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Nutrition and Fiber Fraction Analysis of Fermented Water Hyacinth Plants using Various Probiotics as Alternative Beef Cattle Feed

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ABSTRACT

Apart from being a bioaccumulator, several studies have also proven that water hyacinth has the potential to be an ingredient for animal feed and organic fertilizer because it contains amino acids and other nutritional elements. This research consists of 2 stages. The first stage is the effect of using several probiotics for fermented water hyacinth on nutritional quality and fiber fraction. The 4 types of probiotics used were liquid organic supplements (SOC), burger feed sauce (SBP), microbacter alfaafa 11 (MA-11), and effective microorganisms 4 (EM-4). The use of a liquid dose of each probiotic is 5 ml/1 kg of fresh water hyacinth. The second stage is the effect of the use of probiotic levels of SOC on the nutritional quality and fiber fraction of fermented water hyacinth. The levels of SOC probiotics used were 5 ml, 10 ml and 15 ml for every 1 kg of fresh water hyacinth ingredients. The use of 4 types of probiotics, namely SOC, SBP, MA-11 and EM-4, had a significantly affected in increasing the nutritional content of fresh water hyacinth ingredients, were the percentage of protein, the percentage of crude fat and the percentage of extracts without nitrogen. In this study, the 4 probiotics were able to reduce the fiber fraction, were acid detergent fiber, neutral detergent fiber, hemicellulosa, cellulose and lignin, and also changing the structure of the fiber fraction where the fresh water hyacinth material is a recommendation to be used as an alternative to beef cattle feed. The nutrient content and fiber fraction of the fermented water hyacinth is close to the nutrient content and fiber fraction of natural grasses. The increasing use of probiotic SOC levels will also increase the content of crude protein, crude fat and extracts without nitrogen from 5% to 15% SOC levels. In the fiber fraction, namely hemicellulose, cellulose and lignin in general, the results were significant only at the 5% level.

Key words : *Burger feed sauce; effective microorganism 4; liquid organic supplements; microbacter Alfaafa 11; probiotic*, *water hyacinth*

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INTRODUCTION

The development of ruminants on a small farm scale still depends on the adequacy of the availability of forage feed in terms of quantity, quality and sustainability throughout the year. Forage used for ruminants often experiences shortages, especially in the dry season with low quality. In addition, land use for feed crops still competes with food crops because feed crops have not become a priority. Ruminants have the ability to consume straw or forage types that have low digestibility, such as water hyacinth (Sajimin et al. 2000).

Water hyacinth, Eichornia crassipes (Mart.) Solms (Pontederiaceae family) is an aquatic weed that has high adaptability and reproductive capacity (Wolverton & McDonald, 1999). In some countries, water hyacinth has been recorded to interfere with shipping activities, kill fishing businesses, increase the incidence of diseases caused by mosquitoes that grow faster in water hyacinth overgrown with water hyacinth, and change the composition of aquatic ecosystem biota (Toft et al., 2003). In Indonesia, this plant soon becomes a problem in waters, such as lakes and rivers. In addition to several lakes on the island of Java, Lake Limboto is one of the largest lakes and is famous for its water hyacinth, and its control is quite difficult. Water hyacinth control efforts have been carried out, both using mechanical, chemical, and biological control methods. Chemical control is carried out using herbicides, but this causes higher pollution of aquatic biota. In addition to the negative impact of water hyacinth on the ecosystem, several studies have shown that this weed has several beneficial roles both ecologically and economically.

According to Brix and Schierup (1999), aquatic macrophytes, one of which is water hyacinth, can be used to control pollution in waters. According to Agunbiade et al (2009), water hyacinth can be used as an accumulator of pollutants, especially heavy metals in waters because of its biological properties, including the speed of reproduction. Other studies have shown that water hyacinth can accumulate heavy metals Pb, Cr, Zn, Mn, and Cu (Tiwari et al., 2007). These facts indicate that water hyacinth has great potential as a bioaccumulator in polluted waters, so its existence does not need to be destroyed.

Apart from being a bioaccumulator, several studies have also proven that water hyacinth has the potential to be an ingredient for animal feed, fish feed and organic fertilizer because it contains amino acids and other nutritional elements such as K, Na, Ca, Fe, Mn, Mg, Cu, Zn, S is quite high. Other studies have shown that water hyacinth can be used as a source of potassium which is beneficial for plants (Sriyana, H.Y., 2006).

