The International Journal of Engineering and Science (IJES)
|| Volume || 10 || Issue || 3 || Series II || Pages || PP 01-05 || 2021 ||
ISSN (e): 2319-1813 ISSN (p): 20-24-1805

The Evaluation of Raw Material of Complete Feed Based On Corn Stover withCalliandra Leaf (CalliandraCalothyrsus) And *Myristic Acid* Addition

Akbar, M[1)]S. Chuzaemi[2)]Mashudi[2)*]

[1)] *Postgraduate Student of Animal Nutrition and Food Sciences, Faculty of Animal Husbandry, University of Brawijaya*

[2)] *Department of Animal Husbandry, University of Brawijaya, Malang 65145, Indonesia*

Corresponding Author: Akbar, M

----------***ABSTRACT***----------

This research aimed to evaluate the effect of Calliandra leaf (Calliandracalothyrsus) and myristic acid (MA) addition to complete feed based on corn stover towards the nutrient value. The material used werecomplete feed raw materials based on corn stover, coffee husk, bran, tapioca residue, soybean meal, palm kernel meal, copra meal, urea, molasses, calliandra leaf and myristic acid, The treatments were organized based on DM with the formulations; P1 = Complete Feed (40% Corn Stover + 60% Concentrate), P2 = Complete Feed (40% Corn Stover + 60% Concentrate + 0% Calliandra)+ MA 30g/kg DM, P3 = Complete Feed (40% Corn Stover + 50% Concentrate + 10% Calliandra) + MA 30g/kg DM, P4 = Complete Feed (40% Corn Stover + 45% Concentrate + 15% Calliandra) + MA 30g/kg DM, P5 = Complete Feed (40% Corn Stover + 40% Concentrate + 20% Calliandra) + MA 30g/kg DM. All treated feeds were prepared with protein iso, with a 14-15% protein content. The reduction of feed composition percentage was parallel with the calliandra leaf added to the complete feed. The results indicated that addition of calliandra leaf and MA increased CF and NDF content. This research finally concluded that addition calliandra leaf could increase protein for feed, which the raw material of protein sources was decreased. Thus it could be an alternative solution for an expensive protein source.

Keywords:*Corn stover, calliandra leaf, complete feed*

Date of Submission: 11-03-2021 Date of Acceptance: 26-03-2021

I. INTRODUCTION

A feed is a food given to livestock to meet production and reproduction needs. The essential raw material for the beef castle is forage, which is a significant fiber source for microbial life in the rumen. Forage that breeders often provide is Napier grass, Bengal grass, field grass, and sugarcane. Besides, there are other cheaper sources of forage, agricultural waste such as corn straw. Corn stover is a maize plant where the cobs have been taken so that only stems and leaves are left [1]. It is abundant in areas that are centers of maize plants for intended animal feed. Giving corn stover only could not meet the nutrition needs of livestock; thus, it is necessary to provide a feed booster, namely concentrate. Technological development sustains the beef cattle growth's effectiveness by applying complete feed using forages added with feed booster, a complete feed.

A complete feed is a method or technique of making feed in which the crude fiber and protein sources are mixed homogeneously through a physical treatment process and supplementation, which is packaged in certain forms; thus, it will be effective and simplify in storage [2]. The advantage of this complete feeding for livestock is more practical and potentially increases the feed palatability. Corn stover is corn stalks and leaves that have been harvested and desiccated on the field [3]. Corn straw contains of several nutrient contents such as DM (39.8%), CP (5.5%), EE (0.9%), CF (28.1%), and ash (10.6%) [4]. Corn stover cannot be used in a single feed because it has low quality and high fiber content; thus, feed additive is needed to concentrate by feed booster. [5] stated that fibrous feed (forage) produces more methane gas compared to feed derived from grains (concentrate).

Calliandra is a plant that has a high protein content of 21.10% [6]. Furthermore, it contains tannin, which is positive for ruminants. Tannin can intensify protein in feed in the rumen, thereby reducing the degradation of high protein feed, and the feed can be absorbed in the post-rumen tract [7]. Besides, palm oil is the right product and widely consumed by humans. Crude Palm Oil (CPO) contains ten fatty acids, namely laurate, myristate, palmitate, palmitoleate, stearic, oleic, linoleic, linolenic, arachidate, and gadoleic. [9] conducted research using complete feed based on corn stover by adding several levels of myristic acid; 20, 30, and 40 g/Kg DM tannin sourced from mimosa powder by measuring the nutritional content of a complete feed.

