens", Asian-Australasian Journal of Animal Sciences, 2014">diet on the performance of broiler. Two hundred DOC of broiler were used in this experiment and randomly assigned to five treatments (0%, 17%, 22%, 27%, 32% palm kernel cake fermented in diets) in a completely randomized design (CRD) with four replications. The diets were formulated in iso protein 22% and iso caloric 3000 kcal/ kg ration. The parameters of this study were feed consumption, body weight gain, feed conversion, body weight, carcass percentage of broiler. The result of this study showed that feed consumption, body weight gained, feed conversion, body weight, carcass percentage were not significantly affected (P>0.05) by any treatment. In conclusion the palm kernel cake fermented (PKCF) by Sclerotium roflsii can be used up to 32% in broiler diets. Key words: Broiler, Fermented, Palm Kernel Cake, Sclerotium rolfsii.

INTRODUCTION Palm Kernel Cake (PKC) is one of by-products of palm oil processing. Currently, Indonesia is the largest palm oil producer in the world and 70% of palm oil production came from the island of Sumatera. Furthermore, West Sumatera province is the 4th largest oil producer with CPO production up to 30,948,931 tons/year. The continued development of palm oil processing is certainly going to generate a high volume of waste product in the form of palm kernel cake (PKC), which is found about 45-46% of palm kernel cake as by-product of palm oil processing (Sinurat, 2003). Nutrient contents of the PKC were as follows: 16.07% crude protein, 21.30% crude fiber, 8. 23% crude fat, 0. 27% Ca, 0. 94% P and 48.4 ppm Cu, thus it can be concluded that PKC can be used as animal feed (Mirnawati et al. 2010). Although PKC contains a relatively high crude protein, its usage in broilers diet is still limited and the research conducted by Rizal (2000), discovered that in broilers diet, the amount of PKC can be used up to 10% or it may become a substitute for 40% of soybean meal. The limited usage of PKC in poultry rations is due to its low nutrient quality which is caused by a high crude fiber content, low amino acid content, high Cu content and a high ?-manan/mannose polymer content with 56.4% of crude fiber (Crude fiber of PKC contains ?-manan) (Alimon, 2004 and Purwadaria et al, 2003). Furthermore, poultry has a limited ability in digesting crude fiber. Improving the quality of PKC through biotechnological fermentation using cellulolytic and mananolytic fungi can reduce the crude fiber and ?-manan contentin PKC (Meryandini et al. 2008; Iyayi, 2004). The reduced crude fiber and â-manan content will increase the quality of PKC thus allowing it to become substitute for soybean meal in poultry rations. Mirnawati et al. (2014), stated that the enzyme activity of the Sclerotium rolfsii provides activity for cellulose enzyme (21.89 U/ml) and mannanase enzyme (24.58U/ml) higher than Eupenicillium javanicum and Aspergillus niger.According to Purwadaria and Sari (2004), Eupenicillium javanicum can produce ?-mannanase in 1% of locust bean gum with the highest activity at 49 U/ml and ?-mannanase with a much higher activity, if the fungi are grown in coconut cake.According to Mirnawati et al. (2013), fermentation of PKC with Eupenicillium javanicum showed good nutrient content which can be seen from these parameters; dry matter 42.21%, crude protein 26.27% and crude fiber 11.37%. Palm kernel cake (PKC) also has a high heavy metal content such as Cu and Zn, where heavy metal is an obstacle in the utilization of PKC in poultry rations. This may be due to the high existence of limiting factors such as Cu and Zn in the PKC. Vidal et al. (2001) also stated that Cu becomes the limiting factor in the fermentation process. This study introduced the humic acid role in the processing of PKC in order to obtain the optimal conditions *Corresponding author's e-mail: mirnawati@ansci.unand.ac.id Volume 52 Issue 6 (June 2018) 883 for improving the quality of PKC. It is necessary to find substances or compounds which are able to reduce Cu in PKC. Humic acid is effective in binding nutrient- micronutrients, such as Cu, Zn, and Mn (Tan, 1998). Humic acid fraction can interact with the metal through the formation of chelate compounds (Tate et al. 1980). Humic acid can also provide nutrients like N, P and S in the soil and energy for the activities of microorganisms (Stevenson, 1994;

