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Trichoderma viride as Starter Fermentation Waste Cow Feces for Nutrition Alternative Catfish (*Clarias* sp.)

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ABSTRACT: An increase in the content of nutrients in the feces of beef that has been fermented by *T. viride* with optimum time of 4 days of fermentation. The right of substitution and influential with optimum results in the specific growth rate (SGR), efficient of feed (EP), feed conversion ratio (FCR), retention of energy (RE), resources and content of glycogen in digestion muscle meat that is present on the C protein treatment 30,85% and 43.87% carbohydrate with a commercial feed >< comparison of the fermentation of Feed 73 gr >< 27 gr. Results from deposits of glycogen in the body of the catfish (*Clariassp*), the highest in treatments C, namely of 0.76%. The amount of glycogen is different in different tissues relies on providing glucose and energy needs. Although the levels of glycogen in the liver, there is more (3-5%) than in muscle (0.5-1%), but the amount of glycogen in the muscles more entirely due to more muscle mass.
Keywords : Cow Feces, Fermentation, Nutrition Alternative, Catfish

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INTRODUCTION

Nutritional needs in fisheries very large endeavors, most fish farmers rely on nutrients derived from feed manufacturer/commercial, where the price of commercial feed mills/continue to increase as demand continues to increase [1]. This caused farmers losses, therefore need to his relief efforts include utilizing organic wastes in abundance. Organic waste has a low nutritional quality as fish feed, so the need for efforts to improve the quality of its nutrition value, one through the process of fermentation [2]. Wood [3] reveals, *T. viride* is a species of mold that is able to destroy the high degree of cellulose and has the ability to synthesize some essential factors for dissolving the cellulose that are bound by hydrogen bonds. Further according to the Mandels [4], the bound cellulose decomposed into glucose and simple sugars using enzymes cellulase produced by the moulds.

Fermentation is a process of solving complex compounds into simpler compounds by involving the role of microorganisms, or one might say is all kinds of fermentation process of metabolism (enzyme, remains miniscule as oxidation and reduction, hydrolase or other chemical reactions) that does the chemistry changes on an organic substrate to produce a final product [5].

The energy stored in food or nutrients for living beings which are used for energy of motion, grow and develop. Widiatmo [6] in his State that any organic matter contains the biomass is dried ingredients from organic material. Biomass is very important as a potential source of energy (fuel), or the driving energy in the body. A very important trait of a fuel or energy in the body is a heat value. Stool (cow dung) had the heat energy magnitude 10,90874 MJ/kg, Goat shit 10,37851 MJ/kg and a Bat shit 17,09983 MJ/kg. So the magnitude of the benefits of energy for living beings such as catfish. Energy overhaul before the results in the form of heat, the energy of the body measured in the form of glycogen. to move the muscles of the body and also for the movement of each part of the body. Glycogen as a form of energy in the muscle meat of fish as Catfish are treated using nutrition from cow feces can be measured in terms of volume by using the bomb calorimeter.

Thus research needs to be done in order to investigate more about the *T. viride* fermenters in the media as stool cow to alternative nutrition on catfish. Expected results of this research will provide information and scientific study about the ability of *T. viride* to improve the quality of cow feces will then be used as an alternative raw material fish nutrition.

MATERIALS AND METHODS

This research was conducted in six stages, the first stage of testing the content of nutrition (proximate analysis) of stool cow done in laboratory animal husbandry Faculty of University of Brawijaya. The second phase

