Quest Journals
Journal of Research in Agriculture and Animal Science
Volume 8 ~ Issue 2 (2021) pp: 43-48
ISSN(Online) : 2321-9459
www.questjournals.org

Research Paper

Performance of Broiler Given Palm Oil Waste Fermented with *Pleurotus ostreatus* In Ration

Nurhabiba[1*], Nuraini[2], dan Mirzah[2]
[1] *Pascasarjana Programe, Animal Science Faculty, Universitas of Andalas, Padang*
[2] *Department of Animal Nutrition and Feed Technology Science, Animal Science Faculty, University of Andalas, Padang*

ABSTRACT
This study aims to determine the limits and effects of the use of palm oil waste which is fermented with Pleurotus ostreatus in rations to the performance of broiler. This study used 100 Day of Chicken (DOC). The method used was an experiment with a Completely Randomized Design (CRD) with 5 treatments (0%, 6%, 12%, 18% and 24% fermented palm waste with Pleurotus ostreatus) with 4 replications. The observed parameters in this study are performance (feed consumption, body weight gain, and feed conversion). The results analysis of variance showed that the use of fermented palm waste with Pleurotus ostreatus has no effect (P>0.05) to the broiler performance. The conclusion of this study is the palm waste fermented with Pleurotus ostreatus to the level of 24%, In this condition ration consumption was 2652,19 g/chicken, body weight gain was 1579,94 g/chicken, and feed conversion was 1,68.
KEYWORDS: *palm oil waste, Pleurotus ostreatus, broiler performance, ration*

Received 10 Feb, 2021; Revised: 23 Feb, 2021; Accepted 25 Feb, 2021

I. INTRODUCTION

Feed is groceries single or mixed, whether treated or untreated, which is given to livestock for survival, growth and development, being right diet is a mixture of several feedstuffs are arranged such that the nutrients they contain balanced according to the needs of livestock . Feed is the primary need and the most important factor in addition to the factors of seeds and management in determining the success of a livestock business, especially broiler farms. Broilers have the advantages of fast growth, low feed conversion, tender meat quality and high feed efficiency (Tamalludin, 2014). The characteristics of broilers are fast growth, efficient in converting rations into meat, large body size and broad breasts and have a lot of meat (AAK, 2003).

Feed costs are the largest component of the total production costs that must be incurred during maintenance, about 70% of the total production costs in the broiler business are feed costs. Therefore, the cost factor of feed must be given serious attention, besides that the price of conventional feed often fluctuates so that non-conventional feed is needed as an alternative feed for livestock. Of course, the alternative feed must meet certain criteria so as not to have a negative effect on livestock growth and production.

One of the steps that can be taken is to utilize agro - industrial waste which contains nutrients at low prices and is continuously available . Agro-industrial waste that can be utilized is industrial waste from oil palm plantations. The area of oil palm plantations according to data from the Ministry of Agriculture of the Republic of Indonesia (2018), the area of oil palm plantations in 2017 was 14,030,573 hectares with a total oil palm production of 37,812,628 tons. Oil palm plantation industrial waste that can be used as an alternative feed ingredient is oil palm sludge and palm kernel meal . Per tons of fresh palm fruit bunches (FFB) can produce 294 kg of sludge oil and 35 kg of palm kernel meal (Mathius, 2003).

Oil sludge is a waste of the industrial manufacture of palm oil but has a low crude protein content is 11.30% and the high crude fiber, namely 25, 80% (lignin as high as 19,19% and cellulose height is 20,22%), so that mixed with palm kernel cake, which is an agro byproduct which has a higher crude protein content of 16,30% and lower crude fiber, namely 21,75% (lignin 16,96% and cellulose 17,67%) compared to palm sludge (Nuraini et al., 2016). This palm oil waste is mixed with bran to get good aeration (porosity) for the development of microorganisms.

The mixture of palm oil waste and bran contains 13,35% crude protein but still high crude fiber content of 22,61% (15,59% lignin and 17,59% cellulose), so it is necessary to reduce crude fiber, one of which is fermentation using *Pleurotus ostreatus*. *Pleurotus ostreatus* classified as white rot fungi are able to degrade lignin for producing enzymes ligninolitik such as lignin peroxidase, mangan peroxidase and laccase (Periasamy and Natarajan, 2004), but it also produces the enzyme protease (Shaba and Baba, 2012), cellulase and amylase (Sudiana and Rahmansyah, 2002).