The potential of water hyacinth as ruminant feed and fish feed can be maximized by fermentation. To increase the nutritional value and reduce the crude fiber of water hyacinth plants, fermentation needs to be carried out. Until now, many fermentative materials have been made by forage nutrition experts in order to increase the nutritional value and microorganisms of the ingredients in the fermentation process. So the purpose of this study was to determine how much the increase in nutritional value and decrease in water hyacinth fiber in the fermentation process.

MATERIALS AND METHODS

This study was conducted in May – August 2022. The water hyacinth fermentation process was carried out at the Ruminant Feed Analysis Laboratory, Department of Animal Science, Faculty of Agriculture, State University of Gorontalo. Proximate analysis and fiber analysis using the Van Soest method were carried out at the Laboratory of Chemistry and Animal Feed, Department of Nutrition and Animal Feed, Faculty of Animal Husbandry, Hasanuddin University, Makassar.

This study consists of 2 stages. The first stage is the effect of using several fermented water hyacinth probiotics on nutritional quality and fiber fraction as an

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alternative to beef cattle feed. The 4 types of probiotics used were liquid organic supplements (SOC), burger feed sauce (SBP), microbacter alfaafa 11 (MA-11), and effective microorganisms 4 (EM-4). The use of liquid dose of each probiotic is 5 ml/1 kg of fresh water hyacinth. This study used a completely randomized design with 5 treatments and 3 replications. The study treatments were as follows:

P0 = Fermentation of water hyacinth without probiotic (Control);
P1 = Fermentation of water hyacinth using SOC probiotic;
P2 = Fermentatin of water hyacinth using SBP probiotic;
P3 = Fermentation of water hyacinth using MA-11 probiotic.
P4 = Fermentation of water hyacinth using EM-4 probiotic.

The length of the fermentation process was 21 days.

The second stage is the Effect of Using Water Hyacinth Fermented Liquid Organic Supplement Levels on Nutrition Quality and Fiber Fraction as an Alternative to Beef Cattle Feed.

The levels of SOC probiotics used were 5 ml, 10 ml and 15 ml for every 1 kg of fresh water hyacinth ingredients. This study used a completely randomized design with 4 treatments and 4 replications. The study treatments were as follows:

T0 = Fermentation of water hyacinth without probiotic SOC (control);
T1 = Fermentation of water hyacinth with a dose of 5 ml/1 kg of fresh water hyacinth;
T2 = Fermentation of water hyacinth with a dose of 10 ml/1 kg of fresh water hyacinth;
T3 = Fermentation of water hyacinth with a dose of 15 ml/1 kg of fresh water hyacinth.

The length of the fermentation process was 21 days. Analysis of nutrient content samples using the proximate method to obtain data on the nutritional content of fermented water hyacinth are percentage of crude protein, percentage of crude fat, percentage of crude fiber and percentage of extract material without nitrogen. While the fiber fraction analysis used the Van Soest method to obtain the percentage of neutral detergent fiber, the percentage of acid detergent fiber, the percentage of hemicellulose, the percentage of cellulose and the percentage of lignin. The data were analyzed statically by analysis of variance and the diffence in the mean value was calculated by the list significant difference (LSD) method at 5% level.

RESULTS AND DISCUSSIONS

The Used of several Probiotics Fermented Water Hyacinth Probiotics on Nutritional Quality and Fiber Fraction

The results of the analysis of the nutritional content and the fiber fractions on water hyacinth fermentation using several probiotics as alternative feed for beef cattle was shown in Table 1 and Table 2.

Table 1. The results of the analysis of nutritional content using several probiotics fermented water hyacinth as an alternative to beef cattle feed.

Variables	Treatments				
	P0	P1	P2	P3	P4
Crude protein (%)	8,38±0, 01^{c}	11,73±0, 05^{a}	10,76±0, 01^{b}	11,13±0, 01^{a}	8,29±0, 01^{c}
Crude Fat (%)	3,32±0,01^{a}	3,02±0,02^{b}	3,08±0,02^{b}	2,60±0,03^{c}	2,44±0,02^{c}
Crude fiber (%)	28,10±0,02 ^{a}	24,77±0,04 ^{b}	24,68±0,05 ^{b}	24,20±0,03 ^{b}	28,61±0,02^{a}
BETN	4,06±0,01 ^{c}	47,06±0,03 ^{b}	47,74±0,02^{ab}	48,49±0,01 ^{a}	45,58±0,02^{c}