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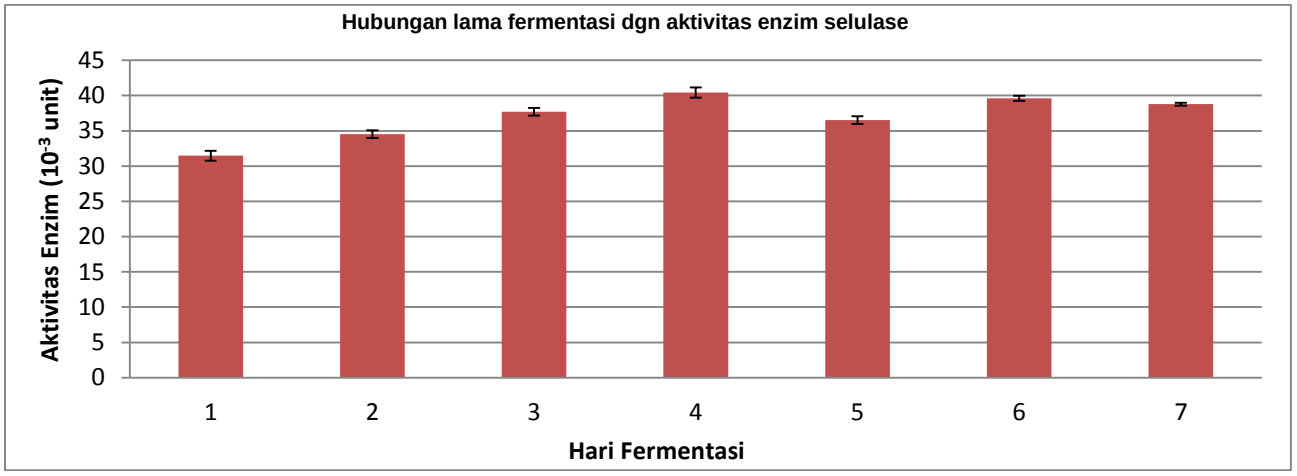
of fermentation of *T. viride* on media (cow feces) conducted in the laboratory the Aquatic Sciences and Marine Biotechnology Fisheries and marine sciences Faculty University of Brawijaya. The third stage of the test the heat energy content found in the feces of cows before and after fermentation in the Faculty of mechanical engineering University of Brawijaya. The fourth stage of enzyme activity test *T. viride* on media (cow feces) is carried out in the laboratory of Biochemistry at the University of Brawijaya and fifth stages to test the power of bowel and womb on digestion glycogen in muscle meat of fish is carried out in the laboratory the Aquatic Sciences and Marine Biotechnology. Further research of the sixth phase test how large a percentage of beef fermented feces to replace the content of nutrients in a commercial pellet feed used for the enlargement of catfish (*Clariassp*) and carried out in the laboratory of Fish Reproductive Fisheries and Marine Science Faculty, University of Brawijaya in March 2013 until January 2014. At this stage of the testing conducted research on the growth phase, the fish fingerling size 7-9 cm for 1 month.

RESULT AND DISCUSSION

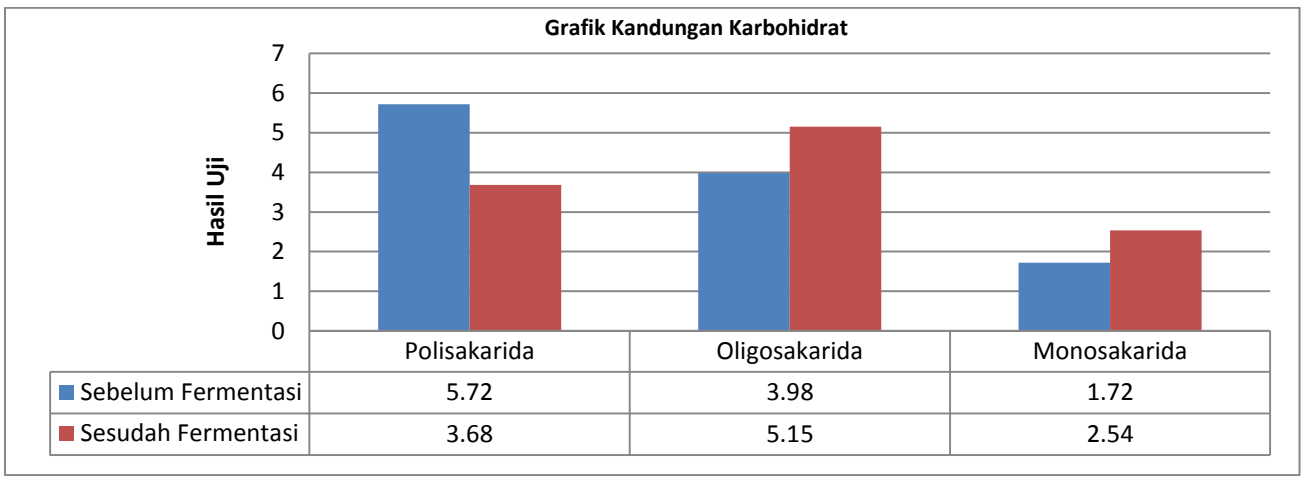
1. The Optimum Nutritional Fermented Feces of Cows By *Trichoderma viride (T. viride)*