The research applied myristic acid with 20, 30, and 40 g/Kg DM, which influenced EE. Therefore, based on that research, this research was conducted to determine the nutrient content of the complete feed's raw material based on corn stover with the addition of calliandra leaf and MA.

II. MATERIAL AND METHODS

Sample Collection and Preparation

Raw material treatment, which contains of corn stover, coffee husks, bran, tapioca residue, soybean meal, palm kernel meal, copra meal, urea, molasses were obtained from livestock shop in Malang. Calliadra leaf was obtained from Tulungagung, East Java. Tannin content test were carried out at LPPT University of Gajah Mada, Yogyakarta, and tannin condensation content test were carried out at BPPT Ciawi, Bogor. The feed ingredients are dried in an oven at temperature 40˚C for 3 days, then the samples are ground into flour. The fatty acids used were obtained from CV.CiptaAnugrahBaktiMandiri, Banyuwangi with 99.7% *myristic acid*, 0.1% lauric acid, 0.1% palmitic acid and 0.1% other compounds. Feed treatment, which contains of corn stover, coffee skin, rice bran, tapioca residue, soybean meal, palm oil meal, copra meal, urea, molasses calliandra leaf, and *myristic acid* were formulated using microsoft excel provided that the feed protein value of 14-15%.The treatments applied were formulated based on DM as follows:

P1 = Complete Feed (40% Corn Stover + 60% Concentrate)
P2 = Complete Feed (40% Corn Stover + 60% Concentrate + 0% Calliandra) + MA 30g/kg DM
P3 = Complete Feed (40% Corn Stover + 50% Concentrate + 10% Calliandra) + MA 30g/kg DM
P4 = Complete Feed (40% Corn Stover + 45% Concentrate + 15% Calliandra) + MA 30g/kg DM
P5 = Complete Feed (40% Corn Stover + 40% Concentrate + 20% Calliandra) + MA 30g/kg DM

Chemical Analysis

The analysis applied was proximate analysis that includes; dry matter, organic matter, ash, crude protein, crude fat with method [10], the analysis of crude fiber, NDF, and ADF using method [11], which conducted in Laboratory of Animal Nutrition and Food Sciences, University of Brawijaya.

III. RESULT AND DISCUSSION

The nutrient content analysis result of raw material treatment can be seen in Table 1. The raw material used in this research were corn stover, coffee husks, bran, tapioca residue, soybean meal, palm kernel meal, copra meal, urea, molasses, calliandra leaf and *myristic acid*.The feed treatment percentage can be seen in Table 2. In Table 2, the percentages of rice bran, soybean meal, palm oil meal, and copra meal were different with P3-P5. The reduction in the percentage of feed ingredients is in line with the addition of calliandra leaf meal. The reduction in feed ingredients is because calliandra has a high protein content and is expected to replace the lost protein from the feed by reducing the protein source feed ingredients. *Myristic acid* used contains 99.7% myristic acid, 0.1% lauric acid and 0.1% palmic acid, and 0.1% other compounds.

Table 1. Nutrient Content of Raw Material and Tannin Content of Calliandra Leaf

Raw Material	DM	OM*	Ash*	CP*	CF*	EE*	Tannin (%)	C. Tannin (%)
Coffee Husk	94.14	89.42	10.58	10.11	34.00	1.50	-	-
Bran	90.63	87.40	12.60	10.15	16.20	13.00	-	-
Tapioka Residue	92.59	82.87	17.13	1.76	25.39	0.44	-	-
Soybean Meal	93.53	91.62	8.38	47.53	4.04	2.57	-	-
Palm Kernel meal	95.39	94.97	5.03	14.24	20.91	10.01	-	-
Copra Meal	95.69	92.23	7.77	22.12	21.78	2.45	-	-
Urea	99.88	99.93	0.07	244.60	-	-	-	-
Molasses	78.47	84.57	15.43	4.55	9.81	-	-	-
Corn Stover	94.46	89.83	10.17	5.13	36.43	0.63	-	-
Calliandra Leaf	93.67	92.37	7.63	23.16	12.08	3.90	8.86	0.46

Note: -*Based on 100% DM.
- Analyzed value of Animal Nutrition and Food Sciences Laboratory, Faculty of Animal Husbandry, University of Brawijaya (2020).

- Tannin content analysis carried out at the Integrated Research and Testing Laboratory University of Gadjah Mada, Yogyakarta (2020).
- Analysis of tannin condensed (C. Tannin) was conducted in BPPT, Ciawi, Bogor (2021).