Description :
P0 = Fermentation water hyacinth without probiotics (control)
P1 = Fermentation water hyacinth using probiotic SOC
P2 = Fermentation water hyacinth using probiotic SBP
P3 = Fermentation water hyacinth using probiotic MA-11
P4 = Fermentation water hyacinth using probiotic EM-4
BETN = Extract ingredients without nitrogen
Different letters in the same row are significantly affected and the list significant difference at 5% level

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The results of analysis of variance (Table 1) showed that the treatment of several probiotics in water hyacinth fermentation had a significantly affected (P<0.05) on changes in the percentage of crude protein content, percentage of crude fat content, percentage of crude fiber content and the percentage of extracts without nitrogen content. The occurrence of a significant change indicates that the fermentation process was going well as seen in the physical assessment where the percentage of mold appearance was very small, there was almost no change in color, the texture was better and softer, there was no change in smell and the acidity level reaches 4.5. The percentage of crude protein of water hyacinth in the fermentation process for all probiotics showed a significant increase in protein value compared to water hyacinth without fermentation (control) except for probiotic EM-4 which had a slightly lower crude protein value than the control. The results of achieving a high percentage of protein were achieved in SOC probiotics with an increase of 3.35%, then MA-11 by 2.75% and SBP by 2.38%. In contrast to the percentage of crude protein, the percentage of crude fat showed a decrease in all probiotics compared to the control. Crude fat decreased relatively very small in SBP and SOC probiotics, while in MA-11 and EM-4 probiotics it decreased significantly. The percentage of water hyacinth crude fiber in the fermentation process for all probiotics showed a significant decrease compared to unfermented water hyacinth (control) except for the EM4 probiotic which actually increased although it was very small compared to the control. The results of achieving a very low percentage of crude fiber reduction were achieved in SOC, SBP and MA-11 probiotics where the average decrease was between 3.33% - 3.90%. Similar to the percentage of protein, the extract material without nitrogen also experienced a significant increase in all probiotics, except for the EM-4 value which was slightly higher than the control. The highest BETN value was achieved in MA-11 probiotics, then SBP and SOC, each with an average increase of 2.0% – 3.43%.

The results of data analysis that have been shown in the water hyacinth fermentation process indicate that liquid organic supplement probiotics (SOC) have a significant effect in increasing water hyacinth nutrients by increasing the percentage of crude protein content, percentage of crude fat content and decreasing crude fiber content. Comparing the 4 probiotics in this study, it can be recommended that SOC probiotics have a good effect compared to other probiotics.

Table 2. The results of the analysis of the fiber fraction content using several probiotics fermented water hyacinth as an alternative to beef cattle feed

Variables	Treatments				
	P0	P1	P2	P3	P4
ADF (%)	71,58±0,01 ^{a}	69,40±0,02 ^{c}	69,32±0,01 ^{c}	71,63±0,03 ^{a}	70,95±0,02^{b}
NDF (%)	41,90±0,01 ^{a}	34,73±0,03^{b}	34,95±0,02 ^{b}	35,89±0,01 ^{b}	40,03±0,02^{a}
Hemicellulose	36,68±0,03 ^{a}	34,67±0,02^{ab}	34,73±0,02 ^{ab}	35,78±0,02 ^{b}	30,92±0,03^{c}
Cellulose	35,59±0,03 ^{a}	30,50±0,01^{cd}	31,11±0,02^{c}	31,65±0,03 ^{c}	34,07±0,02^{b}
Lignin	6,02±0,02 ^{a}	3,88±0,01 ^{b}	3,40±0,01^{bc}	3,89±0,01 ^{b}	5,63±0,03 ^{a}

Description : PO, P1, P2, P3 dan P4 are the same description refer to Table 1.
Different letters in the same row are significantly affected and the list significant difference at 5% level.
ADF = acid detergen fibre; NDF = neutral detergen fibre

The results of analysis of variance (Table 2) showed that the treatment of several probiotics in water hyacinth fermentation had a significantly affected (P<0.05) on changes in the percentage of fiber fractions content were acid detergent fiber (ADF), neutral detergent fiber (NDF), hemicellulose, cellulose. and lignin.

The ADF fiber fraction content showed a significant decrease in all probiotics to the ADF value compared to unfermented water hyacinth (control),

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except for the microbarter alfaafa 11 (MA-11) probiotic. Liquid organic supplement probiotics (SOC) and feed burger sauce probiotics (SBP) in fermentation showed a significant decrease in the percentage of ADF, while the effective probiotic microorganism 4 (EM-4) showed almost the same results as the control. The decreasing value of ADF from non-fermented to probiotic fermented treatment ranged from 0.63% - 2.26%.