Results of enzyme activity on the fermented bovine feces *T. viride* obtained best results i.e. on day four with a result of 40,42x10^{-3} units. The presence of cellulase enzyme activity will degradation the fibers that are difficult to digest to be easily digested by fish.



Graph 1. Enzyme Activity Assay Results

In the graphic content of carbohydrates can be seen that there is a decrease of complex compounds into simpler compounds, compounds are polysaccharides complex which is still in a long chain of nutrients and can not be absorbed by the body's catfish (*Clariassp*) Cow feces that have been fermented on the 4th day of experiencing the breakdown of complex compounds into simpler compounds, in the form of oligosaccharide and Monosaccharaides. This can be evidenced by looking at the results of the test are graphic, carb that simple compound of oligosaccharide and monosaccharide has increased after stool fermented, whereas polysaccharide degradation.



Graph 2. Carbohydrate Content of Test Results

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2. Percentage of Commercial Feed is Fermented Cow Feces was replaced by *T. viride*

On the research value of the SGR, feed efficiency, FCR energy retention, digestion (in vitro) and analysis of glycogen in the muscle meat of fish best in treatment C with a commercial feed comparison: alternative nutrition amounting to 73: 27 (g) with a protein content of 31% and ± 44% carbs. The composition of the formulations of substitution in 100 grams of feed is contained in table 1.

The composition of the results obtained from the feed formulation by the method of square. Romadhon et al. [7] reveals that the standard of protein in feed catfish in General by 20% to 40%, while the Gusrina [8] reveals that the carb needs for catfish ranging between 20-45%. The appropriate carbs will serve as conductor of proteins throughout the body and acts as an adhesive, so that meat chain network conditions closer and heavy meat of fish will also increase. Commercial feed proximate results found in table 2 and proximate cow feces after fermentation are present in Table 3. After known proximate result of commercial feed and feces of beef fermented *t. viride*, conducted the process of substitution that is adapted to the calculation of squares (substitution results in Table 1). Proximate result feed that has substitution shown in Table 4.

Table 1. The composition of the feed substitution formulations

Treatment	Protein (%)	Carbohydrate (%)	Feed Composition (gram)	
			Feces	Commercial
A	± 29	± 43	33	67
B	± 30	± 43,5	30	70
C	± 31	± 44	27	73
D	± 32	± 44,5	24	76
E	± 33	± 45	21	79

Table 2. Commercial feed proximate results

KODE BAHAN	PARAMETER	HASIL
Commercial Feed (Feed Factory)	Protein (%)	39.27 ± 0.015
	Fat (%)	5.27 ± 0.006
	Water (%)	3.11 ± 0.006
	Ash (%)	5.52 ± 0.006
	Carbohydrate (%)	46.84 ± 0.012
	Fiber (%)	5.57 ± 0.012
	BETN (%)	41.26 ± 0.023

Table 3. Proximate result of cow feces fermentation

MATERIALCODE	PARAMETERS	RESULT
Fermented Cow feces Dry	Protein (%)	8.18 ± 0.01
	Fat (%)	0.12 ± 0.01
	Water (%)	33.27 ± 0.01
	Ash (%)	22.52 ± 0.02
	Carbohydrate (%)	35.92 ± 0.01
	Fiber (%)	16.24 ± 0.01
	BETN (%)	19.68 ± 0.01