Enviromate, 2002). The addition of humic acid in drinking water improves body weight gain, carcass percentage and feed efficiency in broiler chicken (Mirnawati et al. 2013). This is due to the fact that humic acid stimulate growth of microbes in the gut (Eren et al. 2000; Rath et al. 2006 and Sukaryana et al. 2010). Mirnawati et al. (2012) stated that PKC fermentation with A. niger combines with 100 ppm of humic acid for 7 days provides increased protein at 23.20 % and reduction of crude fiber at 10.59%. Mirnawati et al. (2017) have studied the palm kernel cake fermentation with Sclerotium rolfsii and dosage of humic acid 200 ppm had better nutrient content and quality than other treatments. This condition can be seen from these parameters; in crude protein (27.43%), nitrogen retention (59.17%), crude fiber (11.53%) and digestibility of crude fiber (55.40%) of fermented palm kernel cake. Thus it can be used as a substitute of imported feed ingredients (soybean meal and corn) in poultry rations. MATERIALS AND METHODS Purpose of the experiment: The purpose of this experiment is to study the effect of several levels of Sclerotium rolfsii fermented palm kernel cake in the diet on the production performance of broiler (feed consumption (g/head/ week), body weight gain (g/head/ week), feed conversion, body weight (g/head/ week), carcass percentage (%) and abdominal fat percentage (%) of broilers. Experimental animal and diet composition: Two hundred day old chicks (DOC) were assigned to this experiment. The experiment was performed in a completely randomized design (CRD) with five treatments (0, 17, 22, 27, 32% PKC- F in diets) and four replications. There were six broilers per unit of experiment. These broilers were kept in box cage (80 x 70 x 60cm). The diets were formulated in iso protein 22% and iso caloric 3000 kcal /kg ration. Diet formulation, nutrient content and metabolizable energy content of treatment diets were figured in Table 1 and Table 2 . Diet formulation consists of yellow corn, rice bran, fish meal, soybean meal, PKC-F, oil and topmix. Diet and drinking water were fermented with provided ad-libitum. The procedure of preparing PKC-F: Fermented palm kernel cake was the product of 80% PKC plus 20% rice bran that was fermented with Sclerotium rolfsii and addition of 200 ppm humic acid. The dose of inoculum Sclerotium rolfsii administered was 10% of the substrate and incubated for 7 days. After harvesting the product, PKC-F then dried and milled then mixed in broiler diets. Data collection: Collected data were feed consumption (g/ head/ week), body weight gain (g/head/ week), feed conversion, body weight (g/head/ week), carcass percentage (%) and abdominal fat percentage (%) of broilers. Data analyses: All the data were analyzed by analysis of variance of a completely randomized design according to Table 1: Composition of diet (%), nutrients (%) and metabolizable energy (kcal/kg) of broiler chickens during research. Feedstuff A B C D E Ration CP (%) Corn Rice Bran Soybean Meal Fish Meal PKCF Oil Top mix TOTAL 13.00 13.00 50.50 40.00 1.50 2.00 20.00 12.00 13.00 13.00 0.00 17.00 1.50 2.50 0.50 0.50 100.00 100.00 13.00 13.00 38.00 34.20 1.00 1.50 10.00 8.00 13.00 13.00 22.00 27.00 2.50 2.80 0.50 0.50 100.00 100.00 13.00 34.00 0.50 5.00 13.00 32.00 2.00 0.50 100.00 Table 2: Ingredient content (%) and Metabolizable Energy (kcal/kg) of ration treatments of broiler during research Feedstuff A B

C D E Protein (%) Crude lipid (%) Crude fiber (%) Ca Phosphorous (%) ME (kcal/kg) Lysine Methionine 22.08 4.12 3.81 1.1 0.6 3006.56 1.76 0.56 22.05 4.71 5.71 1.1 0.7 2988.58 7.91 0.64 22.11 5.19 6.14 1 0.7 3028.90 2.14 0.73 22.22 5.52 6.71 1 0.8 3024.46 2.40 0.84 22.10 4.74 7.20 1 0.8 2997.94 2.63 0.92 884 INDIAN JOURNAL OF ANIMAL RESEARCH Steel and Torrie(1976). Duncan Multiple Range Test (DMRT) was performed for testing the difference among treatments (Steel and Torrie, 1976). RESULTS AND DISCUSSION The effects of treatments on the performance (feed consumption, body weight gain, feed conversion, body weight, carcass percentage) of broilers were illustrated in Table 3. Feed comsumption: The feed consumption of broilers was not affected (P>0.05) by the levels of PKCF in the diets. The increase in the level of PKCF in the diets did not reduce the feed consumption of the broilers. The feed consumption was ranging from 485.16 to 495.98 g/head/week. The differences among treatments R1, R2, R3, R4 and R5 on feed consumption were not significant and were attributed to the reason that it was caused by ration containing fermented palm kernel cake which has the quality, aroma, and taste liked by broilers. Fermentation can also change the feed material to be easily digested, produce aroma and unique flavours and eliminate