The NDF fiber fraction content showed a significant decrease in all probiotics to the NDF value compared to water hyacinth without fermentation (control). The highest decrease in value occurred in SOC probiotics, then SBP and MA-11 probiotics, while EM-4 probiotics only decreased slightly from before the fermentation process occurred. The decreasing value of NDF from non-fermented to probiotic fermented treatment ranged from 1.87% - 7.17%.

Hemicellulose fiber fraction content, cellulose fiber fraction content and lignin fraction content showed a significant decrease in fiber in all types of probiotics to the value of hemicellulose, cellulose and lignin compared to water hyacinth without fermentation. A large decrease in the value of hemicellulose, cellulose and lignin occurred in the probiotic SOC followed by SBP, MA-11 and EM-4. The decreasing value of hemicellulose from non-fermented to probiotic fermented treatment was in the range of 0.6% - 5.76%. The decreasing value of cellulose from non-fermented to probiotic fermented treatment was in the range of 1.5% – 5.09%. Meanwhile, the decrease in lignin value from non-fermented to probiotic fermented treatment was in the range of 0.39% - 2.62%.

The results of data analysis that have been shown in the water hyacinth fermentation process indicate that liquid organic supplement probiotics (SOC) have a significantly affected in increasing water hyacinth nutrients by increasing percentage of crude protein content, percentage of crude fat content and decreasing crude fiber content. Comparing the 4 probiotics in this study, it can be concluded that SOC probiotics have a good effect compared to other probiotics.

A feed ingredient that will be used as feed and/or alternative to cow feed must of course be based on the achievement of nutritional value or basic living needs even though it is through a fermentation process. Comparing the nutritional content of elephant grass as the main feed, rice straw fermentation and water hyacinth fermentation can be seen in Table 3.

Tabel 3. Comparison of changes in nutritional value between elephantgrass, rice straw fermented with EM-4 and water hyacinth fermented with SOC.

Variables	Elephant grass[1]	Jerami Padi[2]		Eceng Gondok[3]	
		Before Fermentation	After Fermentation	Before Fermentation	After Fermentation
Crude protein (%)	11.23	5.31	7.70	6.31	11.74
Crude Fat (%)	2.42	3.32	2.40	2.66	3.85
Crude fiber (%)	31.56	32.14	30.90	29.30	23.79
BETN	41.82	36.68	38.36	33.45	46.16

Keterangan :
1 = Dumadi E.H et.al (2021)
2 = Fermentation using probiotic of EM-4 (Sarwono and Arianto, 2003)
3 = Fermentation using probiotic SOC (Mukhtar, et.al., 2022)
BETN = Extract ingredients without nitrogen

Comparing elephant grass, fermented rice straw and fermented water hyacinth, showed that before fermented water hyacinth plants had better nutritional content than rice straw, and experienced significant changes after fermentation. The nutritional value was very high in water hyacinth using SOC compared to rice straw using EM-4. The value of the increase was very significant.

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In crude protein, rice straw only increased 2.4% while in water hyacinth increased 5.4%. In crude fiber, rice straw only decreased by 0.9% and in water hyacinth decreased by 5.6%. Likewise with BETN, rice straw only increased 1.7%, while in water hyacinth increased 12.6%. This shows that the quality of the nutritional value of water hyacinth compared to rice straw is very good for ruminant animal feed. Comparing the nutritional value of water hyacinth with fresh elephant grass, it can be seen that the nutritional value of water hyacinth is also still better than the nutritional content of elephant grass, although water hyacinth should not be considered to be able to replace elephant grass as fibrous fodder for ruminants because of its use of fermented ingredients. limited.

The Effect of Using Probiotic Levels of Liquid Organic Suplements Water Hyacinth Fermented on Nutrient Quality and Fiber Fraction

The results of the analysis of the nutritional content and the fiber fractions on water hyacinth fermentation using probiotics levels of liquid organic supplements as alternative feed for beef cattle was shown in Table 4 and Table 5.

