

Performance of Male Limousine Crossbreed Cattle by Giving RD Flour at Different Levels

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Submitted: 27 November 2021, Accepted: 07 March 2022

ABSTRACT: The study aimed to evaluate the production performance of male Limousine Crossbreed cattle with different feed levels with the addition of RD flour. It used nine male Limousine crossbreed cattle, aged <1-3 years, with an average initial weight of $335 \pm 29,09$ kg. The method used is an experimental method using CRD with 3x3: T0= Ad libitum corn straw + concentrate without RD powder, T1= Ad libitum corn straw + concentrate containing 7,5% RD, T2= Ad libitum corn straw + concentrate containing 15% RD flour. The variables measured included Daily gain, Average daily gain, feed conversion ratio, and Income over feed cost. Data were analyzed by ANCOVA. Cattle were fed for eight weeks from (March 26 to June 8, 2021), in the Livestock Group of Kucur Village, Dau District, Malang Regency. The result showed that using feed with the addition of RD at different levels of male Limousine crossbreed cattle had a significant effect on FCR ($P > 0,05$) and on Daily gain, Average daily gain, and IOFC ($P < 0,01$) had a different significant effect. This study concluded that the treatment of T1 feed (7.5% "RD" flour) showed the best results for Daily gain ($70,67 \pm 5,43$ kg), Average daily gain (1.26 ± 0.09 kg), FCR (5.85 ± 0.19), IOFC Rp. 36586.50.

Keywords: Limousine Crossbreed; Productions, Daily gain; Average daily gain; Feed Conversion Ratio; Income Over Feed Cost

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INTRODUCTION

The availability of meat organizing from within the country can no longer cover the need for such meat. From 2020 until October, meat imports have reached 149.26 thousand tons with a value of 479US \$ (Outlook, 2020). The low productivity of local beef cattle is thought to be due to feed that does not find the nutritional needs of beef cattle in quality and quantity.

Limousine crossbreed cattle is the result of a cross between Ongole and Limousine cattle with a carcass percentage of about 45-50%. LimPO cattle have greater body performance than Ongole crossbreed (Calvalho, Soeparno, and Ngadiyono, 2010). Cross Breeds of cattle are done to obtain a new breed of beef cattle following the climate and conditions in Indonesia. Beef cattle from crossbreeding are widely liked and can be developed by breeders because having good characteristics such as significant body growth and higher prices.

The constraint of feeding is the relatively high price of feed, mainly concentrate feed, which is very important for fulfilling nutrient needs and increasing the consumption of beef cattle feed. Therefore needs to evaluate the use of alternative feed materials for industrial waste, namely, RD flour. RD flour has almost the same content as date seeds. Dates seeds are the main solid component in dates with carbohydrates (83.1–86.9 g / 100 g date-pit) together with oil (9.9–13.2 g / 100 g date-pit) (Suresh et al., 2013). Date seeds are waste from processing dates that have not been utilized optimally. Date seeds contain flavonoid compounds that act as antioxidants (Warnasih et al., 2019).

Processing into RD powder can increase the economic value of RD as industrial waste, extend the product's shelf life, and facilitate storage and application in animal feed products. RD powder which can be used as a mixture of feed ingredients in concentrates, with a suitable formulation and good nutritional content of flavonoids and antioxidants, can improve the performance and health of livestock seen from knowing the blood physiology of

blood glucose and blood urea profiles. Feed efficiency is the ratio between the bodyweight gain produced and the amount of feed consumed. it is a multifactorial and complex trait in beef cattle. The inter-animal variation stems from the interaction of many biological processes influenced by physiological status and management regimens (Kenny et al., 2018). IOFC (Income Over Feed Cost) is also a parameter in a livestock business because it shows the difference between income and ration consumption. Based on Hertanto (2014) opinion, if a business activity requires a cost analysis so that a loss does not occur, which results in a business stopping due to loss, this cost analysis can be carried out with economic calculation data analyzed using Income Over Feed Cost. (IOFC).