Table 4. Feed proximate result substitution

MATERIAL CODE	PROTEIN (%)	FAT (%)	WATER (%)
A	29.04 ± 0.030	3.53 ± 0.017	13.06 ± 0.021
B	29.95 ± 0.025	3.76 ± 0.031	12.15 ± 0.031
C	30.85 ± 0.030	3.88 ± 0.031	11.26 ± 0.035
D	32.12 ± 0.030	4.09 ± 0.020	10.04 ± 0.025
E	33.08 ± 0.038	4.24 ± 0.025	9.13 ± 0.021
K+	39.27 ± 0.010	5.25 ± 0.026	3.16 ± 0.047
K-	8.18 ± 0.025	0.14 ± 0.026	33.23 ± 0.029
MATERIAL CODE	**ASH (%)**	**CARBOHYDRATE (%)**	
A	11.14 ± 0.012	43.24 ± 0.006	
B	10.61 ± 0.044	43.55 ± 0.010	
C	10.14 ± 0.015	43.87 ± 0.025	
D	9.44 ± 0.015	44.31 ± 0.020	
E	8.93 ± 0.031	44.63 ± 0.031	
K+	5.53 ± 0.044	46.84 ± 0.010	
K-	22.50 ± 0.015	35.96 ± 0.026	
MATERIAL CODE	**FIBER (%)**	**BETN (%)**	
A	9.12 ± 0.020	34.12 ± 0.015	
B	8.77 ± 0.010	34.79 ± 0.012	
C	8.45 ± 0.015	35.42 ± 0.026	
D	8.05 ± 0.01	36.26 ± 0.017	
E	7.73 ± 0.02	36.90 ± 0.031	
K+	5.52 ± 0.04	41.32 ± 0.046	
K-	16.27 ± 0.042	19.69 ± 0.025	

Houlihan et al. [9] reveals that the content of complete and complex nutrients will affect the amount of nutrients which can be absorbed through the stimulation of the synthesis of nutrients and nutrient retention efficiency which has been synthesized. This means that an effective nutritional and complex will be easily absorbed by the fish's body to perform the metabolism and growth of fish. Results of the treatments done on the catfish (*Clariassp*) that have been given feed substitution in Table 5.

Table 5. Results Treatment

Parameters	Feed substitution treatment Fermentation><Feed Commercial		
	A	B	C
SGR (gr/days)	$0.76^{a} \pm 0.07$	$1.13^{b} \pm 0.13$	$1.96^{d} \pm 0.12$
SR (%)	100	100	100
EP (%)	$45.18^{a} \pm 3.90$	$61.54^{b} \pm 5.39$	$87.40^{d} \pm 2.49$
FCR (%)	$2.22^{c} \pm 0.19$	$1.63^{b} \pm 0.14$	$1.14^{a} \pm 0.03$
RE (%)	$7.54^{a} \pm 1.00$	$18.96^{b} \pm 2.34$	$28.33^{c} \pm 3.27$
Digestion (%)	$51.95^{b} \pm 0.023$	$56.13^{c} \pm 0.042$	$75.96^{g} \pm 0.136$
Glycogen (%)	$0.45^{b} \pm 0.03$	$0.53^{bc} \pm 0.02$	$0.76^{d} \pm 0.02$
Parameters	**Feed substitution treatment Fermentation><Feed Commercial**		
	D	E	K+
SGR (gr/days)	$1.58^{c} \pm 0.09$	$1.50^{c} \pm 0.14$	$2.03^{d} \pm 0.05$
SR (%)	100	100	100
EP (%)	$75.56^{c} \pm 3.64$	$74.54^{c} \pm 5.60$	$87.50^{d} \pm 2.54$
FCR (%)	$1.33^{a} \pm 0.06$	$1.35^{ab} \pm 0.11$	$1.14^{a} \pm 0.03$
RE (%)	$21.76^{bc} \pm 4.75$	$21.91^{bc} \pm 4.94$	$28.41^{c} \pm 2.54$
Digestion (%)	$67.81^{e} \pm 0.259$	$65.13^{d} \pm 0.046$	$72.60^{f} \pm 0.021$
Glycogen (%)	$0.60^{c} \pm 0.02$	$0.59^{c} \pm 0.02$	$0.62^{c} \pm 0.06$
Parameters	**Feed substitution treatment Fermentation><Feed Commercial**		
	K-		
SGR (gr/days)	$0.66^{a} \pm 0.04$		
SR (%)	100		
EP (%)	$38.86^{a} \pm 1.09$		
FCR (%)	$2.61^{d} \pm 0.07$		
RE (%)	$7.36^{a} \pm 2.24$		
Digestion (%)	$32.39^{a} \pm 0.163$		
Glycogen (%)	$0.35^{a} \pm 0.03$		

Results of treatment digestibility done by in vitro; SGR: Specific Growth Rate; SR: Survival Rate; EP: Feed Efficiency; FCR: Feed Conversion Ratio; RE: Retention of Energy.