Table 4. The results of the analysis of the nutritional content on water hyacinth fermentation using probiotics levels of liquid organic supplements as alternative feed for beef cattle

Variables	Treatment			
	T0	T1	T2	T3
Crude protein (%)	8,38±0, 01[c]	11,73±0, 05 [a]	9,55±0,03 [b]	9,50±0,02 [b]
Crude Fat (%)	3,32±0,01 [a]	3,02±0,02 [b]	2,96±0,03 [b]	2,94±0,01 [b]
Crude fiber (%)	28,10±0,02 [a]	24,77±0,04 [b]	25,72±0,02 [b]	25,99±0,03 [b]
BETN	45,06±0,01 [c]	47,06±0,03 [b]	47,44±0,02 [b]	48,86±0,03 [b]

Descriptions :
T0 = Fermentation of water hyacinth without probiotic SOC
T1 = Fermentation of water hyacinth with a dose of 5 ml/1 kg of fresh water hyacinth
T2 = Fermentation of water hyacinth with a dose of 10 ml/1 kg of fresh water hyacinth
T3 = Fermentation of water hyacinth with a dose of 15 ml/1 kg of fresh water hyacinth
BETN = Extract ingredients without nitrogen
Different letters in the same row are significantly affected and the list significant difference at 5% level.

The results of analysis of variance (Table 4) showed that the treatment of probiotic levels of liquid organic supplements in water hyacinth fermentation had a significantly affected ($P<0.05$) on changes in the percentage of fiber fraction. The occurrence of a significant change indicates that the fermentation process is going well as seen in the physical assessment where the percentage of mold appearance is very little, almost no change in color, the texture becomes better and softer, there is no change in smell and the acidity level reaches 4.8.

The percentage of crude protein of water hyacinth in the fermentation process using the level of probiotic liquid organic supplements (SOC) showed a significant increase in protein value compared to water hyacinth without fermentation (control) and reached the highest value at the level of 5%. Although there was an increase in the percentage of crude protein compared to without fermentation, along with the increase in the level of SOC, it was seen that the percentage value of crude protein was also decreasing. The decrease in crude fiber protein value for every 5% increase in SOC probiotics was 2.23%. From the results obtained, it can be concluded in this study that the level of use of SOC probiotics was only at a dose of 5% for 1 kg of water hyacinth. In contrast to the percentage of crude protein, the percentage of crude fat of water hyacinth in the fermentation process using probiotic levels of liquid organic supplements (SOC) showed a significant decrease in crude fat values at each level, although the value of the decrease was

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almost no different at the 5%, 10% and 10% levels. 15%.

The percentage of crude fiber of water hyacinth in the fermentation process using probiotic levels of liquid organic supplements (SOC) shows a very significant crude fiber value. This shows that SOC probiotics are very successful in the fermentation process in cell wall remodeling. Although there was a significant decrease in crude fiber percentage at the 5% level, the increase from 5% level of probiotic SOC to 10% or to 15% did not change the percentage of crude fiber or there was a static value. The percentage of water hyacinth extract without nitrogen (BETN) in the fermentation process using the probiotic level of liquid organic supplements (SOC) showed a significant increase in the BETN value at each level. The increase in the value of the BETN ranged from 2.0% - 3.8%.

Table 5 The results of the analysis of the fiber fraction content of fermented water hyacinth using probiotic levels of liquid organic supplements as an alternative to beef cattle feed

Variabel	Perlakuan			
	T0	T1	T2	T3
ADF (%)	71,58±0,01 [a]	69,40±0,02 [b]	71,54±0,01 [a]	71,52±0,03 [a]
NDF (%)	41,90±0,01 [a]	34,73±0,02 [b]	34,92±0,04 [b]	35,87±0,03 [b]
Hemicellulosa	36,68±0,03 [a]	34,67±0,02 [c]	35,82±0,02 [b]	35,65±0,02 [b]
Sellulosa	35,59±0,03 [a]	30,50±0,01 [c]	30,26±0,02[c]	31,19±0,03 [b]
Lignin	6,02±0,02 [a]	3,88±0,01 [c]	4,35±0,02 [b]	4,35±0,03 [b]

Description : TO, T1, T2 and T3 are the same description refer to Table 3.
Different letters in the same row are significantly affected and the list significant difference at 5% level.
ADF = acid detergen fibre; NDF = neutral detergen fibre

The results of the analysis of variance (Table 4) showed that the level of probiotic liquid organic supplement (SOC) treatment in water hyacinth fermentation had a significantly affeected ($P<0.05$) on changes in the percentage of fiber fractions, namely acid detergent fiber (ADF), neutral detergent fiber ($P<0.05$) NDF), hemicellulose, cellulose and lignin.