Based on the description above, it is necessary to conduct a study on the use of RD flour to complement the type of concentrate feed ingredients in male Limousine Crossbreed cattle.

MATERIALS AND METHODS

From March 26 to June 8, 2021, this research was carried out in the Livestock Group of Kukur Village, Dau District, Malang Regency. Analysis proximate samples was carried out at the Laboratory of Nutrition and Animal Feed, Faculty of Animal Science, Brawijaya University.

The livestock used were nine male Limousine Crossbreed aged <1-3 years with an initial weight of 335±29.09 kg. The tools used in this study were "Great scale" digital cattle scales with a capacity of 1,500 kg with an accuracy of 1 kg, scales with a capacity of 150 kg with an accuracy of 10 g, scales with a capacity of 150 kg with an accuracy of 10 g, digital scales with a capacity of 5 kg with an accuracy of 0.01 kg, copper machine for cutting forage for corn, mixer for mixing feed ingredients into concentrate, sacks and plastic bags, a Thermohydrometer to determine the temperature and humidity of the animal housing, a set of cleaning tools to clean the cage regularly, a set of cage maintenance tools to repair the cage in case of damage. The materials used to prepare the

complete ration consisted of cornflour, pollard, rice bran, cassava, copra, palm cake, coffee husk, minerals, and RD flour. The type of animal housing used was an extended group cage consisting of 9 plots with a length of 200 cm, a width of 150 cm, a height of 200 cm, and equipped with feeding and drinking places.

The research method used in this study was a completely randomized design (CRD) consisting of three treatments and three replications so that there were nine experimental units. The treatment given is as follows:

T0 = Ad libitum corn straw + concentrate (without RD)

T1 = Ad libitum corn straw + concentrate (contains 7.5% RD)

T2 = Ad libitum corn straw + concentrate (contains 12.5% RD)

Feed nutrient of T0 was prepared with dry matter content of 91.38 % and crude protein 13.93%, T1 with dry matter 91.34 % and crude protein 12.89%, and T2 with dry matter: 91.28 % and crude protein 12.79%. The research procedure of this study is The preparatory stage was carried out by

preparing the cage with a permanent model consisting of nine plots and the other preparations, including the feed formulation used in the experiment.

Then the process of preparing feed ingredients consisting of cornflour, pollard, rice bran, cassava, copra, palm cake, coffee skin, minerals, and RD powder which are then mixed according to the treatment T0,T1,T2 and given twice a day, in the morning and evening as much as 3% dry matter from the bodyweight of cattle (70% concentrate:30% forages). Drinking water is provided ad libitum.

The data collection stage will begin after the adaptation and preliminary stages have been completed; the time used for the data collection stage is eight weeks, with concentrate feeding that has been applied to each treatment on livestock (T0, T1, T2). Livestock was weighed every two weeks and carried out before feeding in the morning to determine changes in the bodyweight of livestock. During the data collection stage, samples were taken from the feed given. The remaining feed samples were for further analysis in the laboratory (Dry matter, Organic matter, Crude protein, Extract ether and Crude Fiber).

Table 1. Nutrient Content of Feed Ingredients

Feed Material	Dry Matter (%)	Organic Matter (%)	Crude Protein (%)	Extract Ether (%)	Crude Fiber (%)
Cassava	93,47	85,65	6,32	1,46	24,16
RD flour	88,70	87,18	5,27	3,56	18,14
Palm cake	92,66	93,71	15,43	7,24	23,60
Pollar	89,31	94,71	18,48	3,52	12,19
Rice bran	91,25	81,06	8,76	5,35	24,24
Copra	89,92	91,67	23,40	1,38	38,98
Coffe skin	89,44	87,95	12,02	0,59	38,96

Note: *Based on 100% Dry Matter

Source: The results of the Laboratory of Nutrition and Animal Feed analysis, Faculty of Animal Science, Brawijaya University Malang (2021).