toxins from the original material (Sukaryana et al. 2010, Mirnawati et al. 2010). Usually, materials that undergo fermentation process have good quality that can improve the flavor and aroma, thus increasing the palatability of the ration and give a good influence on consumption. The results of this study are equal to that of Mirnawati et al. (2011), Rizal et al. (2013) and Sinurat et al. (2014) which found an increase in the use of PKC fermentation in poultry rations. Body weight gain: The levels of PKC-F in the diets did not influence (P>0.05) the body weight gain of broiler. The increase in the levels of PKCF in the diets mainted this body weight gain. The body weight gain of this experiment was ranging from 286.36 to 294.19 (g/head/week). Body weight gain in treatment R1, R2, R3, R4 and R5 were not significantly different because fermentation of palm kernel cake has a good nutrient quality. Fermentation can improve digestibility, which is in accordance with the opinion of Sukaryana et al. (2010), Dairo and Fasuyi (2008) and Mirnawati et al. (2013) that the materials that undergo fermentation will have a better quality. In this study, palm kernel cake fermentation with Sclerotium rolfsii can be used up to 32% in broiler rations. Results of this study was higher than that obtained by Mirnawati et al. (2011), where palm kernel cake fermented by Aspergillus niger could only be fed up to the level of 17%. This is due to the higher manannase and cellulose activity of Sclerotium rolfsii than Aspergillus niger (Mirnawati et al., 2014). Mirnawati et al. (2012) reported a cellulose activity of 22.84 U/ml from palm kernel cake fermented by Aspergillus niger. Feed conversion: The feed conversion ratio of broilers was not signifcantly effected (P>0.05) by the levels of PKCF in the diets. Eventhough the level of PKCF was increased, the feed conversion was not influenced. The feed conversion of broilers in this experiment was ranging from 1.65 to 1.73. Feed conversion is the ratio of the amount of feed consumption and the body weight gain in a given time period. The average feed conversion of broiler for 5 weeks of the study was 1.70.

This result is lower than the results obtained by Ezhieshi and Olomu (2004) with feed conversion of broiler chicken is 1.89-2.33 and Ugwu et al. (2008) obtained 2.61-3.46. The no different effect of feed conversion in this study was due to the use of fermentation products which have a better quality of itself (Bakker et al. 1981). In the making of fermentation product, the addition of humic acid may increase body weight gain and feed conversion, which was in accordance with a study by Yoruk et al. (2004) and Kucukersan et al. (2005) Body weight: The levels of PKCF in the diets did not influence (P>0.05) the body weight of amyloliquefaciens and Humic Substances and Its Utilization as a Feed Ingredient for Broiler Chickens", Asian-Australasian Journal of Animal Sciences, 2014">broilers. The increase in the levels amyloliquefaciens and Humic Substances and Its Utilization as a Feed Ingredient for Broiler Chickens", Asian-Australasian Journal of Animal Sciences, 2014">of PKCF amyloliquefaciens and Humic Substances and Its Utilization as a Feed Ingredient for Broiler Chickens", Asian-Australasian Journal of Animal Sciences, 2014">in the diets mainted this body weight. The body weight of broilers in this experiment was ranging from 1702.38 to 1777.88 (g/head/week). Quality ration is one of the factors that influence the final body weight of broiler. Genetic and environmental factors also affected the growth rate of body composition that includes the distribution of weight, chemical composition and carcass components. No significant effect of treatment among R1, R2, R3, R4 and R5 on the live weight of broilers was observed indicating the good nutritional quality of fermented palm kernel cake, as fermentation process can improve the digestibility of a product. Fermentation can improve digestibility, which is in accordance with the opinion of Table 3: The Average of feed consumption, body weight gain, feed conversion, body weight, carcass percentage on broiler Parameters Treatments R1 R2 R3 R4 R5 Feed consumption(g) Body weight gain(g) Feed conversion Body weight (g) Carcass percentage (%) 490.23 288.98 1.70 1777.81 71.32 490.88 286.36 1.71 1702.38 60.88 485.16 294.19 1.65 1751.83 64.10 495.98 287.20 1.73 1753.94 61.99 489.17 287.66 1.70 1777.88 70.13 Volume 52 Issue 6 (June 2018) 885 Sukaryana et al. (2010), that the materials that undergo fermentation will have a better quality. Body weight obtained