The ADF fiber fraction showed a significant decrease at the 5% level compared to the control, but there was no change at the 10% and 15% levels. This shows that the best level of use of SOC in changing the ADF content of water hyacinth is 5%. Meanwhile, the NDF fiber fraction showed a significant decrease at all levels of SOC usage. The decrease in NDF fraction at all SOC levels was in the range of 6.03% – 7.23%. Hemicellulose fiber fraction, cellulose fiber fraction and lignin fraction showed a significant decrease in fiber fraction on all levels of probiotic SOC use compared to water hyacinth without fermentation (control). The decrease in the value of the hemicellulosic fraction ranged from 0.86% to 2.01%. The decrease in the value of the cellulose fraction ranged from 4.40% to 5.33%. While the decrease in the value of the lignin fraction ranged from 1.67% - 2.01%.

The results of data analysis that have been shown in the water hyacinth fermentation process indicate that the level of probiotic liquid organic supplements (SOC) has a significantly affected, but in some fiber fractions it did not showed any changed. In this study it can be concluded that the increasing use of probiotic levels of SOC will also increase the percentage of crude protein content, percentage of crude fat content and percentage of extracts without nitrogen content, and further reduce the value of percentage crude fiber content from control to the highest level of use of probiotic SOC, which is 15%. In the fiber fraction were percentage of hemicellulose, percentage of cellulose and percentage of lignin in general, the results were significant only at the 5% level.

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One solution to increase and maintain livestock productivity is by maximizing the optimal supply of nutrients to livestock according to their genetics, by adding additive feed ingredients in the form of probiotics, vitamins, macro minerals and micro minerals to increase productivity and quality and maintain livestock health from gastrointestinal infections. The use of several probiotics in this study indicated an increase in nutrients and a decrease in the value of crude fiber. Probiotics are feed additives that can improve the performance of the rumen function, one of which contains high cellulolytic bacteria, in order to utilize green and agricultural waste and industrial waste efficiently to produce maximum livestock products. Fuller (1989) states that probiotics are feed additives in the form of live microbes that can improve the balance and digestive function of the host animal, manipulate the microflora of the digestive tract for the purpose of improving health conditions and increasing production. This probiotic can also play a role in providing enzymes that are able to digest crude fiber (SK) and can produce acid (lactic acid bacteria). So it can be said that the working principle of probiotics in the digestive system is in the presence of live microorganisms that can improve balance and digestive function for the host animal and are able to improve the microflora of the digestive tract, thereby increasing digestibility. In addition, the addition of probiotics also needs to pay attention to the condition of digestive organs such as the stomach (rumen) of livestock, which already have microbes.

The results showed that the addition of probiotics to beef cattle feed was able to provide NH3 in the rumen for microbial protein synthesis, where this microbial protein is a source of protein for ruminants. Furthermore, the addition of probiotics to complete feed can increase digestibility, NH3 concentration, and VFA in vitro. So it can be concluded that the addition of probitok can increase the digestibility of feed, increase the efficiency of feed use.

The results of this study can be concluded that the use of 4 types of probiotics, namely liquid organic supplements (SOC), burger feed sauce (SBP), microbacter alfaafa 11 (MA-11) and effective microorganism 4 (EM-4) has a significant effect on changing and improving the nutritional content of fresh water hyacinth ingredients and changing the structure of the fiber fraction where this fresh water hyacinth ingredient is a recommendation to be used as an alternative feed for beef cattle. The nutrient content and fiber fraction of the fermented water hyacinth is close to the nutrient content and fiber fraction of grasses. It can also be concluded that SOC probiotics are the best probiotics from other probiotics used in this study.

CONCLUTION

The use of 4 types of probiotics were liquid organic supplements (SOC), burger feed sauce (SBP), microbacter alfaafa 11 (MA-11) and effective microorganism 4 (EM-4) has a real effect on changing and increasing the nutritional content of fresh water hyacinth ingredients. as well as changing the structure of the fiber fraction where the fresh water hyacinth materials is a recommendation to be used as an alternative feed for beef cattle. The nutrient content and fiber fraction of the fermented water hyacinth is close to the nutrient content and fiber fraction of grasses. SOC probiotics are the best probiotics from other probiotics used in this study. The increasing use of SOC probiotic levels will also increase the content of crude protein, crude fat and extracts without nitrogen, and further reduce the crude fiber value from control to the highest level of use of SOC probiotics, which is 15%. In the fiber fraction, namely hemicellulose, cellulose and lignin in general, the results were significant only at the 5% level.

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