Research on the mixture of palm oil waste and fermented bran has been carried out and the results obtained with a dose of 8% and fermentation time of 9 days an increase in crude protein from 13,35% to 20,36% and a decrease in crude fiber from 22,61% to 14,74% (lignin 10,75% and cellulose 11,60 %) and obtained crude fat content of 6,07 %, Ca 0,53%, P 0,41% , and metabolic energy 2.469,85 kcal/kg (Results of analysis of the Laboratory of Non-Ruminant Nutrition and Feed Industry Technology, 2019) . The increase in crude protein content and the decrease in crude fiber content contained from a mixture of palm oil waste and fermented bran with *Pleurotus ostreatus* are expected to have a good effect on broiler performance .

II. METHOD

Research Material

This study 100 DOC broilers were used, a mixture of waste oil and bran fermented with *Pleurotus ostreatus* (LSDF). The ratio is composed of protein iso and energy iso. 21% and 2900 kcal/kg for the starter period, while for the finisher period it is 20% and 2900 kcal/kg. Feed ingredients, the composition of the ration, and ration food substances research can be seen in Table 1, 2 and 3. Equipment used in the research cages as many as 20 units with places for feeding and drinking, scales .

Experimental Design

This study used an experimental method using a completely randomized design with 5 treatments and 4 replications. Each experimental unit is filled each with four tail broiler . Each treatment was differentiated by giving different levels of mixture of palm oil waste and fermented bran with different *Pleurotus ostreatus* in the ration. Each treatment is marked as follows:

A = ration with 0% LSDF
B = ration with 6% LSDF
C = ration with 12% LSDF
D = ration with 18% LSDF
E = ration with 24% LSDF

Research Implementation

The procedures for making fermented products first weighed the substrate with a composition of 80 waste oil (40% sludge oil and 40% palm kernel meal) and bran 20% of the total fermentation products further added distilled water as much as 125ml/100 g of substrate and mineral brook et al as much 7 ml/100g of the substrate. The mineral composition of Brook et al consists of $MgSO_47H_2O$ (2,5 g), $FeSO_47H_2O$ (1 g), KH_2PO_4 (0,01 g), $ZnSO_44H_2O$ (1 g), $MnSO_44H_2O$ (0,01 g), Thyamin hydrochlorine (0,1225 g) and urea (50 g) were dissolved in 1000 ml distilled water . Substrat subsequently steamed using autoclave at a temperature of 121 °C for 15 minutes. Substrat already sterile further in inoculated mushroom *Pleurotus ostreatus* as much as 8% of the substrate, and fermented for 9 days with a substrate thickness of 2 cm. The fermented products that have been fermented are then harvested and dried in the sun until the fermented products are dry. The fermentation products were mixed into the ration according to the treatment.

Observed Variables

In this study, the observed variables were: ration consumption (g/head), body weight gain (g/head) , and ration conversion.

Data Analyze

Data obtained is processed menggun a right analyze of variance (ANOVA) in accordance with the design used. The results of the analyzed of diversity had a real or very real effect. Then the Duncan Multiple Range Test (DMRT) was carried out to determine the differences between treatments (Steel and Torrie, 1995).

Table 1 . Feed ingredients, nutrient content (%) and metabolic energy (kcal / kg) of ingredients for ration (as feed) [a] .

Bahan Pakan	CP (%)	CF (%)	CF (%)	Ca (%)	P (%)	EM[d] (Kcal)
Milled corn[a]	8,50	2,66	2,90	0,38	0,19	3300,00
Rice bran[a]	9,50	5,09	14,50	0,69	0,26	1640,00

Coconut oil	-	100	-	-	-	8600
LSDF	20,36[e]	6,07[g]	14,74[f]	0,53[g]	0,41[g]	2469,85[g]
Soybean meal	43,35	2,49	5,00	0,63	0,36	2240,00
Meat flour[c]	52,15	12,99	4,45	3,66	1,28	2150,00
Bravo 311[b]	21,50	4,50	5,00	1,00	0,60	3200,00
top mix[b]	-	-	-	0,06	0,003	-

Description: [a] Nuraini et al. (2018)
[b] Product Packaging Labels of PT. Charoen Pokphan
[c] Yuniza et al. (2018)
[d] Scott *et al.* (1982)
[e] Nurhabiba (2019)
[f] Gusri (2019)
[g] Non-Ruminant Nutrition Laboratory Analysis Results (2019)