Given that the substitution feed can be put to good use by the body of the fish. The high value of the feed efficiency and energy retention indicates that the given nutrients can be absorbed and utilized by the body of the fish. More and more of the nutrients that can be used and stored in the body of the fish, then it will be able to accelerate the expansion of its body cells of fish so fish can grow well and quickly. Results of water quality during the study are present in Table 6.

Table 6. Results of water quality during treatment

Water Quality	Result	Normal	Reference
pH	7,00 – 8,00	6,5 – 8	Khairuman and Amri (2002)
Suhu (^{o}C)	25 – 27	20 – 30 ^{o}C (optimal 27 ^{o}C)	Khairuman and Amri (2002)
Dissolved oxygen (ppm)	4 - 5	>3ppm	Khairuman and Amri (2002)

During the study the condition of the aquatic environment are concerned, ranging from temperature setting and arrangement of the tank is placed in the room. This is done to avoid the current extreme weather can affect the results of research and study. Thus the condition of the water environment during the study was relatively similar in each treatment code, so that the water conditions are very supportive and are in accordance with the needs of catfish (*Clariassp*).

1. Glycogen content in the body of the Catfish (*Clariassp*) were given Feed Substitution between commercial Feed with feed Fermentation

Carbs in Fish muscle is glycogen mostly is a polymer of glucose energy provider that serves as a backup. Glycogen comes from excess glucose into glucose synthesized and will return if necessary. The result analysis of glycogen in the muscle meat of fish is found in Table 7.

Based on the results of the research can be aware that the content of glycogen is best treatment C i.e. of 0.76%. High or low levels of glycogen in the catfish case because nutritional feed consumed every different treatment. Suarsana [11] revealed that the number of glycogen is different in different tissues relies on providing

glucose and energy needs. Although the levels of glycogen in the liver, there is more (3-5%) than in the muscle (0.5-1%), but the amount of glycogen in the muscles more entirely due to more muscle mass.

Table 7. The result analysis of glycogen

Code	Results Analysis Glycogen (%)
A	$0,45^{b} \pm 0,03$
B	$0,53^{bc} \pm 0,02$
C	$0,76^{d} \pm 0,02$
D	$0,60^{c} \pm 0,02$
E	$0,59^{c} \pm 0,02$
Control +	$0,62^{c} \pm 0,06$
Control -	$0,35^{a} \pm 0,03$

CONCLUSION

The conclusions that can be drawn from this study are as follows:

1. Alternative nutrition on nutritional content of fermented cow feces *T.* viride is on the 4th day of fermentation, this is proved by the results of activity of the enzyme cellulase best on day 4. Then on day 4 has shown that the process of solving complex compounds into simpler on carbohydrates (polysaccharides, disaccharides and Monosaccharaides) fine.

2. The results of substitution between alternative nutrition with commercial feed (feed manufacturer) that can provide the best response to the growth and efficiency of feed catfish (*Clariassp*) is on treatment with protein C 30,85% and 43.87 carbohydrates by comparison between a commercial feed substitution: alternative nutrition amounting to 73 : 27 (g). On treatment of C gives a response to the Catfish with SGR 1.96 ± 0.12; EP (the feed efficiency) 87.40 ± 2.49; FCR 1.14 ± 0.03; energy retention 28.33 ± 3.27; digestion (in vitro) of 75.96 ± 0.136; and analysis of the content of glycogen in the muscle meat of fish of 0.76 ± 0.02. But for Survival Rate (SR) has no effect, because the results of the SR on all treatment is 100%.