Table 2. Nutrient Content of Feed Treatment

Nutrient	Perlakuan			
	T0 (%)	T1 (%)	T2 (%)	Corn Straw
DM*	91,38	91,34	91,28	19,75
OM*	88,55	88,04	88,51	86,82
CP*	13,93	12,89	12,79	7,60
EE*	3,80	4,26	3,72	1,00
CF*	26,47	24,47	25,51	33,74

Note: *Based on 100% Dry Matter

Source: The results of the Laboratory of Nutrition and Animal Feed analysis, Faculty of Animal Science, Brawijaya University Malang (2021).

Research variable

Daily Gain:

Daily gain of livestock/head during the study used the following (Hynd, 2019):

$$Daily\ gain = \frac{W2 - W1}{t2 - t1}$$

Average Daily Gain (Kinder, 2016):

$$Average\ Daily\ Gain = \frac{(Final\ body\ weight\ (g) - Initial\ body\ weight\ (g))}{(Maintenance\ time)}$$

FCR (Feed Conversion Ratio)

Feed conversion formula (Hynd, 2019):

$$FCR = \frac{Daily\ Dry\ Matter\ (kg)}{Average\ Daily\ Gain(kg)}$$

IOFC (Income Over Feed Cost)

IOFC (Hynd, 2019):

$$IOFC = Live\ Weight\ Price\ x\ Daily\ Gain) - Total\ Cost\ Feed$$

Data analysis

The data obtained were tabulated and analyzed by Analysis of Variance (ANCOVA) with accompaniment factors/covariates in the form of initial weight (Daily gain, Average daily gain) and consumption (FCR, IOFC). If there is a significant difference between treatments, the analysis will be continued with Duncan's further test.

($P < 0.01$) on Daily gain and Average daily gain. The average daily gain and daily gain above show that the T1 treatment gave the best results for daily gain and average daily gain. However, the T2 treatment gave the lowest average results for daily gain and average daily gain. The value of daily gain is directly proportional to average daily gain; if the value of average daily gain increases, the daily gain will also increase because the daily gain is the sum of average daily gain within a certain period. The difference in responses displayed by Limousine Crossbreed is because each animal has a different growth rate depending on the ability of individual livestock to absorb and utilize nutrients. According to Kuswati and Susilorini (2016), body weight gain is influenced by genetics and

RESULT AND DISCUSSION

1. Effect of Treatment on Daily Gain and Average Daily Gain of Experimental Male Limousine Breeds Cattle

Average Daily Gain and Daily Gain

Based on the analysis showed that the use of flour level "RD" in concentrate showed different significant effects

environmental factors, mainly feeding, which can cause variations in body weight gain.

Treatment T1 gave a high average daily gain and average daily gain, and T2 gave the lowest average yield because T2 had the highest dry matter (DM) consumption but was not significantly

different. This indicates that adding "RD" flour in concentrate did not reduce feed palatability and livestock consumption. DM consumption of T1 was 7.24 ± 0.91 kgDM, with T0 and T2 having consumption of 7.84 ± 0.32 and 6.69 ± 0.33 kgDM because of the higher consumption of both dry matter consumption and nutrient (protein) feed.

Table 3. Average Daily Gain and Daily Gain of male Limousine Crossbreed cattle with RD flour at different levels

Treatment	Parameter	
	Average Daily Gain	Daily Gain
T0 (0% RD)	1.15 ± 0.021^b	64.67 ± 1.155^b
T1 (7.5% RD)	1.34 ± 0.018^c	75.00 ± 1^c
T2 (15% RD)	0.92 ± 0.027^a	51.67 ± 1.528^a

Note:**) Different superscripts in the same column show a very significant difference ($P < 0.01$)

The higher the availability of nutrients for rumen microbes and the host, high the availability of feed nutrients in the rumen will result in a tendency to increase nutrients that livestock can use to increase body weight and vice versa if nutrient consumption is low, bodyweight will also below. (Pereira, Costa, Martin, Pereira, Squizatti, Owens, Cruz, Millen and Arrigoni, 2021) Explained that DMI (Dry matter consumption) is the factor that most influences livestock performance and production. When DMI needs are met, it means that the nutrients needed by livestock have been fulfilled and the fulfillment of energy substrates in the process of chemical reactions that can contribute to oscillations in cell metabolism, especially in cattle raised for fattening (meat production).