Table 2 . Composition of the sterter phase research ration (%)

Feed Materials	Ration				
	A	B	C	D	E
Milled Corn	49,50	46,50	44,00	41,50	38,50
Soybean Meal	19,50	17,50	15,50	13,00	11,00
Rice Bran	6,50	5,50	4,00	3,00	2,00
LSDF	0,00	6,00	12,00	18,00	24,00
Bravo Ration 311	11,00	11,00	11,00	11,00	11,00
Meat Flour	11,00	11,00	11,00	11,00	11,00
Coconut Oil	2,00	2,00	2,00	2,00	2,00
Top mix	0,50	0,50	0,50	0,50	0,50
Total	100,00	100,00	100,00	100,00	100,00
Crude Protein (%)	21,23	21,24	21,25	21,09	21,10
Crude Fat (%)	6,06	6,24	6,41	6,60	6,78
Crude Fiber (%)	4,39	4,94	5,44	5,98	6,53
Energy Metabolizm (Kcal/kg)	2936,75	2924,84	2921,28	2914,67	2902,76

Table 3 . Composition of the finisher phase research ration (%)

Feed Materials	Ration				
	A	B	C	D	E
Milled Corn	50,00	47,50	45,00	42,50	40,00
Soybean Meal	16,50	14,50	12,50	10,50	8,50
Rice Bran	9,00	7,50	6,00	4,50	3,00
LSDF	0,00	6,00	12,00	18,00	24,00
Bravo Ration 311	11,00	11,00	11,00	11,00	11,00
Meat Flour	11,00	11,00	11,00	11,00	11,00
Coconut Oil	2,00	2,00	2,00	2,00	2,00
Top mix	0,50	0,50	0,50	0,50	0,50
Total	100,00	100,00	100,00	100,00	100,00
Crude Protein (%)	20,21	20,22	20,22	20,23	20,24
Crude Fat (%)	6,12	6,29	6,47	6,64	6,81
Crude Fiber (%)	4,62	5,11	5,61	6,10	6,60
Energy Metabolizm (Kcal/kg)	2926,80	2923,24	2919,68	2916,12	2912,56

III. RESULTS AND DISCUSSION

Effect of Treatment against Broilers Performance

The average performance of broilers given mixed treatment of palm oil waste and fermented bran with *Pleurotus ostreatus* can be seen in Table 4.

Table 4 . Average performance of broilers during the study

Performa^{ns}	Treatment Rations					Standard Error
	A	B	C	D	E	
Ration consumption (g/head)	2660,56	2653,81	2655,13	2643,63	2652,19	9,43
Body weight gain (g/head)	1579,13	1605,88	1587,25	1588,75	1579,94	6,66
Conversion rations	1,68	1,65	1,67	1,66	1,68	0,01

Keterangan : ns = non significant (P>0.05)

Based on the results of analysis of variance showed that the use of a mixture of waste oil and bran fermented with *Pleurotus ostreatus* giving effect no significant (P> 0.05) on the performance of broiler . The consumption of broiler rations in this study ranged from 2643,63 g/head to 2660,56 g/ head. The same intake of broiler rations in the treatment using LSDF (treatment B, C, D, and E) with treatment without LSDF (treatment A) showed that the same ration palatability. This shows that the use of a mixture of palm oil waste and bran fermented with *Pleurotus ostreatus is* still preferred by broilers up to 24% usage . This means that the treatment ration has the same palatability as the control ration (treatment A). This condition is caused by processing a mixture of palm oil waste and fermented bran with *Pleurotus ostreatus which* can improve the quality of the resulting mixture of palm waste so that it does not reduce palatability or affect broiler consumption.

Feed palatability is the attractiveness of feed or feed ingredients that can cause animal appetite. The level of palatability of the ration greatly affects the amount of consumption. The higher the level of palatability of livestock to a given ration, the higher the ration consumption and vice versa (Adha *et al.*, 2016). In addition to palatability, many factors affect ration consumption, including color, smell, taste (Mc. Donald *et al.*, 2010) and Wahju (2004) reported that feed consumption can be influenced by many factors, namely strain, age of birds, feed given, disease. and ambient temperature. All research chickens were raised under the same management and environment. This is in accordance with research by Lubis *et al.* (2007) who showed that broiler chickens reared with the same management and environment had no effect on broiler ration consumption.