Tannin content on calliandra leaf powder can be seen in Table 1. The tannin content in the sample of calliandra leaf powder was 8.86%, with the content of tannin condensation calliandra leaf meal was 0.46%. The result of this tannin content in calliandra is less than that obtained by [12], which is 10%. According to [13], drying and aging of the leaves can affect the content of bioactive compounds contained in a material. According to [14], the drying time can affect the tannin content in the material, with the best drying time obtained is 8 hours.

The nutrient content of feed treatment can be seen in Table 1. The nutritional content expected in this study is 14-15% crude protein feed according to the nutritional needs of beef cattle. The addition of calliandra leaf meal helped increase feed protein, reducing the percentage of protein source feed ingredients. It is because calliandra has a high protein content of 23.16%. The addition of calliandra leaf meal and *myristic acid* to feed can affect the nutritional content of the feed.

Table 2.Feed Treatment Percentage

	Treatment (%)				
Raw Material	P1	P2	P3	P4	P5
Coffee Husks	17	17	17	17	17
Bran	20	20	18	18	16
Tapioca Residue	10	10	10	10	10
Soybean Meal	21.67	21.67	19	18	17
Palm Kernel Meal	13.33	13.33	10	8	7
Copra Meal	12	12	10	8	7
Urea	1	1	1	1	1
Molasses	5	5	5	5	5
Calliandra Leaf	0	0	10	15	20
Total	100	100	100	100	100
Myristic acid (%/kg DM)	0	30	30	30	30
Corn Straw	40	40	40	40	40

Notes: P1 = Complete Feed (40% Corn Stover + 60% Concentrate), P2 = Complete Feed (40% Corn Stover + 60% Concentrate + 0% Calliandra) + MA 30g/kg DM, P3 = Complete Feed (40% Corn Stover + 50% Concentrate + 10% Calliandra) + MA 30g/kg DM, P4 = Complete Feed (40% Corn Stover + 45% Concentrate + 15% Calliandra) + MA 30g/kg DM, P5 = Complete Feed (40% Corn Stover + 40% Concentrate + 20% Calliandra) + MA 30g/kg DM.

Table 3.Nutrient Content of Complete Feed Based on Corn Straw

Treatment	DM (%)	OM (%)	Ash (%)	CP (%)	CF (%)	EE (%)	NDF (%)	ADF (%)
P1	92.54	93.38	6.58	15.41	17.12	3.62	37.65	20.97
P2	93.64	93.07	6.91	15.66	19.19	3.72	41.39	23.10
P3	93.12	93.15	6.85	14.36	19.99	3.62	42.67	20.30
P4	92.61	93.34	6.66	15.96	19.97	2.89	40.21	20.05
P5	92.72	93.28	6.72	15.04	19.64	3.25	41.29	24.01

Notes: Analyzed Value of Animal Nutrition and Food Sciences Laboratory, Faculty of Animal Husbandry University of Brawijaya (2020)

The addition of calliandra leaf powder in the complete feed based on corn stover determines crude fiber (CF) content in feed treatment. In the feed treatment, CF content was 17.12-19.99%. The different CF values were caused by crude fiber from calliandra leaf, which was added to the complete feed. [15] conducted the research utilizing different crude fiber levels (12, 17, and 22% DM) given to Ongole crossbreed cows by

measuring consumption, digestibility, and VFA. The results showed that the difference in crude fiber given to livestock had a significant effect on the consumption and digestibility of DM, OM, CP, and CF, while the difference in the ratio of C2/C3 rumen fluid did not show any significant differences. [16] explicated that low levels of CF will facilitate the penetration of rumen microbes (bacteria, protozoa, and fungi) to digest feed nutrients. [17] concluded that the high crude fiber content in a complete feed would reduce the digestibility coefficient in the feed because crude fiber contains parts that are difficult to digest. Besides, the crude consumed by ruminants is not used as a whole; 20-79% of the fiber consumed is found in feces. Another study was conducted by [2] using a complete feed based on corn cobs with a combination of legumes about 17%. The results indicated that the CF analysis result on complete feed differs from the single feed given, corn cobs. This complete feed technology can also increase the protein value in feed. The research explicated that giving complete feed to PO cattle can increase body weight gain so, and it is more profitable for breeders.

In complete feed, besides the protein content, which must meet the needs of livestock, the content of NDF and ADF is also an essential factor. The results showed that the NDF content in P1 had the lowest value, about 37.65%, and the highest value for P3 was 42.67%. The ADF value in P4 had the smallest value, which was 20.05%, and the highest value in the P5 treatment was 24.01%. The research was conducted by [18] using a complete feed based on rice straw with different levels of mulberry added. The result indicated that the addition of mulberry to the feed did not affect the NDF and ADF content. The NDF content was 50-58% and ADF 40-52%. Another study was conducted by [19] using complete feed made from local ingredients with different protein values, at 9.10 and 11% in beef cattle. The result showed the NDF and ADF contents in the feed were degraded 53-60% of NDF and 33-40% of ADF. [20] stated that the content of NDF and ADF in feed could be a limiting factor in the feed digestibility in rumen. NDF and ADF content in the feed negatively correlated with nutrient digestibility and the number of metabolic energy. A low ADF content will correlate with a high level of feed digestibility.