In fattening cattle production, DMI variation is the main focus during the growth cycle, which helps maintain dynamic balance and deal with changes in metabolic and environmental requirements. The limited number of DMI can prevent the fulfillment of nutrition for livestock. Most of the nutrients in beef cattle feed are used to meet maintenance requirements. Therefore small changes in DMI can limit the efficiency of the production process and result in decreased growth. Treatment T1 gave a high average daily gain and average

daily gain because it had the highest digestibility of Dry matter, namely $74.49 \pm 1.65\%$ with T0 and T2 being $64.05 \pm 7.06\%$ and $57.12 \pm 5.95\%$, respectively.

Nutrient digestibility is one of the benchmarks in determining the quality of feed ingredients. Dry matter digestibility in ruminants including crude fiber digestibility and BETN (Nitrogen free Extract) showed high digestibility of food substances in the rumen (Aling, Tuturoong, Tulung, Merci and Waani, 2020). Sondakh et al., (2018) stated that the higher the percentage of dry matter digestibility of a feed ingredient, the higher the quality.

The feed treatments T1 and T2 contained tannins and saponins in the feed, from the analysis of tannins and saponins conducted at BPTP Ciawi showed that the content of tannins in flour "RD" was 3.85% and saponins 4.89%. Tannins have both positive and negative biological effects when consumed by livestock, depending on the concentration and source of the plant, animal species, physiological status, and nutrient composition of the feed.

This is to the opinion of Jayanegara, Ridla, Laconi, and Nahrowi (2019), if some of the positive effects of tannins include increasing the efficiency of the use of protein rations, faster livestock growth,

increasing milk production, increasing fertility, preventing bloating or bloat, and inhibits nematode infection.

The positive effects of these tannins generally occur at low to medium concentrations. Protein protection by tannins converts several rumen degradable protein (RDP) into rumen undegradable protein (RUP) which then increases metabolizable protein (MP), which is a protein that can be digested and absorbed in the small intestine. Protein protection by tannins converts several rumen degradable protein (RDP) into rumen undegradable protein (RUP) which then increases metabolizable protein (MP), which is a protein that can be digested and absorbed in the small intestine. The maximum use of tannins is 2-4% of the DM feed. (Jayanegara, Ridla, Laconi, and Nahrowi (2019) explained that at high concentrations, the anti-nutritional properties of tannins in binding proteins become more dominant. (Bhat, Kannan, Singh, and Sharma. 2013) strengthen if tannins inhibit rumen microbial enzyme activity, inhibition of Enzymes are caused by the non-specific binding of tannins to enzyme proteins and can also occur when tannins bind to substrates. The T1 treatment had higher daily gain and average daily gain than T0 apart from containing tannins and saponins because "RD" flour had flavonoid content.

Flavonoid analysis at the State Polytechnic of Malang showed that "RD" flour flavonoids were 0.0081%ppm, which could increase performance (animal health). The content of flavonoids in T1 feed improves livestock's health so that they have the highest average daily gain. This is by the opinion of Hussain, Semreen, Shanableh, Khattak, Saadoun, Ahmady, Mousa, Darwish, Radeef and Solimah, (2019) if "RD" flour is a source of various phytochemicals such as phenolic compounds, volatile compounds, flavonoids (apigenin, luteolin, and quercetin), phytosterols (β -sitosterol, isofucosterol, stigmasterol, campesterol) and carotenoids (lutein, neoxanthin, -carotene, violaxanthin, antheraxanthin).