The provision of a mixture of palm oil waste and fermented bran with *Pleurotus ostreatus* up to a level of 24% in the broiler ration can still be used, this can be seen by not disrupting the consumption of rations consumed by broilers after being given a mixture of palm waste and fermented bran with *Pleurotus ostreatus* in the ration. Murugesan *et al.* (2005) reported that fermented products have better nutritional content than their original ingredients because they experience favorable changes such as a better flavor, higher amino acids than the original material, and a decrease in crude fiber content. In accordance with the opinion of Fardiaz (2002) fermented products have better nutritional value than their original ingredients because they have undergone beneficial changes such as flavors, vitamins, and amino acids and can increase digestibility. Microorganisms with the enzymes produced can break down complex compounds such as carbohydrates, proteins and fats into simpler compounds such as glucose, amino acids, and fatty acids. Lubis *et al.* (2007) stated that the consumption of rations that are not different in broiler chickens can be caused by the energy content that meets the needs of broiler chickens. The energy content in this study is the same, namely 2900 kcal / kg. Wahju (2004) added that the high and low consumption of broiler chicken rations could be influenced by the energy content in the rations consumed.

The average broiler body weight gain in this study ranged from 1579.13 (g / head) to 1605.88 (g / head). The same broiler body weight gain in the treatment using LSDF (treatment B, C, D, and E) without LSDF (treatment A) shows that the consumption of the same ration results in the same amount of nutrients used for the formation of body tissue, resulting in increased the resulting body weight is the same. The same body weight gain is also due to LSDF fermentation with *Pleurotus ostreatus which* can cause changes in the digestibility of the substrate as a result of the breakdown of complex food substances, namely protein, fat, and carbohydrates which can be hydrolyzed more simply, for example cellulose to cellubiose and glucose resulting in nutritional value. and metabolic energy increases so that the resulting LSDF has high digestibility.

Body weight is influenced by ration consumption, increasing body weight occurs due to high ration consumption so that the amount of food substances contained in the ration is needed for the formation of meat will be more. The consumption of the same ration, especially the consumption of the same protein in this study , namely treatment A 2660.56 g/head is also the same as treatment B 2653.81 g/head, treatment C 2655.13 g/head, treatment D 2643.63 g/head. tail, and treatment E 2652.19 g/head. Protein is the main element in the formation of meat, if the consumption of protein is high, the resulting body weight will be high. Mousavi *et al* . (2013) stated that optimal productivity is influenced by the proper protein content in the ration.

Body weight in treatment B, C, D, and E with the same treatment A because LSDF can cover the nutritional content of corn, bran, and soybean meal. The advantage of the LSDF mixture is that it has better nutritional content compared to the original product, which is lower crude fiber content and higher crude protein. Fermentation with *Pleurotus ostreatus* has the advantage that it degrades lignin more extensively because it produces lign in olytic enzymes, including laccase, lignin peroxidase and manganese peroxidase (Periasamy and Natarajan, 2004), besides that *Pleurotus ostretaus* also produces protease enzymes (Shaba and Baba, 2012)), cellulase and amylase (Sudiana and Rahmansyah, 2002). Fermentation has the advantage of increasing crude protein content contributed by the microbes themselves, this is in accordance with the opinion of Boonnop *et al.* (2009) fermentation can increase the crude protein content of a material.

The Cu content contained in palm oil waste can affect the work of the enzymes produced by *Pleurotus ostreatus* . The mineral Cu (copper) is an inhibiting factor for the activity of the cellulase enzyme, this is in accordance with the opinion of Deng & Tabata Ba i (1994) that metal compounds and other compounds that can inhibit the activity of cellulase enzymes include Hg^{2+}, Ag^{2+}, and $Cu^{2+.}$, s enyawa such inhibitors can reduce the overall speed of hydrolysis by inhibiting the absorption eksoglukanase and endoglucanase cellulose, and inhibits the action of synergistic eksoglukanase and endoglucanase that works on the surface of the cellulose but the presence of Cu contained in the waste oil can optimize the work of the enzyme laccase where Cu is an important micronutrient for white rot fungi in producing laccase enzymes (Usha *et al* ., 2014). M ineral copper (Cu) is also able to induce labor laccase enzyme activity (Gomaa and Momtaz, 2015) and manganese peroxidase (Montoya *et al* ., 2015) in white rot fungi degrade lignin is optimal. Lignin which is more intensively degraded by lignin-breaking enzymes produced by *Pleurotus ost r eatus* causes the content of crude fiber contained in the fermentation product to be lower than the original material.