from this study is lower than the results of research Mahanta et al. (2017), which ranges from 1825.17g to 2059.83 g. This is due to the use of supplementation of herbal growth promoter. The same results are also obtained by Borah et al. (2015) and Vidyarthi et al. (2010). Carcass Percentage: The carcass percentage of broiler was not affected (P>0.05) by the levels of PKCF in the diets. The increase in the level of PKCF in the diets did not reduce carcas percentage of the broilers. The carcass percentage was ranging from 60.88 to 71.32 (%). Carcass weight is directly related to body weight. The carcass weights of different groups did not differ significantly in the present study due to the equal quality of ration in every treatment, the balance of the food substance content in the feed material and the amount of feed consumed were also relatively common. In accordance with the opinion of Haroen (2003), that the diet contains nutrients similar to the same processing system will generate the same carcass weight. The factors affecting broiler

carcass weight are genetic, sex, physiology, age, body weight and ration composition. These results are higher than the average of carcass weight obtained by Priabudiman and Sukaryana (2011), on the effect of the use of palm kernel cake fermentation. CONCLUSION Based on the results of this study, it can be concluded that the use of PKC fermented by Sclerotium rolfsii in broiler ration can be utilized up to the level of 32% to achieve 287.66 g/head/week body weight gain with feed consumption of489.17 g/head/week resulting in a feed conversion of 1.70, with final body weight of 1777.88 g/ head and 70.13% carcass percentage of broiler. ACKNOWLEDGEMENT The authors were very grateful for the financial support of BOPTN Andalas University. Nomor: 49/ UN.16.17/PP.HGB/LPPM/2017, date March 21st 2017 REFERENCES Alimon, A.R., (2004). The nutritive value of palm kernel cake for animal feed. Palm Oil Dev. 40: 12–14. Bakker T.W., Drouliscos N.J. and Worgan J.T.. (1981). Composition and Nutritional evaluation of Aspergillus orizae biomass grown on palm oil processing effluents. J. Sc. Food Agric. 32: 1014-1020. Borah, L. Das, A.K., Phukan, B. and Das, J. (2015). Effect of dietary supplementation of herbal growth promoter on performance of broilers. Indian Vet. J. 92: 58-60. Dairo, F. A. S and Fauyi, A. O. (2008). Evalution of fermented palm kernel meal and fermented copra meal protein as subsitute for soybean meal protein in laying hens diets. 9(1): 35-44. Enviromate, T. M. (2002). Effect of humic acid on animal and humans (literature review and current research). Effects of humic acid. Eren, M. G. Deniz, S. S. Gezen and L Turkmen. (2000). Broyler yemelerine katilan humat larin, konsantrasyonuve kemik kuluuzerin etkileri. Ankara Oniv. Vet. Fak Derg. 47: 255- 263. Ezhieshi. E. V and J. M. Olomu. (2004). Nutritional evaluation of palm kernel meal types: 2. Effects on live performance and nutrient retention in broiler chicks diets. African Jurnal of Biotechnology. 7(8): 1171 – 1175. Haroen, U. (2003). Respon ayam broiler yang diberi tepung daun sengon (albizziafalcataria) dalam ransum terhadap pertumbuhan dan hasil karkas. J. Ilmiah ilmu-ilmu Peternakan. 6(1): 34-41. Iyayi, E. A. (2004). Changes in the cellulose, sugar and crude protein contens of agro-industrial by-products fermented with Aspergillus hiner, Aspergillus flavus and Penicillium sp. African Journal of Biotechnology. 3(3): 186 – 188. Kucukersan, S., Kucukersan., K., Colpan., I, Goncuoglu. E., Reisli. Z., Yesilbag D. (2005). The effect of humic acid on egg production and egg traits of laying hen. Vet. Med-Czech. 50(9): 406-410. Mahanta, J. D. Borgohain, B., Mihir Sarma, Sapcota D. and Jakir Hussain. (2017). Effect of dietary supplementation of herbal growth promoter on performance of commercial broiler chicken. Indian J. Anim. Res. 51(6): 1097-1100. Meryandini, A.R. Angreandari dan N. Rahmania. (2008). Isolasi bakterimananolitik dan karakterisasi mananasenya. Biota. 13(2): 82-88. Mirnawati, Y. Rizal,Y. Marlida and Kompiang I. P., (2010). The Role of humic acid in palm kernel cake fermented by Aspergillus niger for poultry ration. Pakistan Journal of Nutrition. 9(2): 182-185. Mirnawati, Y. Rizal, Y. Marlida and Kompiang, I. P. (2011). Evaluation of palm kernel cake by Aspergillus niger as substitute for soybean meal protein in the diet of broiler. International Journal of Poultry Science. 10(7): 537-541. Mirnawati, IP. Kompiang and Latif. Suslina A. (2012). Effect of substrate

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