Extract ether content in the treated feed was almost identical to the dietary control without *myristic acid* addition. The results are incompatible with research conducted by [9] using complete feed based on corn stover with the addition of *myristic acid* with levels of 20, 30, and 40 g / Kg DM, also tannin derived from mimosa powder. In this research, the addition of *myristic acid* with 20, 30, and 40 g/Kg DM affected EE in the feed. Too high a fat content in the feed (above 5%) will have a negative effect on fiber digestibility in the rumen [21]. According to [22], the reasons fat can have a negative effect are 1) fat will cover the feed fiber, so that rumen microbes cannot degrade the fiber. 2) PUFA fat (compound, unsaturated fat) is toxic to certain rumen bacteria so that there is a change in the microbial population in the rumen. 3) fatty acids can affect cell membranes and thus inhibit rumen microbial activity. 4) Long-chain fatty acids will form complex bonds with cations so that the availability of cations in the rumen decreases, which results in rumen pH conditions and the need for microbes for these cations. [23] stated that fat supplementation in feed could reduce carbohydrate digestibility, especially fiber digestibility; several factors influence the size of fat; 1) the amount of fat added in the feed. The higher the fat, the greater the effect it will have in suppressing fiber digestibility. 2) type of feed (forage or concentrate) given to livestock. 3) the type of fat given. The higher the saturated fat content, the greater the negative effect on the fiber-breaking bacteria population. Anggorodi (1984) in [24] concluded that the fat content in the ration determines the amount of fat to be absorbed, while in the digestive tract, the bacteria that play a role in digesting fat are lipolytic. Furthermore, [25] asserted that the chemical composition of the feed indicates the tendency of feed ingredient digestibility. Feed ingredients with high-fat content will have low digestibility.

IV. CONCLUSION

This research finally concluded that calliandra leaf addition could increase protein for feed, which the content composition of protein sources was decreased. Thus it could be an alternative solution for an expensive protein source. Besides, Calliandra leaf addition significantly influenced CF and NDF content in the complete feed based on corn straw.

REFERENCE

[1]. Bahar, S. 2016. TeknologiPengolahanJeramijagunguntukPakanternakRuminansia. BuletinPertanianPerkotaan. 6(2): 25 – 32.
[2]. Gusini, E and Permadi. K. 2015. Kajian PengaruhPemberianPakanLengkapBerbahan Baku FermentasiTongkolJagungTerhadapProduktivitasTernakSapi PO di KabupatenMajalengka. JurnalPeternakan Indonesia. 17(1): 12 – 19.
[3]. Umiyasih, U and Wina. E. 2008. Pengolahan dan Nilai NutrisiLimbahTanamanJagungSebagaiPakanTernakRuminansia. Wartazoa. 18(3): 27 – 37.
[4]. Buharman, B. 2011. PemanfaatanTeknologiPakanBerbahan Baku LokalMendukungPengembanganSapiPotong di Provinsi Sumatera Barat. Wartazoa. 21(3): 133 – 145.
[5]. Nur, K., Atabany, A., Muladno., Jayanegara. A. 2015. Produksi Gas MetanRuminansiaSapiPerahdenganPakanBerbeda Serta PengaruhnyaterhadapProduksi dan Kualitas Susu. JurnalIlmuproduksi dan Teknologi Hasil Peternakan. 3(2): 65 – 71.
[6]. Abqoriyah., Utomo. R., Suwignyo. B. 2015. ProduktivitasTanamanKaliandra (*Calliandracalothyrsus*) SebagaiHijauanPakan pada UmurPemotongan yang Berbeda. BuletinPeternakan. 39(2): 103 – 108.