The mean of broiler ration conversion in this study ranged from 1.65 to 1.68. It is different from the fact that the effect of treatment on the conversion of broiler rations is due to the consumption of rations and the weight gain of treatment A to E are the same, so that the conversion of the resulting ration is also the same, in numbers from treatment A to B it has decreased due to consumption A (2660.56 g/head) is higher than the consumption of treatment B (2653.81). In treatment A and E the ration conversion was the same as 1.68, it was obtained because the body weight gain was also the same (1579 g/head)

According to Cahyono (2004) ration conversion is the ratio between the consumption of the ration spent at a certain time to the body weight it achieves. Anggorodi (1995) states that the quality of the ration greatly determines the size of the resulting conversion, good quality rations with balanced nutritional content and high palatability make the resulting ration conversion better, on the other hand, low quality rations result in low conversions. Feed conversion shows a measure of efficiency in feed use. The higher the feed conversion value, the more feed is needed to increase body weight per unit weight. A low feed conversion ratio means that to produce one kilogram of chicken meat, less feed is needed (Wahju, 2004).

The increase in ration conversion in treatment E was caused by decreased body weight gain in treatment E. Low body weight gain resulted in increased ration conversion because ration conversion was closely related to body weight gain. Amrullah (2003) added that the better the quality of the ration, the smaller the conversion value of the ration. The quality of the ration is determined by the balance of nutrients in the ration needed by the livestock. A good quality ration with a balanced nutritional content and high palatability results in better ration conversion, on the other hand, a low quality diet with low palatability results in low conversion.

IV. CONCLUSION

The use of a mixture of palm oil waste and bran fermented with *Pleurotus ostreatus* up to 24% in the ration can maintain broiler performance even though there is a reduction in the use of corn, soybean meal and bran in the ration without disrupting ration consumption, namely 2652.19 g/head , weight gain 1579, 94 g/ head, and ration conversion 1,68.

REFERENCE

[1]. Adha, R.U., T. Widjastuti, Abun. 2016. Pengaruh penambahan tepung kunyit (*Curcuma Domestica Val*) dalam ransum terhadap performa ayam betina sentul putih pada periode grower (8-16 Minggu). Universitas Padjadjaran. Bandung.

[2]. Aksi Agraris Kanisius (AAK). 2003. Beternak Ayam Pedaging. Cetakan ke-18. Kanisius. Jakarta.

[3]. Amrullah, I. K. 2003. Nutrisi Ayam Petelur. Cetakan Pertama. Lembaga Satu Gunung Budi. Bogor.

[4]. Anggorodi, H. 1995. Ilmu Makanan Ternak Unggas. PT. Gramedia, Pustaka Utama, Jakarta.

[5]. Boonnop, K., Wanapat, M., Nontaso, N. dan Wanapat. S. 2009. Enriching nutritive value of casava root by yeast fermentation. Scientia Agricola (Piracicaba, Braz) (6): 629-633.

[6]. Cahyono, B, Ir. 2004. Cara Meningkatkan Budidaya Ayam Ras Pedaging (Broiler). Yayasan Pustaka Nusatama, Yogyakarta.

[7]. Deng, S. P., & Tabatabai, M. A., 1994, Cellulase Activity In Soils, Soil Biol, Biochem, 26, 1347–1354.

[8]. Fardiaz, S. 2002. Mikrobiologi Pangan 2. PT. Gramedia Pustaka Utama, Jakarta.

[9]. Gomaa, O. M., Momtaz, O. A. 2015. Tembaga induction and differential expression of laccase in *Aspergillus flavus*. Braz. J. Microbial. 46(1) : 285-292.

[10]. Kementerian Pertanian Republik Indonesia. 2018. Statistik Pertanian 2018. Jakarta .

[11]. Lubis, Ade Fatma et al. (2007). Aplikasi SPSS (Statistical Product and Service Solutions) untuk penyusunan skripsi & tesis, USU Press, Medan.

[12]. Mathius ,I.W. 2003. Perkebunan kelapa sawit dapat menjadi basis pengembangan sapi potong. Warta Penelitian dan Pengembangan Pertanian, Vol.25, No.5.