3. Glycogen content in the body of the catfish (*Clariassp*) were analyzed through muscle meat of catfish (*Clariassp*) of 0.76% with a standard deviation of 0.02. The result analysis of glycogen in the muscle meat of catfish (*Clariassp*) this is a good result, because the content of glycogen are analyzed through the muscle meat of fish have results between 0.5% to 1%. Suarsana [11] revealed that the number of glycogen is different in different tissues relies on providing glucose and energy needs. Although the levels of glycogen in the liver, there is more (3-5%) than in muscle (0.5-1%), but the amount of glycogen in the muscles more entirely due to more muscle mass.

Recommendation

From the results of this research can be advised as follows:

1. Conducted further research on the use of alternative nutrition of beef fermented feces *T*. viride are substitution with other types of commercial feed then given to other types of fish or fish with other growth phase.

2. Further research needs to be done with respect to the number of feeding on catfish (*Clariassp*) On the research of feed is given according to the research conducted by Radhiyufa (2011) in Rahcmawati (2011), namely 3% fish biomass, then x need to do further research on the amount of feed given (e.g. 5% up to 10% x fish biomass).

REFERENCES

1. Mantayborbir, V., Fadjar, M. Mahendra, A.P.W. 2013. Exploration Laser puncture Exposure Effect on Reproductive Point to Increasing Number of Leydig cells Catfish (Clarias sp). *J. Life Sci. Biomed.* 3(6):444-449.
2. Jauhari A., Susilo E, Wilujeng A., Wildan A. 2012. The study of Empowerment of Rural Poor Through development of Cultivating Catfish Household Scale. Cooperation research and Development Agency Prov. East Java with the Faculty of Fisheries and Marine Science University of Brawijaya. Malang.
3. Wood, B. J. B. 1998. Microbiology of Fermented Food.2th. Blackie Academis and Profesional. London.
4. Mandels, M., F. W. Parrish, dan E. T. Reese. 1961. Sophorose As An Inducer Of Cellulase in *Trichodermaviride*. Received for Publication Pioneering Research Division, Quartermaster Research and Engeneering Center, Natick, Massachusetts.
5. Pujaningsih, R. 2005. Fermentation technologies and improvement of the quality of the feed. Food Technology Laboratory of the Livestock, The University of Diponegoro, Semarang.

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Journal homepage: http://jlsb.science-line.com/

6. Widiatmo, Rev. 2010. A heat Value Fuels Research Biomass On Waste animal droppings. Department Of Mechanical Engineering.University of Muhammadiyah.Riau.
7. Romadhon, R and Subagiyo, S and Setyati, WA. 2009. Pemanfaatan Air Perebusan Untuk Pembuatan Kerupuk Ikan Sebagai Produk Alternatif Industri Kecil Bandeng Duri Lunak. Project Report. Fakultas Perikanan Dan Ilmu Kelautan.
8. Gusrina. 2008. Budidaya Ikan Jilid 1. Jakarta: Pusat Perbukuan Departemen Pendidikan.
9. Houlihan, D., T. Boudarddan M. Jobling. 2001. Food Intake in Fish. Blackwell. Science, Oxford, UK, pp. 130-143.
10. Khairuman and Amri, K. 2002. Budidaya Ikan di Sawah. Penebar Swadaya. Jakarta.
11. Suarsana, n. i., b. p. Priosoeryanto, t. Wresdiyati and m. star. 2010. Synthesis of Liver and muscle Glycogen in Diabetic Mice who were given extracts of Tempe. The Veterinary Journal. 11 (3): 190-195.
12. Radhiyufa, M. 2011. Dinamika Fosfat dan Klorofil dengan Penebaran Ikan Nila (*Oreochromis niloticus)* pada Kolam Budidaya Ikan Lele (*Clarias gariepinus)* Sistem Heterotrofik. [Skripsi]. Prodi Biologi Fakultas Sains dan Teknologi Universitas Islam Negeri Syarif Hidayatullah. Jakarta.70 hal.
13. Rahmawati S. 2011. Estimasi cadangan karbon pada komunitas lamun di Pulau Pari, Taman Nasional Kepulauan Seribu, Jakarta*. Jurnal Segara* 7(1):1–12.