2. Effect of Treatment on Feed Conversion Ratio (FCR) and Income Offer Feed Cost (IOFC) of Experimental Male Limousine Breeds Cattle Feed Conversion Ratio (FCR)

Based on statistical analysis showed that the use of flour level "RD" in the concentrate showed a significant difference ($P < 0.05$) to FCR. The average FCR above shows that the T1 treatment gave the best results to the FCR, but the T2 treatment gave the lowest average result to the FCR. FCR T1 of 5.85kg means that to produce 1kg of meat, the feed required is 5.85kgDM, FCR T2 of 7.25kg, which means to produce 1kg of meat requires 7.25kg DM. This is because FCR is influenced by Dry matter consumption, digestibility, and average daily gain produced, and T1 has the highest average daily gain value, followed by T0 and T2. The T1 treatment had the highest consumption value, the highest digestibility value, and the highest average daily gain value than the other treatments, so the FCR of T1 was also smaller, followed by T0 and T2. The lower the FCR value, the higher the efficiency of the feed produced. The higher the value of feed use efficiency indicates that the ratio consumed is less to produce body weight gain. The efficiency of feed is influenced by several factors, namely the digestibility of feed ingredients, nutrient adequacy for bare life, growth and body function, the type of feed given, age of livestock, feed quality, and body weight.

The better the quality of feed, the better energy formation, and production efficiency. (Umiyasih and Wina, 2014) stated that the conversion value and feed efficiency results showed a change in livestock through calculations using the conversion formula and feed efficiency. A poor efficiency can be seen from the high feed conversion value, and in contrast to the low feed efficiency value, the lower the feed efficiency value, the worse it is. The amount of dry matter consumed divided by the increase in body weight per unit time will result in feed conversion. This value will be more efficient if the amount of feed consumed is less but produces a higher or

the same average daily gain. (Nusi, Utomo, and Soeparno (2011) added that the feed conversion value depends on the quality of the feed given, the higher the nutrients contained, the better the feed conversion produced. FCR is the ratio of dry matter intake to body weight gain. The broad range of FCR values is 4.5-7.5, and a value with a

low FCR number indicates that cows require less feed intake for every one kg of body weight gain. FCR is a suitable parameter that can be used in monitoring or describing the production performance of fattening cattle. Reared with feedlot or fattening systems usually have an average FCR of about 6:1 (Shike, 2013).

Table 4. Average FCR and IOFC of Male Limousine Crossbreeds with “RD” flour at different levels

Treatment	Parameter	
	FCR	IOFC
T0 (0% TRnD)	6.27±0.897 ^a	29583.18±3796,404 ^b
T1 (7.5% TRnD)	5.85±0.238 ^a	36586,50±2170,510 ^b
T2 (15% TRnD)	7.26±0.441 ^a	19976.85±1449.045 ^a

Information:

*) Different superscripts in the same column showed significant differences (P<0.05)

**) Different superscripts in the same column showed significant differences (P<0.01)

The feed conversions of PO and SimPO cattle reared in feedlot were 22.55 ± 6.02 and 18.47 ± 2.36 (Carvalho, Soeparno and Ngadiono, 2010). Conversion of feed for SimPO Bachelor of Village Development (SMD) cattle in Bantul and Sleman Regencies reared by feedlot was 11.15±1.36 vs 13.86±2.03. Beef cattle's ideal feed conversion value is around 9 (Muyasaroh, Budisatria and Kustantinah, 2015). In the study of Yohannis, Tulung, Pendong, and Tulung (2020) the value of dry matter consumption was 5.39 kg/head for RA (50% concentrate: 50% maize stover) and 5.77 kg/head/day for RB (50% concentrate: 50% mixed-grass). This consumption value can produce a daily gain of 0.60 kg for RA and 0.65 kg/head/day, with an average feed conversion value of 0.11 for RA and RB. This means that 1 kg of feed consumed by either RA or RB produces a daily gain of about 0.11 kg/head/day.