[13]. McDonald P, Edwards RA, Greenhalgh JFD, Morgan CA, Sinclair La, Wilkinson

[14]. Montoya, S. Sanchez, O. J., Levin, L. 2015. Production of lignocellulolytic enzymes from three white-rot fungi by solid-state fermentation and mathematical modeling. African Journal of Biotechnology. 14(15) : 1304 – 1317.

[15]. Mousavi SN, Khalaji S, Ghasemi-Jirdehi A, Foroudi F. 2013. Investigation on the effects of dietary protein reduction with constant ratio of digestble sulfur amino acids and threonine to lysine on performance, egg quality and protein retention in two strains of laying hens. Italian Journal Animal Science. Vol. 12(2): 9-15.

[16]. Murugesan, G., M. Sathishkumar and K. Swarninathan. 2005. Suplementation of waste tea fungal biomass as a dietary ingredient for broiler chicken. Bioresurce Technology 96 : 1743–1748.

[17]. North, M. O. & D. D. Bell. 1992. Commercial Chicken Production Manual. 4th Edition. An AVI Book Published by Van Nostrand Reinhold, New York.

[18]. Nuraini, Y. S. Nur dan A Djulardi 2018. Peningkatan kualitas kulit buah kakao melalui fermentasi dengan pelurotus ostreatus dan aplikasinya untuk produksi telur dan daging rendah kolesterol. Laporan Penelitian Hibah Riset Dasar (Kompetensi) Universitas Andalas, Padang.

[19]. Nuraini., A. Djulardi. dan A. Trisna. 2016. Peningkatan kualitas lumpur sawit dan bungkil inti sawit dengan fungi ligninolitik, selulolitik dan karatenogenik untuk memproduksi daging dan telur rendah kolesterol. Laporan Kluster Guru Besar. Lembaga Penelitian Pengabdian Masyarakat. Universitas Andalas. Padang.

[20]. Periasamy, K. and K. Natarajan. 2004. Role of lignocellulosic enzymes during basidiomata production by *Pleurotus* djamor var. roseas. Indian Journal of Biotechnology 3 : 577-583.

[21]. Pond, W.G., D.C. Church, and K.R. Pond, 1995. Basic Animal Nutrition and Feeding. Fourth edition. John Wiley & Sons, New York.

[22]. RG. 2010. Animal Nutrition. Ed ke-7. New York (US): Prentice Hall.

[23]. RG. 2010. Animal Nutrition. Ed ke-7. New York (US): Prentice Hall.

[24]. Scott, M. L.,M.C. Nesheim and R.J. Young. 1982. Nutrition of The Chicken Fourth Ed. Published by M. L. Scott and Associates, Ithaca, New York.

[25]. Shaba, AM. dan Baba, J. 2012. Screnning of *Pleurotus ostreatus* and *Gleophylum septarium* strain for exstracelular protease enzim production. Bayero Journal of Pure and Applied Science. Vol. 5:1.

[26]. Steel, R. G. D. dan Torrie, J. H. 1995. Prinsip dan Prosedur Statistik. PT. Gramedia. Jakarta.

[27]. Sudiana I. M. dan Rahmansyah M, 2002. Aktivitas amilase dan selulase jamur tiram putih yang ditumbuhkan pada media ampas aren dan serbuk gergaji kayu. Jurnal Mikrobiologi Indonesia. Vol. 7: 7-10.

[28]. Tamaluddin, F. 2014. Panduan Lengkap Broiler. Penebar Swadaya, Jakarta.

[29]. Usha, K. Y., Praveen, K. Reddy, B. R. 2014. Enhanced Production of Ligninolytic enzymes by a Mushroom *Stereum ostrea*. Biotechnology Research International. 2014 : 1-9.

[30]. Wahju J. 2004. Ilmu Nutrisi Unggas. Yogyakarta (ID) : Gajah Mada University Press.

[31]. Yuniza, A., Y. Rizal., dan A. Sandra. 2018. Peningkatan Performa Broiler dan Kualitas Karkasnya Melalui Sistem Pemeliharaan Organik dan Pemberian Krokot (*Patulaca cloracca*) Sebagai Sumber Asam Lemak Omega Tiga.Laporan Akhir Penelitian Tahap I KRP2GB.PTU.UNAND.