[7]. Sasongko, W. T., Yusiati. L. M., Bachrudin. Z., Mugiono. 2010. OptimalisasiPeningkatanTanin dan Daun Nangka dengan Protein Bovine Serum Albumin. 34(3): 154 – 158.
[8]. Muchlas, M., Chuzaemi. S., Mashudi. 2020. Evaluatin of Chemical Composition and Lipid Components in Maize Straw Based Complete Feed Diets Suplementation by Conden Tannin and Myristic Acid IOP Conf Series Materials Science and Engineering 811.
[9]. AOAC. 2005. Official Methods of Analysis. 14. Thed. Association of analytical Chemist. Washington.
[10]. Van Soest, P. J., Robertson. J. D., Lewis. B. A. 1991. Methods For Dietary Fibre, Neutral Detergent Fibre and Non-starch Polysaccharides in Relation to Animal Nutrition. J. Dairy. Sci. 74: 3583 – 3597.
[11]. Setyawati, I., Putra. I. G. N. A. D. and Roni. N. G. K. 2017. HistologiTubulusSeminiferusdan Kadar TestosteronTikus yang DiberiPakanImbuhanTepungDaunKaliandra dan Kulit Nanas. JurnalVeteriner. 18(3): 369 – 377.
[12]. Widarta, I. W. R., Wiadnyani. A. A. I. S. 2019. PengaruhMetodePengeringanTerhadapAktivitasAntioksidanDaunAlpukat. JurnalAplikasiTeknologiPangan. 8(3): 80 – 86.
[13]. Karto, A. P., Kusumadewi., Sutjipto. 2008. Pengaruh Waktu PengeringanTerhadap Kadar TaninDaunjati Belanda (*Guazumaulmifolia*Lamk.). JurnalTumbuhanObat Indonesia. 1(1): 38 – 47.
[14]. Permana, H., Chuzaemi. S., Marjuki., Mariyono. 2014. PengaruhPakandengan Level SeratKasarBerbedaterhadapKonsumsi, Kecernaan dan Karakteristik VFA pada Sapi Peranakan Ongole. FakultasPeternakan. UniversitasBrawijaya.
[15]. Pamungkas, D., Mariyono., Antari. R., Sulistya. T. A. 2013. ImbanganPakanSeratdenganPenguatyang BerbedadalamRansumterhadapTampilanSapi Peranakan OngoleJantan. Seminar Nasional TeknologiPeternakan dan Veteriner. 107 – 115.
[16]. Fitriani. 2017. Kandungan Protein Kasar dan SeratKasarPakanKomplitBerbasisTongkolJagungdenganPenambahanAzolaSebagaiPakanRuminansia. JurnalGalungTropika. 6(1): 12 – 18.
[17]. Karim, I. I. 2014. Kandungan ADF, NDF, Selulosa, Hemiselulosa dan Lignin SilasePakanKomplitBerbahan Dasar JeramiPadi dan Beberapa Level BiomassaMurbei (*Morus alba*). SkripsiFakultasPeternakanUniversitasHasanuddin Makassar.
[18]. Hasan, S., Mujnisa. A., Kharani. P. J., Serna., Natsir. A. 2020. Potential of Complete Feed Formulated From Local Raw Materials on Beef Cattle Performance. Eurasian Journal of Bioscience. 14: 1 – 6.
[19]. Stergiadis, S., M. Allen., Chen. X. J., Wills. D., Yan. T. 2015. Prediction of Nutrient Digestibility and Energy Concentrations in Fresh Grass Using Nutrient Composition. Journal of Diary Science. 98(5): 3257 – 3272.
[20]. Wina, E and Susanto, I. W. R. 2013. Manfaat Lemak TerproteksiuntukMeningkatkanProduksi dan ReproduksiTernakRuminansia. WARTAZOA. 23(4): 176 – 185.
[21]. Palmquist, D. L and Jenkins. T. C. 1980. Fat in Lactation Rations: Review J Dairy sci. 63: 1 – 14.
[22]. Harvatine, K. J and Allens. M. S. 2005. The Effect of Production Level on Feed Intake, Milk Yield and Endocrine Responses to Two Fatty Acid Suplements in Lactating Cows. J Dairy Sci. 88: 4018 – 4027.
[23]. Thariq, S. M. H. 2017. PengaruhPakanHijauan dan KonsentratTerhadapDayaCerna pada Sapi Aceh Jantan. GentaMulia. 3(2): 78 – 89.
[24]. Pooli, D. N. Y., Waani. M. R. Pendong. A. F. 2020. Kecernaan Protein Kasar dan Lemak Kasar pada SapiPerah, Peranakan FH (Friesian Holstein) yang DiberiPakanLengkapBerbasisTebonJagung. Zootec. 40(2): 482 – 492.

Akbar, M, et. al. "The Evaluation of Raw Material of Complete Feed Based On Corn Stover with Calliandra Leaf (CalliandraCalothyrsus) And Myristic Acid Addition." *The International Journal of Engineering and Science (IJES)*, 10(03), (2021): pp. 01-05.