Income Offered Feed Cost (IOFC)

Based on statistical analysis showed that the use of flour level "RD" in concentrate showed a significant difference (P<0.01) against IOFC. The average IOFC above shows that treatment T1 gives the best results to IOFC, but treatment T2 gives the

lowest average result to IOFC. Treatment T1 gives the highest profit, followed by T0 and T2, this is because IOFC is directly proportional to Daily gain (Income) and proportional to inversely with DM consumption (expenditure). IOFC is obtained from the amount of Income (Daily gain) minus the cost of feed (ration consumption). The lower the cost of feed, the higher the profit obtained. The IOFC value of the ration is influenced by the amount of Income and the cost of consuming the ration. The higher the IOFC value of the ration, the better the economic value of the ration consumed by cattle (Sodikin, Erwanto, Adhianto, 2016). Income above IOFC's feed costs is one of the benchmarks for the overall financial health of the farm (Kass, 2018). G (gain): F (feed) is calculated by dividing the Average Daily Gain (ADG) by consumption or Dry Matter Intake (DMI) (Lahart, Prendiville, Buckley, Kennedy, Conroy, Boland and McGee, 2019).

CONCLUSIONS

This study concludes that the treatment of T1 feed (7.5% TRD) showed the best results for Daily gain, Average

Daily Gain, and Feed Conversion Ratio (FCR), and Income Over Feed Cost (IOFC). "RD" flour can be used as an alternative to mixed concentrate feed ingredients in beef cattle, with the best addition level in concentrate as much as 7.5% in concentrate.

REFERENCES

- Aling, C., Tuturoong, R. A. V., Tulung, Y. L. R., & Waani, M. R. (2020). Kecernaan serat kasar dan betn (bahan ekstrak tanpa nitrogen) ransum komplit berbasis tebon jagung pada sapi peranakan ongole. *ZOOTEC*, *40*(2), 428. <https://doi.org/10.35792/zot.40.2.2020.28366>
- Bhat, T. K., Kannan, A., Singh, B., & Sharma, O. P. (2013). Value addition of feed and fodder by alleviating the antinutritional effects of tannins. *Agricultural Research*, *2*(3), 189–206. <https://doi.org/10.1007/s40003-013-0066-6>
- de Carvalho, M. D. C., Sueparno., & Ngadiyono, N. (2012). Pertumbuhan dan produksi karkas sapi peranakan ongole dan simmental peranakan ongole jantan yang dipelihara secara feedlot (growth and carcass production of ongole crossbred cattle and simmental ongole crossbred cattle reared in a feedlot system). *Buletin Peternakan*, *34*(1), 38. <https://doi.org/10.21059/buletinpeternak.v34i1.105>
- Hertanto, B. S. (2014). Kajian komparatif parameter ekonomi (harga susu dan pakan) terhadap efisiensi penggunaan teknologi pakan pada usaha sapi perah. *Sains Peternakan*, *12*(1), 49. <https://doi.org/10.20961/sainspet.v12i1.4870>
- Hynd, P. (2019). *Animal Nutrition From Theory to Practice*. CSIRO Publishing.
- Jayanegara, A., Ridla, M., Laconi, E. B., & Nahrowi. (2019). *Komponen Anti Nutrisi Pada Pakan*. IPB Press.
- Kass. C. (2018). *Micro Feeding Machine In The Dairy Industry*. Kankas Stage University.
- Kenny, D. A., Fitzsimons, C., Waters, S. M., & McGee, M. (2018). Invited review: Improving feed efficiency of beef cattle – the current state of the art and future challenges. *Animal*, *12*(9), 1815–1826. <https://doi.org/10.1017/S1751731118000976>
- Kinder, C. A. (2016). Average Daily Gain. In *Animal Science Lesson*. University of Idaho Extension.
- Kuswati, & Susilawati, T. (2016). *Industri Sapi Potong*. UB Press.
- Lahart, B., Prendiville, R., Buckley, F., Kennedy, E., Conroy, S. B., Boland, T. M., & McGee, M. (2020). The repeatability of feed intake and feed efficiency in beef cattle offered high-concentrate, grass silage and pasture-based diets. *Animal*, *14*(11), 2288–2297. <https://doi.org/10.1017/S1751731120000853>
- Ministry of Agriculture. (2020). *Outlook Daging Sapi*. Sekretaris Jendral Kementerian Pertanian.
- Muyasaroh, S., Budisatria, I. G. S., & (Kustantinah), K. (2015). Income over feed cost penggemukan sapi oleh kelompok sarjana membangun desa (smd) di kabupaten bantul dan sleman. *Buletin Peternakan*, *39*(3), 205. <https://doi.org/10.21059/buletinpeternak.v39i3.7989>
- Nusi, M., Utomo, R., & (Soeparno), S. (2012). Pengaruh penggunaan tongkol jagung dalam complete feed dan suplementasi undegraded protein terhadap pertambahan bobot badan dan kualitas daging pada sapi peranakan ongole. *Buletin Peternakan*, *35*(3), 173. <https://doi.org/10.21059/buletinpeternak.v35i3.1090>
- Pereira, I. C., Costa, C. F., Martins, C. L., Pereira, M. C. S., Squizatti, M. M., Owens, F. N., Cruz, G. D., Millen, D. D., & Arrigoni, M. D. B. (2021). Voluntary daily fluctuation in dry matter intake is associated to feedlot performance, feeding behavior and rumen morphometrics in beef cattle. *Livestock Science*, *250*, 104565. <https://doi.org/10.1016/j.livsci.2021.104565>

- Sodikin Ali, Erwanto, & Adhianto Kusuma. (2016). pengaruh penambahan multi nutrient sauce pada ransum terhadap pertambahan bobot badan harian sapi potong. *Jurnal Ilmiah Peternakan Terpadu*, 4(3), 199–203.
- Sola Agboola, O., & Lateef Adejumo, A. (2013). Nutritional composition of the fruit of the nigerian wild date palm, phoenix dactylifera. *World Journal of Dairy & Food Sciences*, 8(2).
- Sondakh, E. H. B., Waani, M. R., Kalele, A. J. D., & Rimbing, S. C. (2018). Evaluation of dry matter digestibility and organic matter unsaturated fatty acid based ration of ruminant. *International Journal of Current Advanced Research*, 7(6(H)).
- Suresh, S., Guizani, N., Al-Ruzeiki, M., Al-Hadhrami, A., Al-Dohani, H., Al-Kindi, I., & Rahman, M. S. (2013). Thermal characteristics, chemical composition and polyphenol contents of date-pits powder. *Journal of Food Engineering*, 119(3), 668–679. <https://doi.org/10.1016/j.jfoodeng.2013.06.026>
- Tulung, Y. L. R., Pendong, A. F., & Tulung, B. (2020). Evaluasi nilai biologis pakan lengkap berbasis tebon jagung dan rumput campuran terhadap kinerja produksi sapi peranakan ongole (PO). *ZOOTEC*, 40(1), 363. <https://doi.org/10.35792/zot.40.1.2020.28254>
- Umiyasih, U., & Wina, E. (2014). Pengaruh fermentasi *saccharomyces cerevisiae* terhadap nutrisi dan pencernaan ampas pati aren (Arenga Pinnata Merr). *JITV*, 19(2), 258–263.
- Warnasih, S., Widiastuti, D., Hasanah, U., Ambarsari, L., & Sugita, P. (2020). Aktivitas antioksidan dan flavonoid ekstrak biji kurma. *EKOLOGIA*, 19(1), 34–38. <https://doi.org/10.33751/ekol.v19i1.1660>